



AKASH AGARWAL CLASSES

PAPER -12 MANAGEMENT ACCOUNTING

INDEX

Sr. no.	Chapter name	Page no.
1	Introduction to management accounting	1-37
2	Marginal costing	38-74
3	Transfer pricing	75-134
4	Standard costing	135-155
5	Budget and budgetary control	156-189
6	Learning curve	190-211
7	Activity based costing	212-240
8	Divisional performance measurement	
a.	Organisations with Multiple divisions, Benefits of Decentralization	241-247
b.	DuPont Analysis	248-259
c.	Divisional Performance Measurement tools – ROI, Residual Income	260-281
d.	Economic Value Added – Definition, EVA Centre, EVA Driver	282-293
e.	Balanced Score Card for Variable Pay Management	294-311
9	Decision Theory	312-393
10	Responsibility Accounting	394-432
	BUILDING BLOCKS	433

CONTACT: 8007777042/043

CA AKASH
AGARWAL

CA SHRUTI
AGARWAL



Conceptual Understanding

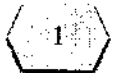
INTRODUCTION:

Accounting is, primarily, the process of keeping records of financial transactions. It encompasses systematic recording, reporting, and analysis of the financial activity of an organisation. Interested parties can analyse the financial performance of companies using accounting information which is the end product of the process of accounting. Accounting information is used by the stakeholders of the company, namely the employees, shareholders, creditors, banks and other lenders, regulatory agencies and tax authorities, etc. for decision making purpose. It is also the language through which the organizations can communicate with the external world.

In 2014, Warren Buffet gave valuable advice to a 17-year-old intern at an investment firm . Buffet referred to accounting as the language of business, since much like a foreign language it must be learned before understanding. This captures the essence of the function of accounting. Language is the basis of communication between two people. So is accounting. It is the language in which the business communicates with the stakeholders, who are also referred as the users . It is important to note that the

AKASH AGARWAL CLASSES

CONT:8007777042/043





users are either internal (managers, shareholders, employees, creditors) or external (potential investors and government).

The user considers the financial information communicated by the business through the language of accounting for purpose of decision making. Various users have various information needs. In the following lines some of the major users along with their financial information needs are given:

- **Owners/Investors** - The primary objective of accounting is to provide necessary information to the owners/ investors relating to their business. The shareholders of a company are interested in the accounting information with a view to ascertaining the profitability and financial strength of the company.
- **Management** - Generally, there is a separation of the ownership and management functions. The managements require a different set of financial information which helps them in their internal decision making.
- **Creditors** - Trade creditors, debenture holders, bankers, and other lending institutions are interested in knowing the short-term as well as long-term position of the company. The financial statements provide the required information for ascertaining such position.
- **Regulatory Agencies** - Various governments and other agencies use accounting reports not only as a basis for tax assessment but also in evaluating how well the business are operating under regulatory framework.



- **Government** - Governments use financial statements for compiling statistics concerning business units, which, assist compilation of national accounts.
- **Potential Investors** - potential investors use the information in accounting reports to a greater extent in order to determine the relative merits of various investment opportunities.
- **Employees** - Employees are interested in the earnings of the enterprise because their remuneration depend on the quantum of profits earned.
- **Researchers** - Research scholars in their research in accounting theory as well as business affairs and practices also use accounting data.

The above list is not exhaustive and there are various other stakeholders whose financial information need is varied.

Thus, the list of actual and potential users of accounting information is exhaustive. From the above, it is obvious that the accounting information need of the management is different from the others. The term management encompass the entire range of activities involved in running an organisation. There are basically three levels of the management; top level, middle level and lower level. Though the financial information need of the three levels varies but their essence is similar: decision making. The top level management is entrusted with the critical task of making effective and efficient decisions which is reflected in company performance measured in terms of profit and market share.

There are, as such, three branches of accounting:

- **Financial Accounting**



- Cost accounting
- Management Accounting.

The above categorisation is on the basis of the presentation, legal requirements and the financial information each of them generate. Though the aspect is taken up in details in the next section of this module, in a nutshell it may be noted that the management accounting is concerned with the provision of accounting information to people within the organisation (internal users) to help them make better decisions and improve the efficiency and effectiveness of existing operations, whereas financial accounting is concerned with the provision of accounting information to external users. Thus, management accounting is often related to internal reporting while financial accounting is related to external reporting. Though the scope of cost accounting is narrow, it is important as it discusses the nuances of the process of cost accumulation for fixation of sale price and valuation of inventory which are the most important aspects of management decision making.

What is Management Accounting?

Management Accounting comprise of two terms 'management' and 'accounting'. While management is all about running an organisation in consonance with the strategic goal, accounting may be seen to encompass any of the activities that attempt to gauge the performance of an organisation. It includes the traditional 'accounting' roles of stewardship, control and audit. In a nutshell, management accounting is accounting (i.e. producing useful information) for management (people with the task of running the business). In this sense, management accounting includes the



production of all information useful in running the organisation. Information, as such, may be :

- financial or non-financial;
- accurate, or broadly correct;
- actual (certain) or estimated (uncertain);
- based in the past or the future;
- detailed, or in a highly aggregated form;
- presented in any of a variety of spoken or written forms, such as numbers, tables, and graphs;
- related to profits/losses, costs/incomes, volumes, quality indicators, trends, etc.

On the other, 'management' may include the activities of individuals in a number of positions, for example:

- senior managers;
- mid-level managers;
- lower-level managers;
- executive directors with management responsibilities;

Chartered Institute of Management Accounting (CIMA) have taken a more wide-ranging view of the scope of management accounting and have tended to take a broader 'management consultancy' view of the work of their members. CIMA provides a comprehensive definition of the term. CIMA official terminology states that management accounting is the application of the principles of accounting and financial management to create, protect, preserve and increase value for the



stakeholders of for-profit and not-for-profit enterprises in the public and private sectors. The document further states that management accounting is an integral part of management. The discipline requires the identification, generation, presentation, interpretation and use of relevant information to:

- 1) Inform strategic decisions and formulate business strategy
- 2) Plan long, medium and short-run operations
- 3) Determine capital structure
- 4) Design reward strategies for executives and shareholders
- 5) Inform operational decisions
- 6) Control operations and ensure the efficient use of resources
- 7) Measure and report financial and non-financial performance to management and other stakeholders
- 8) Safeguard tangible and intangible assets
- 9) Implement corporate governance procedures, risk management and internal controls.

The above nine points, thus, encompasses the scope and significance of management accounting.

Colin Drury states that management accounting combines accounting, finance and management with the leading edge techniques needed to drive successful businesses.

Professionals, in this discipline are functionaries who:

- Advise managers about the financial implications of projects.
- Explain the financial consequences of business decisions.
- Formulate business strategy



- Monitor spending and financial control.
- Conduct Internal business audits.
- Explain the impact of the competitive landscape and
- Bring a high level of professionalism and integrity to business

From the above definition provided by CIMA it is obvious that Management Accounting refers to presentation of accounting information to management by the Management Accountant, in such a way as to assist them in their managerial functions of decision-making, planning and control. Thus, Management Accounting deals with creation and presentation of accounting information for managerial or other decision making purposes. The purpose of management accounting is to assist management in running the business in ways that will improve the performance of the business. Various authors have provided insights about what management accounting comprises of. The following four conceptualisation are noteworthy:

1) Garrison and Noreen (2000) state that managerial accounting is 'concerned with providing information to managers – that is, people inside an organisation who direct and control its operations'. The authors further states that it 'provides the essential data with which organisations are actually run' and that it is 'concerned with providing information to managers for use in planning and controlling operations and in decision making'.

2) Wilson and Way (1993) state that 'managerial accounting encompasses techniques and processes that are intended to provide financial and non-financial information to



people with an organisation to make better decisions and thereby achieve organisational control and enhance organisational effectiveness'.

3) Johnson and Kaplan (1987)

explain that management accounting theory arises from the needs of manufacturing companies. They also explain that the development of management accounting happened mainly because of the need to measure and value the work-in-progress and inventory for financial statements and tax purposes which therefore raised a few issues to the service sector due to the absence of inventory.

4) Horngren, Datter and Rajan (2015) argues that management accounting is the process of measuring, analyzing, and reporting financial and nonfinancial information that helps managers make decisions to fulfill the goals of an organization. Managers use management accounting information to:

- (i) Develop, communicate, and implement strategies and
- (ii) Coordinate product design, production, and marketing decisions and evaluate a company's performance

The above mentioned definitions put forward by the authors sums up the discussion of what management accounting is.

There have been some significant changes during the last few decades, like enhanced global competition, deregulation, growth in the service industries, decline in product life cycles, advances in manufacturing and information technologies, changing dimension of the environmental issues and companies becoming more customer driven to sustain in the competitive environment these issues have changed



the fundamental nature of the business environment. These changes have significantly altered the ways in which firms operate, which in turn, have resulted in changes in management accounting practices. In order to survive in today's competitive environment, companies have had to become more customer driven and have started recognizing that customers are crucial to the success of the companies. This has resulted in companies making customer satisfaction an overriding priority and to focus on identifying and achieving the key success factors that are necessary to be successful in today's competitive environment. Management accounting, which focuses on decision making, is becoming increasingly important as efficient and effective decision making is key to realizing strategic goal which is all important in the new VUCA environment.

Scope of Management Accounting

In the previous section it is reiterated that there is no single definition of management accounting. Therefore, the work of a management accountant cannot be listed exhaustively. It is also important to note that the scope of management accounting is evolving with the advent of time and business environment and thus some traditional areas may have become obsolete and are to be discarded while some new areas may gradually become accepted as mainstream management accounting activities. Based on coverage of contemporary management accounting textbooks, some of the broad areas considered to be part of 'management accounting' is summarised in the following lines:



- Budgeting, planning and forecasting
- Measuring organisational, divisional and departmental performance
- Comparing results and performance within and between organisations
- Assisting in the process of increasing effectiveness and efficiency
- Assessing the performance of past and future capital investments
- Advising on decisions about product mix, markets to be served and selling prices
- Advising on decisions on whether to outsource products, components, activities and services
- Advising on decisions involving the investment of scarce funds between a range of possible alternatives
- Assisting in the making of a wide range of strategic decisions

The above mentioned are some of the relatively precarious activities of the higher level management. While the fundamental activities of management accounting would include:

- calculating the profitability of products, services and operations,
- allocating costs to products,
- setting inter-divisional transfer prices.

There are also some functions of the management accountant which are focussed on delivering critical information to the top level management for initiating the process of increasing effectiveness and efficiency. Techniques such as activity-based cost management and theory of constraints are examples of such specialised activities.



A moot question arises as to whether capital investment appraisal would be included in the discipline of management accounting or in the discipline of financial management. Some authors prefer to include this within the scope of management accounting while others prefer this to be included within the scope of financial management. Possible reason for this dual coverage is that capital investment appraisal deals with investment decisions that have a strategically important effect upon the organisation. Thus, when the strategic aspects of management accounting are considered, investment decisions are part of the work of management accountants. Whereas when the strategic financing decisions related to such investments are made, these decisions form part of financial management. It is obvious from the above discussion that decisions relating to capital investment appraisal cannot be made in a one-dimensional way as financial managers, management accountants, cost accountant and financial accountants are all related to various facets of investment decision.

Evolution of Management Accounting

Management accounting is an offshoot of financial accounting and has specific linkages with cost accounting. With advent of time the discipline of Management accounting developed as a faculty and it has evolved as a profession. Financial literature suggest that the beginning of management accounting is linked with the requirement for accounting information to optimize economic resources during the Industrial Revolution in the United Kingdom. Creation of large corporations and increased competition put pressure on corporations to internalize transactions that



were previously priced by the market. This is yet another reason for the development of the discipline of management accounting. The International Accounting Federation (IFAC, 1998) has described the evolution of managerial accounting through four phases.

- a) First stage (prior to 1950s)
 - b) Second stage (1950s - 1965)
 - c) Third stage (1965 - 1985)
 - d) Fourth stage (1985 - till date)
- The first stage (prior to 1950) which is also referred as the 'classical era' is the period where the focus was on cost determination and financial control. At this stage, the development of managerial accounting was oriented to determining costs and financial control of business processes. IFAC describes this period of Management accounting as 'the technical activity needed to achieve organizational objectives. Managerial accounting before the 1950s was mainly focused on determining the cost of the product. Production technology was relatively simple, with products passing through a number of distinct processes. Societies produced relatively homogeneous products that consumed the same amount of resources and identifying the cost of work and material was easy and the processes were driven by the speed of manual operations.

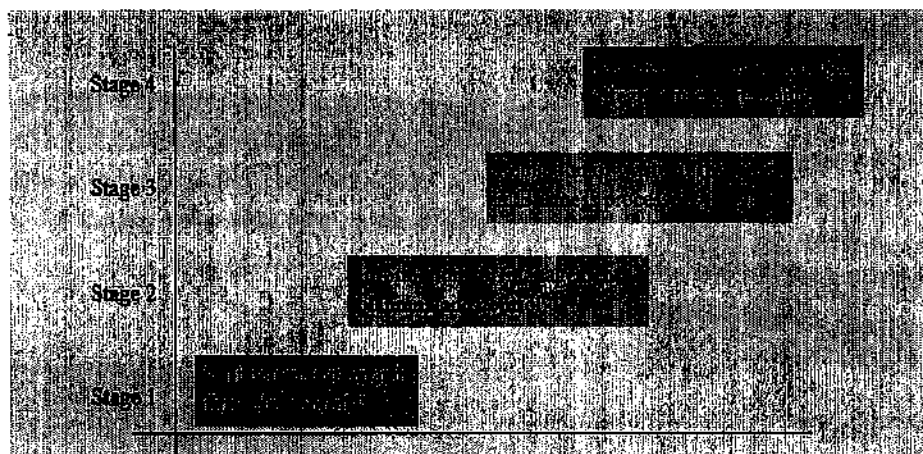


- The second stage (1950-1965) is referred as the age of information for management planning and control. During this period the main focus of managerial accounting was to provide information on planning and control issues. This phase is characterized by the use of traditional accounting management techniques that support decision making and responsibility accounting. Management accounting techniques such as: Standard Costs and Profitability Analysis were introduced during this period. The second phase is described as 'management activity, but in the role of staff'. During this period, the management was focused on the company's production process and internal analysis and paid less attention to external business environment.
- During the third stage (1965 - 1985), management accounting focussed on reduction of waste of resources in production processes by eliminating 'no-value activities'. During this period, Japan's economic progress and rapid technological developments contributed to the growth of global competition. The priority for the companies was to adapt to the new business environment. Companies began to seek both cost reduction and quality improvement at the same time. The use of robotics and computer-controlled processes enabled companies to improve their quality and in many cases impact on cost reduction.
- Creation of value through effective resource use is the epitome of the Fourth Stage (1985-2000). During this period, technological innovations were at the forefront and competition was intensified. Companies, as they were faced with major business uncertainties were made to focus on value creation through effective use of resources, which could be achieved 'with the use of technology



that drives companies to create customer value, shareholder value, and organizational innovations¹⁷. The managerial accounting techniques that dominated this period are: Activity-based Cost (ABC); Production just in time (JIT); Target cost; balanced scorecard; Value chain analysis and strategic management accounting.

The evolution of management accounting as discussed in the previous lines may be pictorially represented as follows:



The distinction between Stage 2, Stage 3 and Stage 4 is the shift of focus from providing information to management in the form of loss reduction to and value creation. The focus on providing information in Stage 2, however, did not disappear,



but is refreshed in Stage 3 and 4. Information becomes a resource, along with other organizational resources. Management Accounting in Stage 3 and 4 is seen as, 'An integral part of the management process because timely information is directly attributed to management and the distinction between staff and management of the first line becomes invisible (IFAC, 1998). The use of resources to create value today is an essential part of the management process in contemporary organisations.

One very conceptual summarization of the evolution of the various tools and techniques of management accounting is found in the study of Gliubic (2012). The various tools and techniques developed in various stages is being contextualised in the study. In the following lines a pictorial representation is presented which is self-explanatory.

Focus	Cost determination and financial control	Information for planning and control	Reduction of waste of resource in Business operation	Creation of Value through effective resource
Stages →	1760 -1950	1950 -1965	1965 -1985	1985 - till date
Methods ↓				
	Cost determination	Standard cost accounting - developments		
	Standard costing	Marginal costing		



Cost determination and accounting	Direct Costing	Target costing		
	Records of cost accounting		Activity based costing	
	allocation of indirect cost		Activity based management	
	Uniform costing			
Planning	Absorption costing			
	Budgeting	Application of discounted cash flow		
Controlling		Transfer costing		
	Return on Investments (ROI)	Responsibility accounting	Application of Kaizen	
	ton -mile ratio	Gentani system	Just in time system	
Strategic		Kaizen costing		
			Life Cycle costing	Value chain analysis



analysis				Five Forces Model
				PEST, SWOT analysis
				Customer profitability analysis
				Competitors analysis
				Balanced scorecard

It is evident from the above table that till the second stage, more or less traditional management accounting techniques were prevalent but with the advent of the 3rd stage and especially in the 4th stage the focus shifted to strategic analysis and various contemporary tools and techniques were adopted into the management accounting discipline which primarily focussed on strategic analysis. In the following lines a classification of some of the traditional and contemporary accounting management techniques is presented, which is derived from the discussion.



Traditional Techniques	Contemporary Techniques
Financial statement analysis	Target Cost
Cash Flow analysis	Just in time
Marginal Costing	Total Quality Management
Absorption Costing	Theory of Constraints
Standard Costing	Value chain analysis
Opportunity Cost	Benchmarking
Budgeting	SWOT analysis
Cost-volume-profit (CVP) analysis	Balanced scorecard
Activity based costing (ABC)	Kaizen (continuous improvement)

The Management Accountant and Strategic Decisions

Strategies are long term plans which help organisations to realise its goal. Strategy is defined as a general direction set for the company and its various components to achieve a desired state in the future. A company's strategy specifies how the organisation matches its own capabilities with the opportunities in the marketplace.

Basically businesses follow one of two broad strategies. Some companies follow a cost leadership strategy. These companies, for long term sustenance, choose to provide quality products or services at low prices and by cautiously managing their costs.



Other companies follow a product differentiation strategy. These companies offer differentiated or unique products or services that appeal to their customers. The products are often priced higher than the products or services of their competitors. Managers are faced with various challenges. One such is to decide between the two strategies discussed above. The crucial issue is that this has long term impact on profitability and growth of the company. Management accountants work closely with managers in various departments to formulate strategies by providing information about the sources of competitive advantage, such as:

- the company's cost, productivity, or efficiency advantage relative to competitors or
- the superior prices the company can charge relative to the costs of adding features that make its products or services distinctive.

Strategic cost management describes cost management that specifically focuses on strategic issues. Management accounting information helps managers formulate strategy by answering the following questions:

- Who are the most important customers, and how can the company deliver value to the customers?
- What substitute products exist in the marketplace, and how do they differ from products of the company in terms of features, price, cost, and quality?
- What is most critical capability of the company which may be technology, production, or marketing?
- How can we leverage it for new strategic initiatives?



e) *Will adequate cash be available to fund the strategy, or will additional funds need to be raised?*

The best-designed strategies and the best-developed capabilities are useless unless they are effectively executed which depends primarily on the information generated and provided by the management accountant. This linkage between successful implementation of strategy and the accounting information generated by management accounting is the subject matter of strategic cost management.



Relationship between Management

Accounting and Cost Accounting

Financial accounting, cost accounting and management accounting are branches of the discipline of Accounting. Any discussion on management accounting and cost accounting is incomplete if the broader aspect of accounting and the important classification of it, namely financial accounting, is set aside. In the below mentioned lines a comparative analysis of the three branches of accounting is considered. The focus being on Management Accounting and Cost Accounting.

Financial accounting, generally, provides information on financial transactions that have occurred in the past, while management accounting provides financial and non-financial information that influences future decision making. Management accounting is not subject to externally-imposed reporting rules (e.g., provisions of Companies Act, 2013 regarding preparation and presentation of financial statements and Ind AS).

Information provided by management accounting is much more detailed and multidisciplinary than the information generated by financial accounting. Both are part of the overall accounting information system. Financial accounting and management accounting cannot exist independently though they make up two different areas of study. Both the areas of study provide useful accounting information. Financial accounting aids recording of countless transactions, and compare an entity's performance between two or more periods or performance



comparison between two entities. In contrast, management accounting helps analyse and evaluate performance, which enables management to make effective judgments regarding the establishment of strategy, plans, and policies for the future.

From the above analysis, the difference between financial accounting and management accounting is obvious as the disciplines are well demarcated. Though the difference between financial accounting and management accounting has been discussed in module 1 of paper 8, it is reiterated below for easy referencing.

The key difference between financial accounting and management accounting is that financial accounting is the preparation of financial reports for the analysis by the external users interested in knowing the company's financial position. In contrast, management accounting is the preparation of financial and non-financial information, which helps managers (internal user) make policies and strategies for the company. The distinguishing features of the two are presented in a tabular format in the next few line.

Basis for Comparison	Financial Accounting	Management Accounting
Purpose	Financial Accounting classifies, analyses, records, and summarizes the financial transactions of a particular period of the company.	Management accounting helps management make effective decisions about the business.
Application	Financial accounting is prepared to reflect true and fair picture of	Management accounting helps management to take



	financial affairs.	meaningful steps and strategize.
Scope	The scope is pervasive, but not as much as the management accounting.	The scope is much broader.
Information type	Quantitative.	Quantitative and qualitative.
Inter dependence	It is not dependent on management accounting.	Management accounting is basically decision making accounting and depends on information created by Financial Accounting as well as Cost Accounting.
Statutory requirement	It is legally mandatory to prepare financial accounts of all companies. (for example in the Indian Context Companies Act 2013, relevant rules of Accounting standards furnishes the statutory requirements)	Management accounting has no statutory requirement.
Format	Financial accounting has specific formats for presenting and recording	There's no set format for presenting information in management accounting.



	Information.	
Users	Mainly for potential investors as well as all stakeholders.	Only for management.
Verifiable	The information presented is verifiable.	The information presented is predictive and not immediately verifiable.

Cost Accounting and Management Accounting – a comparative analysis

The difference between cost accounting and management accounting are not so well defined and the demarcation line is not clearly drawn. Management accounting is very closely linked to cost accounting; so closely, in fact, that it is difficult to say where cost accounting ends and where management accounting begins. They overlap with each other. A study of the literature reveals that the distinction between cost accounting and management accounting is not clear cut and the two terms are often used synonymously. But it is apparent that cost accounting deals with the process of cost accumulation for inventory valuation to meet the requirements of external reporting and to some extent, profit measurement as computation of cost and sale price fixation are integral aspects of cost accounting. Whereas management accounting relates to the provision of suitable information for decision-making, planning, control and performance evaluation. Point wise comparison of the cost accounting and management accounting is presented below:



Cost Accounting and Management Accounting – A comparison:

- (i) The scope of management accounting is broader than that of cost accounting.
- (ii) It is not legally binding to have cost and management accounting systems installed in the organisations as the information generated by both cost accounting and management accounting are for the use of the internal users only.
- (iii) Cost accounting provides only cost information for managerial use whereas management accounting provides all types of accounting information i.e., cost accounting as well as financial accounting information.
- (iv) In Cost accounting, the main emphasis is on cost ascertainment and cost control whereas in management accounting the main emphasis is on decision-making.
- (v) Cost Accounting is a part of Management Accounting whereas Management accounting is an extension of managerial aspects of cost accounting with the ultimate intention to protect the interests of the business.
- (vi) The tools and techniques of cost accounting and management accounting differs.



A comparative analysis between the two is presented in tabular format in the below mentioned lines:

The basis for Comparison	Cost Accounting	Management Accounting
Meaning	Cost accounting revolves around cost computation, cost control, and cost reduction.	Management accounting helps management make effective decisions about operations of the business.
Application	Cost accounting prevents a business from incurring costs beyond budget.	Management accounting offers a big picture of how management should strategize.
Scope	The scope is much narrower.	The scope is much broader.
Measuring grid	Quantitative.	Quantitative and qualitative.
Sub-set	Cost accounting is one of the many sub-sets of management accounting.	Management accounting is the universal set.
Basis of decision making	The task of decision making very less. Even if there is some, it is based on historic information.	Historic and predictive information is the basis of decision-making.
Statutory requirement	Statutory audit of cost accounting is a requirement in some specified industries ²³	The audit of management accounting has no statutory requirement.
Dependence	Cost accounting isn't dependent on management	Management accounting is dependent on both cost &



	accounting to be successfully implemented.	financial accounting for successful implementation.
Used for	Management, shareholders, and vendors.	Only for management.

Thus, it may be inferred that management accounting greatly assists the management in achieving better results by making a clear shift in emphasis from mere recording of transactions to an analysis and interpretation of the transactions which provide a new dimension to the management in their decision making efforts. The tools and techniques of management accounting focuses primarily on formulation of budgets and pre-setting of standards as well as evaluation of deviations in actual performance and also implementation of prompt remedial measures. Management Accounting involves the interpretation of accounting information intended specifically to aid management in running the business. It is concerned with the presentation of accounting information and not with its preparations. Managers use this information in setting the company's overall goals, evaluating the performance of departments and individuals, deciding whether to introduce a new line of products etc. Much of the management accounting information is financial in nature and is prepared in a manner suitable to the making of the decision on the table. Financial information, as such, comprises the largest component of every management information system. The simple reason is that every economic decision involves financial consideration.



Role of a Management Accountant in Modern Business World

The business world has radically changed from what it used to be a few decades ago and accordingly the role of the management accountant has evolved substantially.

The functions of management accountants are dictated by their job positions, agreement with the organisation, knowledge, and capabilities. Before sketching the role of the management accountant in the modern business world, it is pertinent to look into the traditional function of the management accountant which are given in the below mentioned lines.

Functions of the Management Accountant

The management accountant is responsible for the installation, development and efficient functioning of the management accounting system. They are an important part of an organisation's decision-making process. They are responsible for ensuring that managers on behalf of the businesses make well-informed decisions. Financial analysis of management information is provided by management accountants. This is accomplished through preparing, developing, and analyzing financial data which enables strategic and operational decisions to be made by the organization. The functions of a management accountant can be categorized as below:



- a) **Planning and Accounting** - Management accountants prepare an accounting system covering costs, sales forecasts, profit planning, production planning, and allocation of resources. It should also include capital budgeting, short-term and long-term financial planning. They also prepare the procedures necessary to implement the plan effectively.
- b) **Controlling** - Management accountants assist in the control of an organisation's performance through the use of standard costing, budget control, accounting ratios, funds flow statements, cost-cutting initiatives, and assessing capital expenditure proposals and returns on investment.
- c) **Reporting** - Management accountants assist the top management in finding out the root cause of an unfavorable operation or event by identifying the real reasons for the adverse events as well as the responsible parties and comprehensively reporting them.
- d) **Coordinating** - Management accountants improve an organisation's efficiency and profits by providing various coordination tools such as budgeting, financial reporting, financial analysis and interpretation, and so on. These tools aid management by comparing cost and financial records, preparing financial budgets and establishing standard costs, and analyzing cost deviations to enable management by exception.
- e) **Communication** - Management accountants create a wide range of reports to communicate results to the superiors. Through published financial statements and returns, they also inform the outside world about their company's success.



- f) **Financial evaluation and Interpretation** - Management accountants analyze the data and present it to the management in a non-technical approach, together with their comments and ideas, so that the shareholders and senior management can understand it and make informed decisions.
- g) **Tax Administration** - Management accountants are in charge of tax policies and processes. They make the reports that are required by various authorities. Further, they ensure that quarterly tax payments are made in advance, as required by the relevant Act, to prevent the payment of penal interest on late tax payments.
- h) **Evaluation of external effects** - There may be changes in government policy and existing laws. These amendments and policy changes can affect business goals. Management accountants assess the extent of any impact of these external factors on the business and report it to the stakeholder to take necessary precautionary measures.
- i) **Economic appraisal** - When the government makes regular announcements about the country's economic situation, management accountants is entrusted with making the economic study and determine the influence of current economic conditions on the company's operations. They compile a report containing their observations and present it to high management.
- j) **Asset Protection** - Management accountants separate fixed asset registers for each type and provide internal checks and controls to protect the company's assets. They also create the rules and regulations for each type of fixed asset and get insurance coverage for all types of fixed assets.



On the basis of the above discussion it is evident that the role of the management accountant is broad and includes identifying and managing risk, analyzing information, and using it to make plans, and budgets which are cordial to making informed business decisions. The roles of management accountants can be classified as:

- a) To consult with the segments of management responsible for policies and procedures and look into the effectiveness of those policies and procedures.
- b) To make comparisons to the operational plan and standards, as well as to report and evaluate operational outcomes to all levels of management and the business owners.
- c) Establish, coordinate, and execute an adequate plan of operation and control as an inherent aspect of management. Such a plan would include spending budgets, profit planning, sales forecasts, and capital investment and financing program, as well as the procedures necessary to carry out the plan.
- d) To ensure the financial security of the company's assets through effective internal controls and adequate insurance coverages.

The Management Accountant and the Modern Business World

The word 'modern' is a misnomer and cannot be defined precisely. So is the concept of 'modern business world'. It is ever changing and cannot be precisely set within a time frame. As such, the era of globalization may be considered as a not-so-precise definition of the 'modern business world'. The term 'globalization' was proposed for



the first time in 1983, by Theodore Levitt, when he talked about the convergence of the markets around the world. The International Monetary Fund defined globalization as the 'growing economic interdependence of countries worldwide through increasing volume and variety of cross-border transactions in goods and services, free international capital flows and also more rapid and widespread diffusion of technology. Thus, cross border transaction of goods and services or free trade, free international capital flows and diffusion of technology may be considered as the three pillars of globalisation. With the emergence of globalization, more and more companies started going global by undertaking business activities across their national frontiers.

Under the circumstances there has been a paradigm shift in the role of the management accountant in the era of globalisation. The focus shifted to strategic analysis. This ushered in the fourth stage of the evolution of management accounting (this is discussed in previous section of this module). It is observed that conventional management accounting of the earlier stages did not provide the financial information required to monitor existing strategies or support strategy formulation. Strategic management accounting seeks to remedy this situation by providing the financial analysis to support the formulation of successful competitive strategies. On the basis of this there was severe criticism regarding the use of management accounting in the business. Authors have opined that most of the management accounting practices used, were actually developed by 1925, and for the next 60 years there was a slowdown, or even a halt, in management accounting innovation. Thus, the third stage is often referred as the period of lost relevance⁸. In repose to



the criticisms, the CIMA Report²⁶ identified strategic management accounting as a potential area of development that would enhance the future contribution of management accounting. They identified the need for management accounting to adopt a more strategic perspective by reporting information relating to a firm's markets and its competitors.

Globalisation brought about significant changes in the business environment. Along with the changes the roles of the management accountant had to be redefined. In the following lines some of the impacts of the new business environment on management accounting is discussed:

1. **Global competition** - Prior to the era of globalisation, many organizations operated in a protected competitive environment. Globalisation ushered in changes where there have been reductions in tariffs and duties on imports and exports as well as dramatic improvements in transportation and communication systems. This has facilitated firms to operate globally and resulted in stiff competition from the very best organisations worldwide. Business operations also changed significantly. The new competitive environment has increased the demand for information relating to quality and customer satisfaction. Customer profitability analysis and value analysis are important issues being incorporated in the arena of management accounting.
2. **Changing product life cycles** - Changing profile of the customer along with behavioural issues have contributed to drastically reduce the product life cycle. First mover advantage is critical and every organisation is desperately seeking the



advantage by increasing their investment in research and development. In this respect, the management accountant plays a crucial role as in order to compete successfully, companies must be able to manage their costs effectively at the design stage, have the capability to adapt to new environment, different and changing customer requirements and reduce the time to market of new and modified products.

3. **Advances in manufacturing technology** - In order to compete effectively, companies must be able to manufacture high quality innovative products at a low cost, and also provide a first-class customer service. Flexibility to cope with short product life cycles, demands for greater variety of product, more discriminating customers and increasing international competition has created enormous pressure on the operational activities of the business. Some internationally reputed manufacturing companies have responded to these by replacing traditional production systems with lean manufacturing systems that seek to reduce waste by implementing just-in-time (JIT) production systems, focusing on quality, simplifying processes and focussing on advanced manufacturing technologies (AMTs).

4. **The Impact of Information technology** - The use of Information technology (IT) to support business activities has increased dramatically. Along with electronic business communication technologies known as e-business, e-commerce or internet commerce have also developed significantly. Consumers have become more discerning in their purchases as in online transactions it is relatively easy to compare the merits of different products and services. This have a significant



impact on the work of management accountants. The role of the management accountant as a gatherer and processor of information is lost as the managers can directly access the management accounting system on their personal computers to derive the information they require for decision making. Management accountants have now become more involved in interpreting the information generated from the accounting system and providing business support for managers.

5. **Environmental and sustainability Issues** - In recent times, ESG has become the focal point in the operations of the company. Along with this, ethical issues have also come to the forefront as the business has to deal with customers who are more aware of this issues then they were a decade back. Thus, there is desperate need for organisations to be run in a suitable way. Sustainable development, where it is acknowledged that environmental resources are limited and should be preserved for future generations, is the order of the day. Management accounting with specific focus on environmental issues is becoming increasingly important in organizations as environmental costs are large in many organisations. There are three specific reasons for this:

- ▲ Environmental costs are often high in the many manufacturing organisations.
- ▲ Regulatory requirements often impose huge fines for non-compliance.
- ▲ Companies are increasingly realizing that being socially and environmentally responsible improves their image and this has positive impact on their bottom line.

The above mentioned changes impacted the management of the companies and the managers have realized that they need to develop system for measuring and reporting environmental costs along with preparation of detailed report on the



consumption of scarce environmental resources, hazardous materials used and pollutants emitted to the environment.

6. **Deregulation and privatization** – Prior to the era of globalization, companies in many industrial sectors were government –owned monopolies and operated in a highly regulated, protected and non-competitive environment. Thus the organisations, especially those incurring losses, were not under any pressure to improve the quality and efficiency of their operations and to improve profitability by adding or dropping particular products or services from their array of product or service. Thus trivial attention was given to developing management accounting systems that accurately measured the costs and profitability of individual products or services. Globalization ushered in the privatization and deregulation which resulted in the elimination of pricing and competitive restrictions. Thus, companies were compelled to design an elaborate management accounting system that made them to realize their cost base and determine the source of profitability for their products, customers and markets.
7. **Focus on value creation** – The scope of management accounting is enormous. Managers who are in charge of the operations of the organisations depends on the management accountants in realisation of the strategic goal of the organisations. With the advent of time, the role of the management accountant has changed from merely interpreting, managing and recording costs to creating value. Though cost reduction still remains as the basic function of the management accountant as it has specific impact on selling price fixation which impacts customer value. The new business environment resulted in management accounting distinguishing between value-added and non-value-added activities.



There is another aspect of new business paradigm which the management accountant has to consider as they develop the company's management accounting system. Intangibles have increased manifold. This presents a challenge to management accountants as to how to identify, measure and report on the value of intangibles.

8. **Customer orientation** – In the new business environment, gaining competitive advantage has become the singular goal of every business organisation. Companies have realized that in order to sustain in today's competitive environment they need to become more customer driven and recognize that customers are crucial to their future success. This has made the companies realize that customer satisfaction is one of the most important critical success factor (CSF) which helps companies realize their strategic goal. Customer satisfaction is relational to cost, quality, reliability, delivery and the choice of innovative new products.

Discussion made in this section regarding the role of the management accountant in the new business world is reflected in the developments in the arena of management accounting during the fourth stage in the evolution of management accounting (Creation of Value through effective resource use) which ushered in after 1985. This is discussed at length in the previous section of this module. The focus has shifted to strategic analysis. Thus the two collides and the newer tools and techniques which are aligned to the value chain and are thus relational to the attainment of the strategic goal of the organisation have changed the focus of management accounting to strategic management accounting.

**Question 1**

Following information are available for the year 2013 and 2014 of PEG Limited:

Year	2013	2014
Sales	Rs.32,00,000	Rs.57,00,000
Profit/(Loss)	(Rs. 3,00,000)	Rs.7,00,000

Calculate - (a) P/V ratio, (b) Total fixed cost, and (c) Sales required to earn a Profit of Rs 12,00,000.

Question 2

The ratio of variable cost to sales is 70%. The break-even point occurs at 60% of the capacity sales. Find the capacity sales when fixed costs are Rs.90,000.

Also compute profit at 75% of the capacity sales

Question 3

JOJO Ltd sells its product at Rs. 15 per unit. In a period, if it produces and sells 8,000 units, it incurs a loss of Rs. 5 per unit. If the volume is raised to 20,000 units, it earns a profit of Rs. 4 per unit. Calculate break-even point both in terms of rupees as well as in units.

**Question 4 (Nov 2007)**

A company produces single product which sells for Rs. 20 per unit. Variable cost is Rs. 15 per unit and Fixed overhead for the year is Rs. 6,30,000

Required:

- Calculate sales value needed to earn a profit of 10% on sales.
- Calculate sales price per unit to bring BEP down to 1,20,000 units.
- Calculate margin of safety sales if profit is Rs. 60,000

Question 5 NOV 2008

L Lalit Ltd. reports the following cost structure at capacity levels:

	(100% capacity)	(75% capacity)
	2,000 units	1,500 units
Production overhead I	Rs. 3 per unit	Rs. 4 per unit
Production overhead II	Rs.2 per unit	Rs.2 per unit

If the selling price, reduced by direct material and labour is Rs. 8 per unit, what unit, would be its break-even point?

Question 6

By noting "P/V will increase or P/V will decrease or P/V will not change", as the case may be, state how the following independent situations will affect the P/V ratio:

- An increase in the physical sales volume:



- (ii) An increase in the fixed cost;
- (iii) A decrease in the variable cost per unit;
- (iv) A decrease in the contribution margin;
- (v) An increase in selling price per unit;
- (vi) A decrease in the fixed cost;
- (vii) A 10% increase in both selling price and variable cost per unit;
- (viii) A 10% increase in the selling price per & 10% decrease in the physical sales volume
- (ix) A 50% increase in the variable cost per unit and 50% decrease in cost.

Question 7

The following information is given by Guddu Ltd.

Margin of safety = Rs. 1,87,500

Total Cost = Rs. 1,93,750

Margin of Safety = 3,750 units

Break even Sales = 1,250 units

Required

Calculate Selling Price Per unit, Profit, P/V Ratio, BEP Sales (In Rs.) and Fixed Cost



Question 8 (MAY 2014)

You are given the following data:

	Sales	Profit
Year 2013	Rs. 1,20,000	Rs. 8,000
Year 2014	Rs. 1,40,000	Rs. 13,000

Find out-

- (i) P/V ratio,
- (ii) B.E. Point,
- (iii) Profit when sales are Rs. 1,80,000,
- (iv) Sales required earn a profit of Rs. 12,000,
- (v) Margin of safety in year 2014.

Question 9

Jethalal Ltd maintains margin of safety of 37.5% with an overall contribution to sales ratio of 40%. Its fixed costs amount to Rs. 5 lakhs.

Calculate the following:

- i. Break-even sales
- ii. Total sales
- iii. Total variable cost
- iv. Current profit
- v. New margin of safety in Rs. if the sales volume is increased by 7.5%.

**Question 10**

Majnu company had incurred fixed expenses of Rs. 4,50,000, with sales of Rs. 15,00,000 and earned a profit of Rs. 3,00,000 during the first half year. In the second half, it suffered a loss of Rs. 1,50,000

Calculate

- (i) The profit-volume ratio, break-even point and margin of safety for the first half
- (ii) Expected sales volume for the second half year assuming that selling price and fixed expenses remained unchanged during the second half year.
- (iii) The break-even point and margin of safety for the whole year.

Question 11**HOMEWORK SUM****Date:**

1. If margin of safety is Rs. 2,40,000 (40% of sales) and P/V ratio is 30% of Shila Ltd, calculate its

(i) Break even sales, and (ii) Amount of profit on sales of Rs.9,00,000

2. Saffron Ltd. has earned a contribution of Rs.2,00,000 and net profit of Rs.1,50,000 of sales of Rs.8,00,000. What is its margin of safety?

Question 12**HOMEWORK SUM****Date:**

Tripathi company earned a profit of Rs. 30,000 during the year 2014. If the marginal cost and selling price of the product are Rs. 8 and Rs. 10 per respectively, find out the amount of margin of safety.

**Question 13****HOMEWORK SUM****Date:**

		(Rs.)
(i) Ascertain profit, when sales	=	2,00,000
Fixed Cost	=	40,000
BEP	=	1,60,000
(ii) Ascertain sales, when fixed cost	=	20,000
Profit	=	10,000
BEP	=	40,000

Question 14**HOMEWORK SUM****Date:**

A company has fixed cost of Rs. 90,000, Sales Rs. 3,00,000 and Profit of Rs. 60,000.

Required:

- (i) Sales volume if in the next period, the company suffered a loss of Rs. 30,000,
- (ii) What is the margin of safety for a profit of Rs. 90,000?

Question 15**HOMEWORK SUM****Date:**

You are given the following data for the year 2007 of Gotyn& Co, Ltd

Variable cost	60,000	60%
Fixed cost	30,000	30%
Net profit	10,000	10%
Sales	1,00,000	100%

Find out (a) Break-even point, (b) P/V ratio, and (c) Margin of safety.

**Question 16****HOMEWORK SUM****Date:**

You are given the following particulars calculate:

- (a) Break-even point
- (b) Sales to earn a profit of Rs. 20,000
- I. Fixed cost Rs. 1,50,000
 - II Variable cost Rs. 15 per unit
 - III. Selling price is Rs. 30 per unit

Question 17**HOMEWORK SUM****Date:**

The P/V Ratio of Babli Ltd. is 50% and margin of safety is 40%. The company sold 500 units for Rs. 5,00,000. You are required to calculate:

- (i) Break-even point, and
- (ii) Sales in units to earn a profit of 10% on sales

Question 18**HOMEWORK SUM****Date:**

Lootera Ltd, manufactures a product "N-joy". In the month of August 2014, 14,000 units of the product "N-joy" were sold, the details are as under

	(Rs.)
Sale Revenue	2,52,000
Direct Material	1,12,000
Direct Labour	49,000
Variable Overheads	35,000
Fixed Overheads	28,000

A forecast for the month of September 2014 has been carried out by the



General manger of Lootera Ltd. As per the forecast, price of direct material and variable overhead will be increased by 10% and 5% respectively.

Required to calculate:

- (a) Number of units to be sold to maintain the same quantum of profit that made in August 2014
- (b) Margin of safety in the month of August 2014 and September 2014.

Question 19**HOMEWORK SUM****Date:**

If P/V ratio is 60% and the Marginal cost of the product is Rs. 20. What will be the selling price?

Question 20

Baburoo Ltd is having a proposal to purchase two machines X and Y, the cost structure for the products with these two machines is as follows:-

Particular	Machine X	Machine Y
Variable Cost per unit	Rs. 6.00	Rs. 4.00
Fixed Cost	Rs. 2,00,000	Rs. 3,00,000
Selling Price per unit	Rs. 10	Rs. 10

What is cost Indifference point? Which machine should be preferred and when ?

**Question 21**

Two firms Lala & Co. and Lalli & Co. sell the same product in the same market. Their budgeted profit and loss account for the year ending 31st march, 2016 are as follows:-

Particulars	Lala & Co. (Rs.)	Lalli & Co. (Rs.)
Sales	5,00,000	6,00,000
Variable Costs	4,00,000	4,00,000
Fixed Costs	30,000	70,000
Net Profit	70,000	1,30,000

Required:-

1. Calculate at which sales volume both the firms will earn equal profit.
2. State which firm is likely to earn greater profits in condition of:
 - a. Heavy demand for the product
 - b. Low demand for the product. Give reasons

Question 22

Coke, Pepsi and Slice are three similar plants under the same management who want them to be merged for better operation. The details are as under:

Particulars	Plant Coke at 100% (Rs. in Lakhs)	Plant Pepsi at 70% (Rs. in Lakhs)	Plant Slice at 50% (Rs. in Lakhs)
Turnover	300	280	150
Variable Cost	200	210	75
Fixed Cost	70	50	62



Required:-

- a) Compute the capacity of the merged plant for break-even
- b) Compute the profit of the merged plant at 75% capacity
- c) Compute the capacity utilization of the merged plant to earn a profit of Rs.28 lakhs

Question 23**HOMEWORK SUM**

Date:

There are two similar plants under the same management. The management desires to merge these plants.

The following particulars are available:-

Particulars	Factory 1	Factory 2
Capacity operation	100%	60%
Sales	Rs. 300 Lakhs	Rs. 120 Lakhs
Variable Costs	Rs. 220 Lakhs	Rs. 90 Lakhs
Fixed Costs	Rs. 40 Lakhs	Rs. 20 Lakhs

You are required to calculate:-

What would be capacity of the merged plant to be operated for the purpose of break-even and What would be the profitability on working at 75% of the merged capacity?

**Question 24**

BC Ltd sold 2,75,000 units of its product at Rs. 37.50 per unit. Variable costs are Rs. 17.50 per unit (manufacturing costs of Rs. 14 and selling cost Rs. 3.50 per unit). Fixed costs are incurred uniformly throughout the year and amount to Rs. 35,00,000 (including depreciation of Rs. 15,00,000), there are no beginning or ending inventories.

Required:

- Estimate breakeven sales level quantity and cash breakeven sales level Quantity.
- Estimate the P/V ratio.
- Estimate the number of units that must be sold to earn an income (EBIT) of Rs. 2,50,000
- Estimate the sales level achieve an after-tax income (PAT) of Rs. 2,50,000, Assume 40% corporate Income Tax rate.

Question 25

Kukoo Ltd. Manufactures and sells four products A, B, C and D. The total budgeted sales (100%) are Rs. 6,00,000 per month. The Fixed Costs are Rs. 1,59,000 per month

Sales mix in value comprises of :

Product	Present %	Proposed %
A	33.33%	25%
B	41.67%	40%



C	16.67%	30%
D	8.33%	5%

The operating cost as a % of selling prices are:-

A-60%, B-68%, C-80% and D-40%

Calculate break even sales for the company for both these periods.

Question 26

MC Ltd. Manufactures three products P, Q and R. The unit selling prices of these products are Rs.100, Rs.80 and Rs.50 respectively. The corresponding unit variable cost are Rs.50, Rs.40 and Rs.20 the proportions (quantity wise) in which these products are manufactured and sold are 20%, 30% and 50% respectively. Total fixed cost are Rs.14,80,000.

Given the above information, you are required to work out the overall break-even quantity and the product-wise break-up of such quantity.

Question 27**HOMEWORK SUM**

Date:

The product mix of a Bhopa Ltd. is as under:

	Products	
	M	N
Units	54,000	18,000
Selling price	Rs.7.50	Rs.15.00
Variable cost	Rs.6.00	Rs.4.50

Find the break-even points in units, if the company discontinues product M and



replace with product O. The quantity of product O is 9,000 units and its selling price and variable costs respectively are Rs.18 and Rs.9. Fixed Cost is Rs. 15,000

Question 28**HOMEWORK SUM****Date:**

A Company sells two products, Barfi and Heroine. The sales mix is 4 units of Barfi and 3 units of Heroine. The contribution margins per unit are Rs. 40 for Barfi and Rs. 20 for Heroine. Fixed costs are Rs. 3,08,000 per month. Compute the break-even point.

Question 29

Mogambo Limited sells its product at Rs. 30 per unit. During the quarter ending on 31 March, 2014, it produced and sold 16,000 units and suffered a loss of Rs. 10 per unit. If the volume of sales is raised to 40,000 units, it can earn a profit of Rs. 8 per unit.

You are required to calculate:

- (i) Break Even Point in Rupees.
- (ii) Profit if the sale volume is 50,000 units.
- (ii) Minimum level of production where the company needs not to close the production if unavoidable fixed cost is Rs. 1,50,000.

**Question 30****HOMEWORK SUM****Date:**

Mr. Salmon has Rs. 2,00,000 Investments in his business firm. He wants a 15 per cent return on his money. From an analysis of recent cost figures, he finds that his variable cost of operating is 60 per cent of sales, his fixed costs are Rs. 80,000 per year. Show computations to answer the following questions:

- (i) What sales volume must be obtained to break even?
- (ii) What sales volume must be obtained to get 15 per cent return on investment?
- (iii) Mr Salman estimates that even if he closed the doors of his business, he would incur Rs. 25,000 as expenses per year. At what sales would he be better off by locking his business up?

Question 31**HOMEWORK SUM****Date:**

Maximum Production capacity of Munni Ltd. is 28000 units per month. Output at different levels along with cost data is furnished below:

Particulars of Costs	Activity Level		
	16,000 units	18,000 units	20,000 units
Direct Material	Rs.12,80,000	Rs.14,40,000	Rs.16,00,000
Direct labour	Rs.17,60,000	Rs.19,80,000	Rs.22,00,000

Total factory
overheads

Rs.22,00,000

Rs.23,70,000

Rs.25,40,000

You are required to work out the selling price per unit at an activity level of 24,000 units by considering profit at the rate of 25% on sales.

Question 32**HOMEWORK SUM****Date:**

An automobile manufacturing company produces different models of Cars. The budget in respect of model 007 for the month of March, 2015 is as under:

Budgeted Output 40,000 Units

	Rs. In lakhs	Rs. In lakhs
Net Realization		700
Variable Cost		
Materials	264	-
Labour	52	
Direct expenses	124	440
Specific Fixed Costs	90	
Allocated Fixed Costs	112.50	202.50
Total Costs		642.50
Profit		57.50
Sales		700.00

(i) Profit with 10 percent increase in selling price with a 10 percent reduction in sales volume.

(ii) Volume to be achieved to maintain the original profit after a 10 percent rise in material costs, at the originally budgeted selling price per unit.

**Question 33****HOMEWORK SUM****Date:**

Lalla Limited started its operation in the year 2013 with total production capacity of 2,00,000 units. The following information, for two years are made available to you:

	Year 2013	Year 2014
Sales (units)	80,000	1,20,000
Total Cost (Rs.)	34,40,000	45,60,000

There has been no change in the cost structure and selling price and it is anticipated that it will remain unchanged in the year 2015 also. Selling price is Rs. 40 per unit.

Calculate

I. Variable cost per unit.

II. Profit Volume Ratio.

III. Break-Even Point (In units)

IV. Profit if the firm operates at 75% of the capacity.

**Question 34**

Tritoni Ltd produces 3 products A, B and C from the same manufacturing facilities. The cost and other details of the 3 products are as follows:

Particulars	A	B	C	
Selling Price/unit (Rs.)	200	160	100	
Variable Cost/unit (Rs.)	120	120	40	
Fixed Expenses/month (Rs.)				276000
Maximum Production/month (units)	5000	8000	6000	
Total Hours available for the month				200
Maximum demand/month (units)	2000	4000	2400	

The processing hours cannot be increased beyond 200 hours/month.

You are required to :

- (i) Compute the most profitable mix
- (ii) Compute the overall break-even sales of the company for the month based on the mix calculated in (i) above.

**Solution 34****Most Profitable Product Mix**

Product	* No. of units to be produced	Contribution /unit (Rs)	Total Contribution (Rs)
A	2,000	80	1,60,000
B	1,600	40	64,000
C	2,400	60	1,44,000
Total Contribution			3,68,000
Less: Fixed Cost			(2,76,000)
Profit			Rs 92,000

* Please refer to Working Note-1:

(ii) Overall Break Even Sales (based on the mix calculated in

(i) above) Break Even Sales (In Rs)

= (Fixed Cost / Contribution) × Sales

= (Rs 2,76,000 / Rs 3,68,000) × ** 8,96,000

= Rs 6,72,000

**Working Note - 1:**

Products	A	B	C
Selling Price/unit (Rs)	200	160	100
Less Variable Cost/unit (Rs)	(120)	(120)	(40)
Contribution/unit (Rs)	80	40	60
Maximum Production/hr (units)	$(5,000/200)=25$	$(8,000/200)=40$	$(6,000/200)=30$
Contribution per hour (Rs)	$80 \times 25 = 2,000$	$40 \times 40 = 1,600$	$30 \times 60 = 1,800$
Contribution/unit x Maximum Production/hr	(80×25)	(40×40)	(60×30)
Ranking	I	III	II
Units to be produced	2,000	1,600	2,400
Time requirement for the units to be produced-hrs	80	40	80

Working Note - 2:

Products	Units	Selling	Sales Revenue (Rs)
A	2,000	200	4,00,000
B	1,600	160	2,56,000



C	2,400	100	2,40,000
			** 8,96,000

Question 35

In a factory producing two different kinds of articles, the limiting factor is the availability of labour, from the following information show which product is more profitable:

	Product A	Product B
	Cost per unit	Cost per unit



	Rs.	Rs.
Materials	5.00	5.00
Labour:		
6 Hours @ Rs.0.50	3.00	
3 Hours @ Rs.0.50		1.50
Overhead:		
Fixed (50% of labour)	1.50	0.75
Variable	1.50	1.50
Total Cost	11.00	8.75
Selling Price	14.00	11.00
Profit	3.00	2.25
Total Production for the Month (units)	500	600

Maximum capacity per month is 4,800 hours.

Give proof in support of your answer.

Solution 35

	Product A (Rs)	Product B (Rs)
Materials	5	5
Labour	3	1.50
Variable Overhead	1.50	1.50
Marginal Cost Per unit	9.50	8



Selling Price Per unit	14	11
Contribution per unit	4.50	3
No of labour hours per unit (Limiting Factor)	6	3
Contribution per Labour Hour	$\frac{Rs.4.50}{6 Hrs} = Rs.0.75$	$\frac{Rs.3}{3 Hrs} = Rs.1$

Product B is more profitable as it gives higher contribution per labour hour (limiting factor).

	Product A	Product B
Maximum capacity per month	4800 Hrs.	4800 Hrs.
Maximum capacity (In units)	4800 Hrs.	4800 Hrs.
	6 Hrs.	3 Hrs.
Total Hours Hours Per Unit	800 units	1600 units

Statement of Cost and Profit

	Rs.	Rs.
Materials		
Labour 2 Rs.0.50 per labour hour for 4800 hours	4000	8000
Overhead	2400	2400
Fixed (50% of labour)	1200	1200
Variable	1200	2400
Total Cost	8800	14000
Profit	2400	3600
Sales	11200	17600

Question 36

The following data are available in respect of product 'A' manufactured by Pankaj Ltd:

	Rs.
Sales	2,50,000



Direct Materials	1,00,000
Direct Wages	50,000
Variable overhead	25,000
Fixed overhead	50,000

The company now proposes to introduce a new product 'B' so that sales may be increased by Rs.50,000. There will be no increase in fixed costs and the estimated variable costs of the product 'B' are:

	Rs.
Direct Materials	24,000
Direct Wages	11,000
Overhead	7,000

Advice whether products B will be profitable or not.

Solution 36:

Statement of Marginal Cost under proposed position

	Product A (Rs.)	Product B (Rs.)	Total (Rs.)
Direct materials	1,00,000	24,000	1,24,000
Direct Wages	50,000	11,000	61,000
Variable Overhead	25,000	7,000	32,000
Marginal Cost	1,75,000	42,000	2,17,000
Sales	2,50,000	50,000	3,00,000
Contribution	75,000	8,000	83,000
Less: Fixed Overhead	50,000	-	50,000
Profit	25,000	8,000	33,000



Assuming that spare capacity cannot be used for any other purpose (except for producing product 'B'), it is advisable to undertake the production of product 'B' which shall give a contribution of Rs.8000 towards fixed cost and profit.

Question 37

ABC Limited has production capacity of 5,00,000 units per annum at its full capacity.

Company's Cost structure is as under:	
Variable production cost per unit	₹32.00
Variable selling expenses per unit	₹9.60
Fixed production cost per annum	₹30,00,000
Fixed selling expenses per annum	₹20,00,000

During the year ended 31st March, 2022, the company worked at 80 percent of its capacity. The operating data for the year are as follows:

Production	4,00,000 units
Sales	₹ 64 per Unit; 3,87,500 Units
Opening stock of finished goods	50,000 Units

Fixed production expenses are absorbed on the basis of capacity and fixed selling expenses are recovered on the basis of period.

You are required to prepare statements of Cost and Profit for the year ending 31st March, 2022:

- On the basis of marginal costing
- On the basis of absorption costing

**Solution 37**

a. Statement of Cost and Profit under Marginal Costing for the year ending 31st March, 2022 Output = 4,00,000 units

Particulars	Amount (₹)	Amount (₹)
Sales: (3,87,500 units @ ₹ 64 per unit)		2,48,00,000
Less: Marginal costs:		
Variable cost of production (400000 × ₹32)	1,28,00,000	
Add: Opening stock (50000 units @ ₹32)	16,00,000	
Less: Closing Stock [(4,00,000 + 50,000 - 3,87,500) = 62,500 units @ ₹32]	(20,00,000)	
Variable cost of production of 3,87,500 units	1,24,00,000	
Add: Variable selling expenses @ ₹ 9.60 per unit	37,20,000	1,61,20,000
Contribution (sales - variable cost)		86,80,000
Less: Fixed Cost of Production	30,00,000	
Fixed selling expenses	20,00,000	50,00,000
Profit under marginal costing		3,68,0000

b. Statement of Cost and Profit under Absorption Costing for the year ending 31st March, 2022 Output = 4,00,000 units

Particulars	Amount (₹)	Amount (₹)
Sales: 3,87,500 units @ ₹64		2,48,00,000
Less : Cost of sales:		
Variable cost of production (4,00,000 @ ₹ 32)	1,28,00,000	
Add: Fixed cost of production absorbed 4,00,000 units @ ₹6 (As per W.N. 1)	24,00,000	
Add: Opening Stock	19,00,000	



Less : Closing Stock	23,75,000	
Production cost of 3,87,500 units	14,72,5000	
Selling expenses: Variable: ₹9.60 × 3,87,500 units	37,20,000	
Fixed	37,20,000	
Profit	20,00,000	2,04,45,000
Less : Overheads under absorbed: (As per W.N. 2)		6,00,000
Profit under absorption costing		37,55,000

Working Notes:

- a. Absorption rate for fixed cost of production = $\frac{₹30,00,000}{5,00,000 \text{ units}} = ₹ 6 \text{ per unit}$
- b. Fixed production overhead under absorbed = $₹ (30,00,000 - 24,00,000) = ₹ 6,00,000$

Observations from the Solution:

Marginal Costing rewards sales and Absorption Costing rewards production.

Question 38

From the cost records of a company for a specific period, for product X, the information given in the first column can be ignored since it is only one of the several projections of an assistant accountant, but it may be useful to you

Particular	This Period Actual (₹)	One of The Future Projections (₹)
Sales (Units)	10,000	20,000
Profit (Loss)	(10,000)	10,000
Fixed Costs	30,000	30,000
Variable Cost Per Unit	8	8



On the basis of the first column, determine

1. What increased sales volume is required to cover an additional attractive packaging cost of ₹ 0.50 per unit, to increase the sales, at the existing sales price, to yield zero profit?
2. What increased sales volume is required at the present sale price, to cover an additional publicity expense of ₹5,000 for that period, while yielding a profit of ₹5,000.
3. What increased sale volume is required to reach a profit of ₹4,000 while reducing the selling price by 3 per cent per unit?

Solution 38

(1) Sales volume required to yield zero profit: = Fixed costs/ CM per unit = ₹ 30,000/₹ 1.50 = 20,000 units. Sales volume required = 20,000 units (₹ 2,00,000). Existing sales volume = 10,000 units (₹ 1,00,000). Difference represents increase in sales volume required to make zero profit = 10,000 units (₹ 1,00,000).

(2) Assuming situation (2) Independent of (1): Sales volume required to earn a profit of ₹ 5,000 = [₹ 30,000 + ₹5,000 (publicity expenses) + ₹ 5,000 (profit)]/₹ 2 = 20,000 units (₹ 2,00,000); 10,000 units (₹ 1,00,000) is the increased sales volume required.

(3) Assuming (3) to be independent of situations (1) and (2): Desired sales volume to earn a profit of ₹ 4,000 = (₹30,000 + ₹ 4,000)/(₹ 9.70 - 8) = 20,000 units (or ₹ 1,94,000). Increased sales volume required is 10,000 units.



Working Note:

Determination of total sales revenue and selling price per unit:

Total sales revenue	= Total costs - Loss
Total costs	= FC + (VC per unit × Sales in units)
₹ 80,000	= ₹ 30,000 + (₹ 8 × 10,000)
Total sales revenue	= ₹ 1,10,000 - ₹ 10,000 = ₹ 1,00,000
SP per unit	= ₹ 1,00,000/10,000 = ₹10.

Question 39

A company is producing two products A and B. The particulars of the company are as follows:

Particulars	Product A (₹ per unit)	Product B (₹ per unit)
Sales	75	80
Material Cost	15	20
Labour Cost	20	15
Direct Expense	10	12
Variable overheads	10	15
Machine Hours used	3 HOURS	2 HOURS
Consumption of material	2 kgs	2 kgs

Comment on profitability of each product, if both use the same raw material, when:

- (i) Total sales potential in units is key factor.
- (ii) Total sales potential in values is key factor.



(iii) Raw material is in short supply.

(iv) Production Capacity (in terms of machine hr.) is the key factor

Solution 39:

Particulars	Product A (₹ per unit)	Product B (₹ per unit)
Sales	75	80
Marginal Costs:		
Materials	15	20
Wages	20	15
Direct expense	10	12
Variable overheads	10	15
Total Marginal Cost	55	62
Contribution (Sales- Total marginal cost)	20	18
Contribution (per ₹ of Sales)	20/75	18/80
(Contribution/Sales)	₹ 0.267	₹ 0.225
Contribution per kg of materials	₹ 10	₹ 9
Contribution per hour	₹ 6.6	₹ 9

Comments:

- a. When total sales potential in units is limited, product A is more profitable as its contribution per unit is more than that of product B.
- b. When total sales potential in value is limiting factor, product A is more profitable as it has more contribution as per sales in rupees than that of product B.



c. Product A is more profitable than product B, when raw material is in short supply.

d. Product B is more profitable than product A, when production capacity in terms of machine hour is the key factor.

Question 40

The Management Accountant of X Ltd., has prepared the following estimates of working results for the year ending 31st December, 2021 for the purpose of preparing the budgets for the year ending 31st December, 2022.

Year ending 31/12/2021

Direct material	₹/unit	16.00
Direct wages	₹	40.00
Variable overheads	₹	12.00
Selling price	₹	125.00
Fixed expenses	₹	6,75,000 p.a.
Sales	₹	25,00,000 p.a.

During the year 2022, it is expected that the material prices and variable overheads will go up by 10% and 5% respectively. As a result of re-organisation of production methods the overall direct labour efficiency will increase by 12% but the wage rate will go up by 5%. The fixed overheads are also expected to increase by ₹1,25,000. The technical director states that the same level of output as obtained in 2021 should be maintained in 2022 also and efforts should be made to maintain the same level of profit by suitably increasing the selling price. The marketing director states that the market will not absorb any increase



In the selling price. On the other hand he proposes that publicity involving advertisement expenses in the proportions will increase the quantity of sales as under:

Advertisement expenses (₹)	80,000	1,94,000	3,20,000	4,60,000
Additional units of sales	2,000	4,000	6,000	8,000

Required:

- Present an income statement for the year 2022.
- Find the revised price and the percentage of increase in the price for 2022 if the Technical Directors' views are accepted.
- Evaluate the four alternative proposals put forth by the Marketing Director, determine the best output level to be budgeted and prepare an overall income statement for 2022 at that level of output.

Solution 40:

Statement of profit at budget

Particulars	Product A (₹ per unit)
(i) Selling price	125.00
(ii) Variable cost	
a. direct material	16.00
b. direct wages	40.00
c. variable overheads	12.00
	68.00
(iii) Contribution (I-II)	57.00
(iv) No. of units (25,00,000/125)	20,000.00



(v) Total contribution	11,40,000.00
(vi) Less: Fixed cost	6,75,000.00
(vii) Profit (v-vi)	4,65,000.00

II. Computation of selling price, if the technical director views are implemented

Variable cost	Workings	Amount (₹)
Direct material	(16 × 110%)	17.60
Direct wages	[(40 × 105%) × (100/112)]	37.50
Variable overheads	(12 × 105%)	12.60
		67.70

In order to get the same profit contribution to be recovered is as follows:

Particulars	Amount (₹)
Existing fixed overheads	6,75,000.00
Add: Expected increase	1,25,000.00
	8,00,000.00
Add: desired profit	4,65,000.00
	12,65,000.00
Therefore contribution per unit (12,65,000/20,000)	₹ 63.25
Required selling price = variable cost + contribution = 67.7+63.25	₹ 130.95
% increase in sale price = [(130.95-125)/125]×100	4.76%

III. Computation of additional profit at four alternatives proposed by marketing Director

Additional Units	2000	4000	6000	8000
a. contribution per unit (125-67.7)	57.30	57.30	57.30	57.30



b. Total contribution	1,14,600.00	2,29,200.00	3,43,800.00	4,58,400.00
c. additional fixed cost	80,000.00	1,94,000.00	3,20,000.00	4,60,000.00
d. Profit/(loss)	34,600.00	35,200.00	23,800.00	(1,600.00)

Statement showing overall Income for the year 2022

a. No. of units	24,000
	Amount ₹
b. Contribution per unit	57.30
c. Total contribution	13,75,200.00
d. Fixed cost (8,00,000+1,94,000)	9,94,000.00
e. Profit	3,81,200.00

Question 41

T.T.D Ltd., manufacturing a single product has normal working capacity of 8,000 units per annum. The sales manager has projected a sale of 10,000 units for the year 2021 - 22 at a price of ₹250 per unit. The operating budget for 2021-22 as under:

Particulars	₹ in lakhs	₹ in lakhs
Sales: 8,000 units @ ₹250 each		20.00
Cost of production		
Raw material	12.00	
Direct wages	3.00	
Works overhead (50% Fixed)	1.40	
Admn. overhead (all fixed)	0.60	
Selling & Distribution OH (80% fixed)	1.00	18.00



Profit	2.00
--------	------

In order to increase production to meet the sales demand, two proposals have been

1) Subcontracting the production of 2,000 units at ₹225 per unit.

2) Installing additional machine which will entail the following expenses :

(a) Cost of machine ₹2,00,000; Life 20 years

(b) Recruitment of 10 workers including direct workers to operate the machine at a wage rate of ₹500 each per month. Add 25% towards employee benefits. (None of the existing workers will be utilised for this purpose).

(c) Interest on capital required for the purchase of machine 15% p.a.

The following additional fixed expenses will be required in respect of both alternatives.

Administration expenses - ₹10,000 per year.

Selling & Distribution expenses - ₹20,000 per year.

You are required to prepare

(1) A statement showing respective profitability of the two methods of increasing the production.

(2) Comment upon the choice of one of the two proposals.

Solution 41:

Statement Showing Computation of Profit at Proposed alternatives as well as present position:

Particulars	Present Position (8000)	Sub Contract (10000)	Own Expansion (10000)
	₹ In lakhs	₹ In lakhs	₹ In lakhs



	Sales	20	25	25
Variable Cost				
Raw Materials	12	12	15	
Direct Wages	3	3	3	
Works Overhead	0.7	0.7	0.875	
Selling & Distribution Overhead	0.2	0.2	0.25	
Sub Contract Cost		4.5		
Add Workers			0.75	
	15.9	20.4	19.875	
(I) Contribution	4.1	4.6	5.125	
(IV) Fixed Cost	2.1	2.4	2.8	
(V) Profit	2.0	2.2	2.325	

The best proposal is to produce by their own to meet the additional demand by Inst. has highest profit.

Fixed Cost includes interest & depreciation.

Question 42

Recently your Managing Director, who is an engineer, called a meeting of the Cost Department and in the meeting he has asked some explanations for certain items listed below, as relevant costs or not. He is not having clear ideas about relevant costs. You are heading the Cost Department and asked to clarify the same, highlighting the relevancy or irrelevancy of each item.

(a) The salary to be paid to a market researcher who will oversee the development of a new product. This is a new post to be created especially for the new product but ₹1,20,000 salary will be a fixed cost. Is this cost relevant



to the decision to proceed with the development of the product?

(b) The ₹25,000 additional monthly running costs of a new machine to be purchased to manufacture an established product. Since the new machine will save on labour time, the fixed overhead to be absorbed by the product will reduce by ₹1,000 per month. Are these costs relevant to the decision to purchase the new machine?

(c) Office cleaning expenses of ₹1,250 for next month. The office is cleaned by contractors and the contract can be cancelled by giving one month's notice. Is this cost relevant to a decision to close the office?

(d) Expenses of ₹7,500 paid to the marketing manager. This was to reimburse the manager for the cost of travelling to meet a client with whom the company is relevant to the decision to continue negotiations?

Solution 42:

As a Departmental head of the Company the above items will be considered on case to case basis as under:

(a) The salary is a relevant cost of ₹1,20,000. There should not be any confusion. It is a cost that is relevant to the decision to proceed with the future development of the new product. This is an example of a directly attributable fixed cost. A directly attributable fixed cost may also be called a product specific fixed cost.

(b) The ₹25,000 additional running costs are relevant to the decision to purchase the new machine. The saving in overhead absorption is not relevant since we are not told that the total overhead expenditure will be altered. The saving in labour cost would be relevant but we shall assume that this has been accounted for in determining the additional monthly running costs.



(c) This is not a relevant cost for next month since it will be incurred even if the contract is cancelled today. If a decision is being made to close the office, this cost cannot be included as a saving to be made next month.

However, it will be saved in the months after that so it will become a relevant cost saving from month 2 onwards.

(c) This is not a relevant cost of the decision to continue with the contract.

(d) The ₹7,500 is sunk and cannot be recovered even if the company does not proceed with the negotiations.



CONCEPT

Transfer pricing is concerned with the price one profit centre charges another profit centre within the company for products or services provided. Since the supplying profit center's revenue becomes the receiving profit center's cost, the transfer price chosen can have a significant impact on the evaluation of a profit center's performance.

Transfer pricing technique is a major issue in the current business world. As the scope of business is increasing day by day, it is not possible for upper level managers to manage such a large organisation. Organisations have a system of transfer pricing, therefore, in order to assess the efficiency and effectiveness of its department and divisional managers. This maybe in spite of the fact that transfer prices may be artificial in the sense that it is felt that there is no rationale for "selling" between departments and divisions. So for the purpose of better management and control organisations are divided in to smaller divisions, each having an independent divisional manger. Sometimes, performance of divisional managers is linked with the profits earned by their respective divisions.

Divisional managers are therefore responsible for all operations (production, sales and so on) relating to their product, the functional structure being applied to each division. It is possible, of course, that only part of a company is divisionalized and activities such as administration are structured centrally on a functional basis with the responsibility of providing services to all divisions.



Transfer pricing plays a very important in international taxation also, as by fixing fair transfer prices one can avoid a lot of tax burden.

In general, a large organisation can be structured in one of two ways: functionally (all activities of a similar type within a company, such as production, sales, research, are under the control of the appropriate departmental head) or divisionally (split into divisions in accordance with the products or services made or provided).

Transfer pricing is a topic that one is need to know from both a theoretical standpoint and a numerical standpoint. The questions may require understanding the issues that a company faces in establishing the transfer price as well as be able to calculate an acceptable transfer price under certain situations.

As the transfer price chosen can impact performance evaluation, it is important that the transfer price is perceived as equitable to all parties involved. When there is a market price for the transferred good or service, market price is the appropriate transfer price. However, transfer pricing is often an issue for intermediate products that have no market value.

When one division of a company sells to another division, both divisions as well as the company as a whole are affected. The price charged for the transferred good affects the costs of the buying division and the revenues of the selling division. Thus, the profits of both divisions, as well as the evaluation and compensation of their managers, are affected by the transfer price. Since profit-based performance measures of the two divisions are affected (for example, ROI and Residual Income), transfer pricing can often be a very emotionally charged issue.



Advantages of Transfer Pricing

The main advantages are as follows:

- (1) Top managers have more time to devote to general planning since they are not burdened with routine daily decisions.*
- (2) The decision-making task is distributed among more personnel so that each person has enough time to give matters sufficient attention.*
- (3) Better control can be achieved, as the manager can move quickly to make needed corrections.*
- (4) Managers are better motivated, as they have more control over those matters on which their performance is measured.*
- (5) Managers are more likely to exercise initiative in such matters as "comparison shopping" in order to reduce costs of outside materials. Comparison of internal and external costs tends to keep internal costs, such as transfer pricing of intercompany goods or services, in line.*
- (6) As managers become more proficient in decision making, they become more qualified for higher management positions.*

Disadvantages of Transfer Pricing

The principal disadvantages are as follows:

- (1) The extent of authority and responsibility to be decentralized is difficult to determine.*
- (2) Managers needed to head the decentralized units must be selected and trained, a process that is often time consuming and expensive.*



(3) The varied activities of decentralized units must be coordinated, a difficult task.

(4) Evaluating the performance of the units and the individual managers is often problematic.

Selection of Transfer Price

Any transfer-pricing system should aim to:

- ◆ Ensure that resources are allocated in an optimal manner;
- ◆ Promote goal congruence;
- ◆ Motivate divisional managers;
- ◆ Facilitate the assessment of management performance;
- ◆ Retain divisional autonomy.

Why do transfer-pricing systems exist?

1. To communicate data that will lead to goal-congruent decisions.
2. To evaluate segment performance and thus motivate managers toward goal congruence decisions.
3. Multinational companies use transfer pricing to minimize their worldwide taxes, duties, and tariffs. Ideally, the chosen transfer-pricing method should lead each sub-unit manager to make optimal decisions for the organisation as a whole.

The three specific criteria that can help in choosing a transfer-pricing method are:

(a) Promotion of Goal Congruence:

Goal congruence exists when each divisional or sub-unit manager acting in his or her own best interest takes actions that automatically result in achieving the organisation goals established by top management.



(b) Promotion of a Sustained High Level of Management Effort:

Effort is defined as exertion towards a goal, for example, sellers are motivated to hold down costs of supplying product or service, and buyers are motivated to acquire and use inputs efficiently. The environment in the organisation should be such that a sustained high level of management effort is promised.

(c) Promotion of a High Level of Subunit Autonomy in Decision-making:

Autonomy is the degree of freedom a division manager can exercise in decisions making. If top management favors a high degree of decentralization, this criterion is of particular importance.

Objectives of Transfer Pricing

A question arises as to how the transfer of goods and services between divisions should be priced. The price charged to the interdivisional transfer of goods and services is revenue to the selling division and cost to the buying division.

Therefore, the price charged will affect the profit of both divisions; benefit (revenue) to one division can be created only at the expense of the other division. For example, the selling division will benefit from charging higher prices for such transfers of goods and services. However, for the buying division, this will result into higher costs. The transfer prices, thus, can have impact on the evaluation of each division's performance and measures applied for such measurements of performance.



While determining transfer prices, a number of criteria (objectives) should be fulfilled:

- (i) Transfer prices should help in the accurate measurement of divisional performance (profitability).*
- (ii) Transfer prices should motivate the divisional managers into maximizing the profitability of their divisions and making decisions that are in the best interests of the organizations as a whole.*
- (iii) Transfer prices should ensure that divisional autonomy and authority is preserved. The main purpose of decentralization is to enable divisional managers to exercise greater autonomy and to measure the overall results achieved on a profit centre or investment centre. It is, therefore, not proper to give divisional managers authority by one hand by placing those in charge of divisional operations and to remove that authority by dictating transfer prices that affect the performance of the division.*
- (iv) Transfer prices should allow goal congruence to take place, which in effect means that the objectives of divisional managers are compatible with the objectives of overall company.*
- (v) A transfer pricing system, if properly established, can check multinational companies and international groups which may try to manipulate transfer prices between countries in order to minimize the overall tax burden.*



Problems with transfer pricing

1. Maintaining the right level of divisional autonomy:

Transfer prices are particularly appropriate for profit centres because if one profit centre does work for another the size of the transfer price will affect the costs of one profit centre and the revenues of another. However, a danger with profit centre accounting is that the business organisation will divide into a number of self interested segments, each acting at times against the wishes and interests of other segments. Decisions might be taken by a profit centre manager in the best interests of his own part of the business, but against the best interests of other profit centres and possibly the organisation as a whole.

2. Ensuring divisional performances are measured fairly:

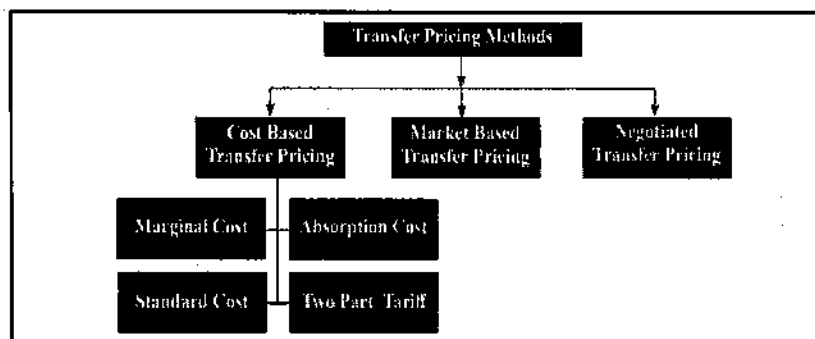
Profit centre managers tend to put their own profit performance above everything else. Since profit centre performance is measured according to the profit they earn, no profit centre will want to do work for another and incur costs without being paid for it. Consequently, profit centre managers are likely to dispute the size of transfer prices with each other, or disagree about whether one profit centre should do work for another or not. Transfer prices affect behaviour and decisions by profit centre managers.

3. Ensuring corporate profits are maximized:

When there are disagreements about how much work should be transferred between divisions, and how many sales the division should make to the external market, there is presumably a profit-maximizing level of output and sales for the organisation as a whole. However, unless each profit centre also maximizes its own profit at this same level of output, there will be inter-divisional disagreements about output levels and the profit maximizing output will not be achieved.



Methods and Techniques



1. Cost-based Prices

Four versions of 'cost' are commonly used, marginal cost, absorption cost, standard cost, and marginal cost plus a fixed charge. Actual costs will vary with volume, seasonal and other factors; furthermore, if actual costs are used as a basis for transfer prices, any inefficiency in the producing department will be passed on in the form of increased cost to the receiving department. The use of standard costs is therefore recommended, so that all of the supplying division's efficiencies and inefficiencies are reflected in its own accounts.

When to use Cost Based Transfer Prices:

- When market prices are unavailable, this is common for intermediate products.
- When the transferring division is treated as a cost centre. In this case, a profit is not necessary, as performance evaluation is based on cost control.

Various types of Cost Based Transfer Pricing System are:



Let us explore the transfer pricing method based on marginal cost, through the following example:

ABC Company Limited has two divisions – X and Y. Division X manufactures advanced computer microchips, and most of its production is taken up by division Y, which assembles computers. Data for division X are:

Standard unit production cost per unit	Amount (₹)	Amount (₹)
Direct materials		35
Direct labour		10
Variable manufacturing overhead		15
(a)		60
Fixed Overhead	20	
Fixed selling and administration	5	
(b)		
Total cost (A+B)		85
Mark-up: 40%		30
List price to outside buyers		115
Note on Fixed Cost:		
Fixed costs are allocated on the basis of estimated volume Estimated production (units):		
Internal transfers		300
External sales		200
Total production		500



If we assume that variable cost can be used as marginal cost, then the transfer price based thereon would be ₹60. If costs, revenues and volume are as expected, the use of this price will result in a 'loss' for the selling division to ₹1,500, as calculated below:

	Amount ₹
Internal transfers: 300 @ ₹60	18000
External sales: 200 @ ₹115	23000
	41000
Total costs: 500 @ ₹85	42500
loss	1500

However, if no more than the current 200 units could be sold externally, and the capacity represented by the production on chips for internal transfer would otherwise remain idle, there is no opportunity cost associated with a transfer at marginal cost, other things being equal, and division X would be indifferent to the production and transfer.

Obviously, if more than the current 200 units could be sold externally, X's indifference may change, depending on whether a price in excess of marginal cost is offered. If no excess is offered, X would have a strong disincentive to supply Y.

(II) Absorption Cost

Let us now proceed with the Absorption cost method, taking into account the previous example:

Using this variant of cost gives a transfer price of ₹70 (variable costs ₹50, fixed manufacturing cost ₹20) and a rather happier income statement:



	Amount ₹
Internal transfers: 300 @ ₹70	21000
External sales: 200 @ ₹105	21000
	42000
Total costs: as above	37500
Profit	4500

Although the new transfer price does not generate the same level of profit as a sale of that quantity to an outside party, nevertheless a contribution towards fixed costs is provided thereby, thus modifying the disincentive noted above. However, as the level of the transfer cost is increased, its effect on the buying division, B, could lead to problems of sub-optimization for the firm as a whole. For example, suppose Y could buy the same components from an outside supplier at a cost of ₹65. An internal transfer price of ₹70 would force Y to buy in a product at ₹65 that could be manufactured in-house for a variable cost of ₹50. Although the buying division would 'save' ₹5 per chip (₹70 - ₹65), the firm would lose ₹4,500 thereby:

	Amount ₹
Marginal cost to produce	50
External purchase cost	(65)
Loss, if buy in	(15)
300 units x ₹15 =	4500

This loss assumes that the opportunity cost of the released capacity is less than 15 per unit. If alternative goods generating more than this could be produced with the spare capacity – if, for example, the marginal 300 units could be sold externally at the list price – then ABC would be optimizing its resources by buying in the components:



	Amount ₹
List price	115
Marginal cost	(50)
Contribution	65
Loss if buy in	(15)
Incremental profit	50
300 units × ₹50 =	15000

We can see here a clear application of the minimum/maximum rule noted above, the sum of the selling division's marginal cost and the opportunity cost of the resources used (at list price) is ₹115, the minimum transfer price that the selling division could change without making a loss for the firm, which exceeds the ₹65 maximum transfer price dictated by the prevailing market price. ABC should not transfer the components internally as long as the market price is less than ₹115.

(iii) Standard Cost

One of the problems of cost-based systems is that they allow a transferor division to pass on cost inefficiencies to a transferee division. Such inefficiencies can result from anything as simple as high fixed overheads per unit arising from low output levels in the current period, or high unit material costs resulting from machine defects in the current period.

One variant on the absorption cost method is standard cost. Such standards are used irrespective of what actual costs were, with the result that the impact of adverse or favorable cost variances rests with the transferor division.

Many business managers would consider that this gives the most equitable distribution of profit.



(iv) Two-part tariff

Under this variant, the selling division transfers at marginal cost (including any opportunity cost), but raises a fixed annual fee on the buying division for the privilege of receiving transfers at that price. The theory underlying this approach is that the buying division will have a correct understanding of the selling division's cost behaviour patterns.

The buying division will be able to correctly identify the appropriate marginal cost when calculating the optimum output level. The fixed fee is designed to cover a share of the selling division's fixed costs and provide a return on the capital employed in it, and thus both selling and buying divisions should be able to record a profit on intracompany transfers.

Drawbacks of this system include:

- The supplying division has no incentive to supply units swiftly, because individual units do not generate a profit.
- A profit is made when the fixed fee is transferred.

Advantages and disadvantages of Cost Based Transfer Pricing:

Advantages:

- Costs are likely available since they will be computed for other purposes.
- For organisations, units that do not control investment or revenues, cost based transfer prices are consistent with the appropriate performance measure for those units.

Disadvantages:

- Using actual costs transfers inefficiencies.
- Can lead to sub-optimal decisions as divisional managers make decisions that are beneficial for their unit, but detrimental to the company as a whole. This is particularly the case in absorption or full cost based transfer prices. Even if



there is idle capacity, a manager may refuse a special order if it does not meet the absorption or full cost transfer price. This can result in the buying manager purchasing externally, resulting in lower overall company profit.

2. Market-based Prices

The price of a comparable product or service in the market can be seen as an objective basis for the transfer price between divisions. In most circumstances, where there is a perfectly competitive market for an intermediate product, the current market price is the most suitable basis for setting the transfer price. When transfers are recorded at market prices divisional performance is more likely to represent the real economic contribution of the division to total company profits. If the supplying division did not exist, the intermediate product would have to be purchased on the outside market at the current market price.

Alternatively, if the receiving division did not exist, the intermediate product would have to be sold on the outside market at the current market price. Divisional profits are therefore likely to be similar to the profits that would be calculated if the divisions were separate organisations. Consequently, divisional profitability can be compared directly with the profitability of similar companies operating in the same type of business. It is the price that reflects the autonomous nature of divisionalization, in as much as it simulates the price that would be offered and paid by fully independent entities. If the selling division is operating efficiently relative to its competitors, it would be expected to show a profit at such a price, and, similarly, a market-based price should not cause problems for an efficiently managed buying division, as the only alternative to an internal transfer would be to buy the goods or services in the open market at that price.



However, it is not always easy to determine the appropriate market price to use:

- A comparable product might not be available in the market.
- Different suppliers will quote different initial prices.
- Different buyers command different discounts and credit terms, depending on the order size and their status.
- Current market prices may reflect temporary aberrations in trading conditions, and thus might not prevail in the longer term.
- An internal transfer of goods may involve savings in advertising, packaging and delivery costs, and thus an external market price would not be entirely appropriate.

When to use Market Based Transfer Prices:

- When a competitive external market for the product exists.
- When managers have the autonomy to purchase externally or internally.
- When transferring and receiving divisions are treated as a profit or investment centre and, therefore, are evaluated on profit based measures, such as ROI or residual income.

Advantages and disadvantages of Market Based Transfer Pricing:

Advantages:

- As the transfer price is based on competitive market conditions, managers are motivated to become more efficient – the market sets the price; therefore, to increase profit, costs must be reduced.
- Easy to use when market prices are readily available.

**Disadvantages:**

- A market price may not exist for the exact product.
- In some industries, market prices can fluctuate widely creating uncertainties in planning for both the supplying and receiving profit centre managers.

3. Negotiated Transfer Prices

The transfer prices may be determined by various means, including the use of mathematical formulae based on opportunity cost and by determining the correct transfer price to encourage all divisions to operate at the profit maximizing output level.

Alternatively, transfer prices could be set through a process of negotiation between the buying and selling divisions. It could be argued that this is the correct procedure in a truly autonomous system, with no interference whatsoever from central management or head office. The resulting transfer price should be acceptable to both the buying and selling division since the relevant managers have been directly responsible for the negotiations.

However, there are disadvantages to the use of negotiated transfer prices.

- The negotiations may be protracted and time-consuming.
- The managers may find it impossible to reach agreement. In this case central management may need to intervene. If a transfer price is imposed as a consequence, then this may cause behavioural problems and would negate the objective of giving autonomy to divisions.



- On the other hand, central managers might act simply as arbitrators in any dispute during negotiations, providing a mediation service to assist the negotiations to reach a conclusion that is acceptable to all concerned.
- The managers may not be negotiating from an equal basis. For example, one of the managers may be more experienced than the other with the result that the outcome of negotiations may be unfair. This could lead to poor motivation and consequent behavioural problems.

When to use Negotiated Transfer Pricing:

- When an external market does not exist and market prices are not available.
- When divisions are forced to purchase internally.
- Where there is not an excessive number of transfers subject to negotiation.

Advantages and Disadvantages of Negotiated Transfer Pricing:**Advantages:**

- Of all transfer pricing methods, negotiated transfer pricing provides managers with the greatest control over divisional profits.

Disadvantages:

- Negotiations may be time consuming and require a great deal of data, which can be costly to accumulate.
- The bargaining parties may not be able to resolve disputes; to counter this, an organisation needs a mediation or arbitration mechanism.
- Disputes can result in conflict and hostility between divisions.
- Focus is on divisional results, not the company as a whole.



Conflicts between Divisions and Company as a whole:

If Divisional Managers are given "absolute free hand" in decision making on Transfer Prices, there is a possibility that divisional goals may be pursued, ignoring overall Company interests. This may force the top Management to interfere in decision-making.

However, interference of top Management and "dictating a Transfer Price" on the divisions is usually the main basis of conflict between a Division and the Company as a whole.

Conflicts Resolution:

To resolve transfer pricing conflicts, the following transfer pricing methods can be suggested -

(i) Dual-Rate Transfer Pricing System:

The dual price method of transfer pricing was introduced in order to overcome the problems caused by using marginal cost, namely poor morale in the selling division, and lack of motivation by the receiving division to maximize the group's profit. The dual pricing method uses two prices:

The supplying division is credited with a price based on total cost plus a mark-up.
The receiving division is debited with marginal cost.

(ii) Two-Port Transfer Pricing System:

Under this variant, the selling division transfers at marginal cost (including any opportunity cost), but raises a fixed annual fee on the buying division for the privilege of receiving transfers at that price.



Divisional Performance and Problem of Goal Congruence

Transfer pricing system should accomplish the following objectives:

1. It should motivate the divisional manager to make sound decisions, and it should communicate information that provides a reliable basis for such decisions. This will happen when actions those divisional managers take to improve the reported profit of their divisions also improve the profit of the company as a whole.
2. It should result in a report of divisional profits that is a reasonable measure of the managerial performance of the division.
3. It should ensure that divisional autonomy is not undermined. One of the purposes of is to allow managers to exercise greater autonomy. There is little point in granting additional autonomy and then imposing transfer prices that will affect the profitability of the division.

Each divisional manager wants to increase profits of his respective division. Now a problem arises where output of a particular division can be the input for a particular division, in this situation the problem is to decide proper transfer price as improper price may impact the profitability of both the divisions and give birth to various conflicts.

Divisional managers may not be interested to transfer goods internally; instead they can choose to deal with external parties and may adversely impact the profitability of organisation as a whole. That's why it is very important to decide fair transfer prices.



When goods are transferred from one division to another, a portion of the revenue of the supplying division becomes a portion of the cost of the receiving division. Consequently, the prices at which goods are transferred can influence each division's reported profits, and there is a danger that, an unsound transfer price will result in a misleading performance measure that may cause divisional managers to believe that the transfer price is affecting their performance rating unfairly. This may lead to disagreement and negative motivational consequences. In some situations, the decision-making and the performance evaluation objectives required for establishing a transfer pricing system may conflict with each other. For example, in some situations the transfer price that motivates the short-run optimal economic decision is marginal cost. If the supplier has excess capacity, this cost will equal variable cost. The supplying division will fail to cover any of its fixed costs when transfers are made at variable cost, and will therefore report a loss. Furthermore, if a transfer price equal to marginal cost is imposed on the manager of the supplying division, the concept of divisional autonomy is undermined. On the other hand, a transfer price that may be satisfactory for evaluating divisional performance may lead divisions to make suboptimal decisions when viewed from the overall company perspective.

In the absence of a competitive market for the intermediate product, the theoretically correct transfer price can be established only when the information for all the divisions is gathered together to give a composite picture. This is likely to result in staff at the central H.O. gathering together the information and setting the transfer prices.



When transfer prices are set by central H.O., there is a loss of divisional autonomy. It can be argued that if divisions are not free to set their own transfer prices, central headquarters might just as well dictate the types and volumes of products to be transferred instead of dictating the prices at which transfers are to pass between them. However, even though imposed transfer prices from central H.O. are likely to be an infringement of divisional autonomy, they are likely to be less objectionable to divisions than direct interference with production and marketing plans.



Determination of Inter-Departmental or Inter-Company Transfer Price

Rules for Transfer Pricing:

The limits within which transfer prices should fall are as follows:

- The minimum- the sum of the supplying division's marginal cost and opportunity cost of the item transferred.
- The maximum- the lowest market price at which the receiving division could purchase the goods or services externally, less any internal cost savings in packaging and delivery.

The minimum results from the fact that the supplying division will not agree to transfer if the transfer price is less than the marginal cost + opportunity cost of the item transferred (because if it were the division would incur a loss).

The maximum results from the fact that the receiving division will buy the item at the cheapest price possible.

Example:

Division X produces product L at a marginal cost per unit of ₹100. If a unit is transferred internally to division Y, ₹25 contribution is foregone on an external sale. The item can be purchased externally for ₹150.

- The minimum- Division X will not agree to a transfer price of less than $₹(100 + 25) = ₹125$ per unit.
- The maximum- Division Y will not agree to a transfer price in excess of ₹150. The difference between the two results (₹25) represents the savings from producing internally as opposed to buying externally.



In most cases where the transfer price is at market price, internal transfers should be expected, because the buying division is likely to benefit from a better quality of service, greater flexibility, and dependability of supply. Both divisions may benefit from cheaper costs of administration, selling and transport. A market price as the transfer price would therefore result in decisions which would be in the best interests of the company or group as a whole.

Conclusion:

Since transfer prices are set according to motives other than performance evaluation of divisional managers, the transfer price could result in hostility, a lack of managerial effort towards goals such as profit maximization or goal incongruent decisions. The potential negative consequences are particularly strong if divisional managers are evaluated based on profit performance evaluation measures. To resolve this situation an organisation could use dual transfer prices, one for performance evaluation purposes and one for financial reporting purposes. The result is divisional managers are not penalized for transfer pricing decisions that are beyond their control.

The disadvantage is two sets of records must be kept, which can be time consuming and costly.



International Transfer Pricing

Globalization and the rapid growth of international trade has made inter-company pricing an everyday necessity for the vast majority of businesses. However, the growth of national treasury deficits and the frequent use of the phrase 'transfer pricing' in the same sentence as 'tax shelters' and 'tax evasion' on the business pages of newspapers around the world have left multinational enterprises at the centre of a storm of controversy. The creation of foreign subsidiaries and bases of operation for cross-border flow of products, services, trademarks, funding and technology is having a significant impact on the issue of transfer pricing in today's international business scenario. The transfer pricing problem for multinationals is of great significance. There are different income tax rates in different countries. So, it becomes desirable from the view point of overall corporate strategy to show higher profits in low-tax countries and lower profits in high-tax countries. One way to do so is through transfer prices.

While domestic transfer pricing is concerned with fairly compensating an internal division for products it has produced and supplied to another division, international transfer pricing is usually set according to another purpose, such as lowering a company's worldwide taxes. For example, a company can choose a transfer price to locate profit in a division in a country with a low corporate tax rate. Transfer pricing guidelines set down by international bodies, such as the Organisation for Economic Co-operation and Development (OECD), are intended to result in transfer prices that reflect the underlying economic characteristics of the goods or products being transferred. In these settings, the international transfer price is consistent with the objectives of internal transfer pricing. However, if the



international transfer price reflects other considerations, such as negotiations between tax authorities about sharing tax revenues, international transfer prices will no longer be consistent with the objectives of internal transfer prices and the resulting profits reported by the profit centres will no longer reflect the principle of controllability.

Factors influencing international transfer pricing decisions:

- tax rates
- income repatriation restriction
- dividend repatriation restrictions
- duties and tariffs
- exposure to foreign exchange rate fluctuations
- political climate
- the need to maintain cash flows in the foreign division
- competitive position of the foreign division
- trade treaties that restrict transfer pricing

There are two basic issues relating to transfer prices in case of multinational companies having divisions in different countries. It is important to note that it is the substance of the situation that always determines whether a transaction has taken place, rather than whether an invoice has been rendered. For instance, management services may be delivered through the medium of a telephone call between executives of a parent company and its subsidiary. In this example, a service has been performed that the provider had to finance in the form of payroll costs, phone charges, overheads, etc. and the service itself is of value to the recipient in the form of the advice received. As a result, a transaction has taken place for transfer pricing purposes even though, at this stage, no charge has been



made for the service. Transfer pricing rules typically require related entities to compensate each other appropriately so as to be commensurate with the value of property transferred or services provided whenever an inter-company transaction takes place. The basis for determining proper compensation is, almost universally, the arm's-length principle.

Simply stated, the arm's-length principle requires that compensation for any intercompany transaction conform to the level that would have applied had the transaction taken place between unrelated parties, all other factors remaining the same.

Although the principle can be simply stated, the actual determination of arm's-length compensation is notoriously difficult. Important factors influencing the determination of arm's-length compensation include the type of transaction under review as well as the economic circumstances surrounding the transaction. In addition to influencing the amount of the compensation, these factors may also influence the form of the payment.

One of the important aspects of management accounting in multinational firm's is that of transfer pricing. Transfer prices may be set with the following objectives in mind:

Minimization of import duties:

If import duties are levied on the price of the import (rather than, say, on its volume-specific composition), then a low transfer price will reduce the import duties of the group as a whole if its goods enter a high-import-duty economy.



Management of direct taxation:

By being aware of the respective government's legislation concerning domestic tax neutrality, withholding taxes the firm may plan effectively to minimize their global tax charge.

Management of indirect taxation:

Most countries have indirect tax regimes involving a value-added tax. This requires that the firm effectively pays the tax on its purchases (input tax) and then recoups the taxes in the price of its sales (output tax). In competitive markets it may be hard to pass on the indirect tax to the price of the good and so its input tax will not be wholly recovered. To avoid this, it may transfer some goods to itself at very low prices which can then be sold on at high prices to recover the indirect tax paid on other lines of product.

Repatriation of profits in kind:

Where a country operates currency controls it may be difficult (or of low worth) for the Multinational enterprise (MNE) to repatriate profits in local currency, yet it is unable to exchange its local currency profits for a world currency. In this situation, the firm seeks to export product (either manufactured by itself or purchased with the local currency) at a low price for sale at home to gain the revenue in its home currency. This can likewise avoid local restrictions on the amount of dividend that can be declared or repatriated.

To win host-country approval:

To avoid accusations of overcharging locals for product or of exporting unfair amounts of value from the country, the MNE may set a transfer price that seems fair to the authorities.



To disguise profitability of a subsidiary:

The MNE may deliberately declare low profits in an operating country to prevent local businesses setting up in competition.

To enable penetration pricing:

The MNE may allow an operating subsidiary to receive inputs at low prices in order that these may be passed on in the local market as low final good prices. This will help the MNE to destroy local competitors without the subsidiary's low profits provoking the authorities to accuse it of tax avoidance.



Question 1

A manufacturing company has two divisions-X and Y. Division X is mainly engaged in production of an electronic devices and Division Y packs and labels the Product and sells it in market. Division X supplies 25,000 units of the product per month to Y for packing and labelling. Division X incurs Rs.16 as the variable cost for the product fixed cost of Rs.8,40,000 per year. Investment in fixed assets is Rs.9,60,000. The division plans to have 12% return on fixed assets as normal profits. Division Y incurs Rs.10 per product as variable expenses for packaging and marketing.

- (i) Find the Transfer Price per unit of the product that Division X can charge for Transfer to Y.
- (ii) What will be profit of Division Y if it can sell all the products in the market at Rs.80 per unit?
- (iii) If Division Y can sell only 15,000 units of the product per month and asks Division X to supply only 15,000 units, what will be the effect on the Transfer Price and the profits of the divisions?

Solution 1

- (i) Computation of Transfer Price:

To be charged by 'X' to 'Y'

Variable Cost per unit	16
Fixed Cost per Unit (8,40,000/3,00,000)	2.80
Return per Unit (9,60,000 x 12%)/3,00,000	0.384
	19.184

- (ii) Computation of Profit of Division 'Y'

Transfer Price	19.184
Variable cost	10





	29.184
Contribution and Profit per Unit	= (80 - 29.184)
	= 50.815
Monthly Profit	= 25,000 x 50.186
	= 12,70,400
Yearly Profit	= 3,00,000 x 50.186
	= Rs. 1,52,44,800

Transfer Price :

Variable cost per unit	16
Fixed Cost per Unit (8,40,000 / 1,80,000)	4.67
Return per Unit (9,60,000 x 12%)/1,80,000	0.64
	21.31
Variable Cost for Packaging and Marketing	10
	31.31
Contribution and Profit per Unit	48.69
	(80 - 31.31)

Question 2

A company has two divisions, manufacturing and assembly. At a normal volume of component YPV per year, production cost per unit are:

Direct materials	40
Direct labour	20
Variable factory overhead	12
Fixed factory overhead	42

The manufacturing division has been manufacturing and selling 2,50,000 components per year to outside buyers for Rs.136 each. However, the division can manufacture 3,50,000 components per year. The assembly division has been buying the components from outside suppliers for Rs.130 each. The assembly



division has offered to purchase 90,000 units of component YPY from the manufacturing division at the rate of Rs.104 per unit. Should the manager of Electrical Division accept the offer? Will an internal transfer be of any benefit to the company?

Solution 2

There is surplus capacity in manufacturing division. So, the relevant cost for production will be variable cost only amounting to Rs.72 per unit (40 + 20 + 12). This will result in a profit Rs.28,80,000 [(104 - 72) x 90,000].

Therefore, manufacturing division should accept the offer. Internal transfer will be beneficial to the company. The company is paying Rs.130 for the component which can be made internally at an incremental cost Of Rs.72.

The company will save Rs.52,20,000. [(130 - 72) x 90,000].

Question 3

Material costs, labour costs and variable overhead costs and Rs.125, Rs.150 and Rs.50 per unit respectively. If the fixed expenses for 20000 units are Rs.6,40,000 and required rate of return is 25% on transfer price, then find out the transfer price per unit.

**Solution 3**

Particulars	Rs.
Per unit variable cost (125 + 150 + 50)	325
Add : Fixed expenses per unit (Rs. 6,40,000/20,000)	32
Total cost per unit	357

Adding Desired return 25% on transfer price (1/3 of cost) = $357 \times \frac{4}{3} = 476$

Question 4

The following information relates to budgeted operations of Division P of a Manufacturing company.

Particulars	Amount in Rs.
Sales- 50,000 units @ Rs 8	4,00,000
Less: Variable Costs @ Rs.6 per unit	3,00,000
Contribution margin	1,00,000
Less: Fixed Costs	75,000
Divisional Profits	25,000

The amount of divisional investments is Rs.1,50,000 and the minimum desired rate of return on the investments is the cost of capital of 20%.

Calculate

(i) Divisional expected ROI and (ii) Divisional expected RI

**Solution 4**

(i) ROI = $\text{Rs.} 25,000 / 1,50,000 \times 100 = 16.7\%$

(ii) RI = Divisional Profits - Minimum desired rate of return
= $25,000 - 20\% \text{ of } 1,50,000 = (\text{Rs.} 5000)$

Question 5

A company fixes the inter-divisional transfer prices for its products on the basis of costs plus an estimated return on investment in its divisions. The relevant portion of the budget for the Division X for the year 2015-16 is given below :

Particulars	Amount in Rs.
Fixed Assets	5,00,000
Current Assets (other than debtors)	3,00,000
Debtors	2,00,000
Annual fixed cost for the division	8,00,000
Variable cost per unit of product	10
Budgeted volume of production per year (units)	4,00,000
Desired Return on Investment	28%

You are required to determine the transfer price for Division X.

Solution 5

Computation of Transfer Price per unit for division X

Particulars	Amount in Rs.
Variable cost	10
Fixed cost (8,00,000 / 4,00,000)	2
Total cost	12



Add: Desired return $(10,00,000 \times 28\%) + 4,00,000$	0.70
Transfer Price	12.70

Question 6

XYZ Ltd has a system of assessment of Divisional Performance on the basis of residual income has two Divisions, Alfa and Beta. Alfa has annual capacity to manufacture 15,00,000 numbers of special components that is sells to outside customers, but has idle capacity. The budgeted residual income of Beta is Rs.1,20,00,000 while that of Alfa is Rs.1,00,00,000. Other relevant details extracted from the budget of Alfa for the current years were as follows:

Particulars	
Sale (outside customers)	12,00,000 units @ 180 per unit
Variable cost per unit	Rs.160
Divisional fixed cost	Rs.80,00,000
Capital employed	Rs.7,50,00,000
Cost of capital	12%

Beta has just received a special order for which it requires components similar to the ones made by Alfa. Fully aware of the Idle capacity of Alfa, beta has asked Alfa to quote for manufactures and supply of 3,00,000 numbers of the components with a slight modification during final processing. Alfa and Beta agree that this will involve an extra variable cost of Rs.5 per unit.

You are required to calculate,

The transfer price which Alfa should quote to Beta to achieve its budgeted residual income.

**Solution 6**

Contribution required at Budgeted Residual Income :

	Rs.
Fixed Cost	80,00,000
Profit on 7,50,00,000 $\times 12\%$	90,00,000
Residual Income	1,00,00,000
Total Contribution required	2,70,00,000

Contribution derived from existing units = $12,00,000 \times 20 = \text{Rs.}2,40,00,000$.

Contribution required on 3,00,000 units = $2,70,00,000 - 2,40,00,000$
= Rs.30,00,000

Contribution per unit = $30,00,000 / 3,00,000 = \text{Rs.}10$

Increase in variable cost = Rs.5

$\therefore$ Transfer Price = V.C + Desired Residual Income + Increase in V.C
= $160 + 10 + 5 = \text{Rs.}175$

(II) If Beta can buy from outside at less than the variable cost of manufacture, i.e Rs.165, then only the decisions to transfer price of Rs.175, will be sub-optimal for the group as whole.

Question 7

The Production Director of PQ Company is concerned with the problem of measuring the efficiency of process managers. In the production department there are six processes and all products processed pass through a combination of these processes. One specific area of investigation is the measurement of output values which involves the use of transfer prices. You as a Management Accountant of the Company have been asked by the production director to make a report on advantages and disadvantages of using



each of the following systems of transfer pricing as related to process costing:

- (i) Variable Cost;
- (ii) Actual Full Cost;
- (iii) Full Cost-Plus Profit Margin;
- (iv) Standard cost.

Solution 7

The report will cover the following points:

(i) Variable Cost: Variable cost-based pricing approach is useful when the transferor / selling division is operating below capacity. The manager of the transferor division will generally not like this transfer price because it yields no profit to that division. The obvious problem is that selling division is left holding all its fixed costs and operating expenses. The profit center concept will be vitiated.

(ii) Actual Full Cost: When full cost is used for transfer pricing, the transferor division cannot realise a profit on the goods transferred.

Further, full cost transfer pricing can provide perverse incentives and distort performance measures.

(iii) Full Cost-Plus Profit Margin

With such a system, the transferor division obtains a profit contribution on units transferred and hence, benefits if performance is measured on the basis of divisional operating profits. However, the manager of the buying/ transferee division would naturally object that his costs (and hence reported performance) are adversely affected.

(iv) Standard cost: To promote responsibility in the selling division and to isolate variances within divisions, standard costs are usually used as a basis for transfer



pricing in cost-based systems.

Question 8

In a meeting with the Director Finance of your company, he had pointed out that there might be some disadvantages in taking divisions as a profit centres. As a Management Accountant of the company you are required to state the various disadvantages in taking divisions as a profit centres.

Solution 8

As a Management Accountant, the following points are considered to be of importance:

- (i) Divisions may compete with each other and may take decisions to increase profits at the expense of other divisions thereby overemphasizing short term results.
- (ii) It may adversely affect co-operation between the divisions and lead to lack of harmony in achieving organizational goals of the company. Thus, it is hard to achieve the objective of goal congruence.
- (iii) It may adversely affect co-operation between the divisions and lead to lack of harmony in achieving organizational goals of the company. Thus, it is hard to achieve the objective of goal congruence.
- (iv) The cost of activities, which are common to all divisions, may be greater for decentralized structure than centralized structure. It may thus result in duplication of staff activities.



- (v) Top management loses control by delegating decision making to divisional managers. There are risks of mistakes committed by the divisional managers, which the top management, may avoid.
- (vi) Series of control reports prepared for several departments may not be effective from the point of view of top management.
- (vii) It may underutilize corporate competence.
- (ix) It leads to complications associated with transfer pricing problems.
- (x) It becomes difficult to identify and defines precisely suitable profit centres.
- (xi) It confuses division's results with manager's performance.

Question 9

BC Company fixes the inter-divisional transfer prices for its products on the basis of cost, plus a return on investment in the division. The Budget for Division for Alpha for the year 2021-22 appears as under:

₹	
Fixed Assets	5,00,000
Current assets	3,00,000
Debtors	2,00,000
Annual Fixed Cost of the Division	8,00,000
Variable Cost per unit of Product	10
Budgeted Volume	4,00,000 units per year
Desired ROI	28% on ₹10,00,000
Determine the transfer Price for Alpha.	

**Solution 9**

Computation of the Transfer Price per unit for the Product Alpha

Particulars	₹
Variable Cost per unit of Product	10.00
Annual Fixed Cost per unit (₹8,00,000 ÷ 4,00,000 units)	2.00
Desired Return (@ 28% on ₹10,00,000) ÷ 4,00,000 units)	0.70
Transfer price	12.70

Question 10

Division A is a profit centre, which produces four products P, Q, R and S. Each product has its own market also. Data for the period is as follows:

	P	Q	R	S
Market Price per unit (₹)	350	345	280	230
Variable Cost of Production per unit (₹)	330	310	180	185
Labour hours required per unit	3	4	2	3

Product S can be transferred to Division B but the maximum quantity that might be required for transfer is 2,000 units of S.

The maximum sales in the external market are:

P	3,000 units
Q	3,500 units
R	2,800 units
S	1,800 units

Division B can purchase the same product at a slightly cheaper price of ₹ 225 per unit instead of receiving transfers of products S from Division A. What should be transfer price for each unit for 2,000 units of S, if the total labour hours available in Division A are:

- (i) 24,000 hours?



(ii) 32,000 hours?

Solution 10:**Statement Showing Contribution per unit and per labour hour**

Particulars	P	Q	R	S
Selling Price per unit (₹)	350	345	280	230
Variable Cost per unit (₹)	330	310	180	185
Contribution per unit (₹)	20	35	100	45
Labour Hours per unit	3	4	2	3
Contribution per labour hour (₹)	6.67	8.75	50	15
Ranking	IV	III	I	II

Statement Showing Production Plan

Total Hours	Products	Hours/unit	Allocation of Hours
24000	P	3	-
	Q	4	13,000
	R	2	5,600
	S	3	5,400
			24000

Statement Showing Transfer Price per unit of the product S

Total labour hours required for S (2000 units × 3 hours per unit)	6000
Hours diverted from Product Q (1,500 units × 4 hours per unit)	6000
Variable Manufacturing cost for Product 'S' (2000 × ₹ 185) =	₹ 3,70,000



Contribution foregone/ Opportunity Cost of Product Q (1500 × ₹35)	₹ 52,500
---	----------

₹ 4,22,500

(i) Hence, Transfer Price per unit (₹4,22,500 ÷ 2,000 units) = ₹211.25

Statement Showing Production Plan

Total Hours	Products	Hours/unit	Allocation of Hours
32000	P	3	7000
	Q	4	14,000
	R	2	5,600
	S	3	5,400
			32000

Total labour hours required for S (2000 units × 3 hours per unit)	6000
---	------

Hours diverted from Product Q (1,500 units × 4 hours per unit)	6000
--	------

Variable Manufacturing cost for Product 'S' (2000 × ₹ 185) =	₹ 3,70,000
--	------------

Contribution foregone/ Opportunity Cost of Product Q (1500 × ₹35)	₹ 40000
---	---------

₹ 4,10,000

(ii) Hence, Transfer Price per unit (₹4,10,000 ÷ 2,000 units) = ₹205.00

**Question 11**

Mother Co. Ltd has two business units, viz. X unit engaged into telemarketing, and Y unit focusing on business analytics. Recently the CEO was reviewing the half yearly financial data which had the following key indices:

Turnover of X unit at 90% capacity utilization ₹250 Lakhs. Turnover of Y unit at 60% capacity utilization ₹550 Lakhs. Profit Margin of X and Y units respectively 18 % and 15 % respectively Present number of shared employees from the X unit to the Y unit on requirement basis 10 employees. Number of hours required on cross training of one employee and the rate per hour Approx. 10 hours at ₹3,000 per hour.

The CEO's next half year overall target for the company is ₹1,200 Lakhs with a profit margin of 18% for the company as a whole. However, the X unit head has told categorically to the CEO that he cannot spare any additional employee as the X is working at optimum capacity. The Y unit head, on the other hand, finds it cost effective to cross train employees of the X for specific tasks instead of hiring directly from the market.

Required

- (i) Analyze the strategic problem that Mother Co Ltd is facing.
- (ii) List few suggestions in brief.

Solution 11:

(i) The present position of the units and the overall company is as under:

	X	Y	Combined
Turnover (in ₹ Lakhs)	250	550	800
Capacity	90%	60%	67%
Turnover at full capacity (in ₹ Lakhs)	278	916	1,196



Profit Margin	18%	15%	16%
Present Profit (in ₹ Lakhs)	45	83	128
Profit at full capacity (in ₹ Lakhs)	50	138	188

In Mother Co. Ltd., both unit heads are focusing only on their respective unit performances rather than strategizing on the company's performance growth as a whole.

Calculations revealed that the X unit is a low margin high manpower-oriented unit as its overall contribution is just 35% share of the overall company, whereas the Y is a high margin low manpower-oriented unit as its share is 65%. It is clear that the strategic problem being faced by Mother Co. Ltd is concerned with divisional performance measures in terms of goal congruence. The CEO's target for the next half yearly is really ambitious, and this can be achieved only if goal congruence is met by the heads of both units.

(ii) Few brief suggestions are given below:

- Overall revenue target of 1,200 thousand to be achieved by cranking up the utilization for each division at 100% (still there will be a gap of ₹ 6 thousand).
- Company's profit margin of 16% calculated at full capacity, to be increased by 2% through means of cost cutting techniques.
- Cross training can be helpful in proper utilization of work force.
- The Y should focus on further cost reduction and improve its % of profit margin.

**Question 12**

Aurthor company is a multidivisional company and its managers have been delegated full profit responsibility and autonomy to accept or reject transfers from other divisions.

Division X produces a sub-assembly with a ready competitive market. This sub-assembly is currently used by Division Y for a final product that is sold outside at ₹1,200. Division X Charges Division Y market price for the sub-assembly which is ₹700 per unit. Variable costs are ₹520 and ₹600 for Divisions A and B respectively.

The manager of Division Y feels that Division X should transfer the subassembly, at a lower price than market because at this price, Division Y is unable to make a profit.

Required:

1. Compute Division Y's profit contribution if transfers are made at the market price and also the total contribution to profit for the company.
2. Assume that Division A can sell all its production in the open market. Should Division X transfer goods to Division Y? If so, at what price.
3. Assume that Division X can sell in the open market only 500 units at ₹700 per unit out of 1,000 units that it can produce every month and that a 20 per cent reduction in price is necessary to sell at full capacity. Should transfers be made? If so, how many units should it transfer and at what price? Submit a schedule showing comparisons of contribution margins under three different alternatives to support your decision.

**Solution 12:**

Calculation for Division Y's contribution Margin	₹	₹
1. Selling Price of Final Product		1,200
Less: Division Y's variable cost	600	
Division Y's purchase cost	700	1,300
Division Y's loss		(100)

Calculation for Company's contribution Margin

Selling price of final product		1,200
Less: Division Y's variable cost	600	
Division X's variable cost	520	1,120
Company's Contribution margin		80

2. Selling price of sub-assembly		700
Less: Division X's variable cost		520
Company's contribution margin		180

The company contribution is ₹100 greater if the sub-assembly is sold on the intermediate market rather than to Division B. Thus, it should be sold in the intermediate market. The market price would be the appropriate transfer price if transfers were made:

3. Alternative 1: Transfer 1,000 units to Division Y.

Alternative 2: Sell 500 units in the intermediate market at ₹700 and transfer 500 units to Division Y.

Alternative 3: Sell 1,000 units on the intermediate market at 20% reduced price.



Alternative 1:	₹
Company sales: (1000 units × ₹1200)	12,00,000
Less: Variable costs (1000 units @ ₹520 + 1,000 units @ ₹600)	11,20,000
Contribution margin	80,000

Alternative 2:	₹
Company sales:	9,50,000
(500 units @ ₹700 + 500 units @ ₹1,200)	
Variable costs: (1000 units @ ₹520 + 500 units @ ₹600)	8,20,000
Contribution margin	1,30,000

Alternative 3:	₹
Company sales:	
(1000 units @ ₹560 (700-140))	5,60,000
Variable costs: (1000 units @ ₹520)	5,20,000
Contribution margin	40,000

Conclusion:

Transfers should be made, 500 units should be transferred to Division Y. The transfer price should be set at a price greater than the variable cost of Division X (₹520) and less than the marginal revenue to Division Y (₹600). Division Y's marginal revenue will be ₹600 (₹1,200 market division Y's own variable ₹600)



Question 13

The WEBEL Ltd. manufactures and sells television sets. The Assembly Division assembles the television sets. It buys the Picture tubes for the television sets from the Picture tubes Division. The Picture tubes division is operating at capacity. The incremental cost of manufacturing the Picture tube is ₹700 per unit. The Picture tubes Division can sell as many Picture tubes as it wants in the outside market at a price of ₹1,100 per picture tube. If it sells Picture tube in the outside market, the Picture tubes Division will incur variable marketing and distribution costs of ₹40 per unit. Similarly, if the Assembly Division purchases Picture tube from outside suppliers, it will incur variable purchasing costs of ₹20 per screen.

Required:

- Using the general guideline on transfer pricing policy what is the minimum transfer price at which the Picture tubes Division will sell Picture tube to the Assembly Division?
- Suppose division managers act autonomously to maximize their own division's operating income, either by transacting internally or buying and selling in the market. If the two division managers were to negotiate a transfer price, what is the range of acceptable transfer prices?

**Solution 13:**

(i) If the Picture tubes division sells Picture tube in the outside market, it will receive, for each tube, the market price of the tube minus variable marketing and distribution costs per tube = ₹1,100 - ₹40 = ₹1,060. The incremental cost of manufacturing each tube is ₹700. The Picture tubes Division is operating at capacity.

Hence, the opportunity cost per tube of selling the tube to the Assembly Division rather than in the outside market is the contribution margin, the Picture tubes Division would forego, if it transferred Picture tube internally rather than sold them in the outside market. Contribution margin per tube = ₹1,060 - ₹700 = ₹360.

Minimum transfer price per tube = Incremental costs per tube + Opportunity costs per tube up to the point of transfer to the selling division.

That is, Minimum transfer price per tube = ₹700 + ₹360 = ₹1,060

(ii) If the two division managers were to negotiate a transfer price, the range of possible transfer prices is between ₹1,060 and ₹1,120 per tube. As calculated in requirement (i), the Picture tubes Division will be willing to supply Picture tube to the Assembly Division only if the transfer price equals or exceeds ₹1,060 per tube.

If the Assembly Division were to purchase the Picture tube in the outside market, it will incur a cost of ₹1,120, the cost of the tube equal to ₹1,100 plus variable purchasing costs of ₹20 per tube. Hence, the Assembly Division will be willing to buy Picture tube from the Picture tubes Division only if the price does



not exceed ₹1,120 per tube. Within the price range of ₹1,060 and ₹1,120 per tube, each division will be willing to transact with the other. The exact transfer price between ₹1,060 and ₹1,120 will depend on the bargaining strengths of the two divisions.

Question 14

A company has two divisions, X and Y. Division X manufactures a component which is used by Division B to produce a finished product. For the next period, output and costs have been budgeted as follows:

Particulars	Division X	Division Y
Component units	50,000	-
Finished units	-	50,000
Total variable costs	₹2,50,000	₹6,00,000
Fixed Costs	₹1,50,000	₹2,00,000

The fixed costs are separable for each division. You are required to advise on the transfer price to be fixed for Division X's component under the following circumstances:

- (i) Division X can sell the component in a competitive market for ₹10 per unit. Division B can also purchase the component from the open market at that price.
- (ii) As per the situation mentioned in (i) above, and further assume that Division Y currently buys the component from an external supplier at the market price of ₹10 and there is reciprocal agreement between the external supplier and another Division Z, within the same group. Under this agreement, the external supplier agrees to buy one product unit from Division Z at a profit of ₹4 per unit to that division, for every component which Division Y buys from the supplier.

**Solution 14:**

(i) Transfer price decisions can be taken on the following basis.

Transfer Price = Marginal Cost + Opportunity Cost i.e. ₹ (5 + 5) = ₹10

Note: Marginal Cost = ₹2,50,000 / 50,000 units = ₹5

Opportunity cost ₹5 is computed on the basis that the Division A will sacrifice ₹ 5 if they sell the product to Division Y.

(ii) In this situation, the transfer price will be worked out as under:

Transfer price = Marginal Cost + Contribution + Profit foregone by Division Z
= ₹(5 + 5 + 4) = ₹14

In situation (ii), if Division Y purchases from Division X, it will not purchase from external supplier.

Hence, the supplier will stop purchasing from Division Z, which will result in a loss of profit to Division Z @ ₹4 per unit, and therefore this amount will be recovered from the transfer price.

Question 15

XYZ Ltd which has a system of assessment of Divisional Performance on the basis of residual income has two Divisions, X and Y. X has annual capacity to manufacture 15,00,000 numbers of a special component that it sells to outside customers, but has idle capacity. The budgeted residual income of Y is ₹ 1,20,00,000 while that of X is ₹1,00,00,000. Other relevant details extracted from the budget of X for the current year were as follows:



Sale (outside customers) 12,00,000 units @ ₹180 per unit

Variable cost per unit ₹ 160

Divisional fixed cost ₹ 80,00,000

Capital employed ₹ 7,50,00,000

Cost of Capital 12%

Y has just received a special order for which it requires components similar to the ones made by X. Fully aware of the idle capacity of X, Y has asked X to quote for manufacture and supply of 3,00,000 numbers of the components with a slight modification during final processing. X and Y agree that this will involve an extra variable cost of ₹5 per unit.

You are required to calculate,

(i) The transfer price which X should quote to Y to achieve its budgeted residual income.

(ii) Also indicate the circumstances in which the proposed transfer price may result in a sub-optimal decision for the Company as a whole.

Solution 15

(i) Contribution required at Budgeted Residual Income:

Fixed cost ₹ 80,00,000

Profit on ₹7,50,00,000 × 12 % = ₹ 90,00,000

Residual Income = ₹ 1,00,00,000

Total Contribution required = ₹ 2,70,00,000

Contribution derived from existing units = 12,00,000 × ₹20 = ₹2,40,00,000

Contribution required on 3,00,000 units = ₹ 2,70,00,000 – ₹ 2,40,00,000 = ₹ 30,00,000

Increase in Variable Cost = ₹5



$\therefore \text{Transfer price} = \text{Variable Cost} + \text{Desired Residual Income} + \text{Increase in Variable Cost}$

$= ₹ 160 + ₹ 10 + ₹ 5$

$= ₹ 175$

Question 16

A company has two profit centres, X and Y. X sells half of its output on the open market and transfers the other half to Y. Costs and external revenues in an accounting period are as follows.

	X	Y	Total
	₹	₹	₹
External sales	8,000	24,000	32,000
Costs of production	12,000	10,000	22,000
Company profit			10,000

Required

What are the consequences of setting a transfer price at market value?

Solution 16:

If the transfer price is at market price, X would be happy to sell the output to Y for ₹ 8,000

External Sales	8000	24000	32000
Transfer sales	8000	-	-
Transfer costs	-	8000	-
Own costs	12000	10000	22000
Profit	4000	6000	10000



The transfer sales of X are self-cancelling with the transfer cost of Y, so that the total profits are unaffected by the transfer items. The transfer price simply spreads the total profit between X and Y.

Consequences:

- (i) A earns the same profit on transfers as on external sales. Y must pay a commercial price for transferred goods, and both divisions will have their profit measured in a fair way.
- (ii) A will be indifferent about selling externally or transferring goods to Y because the profit is the same on both types of transaction. B can therefore ask for and obtain as many units as it wants from X. X division's market-based transfer price therefore seems to be the ideal transfer price.

Question 17

Mineral Ltd. has two profit centres, A and B. A transfers all its output to B. The variable cost of output from A is ₹ 5 a unit, and fixed costs are ₹ 1,200 a month. Additional processing costs in B are ₹ 4 a unit for variable costs, plus fixed costs of ₹ 800 a month. Budgeted production is 400 units a month, and the output of B sells for ₹ 15 per unit.

Required

Determine the range of prices for which the transfer price (based on standard full cost plus) should be selected, in order to motivate the managers of both profit centres to both increase output and reduce costs.

**Solution 17**

Any transfer price based on standard cost plus will motivate managers to cut costs, because favourable variances between standard costs and actual costs will be credited to the division's profits. Managers of each division will also be willing to increase output (above the budget) provided that it is profitable to do so.

- (a) The manager of A will increase output if the transfer price exceeds the variable cost of ₹ 5 a unit.
- (b) The manager of B will increase output if the transfer price is less than the difference between the fixed selling price (₹ 15) and the variable costs in B itself. This amount of ₹ 11 (₹ 15 - ₹ 4) is sometimes called net marginal revenue.

The range of prices is therefore between ₹ 5.01 and ₹ 10.99.

Question 18

The Domino Company has two decentralized divisions, A and B. Division A has always purchased certain units from Division B at ₹ 75 per unit, because Division B plans to raise the price to ₹ 100 per unit, Division A desires to purchase these units from outside suppliers for ₹ 75 per unit. Division B's costs follow:

Division B's variable costs per unit ₹ 70

Division B's annual fixed costs ₹ 15,000

Division A's purchase 1,000 units

If Division A buys from an outside supplier, the facilities Division B uses to manufacture these units will remain idle. Would it be more profitable for the company to enforce the ₹ 100 transfer price than to allow Division A to buy from outside suppliers at ₹ 75 per unit?



Total purchase costs ₹ 75,000

Total outlay costs if purchased inside ₹ 70,000

Net advantage to the company as a whole ₹ 5,000

Therefore, it would be more profitable for the company to enforce the ₹ 100 transfer price.

Alternatively,

Division A's Action

	Buy Inside	Buy Outside
Total purchase costs	-	₹ 75,000
Total outlay costs	₹ 70,000	-
Net cash outflow to the company as a whole	₹ 70,000	₹ 75,000

Question 19

The A division of G Corporation, operating at capacity, has been asked by the D division of G to supply it with electrical fitting no. 26. A sells this part to its regular customers for ₹ 7.50 each. D which is operating at 50 percent capacity is willing to pay ₹ 5 each for the fitting. D will put the fitting into a brake unit that it is manufacturing on essentially a cost-plus basis for a commercial airplane manufacturer.

A has a variable cost of producing fitting no. 26 of ₹ 4.25. The cost of the brake unit as being built by D follows:

Purchased parts (outside vendors)	₹ 22.50
A's fitting no. 26	₹ 5.00
Other variable costs	₹ 14.00
Fixed overhead and administration	₹ 8.00
	<u>₹ 49.50</u>



D believes the price concession is necessary to get the job.

The company uses return on investment and profits in the measurement of division and division manager's performance.

1. Assume that you are the division controller of A. Would you recommend that A supply fitting no. 26 to D?

Why or why not? (Ignore any tax issues.)

2. Would it be to the short-run economic advantage of the G Corporation for the A division to supply the D

division with fitting no. 26 at ₹5 each? (Ignore any tax issues.)

3. Discuss the organizational and manager-behavior difficulties, if any, inherent in this situation.

As the G's controller, what would you advise the G Corporation president do in this situation?

Solution 19

1. The division controller should not recommend that A supply D with fitting no. 26 for the ₹5.00 per unit price. A is operating at capacity and would lose ₹2.50 (₹7.50 - ₹5.00) for each fitting sold to D. The management performance of A is measured by return on investment and profits; selling to D ₹5.00 per unit would adversely affect those performance measures.

2. G would be ₹5.50 better off, in the short run, if A supplied D the fitting for ₹5.00 and the brake unit was sold for ₹49.50. Assuming the ₹8.00 per unit for fixed overhead and administration represents an allocation of cost D incurs regardless of the brake unit order, G would lose ₹2.50 in cash flow for each fitting sold to D but gain ₹8.00 from each brake unit sold by D.

3. In the short run there is an advantage to the company as a whole of



transferring the fitting at the ₹ 5.00 prices and thus selling the brake unit for ₹49.50. In order to make this happen, G will have to overrule the decision of the A's management. This action would be counter to the purposes of decentralized decision making. If such action were necessary on a regular basis, the decentralized decision making inherent in the divisionalized organisation would be a sham. Then the organisation structure is inappropriate for the situation.

On the other hand, if this is an occurrence of relative infrequency, the intervention of corporate management will not indicate inadequate organisation structure. It may, however, create problems with division managements. In the case at hand, if G's management requires that the fitting be transferred at ₹5.00, the result will be to enhance D's operating results at the expense of A. This certainly is not in keeping with the concept that a manager's performance should be measured on the results achieved by the decisions he or she controls. In this case, it appears that A and D serve different markets and do not represent closely related operating units.

A operates at capacity, D does not; no mention is made of any other inter-divisional business. Therefore, the G controller should recommend that each division be free to act in accordance with its best interests. The company is better served in the long run if A is permitted to continue dealing with its regular customers at the market price of ₹7.50. If D is having difficulties, the solution does not lie with temporary help at the expense of another division, but with a more substantive and long-term course of action.

**Question 20**

Siemens Ltd. has two Divisions A and B with profit centre concept. The Division A produces Component 'Alpha' which it sells to 'outside' customers only. The Division B produces a product called the Beta which incorporates Component 'Alpha' in its design.

B Division is currently purchasing required units of Component 'Alpha' per year from an outside supplier at market price.

New Director of Cost has analyzed that A Division has enough capacity to meet entire requirements of Division B and accordingly he requires internal transfer between the divisions at marginal cost from the overall company's perspective.

Manager of Division A claims that transfer at marginal cost are unsuitable for performance evaluation since they don't provide an incentive to the division to transfer goods internally. He has given preference on a transfer price based on Cost-plus-mark up.

New Cost Director having opinion that transfer price suggested by the manager of Division A will not induce managers of both the Divisions to arrive at optimum plan.

You are the Management Accountant of the Company and are requested to help him to solve the problem.

Solution 20

Marginal Cost based price is not acceptable to the Manager of Division A. Hence, as a Management Accountant of the Company the following alternatives are suggested:

1. Dual-Rate Transfer Pricing System:

Dual-rate transfer pricing uses two separate transfer prices to price each inter-divisional transaction.



For example, the supplying division may receive the full cost plus a mark-up on each transaction and the receiving division may be charged at the marginal (variable) cost of the transfers. The former transfer price is intended to approximate the market price of the goods or services transferred.

2. Two-part transfer pricing system:

A solution that has been proposed where the market for the intermediate product is imperfect or non-existent, and where the supplying division has no capacity constraints, is to price all transfers at the short run marginal cost (assumed to be equivalent to variable cost per unit of output) and for the supplying division to also charge the receiving division a fixed fee for the privilege of obtaining these transfers at short-run variable cost. This approach is sometimes described as a two-part transfer pricing system.

With this system, the receiving division acquires additional units of the intermediate product at the variable cost of production. Therefore, when it equates its marginal (variable) costs with its net marginal revenues to determine the optimum profit-maximizing output level, it will use the appropriate variable costs of the supplying division. The supplying division can recover its fixed costs and earn a profit on the inter-divisional transfers through the fixed fee charged each period. The fixed fee is intended to compensate the supplying division for tying up some of its fixed capacity for providing products or services that are transferred internally. The fixed fee should cover a share of fixed costs of the supplying division and also provide a return on capital.

**Question 21**

AB Ltd has two Operating Divisions – A and B. A manufactures the Unit (marginal cost ₹5, market selling price ₹10), while B manufactures the Product (each requiring 1 Unit, a marginal cost of ₹3 and a market selling price of ₹12). In the absence of any considerations, other than those stated, is the manufacture of the Product to the advantage of AB Ltd and will a transfer pricing system, based on market price, induce the manager of B to manufacture the Product?

Solution 21

The manufacture of the Product incurs a total marginal cost of ₹8 to AB Ltd and generates sales revenue of ₹12. Clearly, it is to the advantage of AB Ltd to manufacture and sell the Product. However, if units are transferred from A to B at the market price of ₹10, then the manager of B might reject product manufacture, on the ground that each product gives division B a loss of ₹1 i.e., ₹12 sales revenue less the ₹13 marginal cost to the division (₹10 transfer price + ₹3 marginal cost).

**Question 1**

Following are the details of the product Panoti for the month of April 2013

Standard quantity of material required per unit	5 kg
Actual output	1000 units
Actual cost of materials used	Rs. 7,14,000
Material price variance	Rs. 51,000 (Fav)
Actual price per kg of material is found to be less than standard price per of material by Rs. 10.	

You are required to calculate:

- (i) Actual quantity and Actual price of materials used.
- (ii) Material Usage Variance
- (iii) Material Cost Variance.

Question 2

Besharam Manufacturing Concern furnishes the following information:-

Standard	Material for 70 kg finished 100 kg. products	100 Kg
	Price of material	Rs.1 per kg.
Actual:	Output	2,10,000 kg.
	Material used	2,80,000 kg.
	Cost of Materials	Rs 2,52,000

You are required to calculate



- (1) Material Usage Variance
(2) Material Price Variance
(3) Material Cost Variance

Question 3

The standard cost of a chemical mixture is as follows: 40% material A at Rs 20 per kg. 60% material B at Rs 30 per kg. A standard loss of 10% of input is expected in production. The cost records for a period showed the following usage: 90 kg material A at a cost of Rs. 18 per kg. 110 kg material B at a cost of Rs. 34 per.

The quantity produced was 182 kg. of good product.

Calculate all material variances.

Question 4**HOMEWORK SUM****Date:**

Sanju Ltd. presents the following information for November, 2013:

Budgeted production of product P = 200 units.

Standard consumption of Raw materials = 2 kg. per unit of P.

Standard price of material A = Rs. 6 per kg.

Actually, 250 units of P were produced and material A was purchased at Rs. 8 per kg and consumed at 1.8 kg per unit of P. Calculate the Material Cost Variances.

**Question 5****HOMEWORK SUM****Date:**

The standard mix to produce one unit of product is as follows:

Material X 60 units @ Rs. 15 per unit = 900

Material Y 80 units @ Rs. 20 per unit = 1,600

Material Z 100 units @ Rs. 25 per unit = 2,500

240 units

5,000

During the month of April, 10 units were actually produced and consumption was as follows:

Material X 640 units @ Rs. 17.50 per unit = 11,200

Material Y 950 units @ Rs. 18.00 per unit = 17,100

Material Z 870 units @ Rs. 27.50 per unit = 23,925

Calculate all material variances.

Question 6

The standard labour employment and the actual labour engaged in a 40 hours week for a job are as under:

Category of Workers	Standard		Actual	
	No. Of workers	No. of Wage Rate per hour (Rs.)	No. Of workers	No. of Wage Rate per hour (Rs.)
Skilled	65	45	50	50
Semi-skilled	20	30	30	35
Unskilled	15	15	20	10

Standard output: 2,000 units; Actual output: 1,800 units

Abnormal Idle time 2 hours in the week



Calculate:

- (i) Labour Cost Variance
- (ii) Labour Efficiency Variance
- (iii) Labour Idle Time Variance

Question 7**HOMEWORK SUM**

Date:

The standard labour employment and the actual labour engaged in a week for a job are as under

	Skilled workers	Semi-skilled workers	Unskilled workers
Standard no. of workers in the gang	32	12	6
	28	18	4
Actual no. of workers employed	3	2	1
	4	3	2
Standard wage rate per hour			
Actual wage rate per hour			

During the 40 hours working week, the gang produced 1,800 standard labour hours of work. Calculate.

- (a) Labour Cost Variance
- (b) Labour Rate Variance
- (c) Labour Efficiency Variance
- (d) Labour Mix Variance
- (e) Labour Yield Variance

**Question 8****HOMEWORK SUM**

Date:

The standard and actual figures of a firm are as under:-

Standard time for the job	1,000 hours
Standard rate per hour	Rs.0.50
Actual time taken	900 hours
Actual wages paid	Rs.360
Compute the variances.	

Question 9

The following information has been provided by a company

Number of units produced and sold	6,000
Standard labour rate per hour	Rs. 8
Standard hours required for 6,000 units	-
Actual hours required	17,094 hours
Labour efficiency	105.3%
Labour rate variance	Rs. 68,376 (A)

You are required to calculate:

- (i) Actual labour rate per hour
- (ii) Standard hours required for 6,000 units
- (iii) Labour Efficiency variance
- (iv) Standard labour cost per unit
- (v) Actual labour cost per unit.

**Question 10**

The following information was obtained from the records of a manufacturing unit using standard costing system

Particulars	Standard	Actual
Production	4000 units	3800 units
Working Hrs	20	21
Fixed Overhead	Rs 40,000	Rs. 39,000
Variable Overhead	12,000	12,000

You are required to calculate the following overhead variance

- Variable overhead cost variance
- Fixed overhead variance
- Cost variance
- Expenditure variances
- Volume variance

Question 11

Kevda & company has a normal capacity of 120 machines, working 8 hours per day of 25 days in a month. The fixed overheads are budgeted at Rs 1,44,000 per month. The standard time required to manufacture one unit of product is 4 hours.

In April, 2012, the company worked 24 days of 840 machine hours per day and produced 5,305 units of output. The actual fixed overheads were Rs.1,42,000.

Compute:

- Expense variance



- Volume variance

- Total fixed overheads variance.

Question 12**HOMEWORK SUM****Date:**

The following data has been collected from the cost records of a unit for computing the various fixed overhead variances for a period:

Number of budgeted working days	25
Budgeted man-hours per day	6,000
Output (budgeted) per man-hour (in units)	1
Fixed overhead cost as budgeted	Rs.1,50,000
Actual number of working days	27
Actual man-hours per day	6,300
Actual output per man-hour (in-units)	0.9
Actual fixed overhead incurred	Rs.1,56,000

Calculate fixed overhead variances:

- Expenditure Variance
- Volume Variance
- Fixed Cost Variance

Question 13**HOMEWORK SUM****Date:**

Dhopa has furnished you the following information for the month of August 2012

	Budget	Actual
Output units	30,000	32,500



Hours	30,000	33,000
Fixed Overhead	Rs. 45,000	50,000
Variable Overhead	Rs. 60,000	68,000
Working days	25	26

Calculate overhead variances.

Question 14

Compute the sales variances (total, price and volume) from the following figures.

Product	Budgeted Quantity	Budgeted Price per Unit (Rs.)	Actual Quantity	Actual Price per unit
P	4000	25	4800	30
Q	3000	50	2800	45
R	2000	75	2400	70
S	1000	100	800	105

Question 15

Calculate Profit variances from the following:-

Product	Budgeted			Actual	
	Units	Selling Price Per unit (Rs.)	Cost per unit (Rs.)	Units	Selling Price per unit (Rs.)
X	800	Rs. 15	Rs. 10	1500	Rs. 14
Y	1200	R	Rs. 12	1000	Rs. 21



Question 16

The Khilji & Company manufactures Product X in standard batches of 100 units. A standard cost system is in use. The standard costs for a batch are as follows-

Raw Materials	60 Kg at Rs. 4.50/kg	Rs 270
Direct Labour	36 hrs at Rs. 8.25 /hour	Rs. 297
Overhead	36 hrs at Rs. 4.75/hour	Rs. 171

Production for April amounted to 210 batches. The relevant statistics follows -

Standard output per month	24,000 units
Raw material used	13,000 kg
Cost of Raw Material used	Rs. 61,100
Direct Labour Cost	Rs. 66,924
Overhead Cost	Rs. 36,000
Actual hours worked	7,920

The Management has noted that Actual Costs per batch deviate somewhat from Standard Costs per Batch. Prepare a statement containing a detailed explanation of the difference between the Actual Costs and Standard Costs

Question 17

Munni Ltd. has furnished the following standard cost data per unit of production:

Material 10 kg @ Rs. 10 per kg.

Labour 6 hours @ Rs. 5.50 per hour Variable overhead 6 hours @ Rs. 10 per hour.



Fixed overhead Rs. 4,50,000 per month (Based on a normal volume of 30,000 labour hours)

The actual cost data for the month of August 2013 are as follows:

Material used 50,000 kg at a cost of Rs. 5,25,000. Labour paid Rs. 1,55,000 for 31,000 hours worked Variable overheads Rs. 2,93,000

Fixed overheads Rs. 4,70,000 Actual production 4,800 units Calculate:

- i) Material Cost Variance.
- ii) Labour Cost Variance.
- iii) Fixed Overhead Cost Variance.
- iv) Variable Overhead Cost Variance

Question 18

Badrinath Ltd, manufactures NXE by mixing three raw materials. For every batch of 100 kg of NXE, 125 kg. of raw materials are used. In April, 2012, 60 batches were prepared to produce an output of 5,600 kg. of NXE. The standard and actual particulars for April, 2012, are as follows:

Raw Materials	Standard		Actual		Quantity of Raw Materials Purchased
	Mix %	Price per kg (Rs.)	Mix %	Price per kg (Rs.)	
A	50	20	60	21	5000
B	30	10	20	8	2000
C	20	5	20	6	1200

Calculate all variances. Also calculate material price variance at the time of purchase of raw material?



Question 19

HOMEWORK SUM

Date:

Ladla Limited produces a product 'Tempex which is sold in a 10 kg per packet of Tempex are as follows:

Particulars	(Rs.)
Direct materials 10 kg @ Rs. 45 per kg	450
Direct Labour 8 hours @ Rs. 50 per hour	400
Variable Overhead 8 hours @ Rs. 10 per hour	80
Fixed Overhead	200
Total	1130

Budgeted output for the third quarter of a year was 10,000 Kg. Actual output is 9,000 Kg. Actual cost for this quarter are as follows:

Particulars	(Rs.)
Direct materials 8,900 Kg @ Rs. 46 per kg.	409400
Direct Labour 7,000 hours @ Rs. 52 per hour	364000
Variable Overhead Incurred	72500
Fixed Overhead Incurred	192000

You are required to calculate

- (1) Material Usage Variance
- (2) Material Price Variance
- (3) Material Cost Variance
- (4) Labour Efficiency Variance
- (4) Labour Rate Variance
- (5) Labour Cost Variance
- (6) Variable Overhead Cost Variance (7) Fixed Overhead Cost Variance.

**Question 20****HOMEWORK SUM****Date:**

Laila Ltd. had prepared the following estimation for the month of April:

	Quantity	Rate (Rs.)	Amount (Rs.)
Material-A	800 Kg	45.00	36,000
Material-B	600 kg.	30.00	18,000
Skilled labour	1,000 hours	37.50	37,500
Unskilled labour	800 hours	22.00	17,600

Normal loss was expected to 10% of total input materials and an idle labour time of 5% of expected labours was also estimated. At the end of the month the following information has been collected from the cost accounting department:

The company has produced 1,480 kg. finished product by using the followings:

	Quantity	Rate (Rs.)	Amount (Rs.)
Material-A	900 Kg	43.00	38,700
Material-B	650 kg.	32.50	21,125
Skilled labour	1,200 hours	35.50	42,600
Unskilled labour	860 hours	23.00	19,780

You are required to calculate:

- i) Material Cost Variance;
- ii) Material Price Variance;
- iii) Material Mix Variance;
- iv) Material Yield Variance;
- v) Labour Cost Variance;
- vi) Labour Efficiency Variance and
- vii) Labour Yield Variance

**Question 21**

Mr M. S. Pandurangan is the owner of Ranga Pens Inc. which specialises in production of handmade fountain pens.

Ranga Pens are produced in batches that are designed on the basis of 'group buy' schemes. During the last quarter of 2021, Mr M.S. Pandurangan designed the 'Abhimanyu' (an acrylic oversized fountain pen with #8 Ambitious Nib) and circulated a google form amongst fountain pen connoisseurs and launched a 'group buy' scheme. Mr M.S. Pandurangan buys the #8 Ambitious Nibs from Mr Subramaniam of Chennai who produces the nibs in his factory in Chennai. On receiving the order, Mr Subramaniam revises his manufacturing facilities. During the year ended 30th June 2022, Mr Subramaniam finds that there is significant difference between the budgeted profit of ₹2,00,000 (standard profit - ₹10 and standard output for the year ended 30th June 2022 - 20000 units) and the actual profit of ₹55,000 (as shown in the profit and loss account). Mr Subramaniam requests his friend Mr Nikhil who is a Cost Accountant by profession to look into the issue. Mr Nikhil extracts the following information from the accounts of Mr Subramaniam.

Profit and Loss Account for the year ended 30th June 2022

Particulars	₹	Particulars	₹
To Direct Material	2,18,000	By Sales (13000 units)	5,20,000
To Direct Labour	1,10,000		
To Direct Charges	26,000		
To Factory Overhead Charges	37,000		
To Variable Overhead	36,000		



Charges			
To Office Expenses	38000		
To Net Profit	55,000		
	5,20,000		5,20,000

The standard output for the year ended was 20000 units. The standard cost and the standard profit per unit are given as below:

Particulars	₹
Direct Material (4 grams @ ₹ 3.75 per gram)	15.00
Direct Labour (4 hours @ ₹ 2 per hour)	8.00
Direct Charges	2.0
Works Charges	
Fixed	2.0
Variable	3.0
Office Expenses (Fixed)	2.0
Total Standard Cost (per unit)	32.0
Standard Profit (per unit)	10.0
Standard Selling Price	42.0

During the period actual material price was ₹ 4.00 per unit and Labour was actually paid @ ₹ 2.20 per hour and it is also stated that 4 units are produced in an hour.



Solution 21

After extracting the information Mr Nikhil calculated the variances and categorised the variances. His calculation and categorisations are presented below.

$$\begin{aligned} \text{A. Sales Price Variance} &= \text{Actual Quantity (Budgeted Price - Actual Price)} \\ &= 13,000 (42-40) = 26,000 (A) \end{aligned}$$

$$\begin{aligned} \text{B. Sales Volume Variance} &= \text{Budgeted Profit (Budgeted Quantity - Actual Quantity)} \\ &= 10 (20,000-13,000) = 70,000 (A) \end{aligned}$$

$$\begin{aligned} \text{C. Contribution difference due to sales volume} &= \text{Budgeted contribution per unit (Budgeted Sales - Actual Sales)} \\ &= \text{Budgeted contribution per unit (Budgeted Sales - Actual Sales)} \\ &= 14 (20,000-13,000) = 98,000 (A) \end{aligned}$$

Working note:

$$\begin{aligned} \text{Budgeted contribution per unit} &= \text{Sales per unit - Variable Cost per unit} \\ &= 42 - (15 + 8 + 2 + 3) = 14 \end{aligned}$$

Material Variance

$$\begin{aligned} \text{a. Material Price Variance} &= (\text{Standard cost of actual mix}) - (\text{Actual cost of actual mix}) \\ &= \text{Actual quantity (Standard Price - Actual Price)} \\ &= 54,500 (3.75 - 4.00) = 13,625 (A) \end{aligned}$$

**Working note**

Actual quantity = (Actual Material Cost)/(Actual Material price unit)

$$= 218000 / (\text{₹ } 4 \text{ per grams})$$

$$= 54500 \text{ grams}$$

b. Material Usage Variance

$$= (\text{Actual Yield} \times \text{Standard Cost per unit of output})$$

$$- \text{Standard cost of actual mix}$$

$$= \text{Standard Cost (Standard Quantity for actual yield - Actual Quantity used)}$$

$$= 3.75 (13000 \times 4 - 54500)$$

$$= 9375 \text{ (A)}$$

C. Labour Variance

a. Labour rate variance = Actual Hours (Standard rate per hour - Actual rate per hour)

$$= 11000 / 2.20 \times (2.00 - 2.20) = 10000 \text{ (A)}$$

b. Labour efficiency variance = Standard Rate $\times$ (Standard hours for Actual Yield - Actual hours)

$$= 2 (4 \times 13000 - 50000) = 4000 \text{ (F)}$$

D. Direct Charges Variance = Nil

For 13000 units, direct charges should be ₹ 26,000 [13000 $\times$ 2 (Standard rate)], and it is ₹ 26,000 as shown in profit and loss account. Thus, direct charges variance is NIL.

**E. Variable Overhead Variances****a. Variable overhead expenditure variance**

$$= (\text{Actual hours taken} \times \text{Standard Rate per hour}) - \text{Actual Overhead cost}$$

$$= (50000 \times \text{₹ } 3/4 \text{ units}) - 36000$$

$$= 1500 \text{ (F)}$$

b. Variable Overhead Efficiency Variance

$$= \text{Standard rate per hour (Standard hours worked for actual production - Actual Hours worked)}$$

$$= \text{₹ } 3/4 \text{ units } (13000 \times 4 - 50000)$$

$$= 1500 \text{ (F)}$$

F. Fixed Overhead Variances (FOH)

a. FOH Expenditure Variance = Budgeted OH Cost - Actual OH Cost

$$= (20000 \times 4) - (37000 + 38000)$$

$$= 5000 \text{ (F)}$$

b. FOH Volume Variance = Standard Rate per unit (Budgeted Yield - Actual Yield)

$$= 4 (20000 - 13000)$$

$$= 28000 \text{ (A)}$$

c. FOH Efficiency Variance = Standard Rate per hour (Standard hours for actual yield - Actual Hours taken)

$$= 4/4 (52000 - 50000)$$

$$= 2000 \text{ (F)}$$



d. FOH Capacity Variance = Standard Rate per hour (Budgeted Hours – Actual Hours)

$$= 1 (80000 - 50000)$$

$$= 30000 (A)$$

After calculating the variances and categorising them Mr Nikhil proceeds with the preparation of a statement of reconciliation which clearly shows the reasons of difference between the budgeted profit and the actual profit (as shown in profit and loss account). The statement of reconciliation prepared by Mr Nikhil is illustrated

Budgeted Profit (20000 units × ₹ 10 per unit)	Variances		Amount in ₹
	Favourable	Adverse	
Sales Price Variance		26,000	
Sales Volume Variance		70,000	
Material Price Variance		13,625	
Material Usage Variance		9,375	
Labour Rate Variance		10,000	
Labour Efficiency Variance	4,000		
Variable Overhead Expenditure Variance	1,500		
Variable Overhead Efficiency Variance	1,500		
FOH Expenditure Variance	5,000		
FOH Volume Variance ^s		28,000	
Net Adjustment for variance	12,000	1,57,000	1,45,000
Actual Profit			55,000



Notes:

4. Fixed element of Works Charges (₹ 2) + Fixed element of Office Expenses (₹ 2) = ₹ 4.

5. The FOH volume variance (28000 (F)) is constituted of the FOH efficiency variance (2000 (F)) and FOH capacity variance (30000 (F)).

Question 22

From the following particulars for a period reconcile the actual profit with the budgeted profit:

Particulars	Budgeted	Actual
	(` lac)	(` lac)
Direct Material	50.00	66.00
Direct Wages	30.00	33.00
Variable overheads	6.00	7.00
Fixed overheads	10.00	12.00
Net Profit	4.00	8.50
	100.00	126.50

Actual material price and wage rates were higher by 10%. Actual sales prices are also higher by 10%.

Solution 22

Sales Price Variance =	$126.5 - [126.5 \times 100/110]$	11.5 (F)
Sales Volume Variance =	$[126.5 \times 100/110] - 100 =$	15.0 (F)
Sales Value Variance =	$126.5 - 100 =$	26.5 (F)
% of Volume Increase =	$15\% [15/100 \times 100]$	
Material Price Variance =	$[66 \times 100/110] - 66 =$	6 (A)



Material Volume Variance =	$[50 \times 15/100] =$	7.5 (A)
Material usage Variance =	$[50 \times 115/100] - [66 \times 100/110] =$	2.5 (A)
Material Cost Variance =	$50 - 66 =$	16 (A)
Wage Rate Variance =	$[33 \times 100/110] - 33 =$	3 (A)
Wage Volume Variance =	$[30 \times 15/100] =$	4.5 (A)
Wage efficiency Variance =	$[30 \times 115/100] - [33 \times 100/110] =$	4.5 (A)
Wage Cost Variance =	$30 - 33 =$	3.0 (A)
Variable overhead Volume Variance =	$[6 \times 15/100] =$	0.9 (A)
Variable overheads efficiency Variance =	$[6 \times 115/100] - 7 =$	0.1 (A)
Variable overhead Cost Variance =	$6 - 7 =$	1.0 (A)
Fixed overhead Cost Variance =	$10 - 12 =$	2.0 (A)

Statement showing the reconciliation of budgeted profit with actual profit

OR

Profit Variance Statement

Budgeted Profit		4.00
Add: Sales Price Variance	11.50	
Sales Volume Variance	15.00	
Wage efficiency Variance	4.50	31.00
		35.00
Less: Material Price Variance	6.00	
Material Volume Variance	7.50	



Material usage Variance	2.50	
Wage Rate Variance	3.00	
Wage Volume variance	4.50	
Variable overhead Volume Variance	.90	
Variable overheads efficiency Variance	.01	
Fixed overhead Cost Variance	2.00	26.50
Actual Profit		8.50

**Question 1**

Calculate efficiency and activity ratio from the following data:

Capacity ratio	75%
Budgeted output	6,000 units
Actual output	5,000 units
Standard Time per unit	4 hours

Question 2 deleted as per syllabus

Question 3

Roses Ltd. is drawing a production plan for its two products Mini max (MM) and Heavy high (HH) for the upcoming year. The company's policy is to hold closing stock of finished goods at 25% of the anticipated volume of sales of the succeeding month. The following are the estimated data for two products:

	Mini max (MM)	Heavy high (HH)
Budgeted Production units	1,80,000	1,20,000
	(Rs.)	(Rs.)
Direct material cost per unit	220	280
Direct labour cost per unit	130	120
Manufacturing overhead	4,00,000	5,00,000

The estimated units to be sold in the first four months of the year 2013-14



are as under

HBA	April	May	June	July
Mini max	8,000	10,000	12,000	16,000
Heavy high	6,000	8,000	9,000	14,000

Prepare production budget and production cost budget for the first quarter in month - wise.

Question 4**HOMEWORK SUM**

Date:

Following is the sales budget for the first six months of the current year in respect of Ghungroo Ltd. :

Month	Jan	Feb	March	April	May	June
Sales (units)	10,000	12,000	14,000	15,000	15,000	16,000

Finished goods inventory at the end of each month is expected to be 20% of budgeted sales quantity for the following month. Finished goods inventory was 2,700 units on January 1 of current year. There would be no work-in-progress at the end of any month.

Each unit of finished product requires two types of materials as detailed below
Material X: 4 kg. @ Rs. 10/kg

Material Y: 6 kg. @ Rs. 15/kg

Material on hand on January 1 of current year was 19,000 kg. of material X and 29,000 kg. of material Y. Monthly closing stock of material is budgeted to be equal to half of the requirements of next month's production.

Budgeted direct labour hour per unit of finished product is 4 hour.

Budgeted direct labour cost for the first quarter of the current year is Rs.10,89,000.



Actual data for the quarter one, ended on March 31 of current year is as under:

Actual production quantity	40,000 units
Direct material cost (Purchase cost based on materials actually issued to production)	
Material X: 1,65,000 kg. @ Rs. 10.20 / kg.	
Material Y: 2,38,000 kg. @ Rs. 15.10 / kg.	
Actual direct labour hours worked :	32,000 hours
Actual direct labour cost:	Rs.13,12,000

Required: Prepare the following budgets:

- (I) Monthly production quantity for the quarter one.
- (II) Monthly raw material consumption quantity budget from January to April of current year.
- (II) Materials purchase quantity budget for the quarter one.

Question 5

HOMEWORK SUM

Date:

All Baba Limited produces and sells a single product Sales budget for current year by a quarters is as under:

Quarters	I	II	III	IV
No. of units to be sold	18,000	22,000	25,000	27,000

The year is expected to open with an inventory of 6,000 units of finished products and close with inventory of 8,000 units. Production is customarily scheduled to provide for 70% of the current quarter's sales demand plus 30% of the following quarter demand. The budgeted selling price per unit is Rs. 40.



The standard cost details for one unit of the product are as follows:

Variable Cost Rs. 34.50 per unit

Fixed Overheads @Rs. 2 per hour based on a budgeted production volume of 1,10,000 direct labour hours for the year. Fixed overheads are evenly distributed through-out the year.

You are required to:

- (i) Prepare Quarterly Production Budget for the year.
- (ii) In which quarter of the year, company expected to achieve break-even Point

Question 6

Bahubali Ltd a single product company estimated its sales for the next year quarter-wise as under:

Quarter	Sales (Units)
I	30,000
II	37,500
III	41,250
IV	45,000

The opening stock of finished goods is 10,000 units and the company expects to maintain the closing stock of finished goods at 16,250 units at the end of the year. The production pattern in each quarter is based on 80% of the sales of the current quarter and 20% of the sales of the next quarter.

The opening stock of raw materials in the beginning of the year is 10,000 kg & the closing stock at the end of the year is required to be maintained at 5,000 kg. Each unit of finished output requires 2 kg. of raw materials.



The company proposes to purchase the entire annual requirement of raw material in the first three quarters in the proportion and at the prices given below:

Quarter	Purchase of raw materials % to total annual requirement in quantity (Rs.)	Price per kg. (Rs.)
I	30%	2
II	50%	3
III	20%	4

The value of the opening stock of raw materials in the beginning of the year is Rs. 20,000. You are required to present the following for the next year, quarter wise :

- (1) Production budget (In units).
- (2) Raw material consumption budget (in quantity).
- (3) Raw material purchase budget (In quantity and value).

Question 7

Prepare a cash budget for three months ending on 30th June of current year from the information given below:-

	Sales	Materials	Wages	Overheads
(a) Months	(Rs.)	(Rs.)	(Rs.)	(Rs.)
February	14,000	9,600	3,000	1,700
March	15,000	9,000	3,000	1,900
April	16,000	9,200	3,200	2,000
May	17,000	10,000	3,600	2,200
June	18,000	10,400	4,000	2,300



(b) Credit Items are:

Sales / Debtors : 10% sales are on cash, 50% of the credit sales are collected next month and the balance in the following month

Creditors : Materials 2 months
 Wages 1/4 month
 Overheads 1/2 month

(c) Cash and Bank balance on 1st April of current year is expected to be Rs.6,000

(d) Other relevant information is :

1. Plant and machinery will be installed in February of current year at a cost of Rs.96,000. The monthly instalment of Rs.2,000 is payable from April onwards.
2. Dividend @5% on preference share capital of Rs.2,00,000 will be paid on 1st June.
3. Advance to be received for sales of vehicles Rs.9,000 in June.
4. Dividends from investments amounting to Rs. 1,000 are expected to be received in June.
5. Income Tax (advance) to be paid in June is Rs.2,000.

**Question 8****HOMEWORK SUM****Date:**

From the information given below, prepare a Cash Budget of Bablu Ltd. for the quarter January - March, 2017:

		Dec., 16	Jan., 17	Feb., 17	March., 17	April., 17
a.	Sales Budget Units	60	60	65	75	80
b.	Selling price per unit Rs.	1,000	1,000	1,000	1,000	1,000
c.	Off-season discount	20%	20%	10%	-	-
d.	End of Month Inventory Units	10	120	15	25	25

- e) Half the sales proceeds are collected in the month of sale and the other half in the month following.
- f) Materials amounting to Rs. 300 per unit manufactured are purchased one month in advance of manufacture and paid for in cash earning 5% cash discount on half of the material purchased.
- g) Direct Labour Budget was Rs.50 per unit and variable overheads Rs. 100 per unit
- h) Indirect Labour Budget was Rs.6,000 per month.
- i) Depreciation was provided uniformly at Rs.3,000 per month.
- j) The fixed overheads budget was Rs.6,000 per month during off-season and Rs.7,000 during the season. Out of this, the quarterly premium for fire insurance amounting to Rs.600 was payable in the first month of each quarter.
- k) Dividends for the year 2016, amounting to Rs.2,000 were expected to be declared in March, 2017 and payments were to be spread between March and April.
- l) A machine was sold for Rs. 10,000 in December, 2016 on 3 months Credit.
- The cash balance as on January 1, 2017 is Rs.1,000.

**Question 9**

Chammak Challo Ltd. has furnished the following information for the month ending 30th June of current year

	Master Budget	Actual	Variance
Units produced and sold	80,000	72000	
Sales (Rs.)	320000	280000	40000 (A)
Direct material (Rs.)	80000	73600	6400 (F)
Direct wages (Rs.)	120000	104800	15200 (F)
Variable overheads (Rs.)	40000	37600	2400 (F)
Fixed overhead (Rs.)	40000	39200	800 (F)
Total Cost	280000	255200	

The Standard costs of the products are as follows:

	Per unit (Rs.)
Direct materials (1 kg, at the rate of Rs. 1 per kg.)	1.00
Direct wages (1 hour at the rate of Rs. 1.50)	1.50
Variable overheads (1 hour at the rate of Rs. 0.50)	0.50

Actual results for the month showed that 78,400 kg. of material were used and 70,400 labour hours were recorded.

Required:

- (i) Prepare Flexible budget for the month and compare with actual result.

**Question 10**

Rotadi Ltd. is currently operating at 75% of its capacity. In the past two years, the levels of operations were 55% and 65% respectively. Presently, the production is 75,000 units. The company is planning for 85% capacity level during 20X3-20X4. The cost details are as follows:

Particulars	55% (Rs.)	65% (Rs.)	75% (Rs.)
Direct Material	11,00,000	13,00,000	15,00,000
Direct Labour	5,50,000	6,50,000	7,50,000
Factory Overheads	3,10,000	3,30,000	3,50,000
Selling and Distribution Overheads	3,20,000	3,60,000	4,00,000
Administrative Overheads	1,60,000	1,60,000	1,60,000
Total	24,40,000	28,00,000	31,60,000

Profit is estimated @ 20% on sales.

The following increases in costs are expected during the year

Particulars	In percentage
Direct Materials	8
Direct Labour	5
Variable Factory Overheads	5
Variable Selling Overheads	8
Fixed Factory Overheads	10
Fixed Selling Overheads	15
Administrative Overheads	10

Prepare flexible budget for the period 20X3-20X4 at 85% level of capacity. Also ascertain profit and contribution.

**Question 11**

Dadda Ltd. has prepared budget for the coming year for its two products Bade and Chote.

	Product Bade (Rs.)	Product Chote (Rs.)
Production & Sales unit	6,000 units	9,000 units
Raw material cost per unit	60.00	42.00
Direct labour cost per unit	30.00	18.00
Variable overhead per unit	12.00	6.00
Fixed overhead per unit	8.00	4.00
Selling price per unit	120.00	78.00

After some marketing efforts, the sales quantity of the Product Bade & Chote can be increased by 1,500 units and 500 units respectively but for this purpose the variable overhead and fixed overhead will be increased by 10% and 5% respectively for the both products.

You are required to prepare flexible budget for both the products:

- Before marketing efforts
- After marketing efforts.

**Question 12****HOMEWORK SUM****Date:**

A department of Company Shakira attains sale of Rs. 6,00,000 at 80 per cent of its normal capacity and its expenses are given below:

	(Rs.)
Administration costs:	
Office salaries	90,000
General expenses	2 per cent of sales
Depreciation	7,500
Rates & Taxes	8,750
Selling costs:	
Salaries	8 per cent of sales
Travelling expenses	2 per cent of sales
Sales office expenses	1 per cent of sales
General expenses	1 per cent of sales
Wages	15,000
Rent	1 per cent of sales
Other expenses	4 per cent of sales

Draw up flexible administration, selling and distribution costs budget, operating at 90 per cent, 100 per cent and 110 per cent of normal capacity.

**Question 13****HOMEWORK SUM****Date:**

Vasooli Ltd, specialized in manufacturing of piston rings for motor vehicle. It has prepared budget for 8,000 units per annum at budgeted cost of Rs. 21,64,400 as detailed below:

	(Rs.)	(Rs.)
Fixed cost (Manufacturing)		2,28,000
Variable costs:		
Power	18,000	
Repairs, etc.	16,000	
Other variable cost	6,400	
Direct material	6,16,000	
Direct labour	12,80,000	19,36,400
		21,64,400

Considering the possible impact on sales turnover by market trends, the company decides to prepare flexible budget with a production target of 4,000 and 6,000 units. On behalf of the company you are required to prepare a flexible budget for production levels at 50% and 75% Assuming the selling price per unit is maintained at Rs. 400 as at present, indicate the effect on net profit. Administration, selling and distribution overheads continue at Rs. 72,000

Question 14 deleted as per syllabus

**Question 15**

Mastani & Co is engaged in the manufacture of specialized sub-assemblies required for certain electronic equipments. The company estimates that in the forthcoming month, December, 20X2, the sales will take a pattern in the ratio of 3:4:2 respectively of sub-assemblies, ACB, MCB and DP.

The following is the schedule of components required for manufacture:

Component requirements

Sub- assembly	Selling price	Base board	IC08	IC12	IC26
ACB	520	1	8	4	2
MCB	500	1	2	10	6
DP	350	1	2	4	8
Purchase price(Rs.)		60	20	12	8

The direct labour time and variable overheads required for each of the sub-assemblies are:

Labour hours per sub-assembly

	Grade A	Grade B	Variable overhead per sub- assembly (Rs.)
ACB	8	16	36
MCB	6	12	24
DP	4	8	24
Direct wage rate per hour (Rs.)	5	4	-

The labours work 8 hours a day for 25 days a month. The opening stocks of sub-assemblies and components for December, 20X2 are as under:



Sub-assemblies		Components	
ACB	800	Base Board	1,600
MCB	1,200	IC08	1,200
DP	2,800	C12	6,000
		IC26	4,000

Fixed overhead amount to Rs. 7,57,200 for the month and a monthly profit target of Rs. 12 lacs has been set.

The company is eager for a reduction of closing inventories for December, 20X2 of sub-assemblies and components by 10% of quantity as compared to the opening stock. Prepare the following budgets for December 2012

- Sales budget in quantity and value.
- Production budget in quantity
- Component usage budget in quantity.
- Component purchase budget in quantity and value.

Question 16

Hasmukh Limited is presently operating at 50% capacity and producing: 30000 units. The entire output is sold at a price of Rs. 200 per unit. The cost structure at the 50% level of activity is as under:

Particulars	Amount (Rs.)
Direct Material	75 per unit
Direct Wages	25 per unit
Variable Overheads	25 per unit
Direct Expenses	15 per unit
Factory Expenses (25% fixed)	20 per unit



Selling and Distribution Exp. (80% variable)	10 per unit
Office and Administrative Exp. (100% fixed)	5 per unit

The company anticipates that the variable costs will go up by 10% and fixed costs will go up by 15%.

You are required to prepare an Expense budget, on the basis of marginal cost for the company at 50% and 60% level of activity and find out the profits at respective levels.

Question 17 deleted as per syllabus

Question 18

Gabbar glass Manufacturing Company requires you to present the Master budget for the next year from the following information:

Sales :	
Toughened Glass	Rs.6,00,000
Bent Glass	Rs.2,00,000
Direct material cost	60% of sales
Direct wages	20 workers @ Rs. 150 per month
Factory overheads :	
Indirect labour -	
Works manager	Rs.500 per month
Foreman	Rs.400 per month
Stores and spares	2.5% on sales
Depreciation on machinery	Rs. 12,600
Light and power	Rs.3,000



Repairs and maintenance	Rs.8,000
Others sundries	10% on direct wages
Administration, selling and distribution expenses	Rs.36,000 per year

Question 19 deleted as per syllabus

Question 20

HOMEWORK SUM

Date:

Gaitonde Limited has prepared its expense budget for 20,000 units in its factory for the year 2017 as detailed below:

Particulars	(Rs per unit)
Direct Materials	50
Direct Labour	20
Variable Overhead	15
Direct expenses	6
Selling Expenses (20% fixed)	15
Factory Expenses (100% fixed)	7
Administration expenses (100% fixed)	4
Distribution expenses (85% variable)	12
Total	129

Prepare an expense budget for the production of 15,000 units and 18,000 units.

**Question 21****HOMEWORK SUM****Date:**

Tequila Motor Vehicle manufacturer has prepared sales budget for the next few months, and the following draft figures are available:

Month	No. of vehicles
October	4,000
November	3,500
December	4,500
January	6,000
February	6,500

To manufacture a vehicle a standard cost of Rs. 2,85,700 is incurred and sold through dealers at an uniform selling price of Rs. 3,95,600 to customers.

Dealers are paid 12.5% commission on selling price on sale of a vehicle.

Apart from other materials four units of Part-X are required to manufacture a vehicle. It is a policy of the company to hold stocks of Part-X at the end of the each month to cover 40% of next month's production. 4,800 units of Part-X are in stock as on 1st October

There are 950 nos. of completed vehicles are in stock as on 1st October and it is policy to have stocks at the end of each month to cover 20% of the next month's sales

You are required to

- Prepare Production budget (in nos.) for the month of October, November, December and January
- Prepare a Purchase budget for Part-X (in units) for the months of October, November and December
- Calculate the budgeted gross profit for the quarter October to December.

**Question 22**

A company is at present working at 90% of its capacity and producing 13,500 Units per annum. It operates a flexible budgetary control system. The following. Figures are obtained from its budget:

	(90%)	(100%)
	(Rs.)	(Rs.)
Sales	15,00,000	16,00,000
Fixed expenses	3,00,500	3,00,600
Semi-fixed expenses	97,500	1,00,500
Variable expenses	1,45,000	1,49,500
Units made	13,500	15,000

Labour and material costs per unit are constant under present conditions. Profit margin is 10%

- You are required to determine the differential cost of producing 1,500 Units by increasing capacity to 100%.
- What would you recommend for an export price for these 1,500 units if overseas prices are much lower than indigenous prices?

Solution 22

Sales at 90% capacity utilization	15,00,000
Less: Profits (10%)	1,50,000
Cost of goods sold	13,50,000



Less: Expenses (fixed, semi-fixed and variable) 5,43,000

Cost of materials and labour 8,07,000

Therefore, cost of materials and labour at 100% capacity utilization
 $= 8,07,000 \times 100/90 = \text{Rs. } 8,96,667$

Differential cost analysis will be as follows :

	Capacity utilization	
	90 %	100%
Production (units)	13,500	15,000
Materials and Labour	8,07,000	8,96,667
Variable expenses	1,45,000	1,49,500
Semi-variable expenses	97,500	1,00,500
Fixed expenses	3,00,500	3,00,600
Total cost	13,50,000	14,47,267

(a) Differential cost = $14,47,267 - 13,50,000 = \text{Rs. } 97,267$

(b) Minimum price for export = $97,267/1,500 = \text{Rs. } 64.84$ per unit

At this price there is no addition to revenue. Any price above Rs.64.84 per unit may be accepted. A price below this may be considered, if other benefits (i.e., other than mere sales and revenue) are likely to accrue. It is assumed that no capital investment is necessary and no export charges have to be incurred and that the export price will have no effect on the home market where the product will continue to be sold at the old price, it is also assumed that necessary precautions have been taken to ensure that the product is not "dumped" back.



Question 23

As a Cost and Management Accountant of MJK Ltd., prepare a Sales Overhead Budget for the months of January, February and March from the estimates given below:

Expenses per month:	Rs.
Advertisement	2,500
Salaries of the Sales Department	5,000
Expenses of the Sales Department	1,500
Counter Salesmen's Salaries and Dearness Allowance	6,000
Commission Salesmen's Salaries and Dearness Allowance	6,000
Commission to counter salesmen @ 1% on their sales. Travelling salesmen's Commission @ 10% on their sales and expenses @ 5% on their sales.	

The sales during the period were estimated as under"

Month	Counter Sales (Rs.)	Travelling Salesmen Sales (Rs.)
January	80,000	10,000
February	1,20,000	15,000
March	1,40,000	20,000

**Solution 23****Sales Overhead Budget (for the period ending....)**

Estimated Sales (Rs.)	90,000	1,35,000	1,60,000
Fixed Overhead :			
Advertising	2500	2500	2500
Salaries of sales department	5000	5000	5000
Expenses of Sales department	1500	1500	1500
Counter salesman Salaries and Dearness Allowances	6000	6000	6000
	15000	15000	15000
Variable Overhead:			
Counter Salesman Commission @ 1% on Sales	800	1200	1400
Traveling Salesman Commission @ 10%	1000	1500	2000
Expenses	500	750	1000
	2300	3450	4400
Total Sales Overhead	17,300	18,450	4,400

**Direct Material Budget**

Direct Materials Budget is prepared for estimating the quantity of raw material required for budgeted production. This budget is prepared on the basis of Production Budget, inventory policy of the firm (with regard to raw materials), material purchase policy, stock levels to be maintained at the stores, delivery period by supplier etc.

QUESTION 24

From the following figures prepare the raw material purchase budget for January, 2021:

Particulars	A	B	C	D	E	E
Estimated Stock on Jan 1	16000	6000	24000	2000	14000	28000
Estimated Stock on Jan 31	20000	8000	28000	4000	16000	32000
Estimated Consumption	120000	44000	132000	36000	88000	172000
Standard Price per unit	25 paise	5 Paise	15 paise	10 paise	20 paise	30 paise

**Solution 24**

Particulars	A	B	C	D	E	F	Total
Estimated consumption	120000	44000	132000	36000	88000	172000	
Estimated Stock on Jan 31	20,000	8000	28000	4000	16000	32000	
	1,40,000	52,000	160000	40000	104000	204000	
Estimated stock on Jan 1, 2021	16,000	6000	24000	2000	14000	28000	
Estimated purchase (units) (1)	124000	46000	136000	38000	90000	176000	610000
Rate per unit (₹) (2)	0.25	0.05	0.15	0.10	0.20	0.30	
Estimated purchases (₹) (1x2)	31000	2300	20400	3800	18000	52800	128300

Direct Labour Budget

Direct Labour Budget is prepared to estimate the labour time required for meeting the budgeting production target, the number of workers required, the labour rate, the labour cost and labour recruitment plan.

QUESTION 25

A factory works 8 hours per day, 6 days in a week and budget period is one year and during each quarter, lost hours due to leave, holidays and other causes are estimated to be 124 hours.

Particulars	Product A	Product B
Direct Labour per unit		
In P Dept.	2 hrs @ ₹ 1 Per Hrs	1 hr @ ₹ 2 Hrs
In Q Dept.	1 hr @ ₹ 3 Per Hrs	1 hr @ ₹ 3 Per Hrs



Units to be produced as per production budget	10000	4000
---	-------	------

Required: Prepare (a) Manpower Budget, showing Direct Labour hours and number of workers; and (b) Manpower Budget showing labour cost.

Solution 25**Manpower Budget showing Labour Hours and Number of Workers**

Particulars	Product A	Product B
A. Hours Required		
For Product 'A'	20000	10000
For Product 'B'	4000	4000
Total Hrs. Required	24000	14000
B. Hours during Budget Period (Note)	2000	2000
C. No. of Workers (A/B)	12	7

Manpower Budget showing Labour Cost

Particulars	Dept. P			Dept. Q		
	Hrs Required	Rate ₹	Amt. ₹	Hrs Required	Rate ₹	Amt. ₹
For Product 'A'	20000	1	20000	10000	3	30000
For Product 'B'	4,000	2	8,000	4000	3	12000
			28000			42000

Note: Budgeted Working Hours $(8 \times 6 \times 52) - (124 \times 4) = 2000$ Hours



Production Overheads Budget

Production Overheads Budget is prepared for estimating the indirect material, indirect labour and other indirect expenses for production. It is also used for estimating Factory Overhead Absorption or Recovery rates.

QUESTION 26

The budget manager of Y Ltd is preparing a budget for the accounting year starting from 1 April 2022.

As a part of the budget operations, some items of factory overhead costs have been estimated by him under specified conditions of volume as follows:

Volume of production in (units)	60000	75000
Expenses:	₹	₹
Indirect materials	1,32,000	1,65,000
Indirect labour	75,000	93,750
Maintenance	42,000	51,000
Supervision	99,000	1,17,000
Engineering services	47,000	47,000

You are required to calculate the cost of factory overhead items given above at 80,000 units of production.



Solution 26

The fixed and variable element included in each item of the fixed overhead is to be computed as follows:

(a) Indirect material:

Formula to compute the variable cost per unit:

Variable cost per unit = $\frac{\text{Change in expense}}{\text{Change in output}}$

$$= \frac{₹1,65,000 - ₹1,32,000}{75,000 - 60,000} = \frac{₹33,000}{15,000} = ₹2.20$$

Variable indirect material = Production × variable cost per unit

$$= ₹60,000 \text{ units} \times ₹2.20 = ₹1,32,000 \text{ (given)}$$

$$= ₹1,32,000 \text{ for } 60,000 \text{ units}$$

The same figure which is given in the question, i.e., ₹1,32,000

Therefore, no fixed element is involved in the indirect material.

(b) Indirect Labour:

Variable cost per unit = $\frac{\text{Change in expense}}{\text{Change in output}}$

$$= \frac{₹93,750 - ₹75,000}{75,000 - 60,000} = \frac{₹18,750}{15,000} = ₹1.25$$

Indirect labour for 60,000 units = 60,000 × ₹1.25 = ₹75,000

In indirect labour also, there is no fixed element involved.

(c) Maintenance:

Variable cost per unit = $\frac{\text{Change in expense}}{\text{Change in output}}$



$$= \frac{₹ 51,000 - ₹ 42,000}{75,000 - 60,000} = \frac{₹ 9,000}{15,000} = ₹ 0.60$$

$$75,000 - 60,000 \quad 15,000$$

Maintenance for 60,000 units = $60,000 \times 0.60 = ₹ 36,000$.

Fixed element involved = $₹ 42,000 - ₹ 36,000 = ₹ 6,000$.

(d) Supervision:

Variable cost per unit = $\frac{₹ 1,17,000 - ₹ 99,000}{75,000 - 60,000} = \frac{₹ 18,000}{15,000} = 1.20$

$$75,000 - 60,000 \quad 15,000$$

Fixed cost in supervision expenses = $₹ 99,000 - (60,000 \times 1.20)$
 $= ₹ 99,000 - ₹ 72,000 = ₹ 27,000$.

Particulars	Amt ₹
Step (i) Indirect material (80,000 units $\times$ ₹ 2.20/unit variable cost)	176000
Step (ii) Indirect labour (80,000 $\times$ variable @ ₹ 1.25/unit)	1,00,000
Step (iii) Maintenance:	
Fixed cost	6000
Variable @ ₹ 0.60 for 80,000 units	48000
Step (iv) Supervision:	
Fixed cost	27000
Variable @ ₹ 1.20 for 80,000 units	96000
Step (v) Engineering service: (Fixed cost)	47000
Total factory Overheads (I+ II+ III+ IV+ V)	5,00,000



6. Office & Administration Overheads Budget

The Administrative Cost Budget signifies the expenses which are to be incurred on the operating activities of office during the plan period. It includes all the expenses that are incurred to run the administration whether expenses are of fixed or variable nature. Generally, administrative expenses are of a fixed nature and they do not change with a change in the level of activity.

Administrative expenses in an institution will be incurred for the activities like:

- (i) Formulation of business policies;
- (ii) Directing the organisation; and
- (iii) Controlling the operations of an organization, etc.

Preparation of administration budget involves budgeting for top management functions like legal, finance, accounting, management information services, internal audit and taxation.

7. Selling & Distribution Overheads Budget

The Selling & Distribution overheads are based on sales forecasts because these are directly related with sales.

The Selling & Distribution Expenses Budget is prepared by Sales Manager/Officer with the help of Branch Managers, Regional Manager, Sales Agents, Office Superintendents and Ministerial Staff, Distributors, officer-in-charge for advertisement etc. The expenses including the Selling & Distribution Expenses Budget may be further classified into four categories:



- (i) Direct Selling Expenses, e.g., Salaries, Commission, Expenses of Salesmen etc.
- (ii) Distribution Expenses, e.g., Rent, Rates, Wages Insurance etc. of the warehouse.
- (iii) Cost of Sales Office Expense, e.g., Salaries, Rent, Rates, Light, Heat etc. of the Sales Office;
- (iv) Publicity Expenditure, e.g., Press, Window Display, Posters, Radios, Televisions etc.

Question 27

In each of the following independent situations, state with a brief reason whether 'Zero Based Budgeting' (ZBB) or 'Traditional Budgeting' (TB) would be more appropriate for year II.

- (i) A company producing a certain product has done extensive ZBB exercise in year I. The activity level is expected to marginally increase in year II.
- (ii) The sale manager of a company selling three products has intuitive feeling that in year II, sales will increase for one product and decrease for the other two. His expectation cannot be substantiated with figure.
- (iii) The top management would like to delegate responsibility to the functional managers for their results during year II.
- (iv) Resources are heavily constrained and allocation for budget requirements is very much restricted.

**Solution 27**

(i) The company has done extensive exercise in Year-I that can be used as a basis for budgeting in year-II by incorporating increase in costs / revenue at expected activity level. Hence, Traditional Budgeting would be more appropriate for the company in year-II.

(ii) In Traditional Budgeting system budgets are prepared on the basis of previous year's budget figures with expected change in activity level and corresponding adjustment in the cost and prices, but under Zero Base Budgeting (ZBB) the estimations or projections are converted into figures. Since, sales manager is unable to substantiate his expectations into figures so Traditional Budgeting would be preferred against Zero Base Budgeting.

(iii) Zero Base Budgeting would be appropriate as ZBB allows top-level strategic goals to be implemented into the budgeting process by tying them to specific functional areas of the organization, where costs can be first grouped, then measured against previous results and current expectation.

(iv) Zero Base Budgeting allocates resources based on order of priority up to the spending cut-off level (maximum level up to which spending can be made). In an organization where resources are constrained and budget is allocated on requirement basis, Zero Base Budgeting is more appropriate method of budgeting.

**QUESTION 28**

As a newly appointed management accountant, you are aware that, the present system of Budgeting is not purposeful for the HTL Company. You are required to address to the management about the problems, the Company is facing with respect to preparation of purposeful 'Budgets' and outline the correct way of presenting the 'Budgets'.

Solution 28

The budgets are 'issued to' budget holders, they clearly have very little or no input to the budget process. Budgets are set centrally by senior management and are imposed on managers without the managers participating in their preparation.

One of the tasks one faces as a financial officer, especially if the organization makes frequent business transactions, is that of preparing a budget. A budget is a tool used for planning and controlling the financial resources. It is a guideline for the future plan of action, expressed in financial terms within a set period of time. A budget does not have to be complex

QUESTION 29

Mr. Managing Director is surprised that his profit every year is quite different from what he wants or expects to achieve. Someone advised him to install a formal system of budgeting. He employs a fresh accountant to do this. For two years, the accountant faithfully makes all budgets based on previous year's accounts. The problem remains unsolved. Advise Mr. Managing Director and the Accountant on what steps they should take. Make assumption



about what is lacking.

Solution 29**(1) Inaccuracy in formulation of budgets:**

A budget is based on a set of assumptions that are generally not too far distant from the operating conditions under which it was formulated. If the business environment changes to any significant degree, then the company's revenues or cost structure may change so radically that actual results will rapidly depart from the expectations delineated in the budget. This condition is a particular problem when there is a sudden economic downturn, since the budget authorizes a certain level of spending that is no longer supportable under a suddenly reduced revenue level. Unless management acts quickly to override the budget, managers will continue to spend under their original budgetary authorizations, thereby rupturing any possibility of earning a profit. Other conditions that can also cause results to vary suddenly from budgeted expectations include changes in interest rates, currency exchange rates, and commodity prices.

(2) Rigidity in the decision making process:

The budgeting process only focuses the attention of the management team on strategy during the budget formulation period near the end of the fiscal year. For the rest of the year, there is no procedural commitment to revisit strategy. Thus, if there is a fundamental shift in the market just after a budget has been completed, there is no system in place to formally review the situation and make changes, thereby placing a company at a considerable disadvantage to its nimbler competitors.

**(3) Time required for preparation of budgets:**

It can be very time-consuming to create a budget, especially in a poorly-organized environment where many iterations of the budget may be required. The time involved is lower if there is a well-designed budgeting procedure in place, employees are accustomed to the process, and the company uses budgeting software. The work required can be more extensive if business conditions are constantly changing, which calls for repeated iterations of the budget model.

(4) Introduction of the budgetary slack:

An experienced manager may attempt to introduce budgetary slack, which involves deliberately reducing revenue estimates and increasing expense estimates, so that he can easily achieve favorable variances against the budget. This can be a serious problem, and requires considerable oversight to spot and eliminate.

(5) Blaming other departments:

If a department does not achieve its budgeted results, the department manager may blame any other departments that provide services to it for not having adequately supported his department.

(6) Allocation of expenses:

The budget may prescribe that certain amounts of overhead costs be allocated to various departments, and the managers of those departments may take issue with the allocation methods used. This is a particular problem when departments are not allowed to substitute services provided from within the company for lower-cost services that are available elsewhere.

**(7) Excessive expenditures:**

If a department is allowed a certain amount of expenditures and it does not appear that the department will spend all of the funds during the budget period, the department manager may authorize excessive expenditures at the last minute, irrespective of their actual need for the funds.

(8) Consideration of financial outcomes only:

The nature of the budget is numeric, so it tends to focus management attention on the quantitative aspects of a business; this usually means an intent focus on improving or maintaining profitability. In reality, customers do not care about the profits of a business – they will only buy from the company as long as they are receiving good service and well-constructed products at a fair price. Unfortunately, it is quite difficult to build these concepts into a budget, since they are qualitative in nature. Thus, the budgeting concept does not necessarily support the needs of customers



The term "learning curve" refers to the idea that efficiency increases the more experience a person has with a given task. As a result, the time required for performing the task decreases as increases occur in the number of times the task has been performed.

Higher costs per unit early in production are part of the start-up costs when a new activity is begun. It is commonly accepted that new products and production processes experience a period of low productivity followed by increasing productivity. However, the rate of productivity improvement declines over time until the improvement stops. The required production time reaches a level where it remains until another change in production occurs.

Learning curve analysis is used in planning, budgeting, and forecasting and also to determine estimated labour costs when bidding on a contract. A company needs to be able to estimate what the long-term costs of production will be.

In case of a job which is repetitive in nature and the working time is not scheduled by the speed of machinery, an individual is likely to become more confident and knowledgeable about his work as he gains more experience.

As a consequence of his learning effect he can do the job in less time than when he initially commenced the first job. Ultimately when he has acquired more experience



the learning process will tend to stop. The speeding up of a job with repeated performance is known as learning effect or learning curve effect. The reduction in the required labour time thus can be quantified. Learning curve theory was first developed in the United States aircraft industry. It has been extended to other labour-oriented industries and has been extended to non production activities such as marketing efforts. Learning curve effect is not only restricted to individual but it also applies to a group of workers. However, the learning effect is not an automatic natural phenomenon. All production process will not show rate of increased efficiency and there may be cases where the differences in the learning rates will be substantial. Learning curve is essentially a measure of the experience gained in production of an article by an organization. As more and more units are produced, workers involved in production become more efficient than before. Each subsequent unit takes fewer man-hours to produce. The Learning curve exists during a worker's startup or familiarization period on a particular job. After the limits of experimental learning are reached, productivity tends to stabilize and no further improvement is possible.



The limits for learning curve percentages are as follows:

(1) The learning curve will always be less than 100%, because if the learning curve is 100% then no learning and no decrease in time required is taking place. This upper limit applies to both the cumulative average-time learning model and the incremental unit-time learning model because both assume that the time required to perform a task decreases as the task is performed multiple times.

(2) When the cumulative average-time learning model is being used, the learning curve percentage must be greater than 50%. If the learning curve percentage is less than or equal to 50%, it would mean one of two impossible scenarios exists:

- If the learning curve is less than 50%, the total time required to produce the additional units when production doubles plus the time required to produce the initial units would be less than the time required for production of the initial units.*
- If the learning curve is equal to 50%, the total time required to produce the additional units when production doubles plus the time required to produce the initial units would be equal to the time required for production of the initial units.*
- Neither of the two scenarios above is possible. The additional units must require some added amount of time, so the total time for the additional units plus the time for the initial units must be greater than the time required for the initial units.*



- This lower limit applies to only the cumulative average-time learning model. No similar restriction exists for the incremental unit-time learning model because that model results only in an estimate of the time needed to produce just the last unit in a quantity of units. Theoretically, at least, the time required for the last unit produced could require less than 50% of the time required for the last unit before production doubled.*

These limits are demonstrated below.

Cumulative Average-Time Learning Model

The cumulative average-time learning model assumes a constant rate of decline in the estimated average time per unit each time the quantity of units produced doubles.

For example, if the learning curve is 70%, every time the total number of units produced doubles the estimated cumulative (total) production time for all units produced decreases to 70% of what it would have been if no learning had taken place.

This model can be used to calculate three things:

- 1) The estimated average time per unit for the entire quantity produced, from the very first unit to the very last unit produced. This is the "cumulative average."*
- 2) The estimated total time required for the entire quantity produced, from the very first unit to the very last unit produced.*



3) The estimated total production time required for a certain block of units can be calculated by finding the total time required for all the units produced through the end of that block and subtracting from that the total time required for the units up to that block. This calculation is possible only if the block of units represents the units that are produced in a doubling of production.

For example, to calculate the total time that is required to produce units 5 through 8, to calculate the total time required to produce units 1 through 8 and to subtract from that the time required to produce units 1 through 4.

Since the jump from 4 units to 8 units represents a doubling of production, the time requirement can be calculated for just the additional units 5 through 8.

Mathematically, two methods are used to calculate the estimated total time required for all units produced and the estimated average time required per unit for all units produced using the cumulative average model:

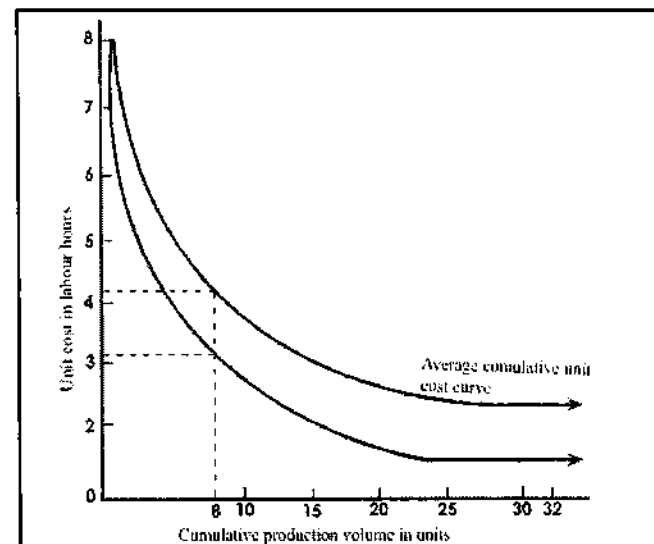
(1) To calculate the estimated total time required for all units produced, then to use the estimated total time to calculate the estimated cumulative average time per unit;

(2) To calculate the estimated cumulative average time per unit, and then to use the estimated average time per unit to calculate the estimated total time required for all units produced.

The learning curve ratio can be calculated with the help of the following formula:



Learning curve ratio = $\frac{\text{Average labour cost of first 2 units}}{\text{Average labour cost of first units}}$



The quantitative average time per unit produced is normally considered to be reduced by a constant percentage every time total output of the product is doubled. The following table the working of which is based on 80% learning effect can exemplify this.

Number of Units (Cumulative)	Cumulative average time	Total Time in hours	Incremental time for additional units
1	100	100	-
2	80	160	60
4	64	256	96



8	51.2	409.6	153.6
---	------	-------	-------

The Learning curve can also be expressed as $y = ax^b$

Where, y = is the average time per unit for x units

a = the time for first unit

x = the cumulative number of units

b = the learning coefficient and is equal to $\log 0.8 \div \log 2 = -0.322$ for a learning rate of 80%.

Note: If a learning rate of 90% is applied, then the value of will change.

Learning curve theory can be used:

- To calculate the incremental cost of making extra units of a particular products,
- To set standards for labour,
- To prepare realistic production budgets and to report labour cost variances, and
- To quote contract price.

Direct labour cost and time as well as variable overhead costs, which vary with direct labour hours, are affected by learning curve. On the other hand, material cost will not be affected. In case where absorption costing system in vogue, the fixed overhead application rate may be affected due to higher production or use of capacity. Besides the above cases where learning curve will have effect directly a management accountant should bear in some other considerations, such as:

1. Sales promotion and advertising expenditure,
2. Delivery date commitments,
3. Budgeting and standard cost,



4. Cash budget,
5. Work scheduling and overtime decisions, and
6. Economics of scale

Application of Learning Curve

The areas in which the application of learning curve can help an organization are:

1. Improvement of Productivity:

As the experience is gained the performance of workers improves, time taken per unit reduces and thus his productivity goes up.

2. Cost Predictions:

Learning curve provides better cost predictions to enable price quotations to be preferred for potential orders.

3. Work scheduling:

Learning curve enables us to predict the inputs required more effectively and helps in the preparation of accurate delivery schedules.

4. Standards setting:

If budgets and standards are set without considering learning curve, it is meaningless because variances will arise.



The theory of learning curves will only hold if the following conditions apply:

- (1) There is a significant manual element in the task being considered.*
- (2) The task must be repetitive.*
- (3) Production must be at an early stage so that there is room for improvement.*
- (4) There must be consistency in the workforce.*
- (5) There must not be extensive breaks in production, or workers will 'forget' the skill.*
- (6) Workforce is motivated.*

The following are some examples of decisions that can be aided by learning curve analysis:

- **Development of production plans and labour requirements:**

Learning curves should be used in the development of production and labour budgets when changes such as new products are planned.

- **Management control:**

Recognizing that higher costs will occur in the early phase of the product life cycle allows more effective evaluation of managers.

- **Development of standard costs:**

Labour costs should be adjusted regularly in recognition of the fact that learning causes standard costs to decrease over time.



- **Life-Cycle costing:**

In calculating the cost of a contract, learning curve analysis can ensure that the cost estimates are accurate over the life of the contract, leading to better bidding.

- **Cost-Volume-Profit analysis:**

If learning is not considered in determining a breakeven point, the result may be an overstatement of the number of units required to break even.

- **Capital budgeting:**

Costs can be projected more accurately over the life of the capital investment when expected improvements in labour productivity due to learning are included.

- **Make or buy decisions:**

The analysis of the cost to make the product will be affected by the learning curve in effect.

Limitations and problems associated with learning curve analysis include:

- *Learning curve analysis is appropriate only for labour-intensive operations involving repetitive tasks where repeated trials improve performance. If the production process primarily relies on robotics and computer controls, little repetitive labour is involved and thus little opportunity exists for learning to take place.*



- The learning rate is assumed to be constant. In real life, the decline in labour time might not be constant. For example, the time required might decline at the rate of 70% for the first 75,000 units, followed by 80% for the next 50,000 units, and 95% for the next 25,000 units.
- The reliability of a learning curve calculation can be jeopardized because an observed change in productivity might actually be associated with factors other than learning, such as a change in the labour mix, the product mix, or other factors. If some factor or factors other than learning are affecting productivity, a learning model developed using the affected historical data will produce in-accurate estimates of labour time and cost.



Question 1

The learning curves as a management accounting has now become or going to become an accepted tool in industry, for its applications are almost unlimited. When it is used correctly, it can lead to increase business and higher profits; when used without proper knowledge, it can lead to lost business and bankruptcy. State precisely,

- Your understanding of the learning curve;
- The theory of learning curve;
- The areas where learning curves may assist in management accounting and
- Illustrate the use of learning curves for calculating the expected average unit cost of making

(a) 4 machines

(b) 8 machines using the data below:

Data:

Direct Labour need to make first machine = 1000 hrs

Learning curve = 90%

Direct Labour Cost = Rs.15/- per hour

Direct materials cost = Rs.1,50,000

Fixed cost for either size orders = Rs.60,000

Solution 1

Statement showing computation of cost of making 4 machines and 8

Machines:



No of machines	Average time	Labour cost	Material	Fixed cost	Total
1	1000	15000	150000	60000	225000
2	900	13500	150000	30000	193500
4	810	12150	150000	15000	177150
8	729	10935	150000	7500	168435

Average cost of making 4 machines = Rs.1,77,150

Average cost of making 8 machines = Rs.1,68,435

Question 2

JANAK LTD. received an order to make and supply sixteen units of standard product which involves intricate labour operations. The first unit was made in 8 hours. It is understood that this type of operations is subject to 90% learning rate. The workers are getting a wage rate of Rs.15 per hour.

Required :

What is the total time and labour cost required to execute the above order?



Solution 2

90% Learning Curve results are as given below:

Production (units)	Cumulative Average Time (Hours)	Total time (Hours)
1	8	8
2	7.2	14.4
4	6.48	25.92
8	5.832	46.66
16	5.2488	83.98

Labour time required for first 16 units = 83.98 hrs.

Labour cost required for 16 units = 83.98 hours x Rs.15 per hr = Rs.1,259.70

Question 3

RADIANCE ENGINES LTD. manufacture engines mounting for Akash airline. They have been asked to bid on a prospective contract for 30 engines mounting for the Jet aircraft. They have just completed and initial run of 10 of these mounting at the following costs:

Particulars	Amount in (Rs.)
Direct materials	7,000
Direct labour (2000 hours @ Rs.4)	8,000



Variable overhead (Rs.0.50 per labour hour)	1,000
Fixed overhead (Rs.1 per labour hour)	2,000
	18,000

An 80% learning curve is thought to be pertinent in this case, Marketing Director believes that the quotation is unlikely to be accepted if it exceeds Rs.38,000 and as the company are short work, he believes the contract to be Vital.

Solution 3

	Cumulative quantity manufactured	Cumulative hours	Cumulative average hours per unit (engine)
I	10	2000	$2000 \div 10 = 200$
II	20	3200	$200 \times 0.80 = 160$
III	40	5120	$160 \times 0.80 = 128$

Additional hour for 30 = hours required for 40 engines minus hours, required Original 10 units (engines) for which initial run has already been

$$= 5120 - 2000 = 3120 \text{ hours}$$

Incremental costs for 30 engines will be :

Particulars	Rs.
Direct Material	21,000
Direct Labour (3120 hours x 4)	12,480



Variable Overhead (3120 x 0.50)	1,560
Fixed Overhead	-----
	Rs.35,040

The contract is worth accepting, if more profitable work is not being turned away, as it yields a contribution of only Rs. 2,960 (i.e Rs.38,000 - 35,040)

Question 4

DANDIA LTD., a manufacturing company received an order for 16 units of a new product. So, for 4 units have been completed; the first unit required 40 direct labour hours and a total of 102.40 Direct Labour has been recorded for the 4 units. The Production Management expects an 80% learning effect for this type of work.

The direct cost attributed to the centre in which the unit is manufactured and its cost are as follows:

	Rs.
Direct Material	30.00 per unit
Direct Labour	6.00 per unit
Variable overhead	0.50 per direct labour hour
Fixed overheads apportioned	5.00 per direct labour hour

You are required to produce an estimated product cost for the initial order based on the cost data given.

**Solution 4**

80% learning curve results are given below:

Production (units)	Cumulative Avg. time (hours)	Total time (hours)
1	40	40
2	$(0.80 \times 40) 32$	64
4	$(0.80 \times 32) 25.6$	102.40
8	20.48	163.843
16	16.384	262.144
32	13.1072	419.4304

Material (30x16)	480.00
Direct labour (262.144x6)	1572.86
Variable overheads (0.5x262.144)	131.07
Fixed overhead apportioned (5x262.144)	1310.72
Total cost	3494.65

**Question 5**

A firm received an order to make and supply eight units of standard product which involves intricate labour operations. The first unit was made in 10 hours. It is understood that this type of operations is subject to 80% learning rate. The workers are getting a wage rate of ₹ 12 per hour.

- (i) What is the total time and labour cost required to execute the above order?
(ii) If a repeat order of 24 units is also received from the same customer, what is the labour cost necessary for the second order?

solution 5

(i) 80% Learning Curve results are given below:

Production (Units)	Cumulative Average Time (hours)	Total Time (hours)
1	10	10
2	8	16
4	6.4	25.6
8	5.12	40.96
16	4.096	65.54
32	3.2768	104.86

Labour time required for first eight units = 40.96 hours

Labour cost required for 8 units = 40.96 hours × ₹ 12/hr = ₹ 491.52



- (ii) Labour time for 32 units = 104.86 hours
 Labour time for first eight units = 40.96 hours
 Labour time required for 2nd order for 24 units = 63.90 hours (104.86 - 40.96)
 Labour cost for 24 units = 63.90 hours $\times$ ₹12/hr = ₹ 766.80

Question 6

C has designed a new type of sailing boat, for which the cost and sales price of the first boat to be produced has been estimated as follows:

Materials	5000
Labour (800 hrs @ ₹5 per hr)	4000
Overhead (150% of labour cost)	6000
	15000
Profit mark-up (20%)	3000
Sales price	18000

It is planned to sell all the yachts at full cost plus 20%. An 80% learning curve is expected to apply to the production work. Only one customer has expressed interest in buying the yacht so far, but he thinks ₹18,000 is too high a price to pay. He might want to buy two or even four of the yachts over the next six months.

He has asked the following questions:

- (a) If he paid ₹18,000 for the first yacht, what price would he have to pay later for a second yacht?



- (b) Could C quote the same unit price for two yachts, if the customer ordered two at the same time?

- (c) If the customer bought two yachts now at one price, what would be the price per unit for a third and fourth yacht, if he ordered them both together later on?

- (d) Could C quote a single unit price for the following numbers of yachts if they were all ordered now?

- (i) Four yachts

- (ii) Eight yachts

Assuming there are no other prospective customers for the yacht, how would the questions be answered?

Solution 6

Number Of yachts		Cumulative average time per yacht (Hours)		Total time for all yachts to date (Hours)		Incremental time for additional yachts (Hours)
1		800.00		800.00		
2	($\times 80\%$)	640.00	($\times 2$)	1280.00	(1,280.00 - 800.00)	480.00



					800.00)	
4	(x80%)	512.00	(x4)	2048.00	(2,048.00 - 1,280.00)	768.00
8	(x80%)	409.60	(x8)	3276.80	(3,276.80 - 2,048.00)	1,228.80

(a) Separate price for a second yacht:

Materials	5,000
Labour (480 hrs @ ₹5)	2,400
Overhead (150% of labour cost)	3,600
Total cost	11,000
Profit (20%)	2,200
Sales price	13,200

(b) A single price for the first two yachts:

Materials cost for two yachts	10,000
Labour (1,280 hrs @ ₹5)	6,400
Overhead (150% of labour cost)	9,600
Total cost for two yachts	26,000
Profit (20%)	5,200
Total sales price for two yachts	31,200
Price per yacht (÷ 2)	15,600

(c) A price for the third and fourth yachts:



Materials cost for two yachts	10,000
Labour (768 hours @ ₹5)	3,840
Overhead (150% of labour cost)	5,760
Total cost	19,600
Profit (20%)	3,920
Total sales price for two yachts	23,520
Price per yacht (÷ 2)	11,760

(d) A price for the first four yachts together and for the first eight yachts together

Particulars		First four yachts		First eight yachts
Materials		20,000		40,000
Labour	(2,048 hrs x ₹5)	10,240	(3,276.80 hours x ₹5)	16,384
Overhead	(150% of labour cost)	15,360	(150% of labour cost)	24,576
Total cost		45,600		80,960
Profit (20%)		9,120		16,192
Total sales price		54,720		97,152
Price per yacht	(÷ 4)	13,680	(÷ 8)	12,144



CHAPTER 7: ACTIVITY BASED COSTING

Question 1

The cost accountant of ABC Manufacturing attended a workshop on activity-based costing and was impressed by the results. After consulting with the production personnel, he prepared the following information on cost drivers and the estimated volume for each driver.

	Products			Total
	A	B	C	
Units produced	25,000	15,000	5,000	45,000
Direct Materials Cost per unit (In Rs.)	40	30	55	
Direct Labour in Rs.	15	15	15	

Cost Driver	Cost Driver Volume			Total
	A	B	C	
No. of Set ups	125	75	50	250
Machine Hours	2500	1500	2000	6000
Direct labour hours	25000	15000	5000	45000
No. Of Inspection	50	25	25	100

The cost accountant also determined how much overhead costs were incurred in each of the four activities as follows:

Activity	Overheads Cost in Rs.
Machining	
Setup	1,50,000
Machining	7,50,000



Total machine overhead	9,00,000
Assembly	
Assembly	3,60,000
Inspection	90,000
Total Assembly overhead	4,50,000
Total Over Cost	13,50,000

Required:

1. Determine the cost driver rate for each activity cost pool.
2. Use the activity-based costing method to determine the unit cost for each product

Question 2

The Indiana Company produces only two products: a major computer part and cell phones. The company uses a normal cost system and overhead costs are currently allocated using a plant-wide overhead rate based on direct labour hours. Outside cost consultants have recommended, however that the company use activity-based costing to charge overhead to products. The company expects to produce 4,000 computer parts and 2,000 cell phones in 2013. Each computer part requires two direct labour hours to produce and each cell phone requires one-half hour to produce. The direct material and direct labour costs included in the two products are as follows:



Particulars	Computer Part	Cell Phone
Direct material cost	30	17
Direct labour cost	16	4

Budgeted (Estimated) Total Factory Overhead Data For 2013:

	Budgeted Overhead in	Estimated Volume Le
Production Setups	80,000	20 setups
Material Handling	70,000	5,000 lbs.
Packaging and Shipping	120,000	6,000 boxes
Total Factory Overhead	270,000	

Based on an analysis of the three overhead activities, it was estimated that the two products would require these activities as follows in 2013

Particulars	Computer Part	Cell Phone	Total
Production Setups	5	15	20
Material handling (lbs)	1,000	4,000	5,000
Packaging and Shipping (boxes)	4,000	2,000	6,000

Required:

1. Calculate the cost of each product using a plant-wide rate based on direct labour hours.
2. Calculate the activity cost rates for (a) setups, (b) material handling and (c) packaging and shipping.
3. Cost out the two products using an activity-based costing system



Question 3

A company manufactures two products furnishes the following data for a year:-

Product	Annual Output	Total Machine	Total number of Purchase Orders	Total number of set-ups
A	5,000	20,000	160	20
B	60,000	120,000	384	44

The annual overheads are as under:

	Rs
Volume related activity cost	5,50,000
Set-up related cost	8,20,000
Purchase related cost	6,18,000

You are required to calculate the cost per unit of each Product A and B based on:

- (i) Traditional method of charging overheads
- (ii) Activity based costing method

**Question 4**

Major Ltd. manufactures two products A & B. The product A is low volume item & its sales are only 5,000 units per annum. Both products require two direct labour hours for completion. The company works 50,000 direct labour hours each year as given below:

Product		Hours
A	5,000 units X 2 hours	10,000
B	20,000 units X 2 hours	40,000
		50,000

Details of cost for material and labour for each product (per unit) are given below:

	Product A	Product B
Direct Material	Rs. 25	Rs. 15
Direct Labour (at Rs. 5 per hour)	Rs. 10	Rs. 10

The company's total manufacturing overheads are Rs. 8,75,000 per annum. The company has analyzed its operation & has determined that five activities act as cost drivers in the occurrence of overhead cost.

Data relating to the five activities are given below:

Activity	Traceable Cost (Rs)	Number of Events or Transaction		
		Total	Product A	Product B
Machine setups	2,30,000	5,000	3,000	2,000
Quality inspections	160,000	8,000	5,000	3,000
Production orders	81,000	600	12,000	400
Machine hours	3,14,000	40,000	12,000	28,000



worked				
Material ecclpts	90,000	750	150	60
Total	8,75,000			

You are required to compute per unit cost for each product using:

- (i) Direct labour hour rate method for absorption of overhead cost
- (ii) Activity based costing technique for absorption of overhead cost

Question 5

Family stores wants information about the profitability of individual product lines: Soft Drinks, Fresh produce and Packaged food. Family store provides the following data for the year 2002-03 each product line:

Particulars	Soft Drinks	Fresh Produce	Packaged
Revenues	Rs. 7,93,500	Rs. 21,00,000	Rs. 12,09
Cost of goods sold	Rs. 6,00,000	Rs. 15,00,000	Rs. 9,00
Cost of bottles returned	Rs. 12,000	Rs. 0	Rs. 0
Number of Purchase orders placed	360	840	360
Number of deliveries received	300	2,190	660
Hours of shelf stocking time	540	5,400	2,700
Items sold	1,26,000	11,04,000	3,06,000

Family stores also provide the following information for the year 2002-



Activity	Description of activity	Total Cost (Rs)	Cost allocation base
Bottles returned	Returning of empty bottles	12,000	Direct tracing to soft drink lines
Ordering	Placing of orders for purchases	1,56,000	1,560 purchase orders
Delivery	Physical delivery & receipt of goods	2,52,000	3,150 deliveries
Shelf stocking	Stocking of goods on store shelves and ongoing restocking	1,72,800	8,640 hours of shelf stocking time
Customer support	Assistance proved to customers including check-out	3,07,200	15,36,000 item sold

Required:

(I) Family stores currently allocates support cost (all cost other than cost of goods sold) to product lines on the basis of cost of goods sold of each product line. Calculate the operating income & operating income as a % of revenue of each product line.

(II) If family stores allocates support cost (all cost other than cost of goods sold) to product lines using an activity based costing system. Calculate the operating income & operating income as a % of revenue of each product line.



Question 6

XYZ Plc manufactures four products, namely A, B, C and D, using same plant and processes. The following information relates to a production period.

Product	Volume	Machine time cost per unit	Direct labour per unit	Machine time per unit	Labour cost per unit
A	500	Rs. 5	1/2 hour	1/4 hour	Rs. 3
B	5,000	Rs. 5	1/2 hour	1/4 hour	Rs. 3
C	600	Rs. 16	2 hour	1 hour	Rs. 12
D	7,000	Rs. 17	2 1/2 hours	1 1/2 hours	Rs. 9

Total production overhead recorded by the cost accounting system is analysed under the following headlines Factory overhead applicable to machine oriented activity is Rs. 37,749. Set-up costs are Rs. 4250. The cost of ordering materials is Rs. 1920 Handling materials- Rs. 1560. Administration for spare parts - Rs. 8400.

These overhead costs are absorbed by products on a machine hour rate of Rs. 4.80 per hour, giving an overhead cost per product of:

A = Rs. 1.20, B = Rs. 1.20, C = Rs. 4.80, D = Rs. 7.20

However investigation into the production overhead activities for the period reveals the following totals:

Product	Number of set ups	Number of material	Number of times Materials was	Number of spare part
---------	-------------------	--------------------	-------------------------------	----------------------



		orders	handled	
A	1	1	2	2
B	6	4	10	5
C	2	1	3	1
D	8	4	12	4

Required

To compute an overhead cost of product using activity based costing, tracing overheads to productions units by means of cost drivers.

Question 7

A company produces three products A, B and C for which the standard costs and quantities per unit are as follows:

Particulars	Products		
	A	B	C
Quantity produced	10,000	20,000	30,000
Direct material/p.u.(Rs.)	50	40	30
Direct Labour/p.u. (Rs.)	30	40	50
Labour hours/p.u.	3	4	5
Machine hours	4	4	7
No. of batches inspected	1,200	1,800	2,000
No. of set ups	240	260	300

Production overhead split by departments - Department 1 = Rs. 11,00,000
- Department 2 = Rs. 15,00,000



Department 1 is labour intensive and department 2 is machine intensive

Total labour hours in Department 1 = 1,83,333

Total machine hours in Department 2 = 5,00,000

Production overhead split by activity - Receiving/Inspecting Rs. 14,00,000

Production scheduling machine set up Rs. 12,00,000

Rs. 26,00,000

Number of batches received/ inspected = 5,000

Number of batches for scheduling and set-up = 800

Required:

Prepare Product Cost Statement under traditional absorption costing and Activity Based Costing.

Question 8 HOMEWORK SUM DATE:

The following information provides details of costs, volume & cost drivers for a particular period in respect of ABC Ltd; for product X Y & Z

	Product X	Product Y	Product Z	Total
Production & sale unit	30,000	20,000	8,000	
Raw Material unit (usage)	5	5	11	
Direct material cost (Rs)	25	20	11	12,38,000
Direct labour hour	1-1/3	2	1	88,000



Machine hour	1-1/3	1	2	76,000
Direct labour cost (Rs.)	8	12	6	
No. of Production Runs	3	7	20	30
No. of deliveries	9	3	20	32
No. of receipts (2x7)	15	35	220	270
No of production	15	10	25	50

Overhead costs:

Set-up	30,000
Machines	7,60,000
Receiving	4,35,000
Packing	2,50,000
Engineering	3,73,000
	Rs. 18,48,000

The Company operates a just-in-time inventory policy and received each component once per production run. In the past the company has allocated overheads to products on the basis of direct labour hours.

However the

majority of overheads are related to machine hours rather than direct labour hours. The company has recently redesigned its cost system by recovering overheads using two volume related bases: Machine hours and a material handling overhead rate for recovering overheads of the receiving department.

Both the current and the previous cost system reported low profit margins for product X, which is the company's highest-selling product. The management accountant has recently attended a conference on activity-based costing and the overhead costs for the last period have been analyzed by the major



activities in order to compute activity-based costs.

Required:

(a) Compute the product costs using a traditional volume-related costin

system based on the assumption that:

All overheads are recovered on the basis of direct labour hours

(i.e. company past product costing system.).

The overheads of the receiving department are recovered by a material handling overhead rate and the remaining overheads are recovered

(b) Compute product costs using an activity based costing system,

Question 9**HOMEWORK SUM****DATE:-**

Krone Ltd, manufactures three products, W, X and Y. Each product uses the same materials and the same type of direct labour but in different quantities. The company currently uses a cost plus basis to determine selling price of its products. This is based on full cost using an overhead absorption rate per direct labour hour. However, the Managing Director is concerned that the company may be losing sales because of its approach to setting prices. He thinks that a marginal costing approach may be more appropriate, particularly since the workforce is guaranteed a minimum weekly wage and has a three month notice period.

(a) The direct costs of the three products are shown below:



Product	W	X	Y
Budgeted annual production (units)	15,000	24,000	20,000
	Rs. per unit	Rs. per unit	Rs. per unit
Direct materials	35	45	30
Direct labour (Rs. 10 per hour)	40	30	50

In addition to the above direct costs, KL incurs annual indirect production cost of Rs. 10,44,000.

An analysis of the company's indirect production costs shows the following:

	Rs.	Cost driver
Material ordering cost	2,20,000	Number of supplier orders
Machine setup costs	1,00,000	Number of batches
Machine running costs	4,00,000	Number of machine hours
General facility costs	3,24,000	Number of machine hours

The following additional data relate to each product:

Product	W	X	Y
Machine hours per unit	5	8	7
Batch size (units)	500	400	1000
Supplier orders per batch	4	3	5

Required:

(a) Calculate the full cost per unit of each product using KL's current



method of absorption costing.

(b) Calculate the full cost per unit of each product using Activity Based Costing

Question 10 HOMEWORK SUM DATE:-

X Ltd. is engaged in the production of four products: A, B, C and D. The price charged for the four products are Rs.180, Rs.175, Rs.130 and Rs.180 respectively, Market research has indicated that if X Ltd can reduce the selling prices of its products by Rs.5, it will be successful in getting bulk orders and gain a significant share of market of those products. The company's profit markup is 25 per cent on cost of the product. The relevant information products are as follows:

Products	A	B	C	D
Output in units	600	500	400	600
Cost per unit:				
Direct material (in Rs.)	40	50	30	60
Direct labour (in Rs.)	28	21	14	21
Machine hours (per unit)	4	3	2	3

The four products are usually produced in production runs of 20 units and so in batches of 10 units. The production overhead is currently absorbed by using a machine hour rate, and the total of the production overheads for the period has been analyzed as follows:



	(Rs.)
Machine department costs	52,130
Setup costs	26,250
Stores receiving	18,000
Inspection/Quality Control	10,500
Material handling and dispatch	23,100

The cost drivers to be used for the overhead costs are as follows:

Cost	Cost driver
Setup costs	Number of production runs
Store receiving	Requisition raised
Inspection Quality control	Number of production runs
Materials handling and dispatch	Order executed

The number of requisitions raised in the stores was 100 for each product and the number of orders executed was 210, each order being for batch of 10 units of a product.

Required:

- (i) To compute the target cost for each product.
- (ii) To compute total cost of each product using activity based costing.
- (iii) Compare target cost and activity based cost of each product and comment whether the price reduction is profitable or not.

Question 11 **HOMEWORK SUM** **DATE:-**



ABC Ltd plans to use activity-based costing to determine its product costs. It presently, uses a single plant-wide factory overhead rate for allocating factory overhead to products, based on direct labour hours.

The total factory overhead cost is as follows:

Department	Factory overhead Rs.
Production Support	12,25,000
Production (factory overhead only)	1,75,000
Total cost	14,00,00

The Company determined that it performed four major activities in the Production Support Department. These activities, along with their budgeted costs, are as follows:

Production Support Activities	Budgeted Cost Rs.
Set up	4,28,750
Production control	2,45,000
Quality control	1,83,750
Materials management	3,67,500
Total	12,25,000

ABC Ltd estimated the following activity-base usage quantities and produced for each of its three products:

Products	No of units	Direct labour hours	Setups	Production order	Inspections	Material Requisition
K	10,000	25,000	80	80	35	320
L	2,000	10,000	40	40	40	400
M	50,000	1,40,000	5	5	0	30



Total cost	62,000	1,75,000	125	125	75	750
------------	--------	----------	-----	-----	----	-----

Instructions:

1. Determine the factory overhead cost per unit for Products K, L & M, under the single plant-wide overhead rate method. Use direct labour hours as the activity base.
2. Determine the factory overhead cost per unit for Products K, L and M under activity-based costing.
3. Which method provides more accurate product costing? Why?

Question 12

IBM Ltd. Manufactures and sells computers peripherals to several retail outlets throughout the country. Amar is the manager of the printer division. Its two largest-selling printers are P1 & P2.

The manufacturing cost of each printer is calculated using IBM's activity based costing system. IBM has one direct manufacturing cost category (direct materials) and the following five indirect manufacturing cost pools.

Indirect manufacturing cost pool	Allocation Base	Allocation Rate (Rs.)
1. Materials handling	No. of parts	Rs.1.20 per part
2. Assembly management	Hours of assembly time	Rs.40 per hour of Assembly time



3. Machine insertion parts	No. of machine inserted parts	Rs.0.70 per machine inserted part
4. Manual insertion of parts	No. Of manually inserted parts	Rs. 2.10 per manually inserted part
5. Quality testing	Hours of quality testing time	Rs.25 per testing hour.

Product characteristics of P1 and P2 are as follows:

Product	P1	P2
Direct materials cost	Rs.407.5	Rs.292.10
Number of parts	85	46
Hours of assembly time	3.2	1.9
Number of machine - Inserted parts	48	31
Number of manually inserted parts	36	15
Hours of quality testing time	1.4	1.1

A foreign competitor has introduced products very similar to P1 and P2. Given their announced selling prices and to maintain his company's market share profits, Amar estimates the P1 to have manufacturing cost of approximately 680 and P2 to have a manufacturing cost of approximately 390. He calls meeting of product designers and manufacturing personnel at the printer, division. They all agree to have the 680 and 390 figures as target costs for designed version of P1 and P2 respectively. Product designers examine alternative ways of designing printer with comparable performance but lower costs. They come up with the following revised designs for P1 and P2 (termed P1 - REV and P2 - REV, respectively)

Particulars	P1 - REV	P2-REV
Direct materials cost	Rs.381.20	Rs.263.10



Number of parts	71	39
Hours of assembly time	2.1	1.6
Number of machine - Inserted parts	59	29
Number of manually - inserted parts	12	10
Hours of quality testing time	1.2	0.9

- i) Compute the present costs of products P1 and P2 using ABC system.
 ii) Compute the manufacturing costs of P1 - REV and P2 - REV. How do they compare with the 680 and 390 target costs?

Question 13 HOMEWORK SUM DATE:-

ABC Ltd is manufacturing 4 similar products W, X, Y, Z with the following details:

Set up cost is Rs. 9000, Purchase Ordering Cost Rs.10,400, Handling Cost Rs 6000 and other factory overheads is Rs.1,27,000. In present system, total overheads are charged to production on machine hour basis. Apply Activity based costing on the basis of relevant cost drivers and indicate the difference in cost of products under the two methods.

Question 14 HOMEWORK SUM DATE:-



W is a manufacturing company that produces three products: X, Y and Z. Each uses the same resources, but in different quantities as shown in the table of budgeted data for 2010 below:

Products	X	Y	Z
Budgeted production	1500	2500	4000
Direct labour hours per unit	2	4	3
Machine hours per unit	3	2	3
Batch size	50	100	500
Machine setups per batch	2	3	1
Purchase orders per batch	4	4	6
Material movements per batch	10	5	4

W's budgeted production overhead costs for 2010 are RS 4,00,000 & current practice is to absorb these costs into product costs using an absorption rate based on direct labour hours. As a result the production attributed to each product unit is:

Product X Rs.32

Product Y Rs.64

Product Z Rs.48

The management of W is considering changing to an activity based method of attributing overhead costs to products and as a result has identified the following cost drivers and related cost pools:

Cost pool	Amount (Rs)	Cost driver
Machine maintenance	100,000	machine hours
Machine setups	70,000	machine setups
Purchasing	90,000	purchase orders
Material handling	60,000	material movements

The remaining Rs.80,000 of overhead cost are caused by a number of



different factors and activities that are mainly labour related and are to be attributed to products on the basis of labour hours.

Required: Calculate the production overhead cost attributed to each product unit using an activity based approach.

Question 15 HOMEWORK SUM DATE:-

A company manufactures several products of varying levels of designs and models. It uses a single overhead-recovery rate based on direct labour hours. The overhead incurred by the company in the first half of the year are as under

Particulars	Rs.
Machine operation expenses	10,12,500
Machine maintenance expenses	1,87,500
Salaries of technical staff	6,37,500
Wages and Salaries of stores staff	2,62,500

During this period, the company-introduced activity based costing system and the following significant activities were identified:

Receiving materials and components

Set up of machines for production runs

Quality inspection. It is also determined that:



It is also determined that the machine operation and machine maintenance expenses should be apportioned between stores and production activity in 20:80 ratio.

The technical staff salaries should be apportioned between machine maintenance, set up and quality inspection in 30:40:30 ratio. The consumption of activities during the period under review are as under:

Direct labour hours worked

40,000

Direct wage rate Rs. 6 per hour

Production set-ups 2040

Material and component consignments received from suppliers 1960

Number of quality inspections carried out 1280

The data relating to two products manufactured by the company during the period are as under:

Particulars	Products	
	P	Q
Direct material costs	Rs. 6,000	Rs. 4,000
Direct labour hours	960	100
Direct material consignment received	48	52
Production runs	36	24
Number of quality inspection done	30	10
Quantity produced (units)	15,000	5,000

A potential customer has approached the company for the supply of 24,000 units of a component K to be delivered in lots of 3,000 units per quarter. The job will involve as initial design cost of Rs. 60,000 and the manufacture will involve the following per quarter:

Direct Material Costs	Rs. 12,000
-----------------------	------------



Direct labour hours	300
Production runs	6
Inspection	24
Number of consignment of direct materials to be received	20

The company desired of 25 % profit on cost.

Required:

1. Calculate the cost of product P and Q based on the existing system of single overhead recovery rate.
2. Determine the cost of products P and Q using activity based costing system.
3. Compute the sales value per quarter of component K using activity based costing system.

Question 16 HOMEWORK SUM DATE:-

Aerodecinc manufactures and sells two types of Wooden deck chairs. Deluxe and Tourist. Annual Sales in units, Direct labour hours (DLHs) per unit and Total Labour-Hours per year are provided below:-

Particulars	Total Hours
Deluxe deck chair (2000 units x 5 direct labour hours per unit)	10,000
Tourist deck chair	40,000



(10000 units x 4 direct labour hours per unit)	
Total Direct labour hours	50,000

Costs for materials and labour for one unit of each product are given below:

Particulars	Deluxe (Rs.)	Tourist (Rs.)
Direct materials	25	17
Direct labour @ Rs. 12 per direct labour hour	60	48

Manufacturing overhead costs total Rs. 8,00,000 each year. The breakdown of three costs among the company's six capacity pools is given below. The activity measures are shown in brackets.

Activity and activity measures	Estimated overhead cost Rs.	Expected activity		
		Total	Delux	Tourist
Labour related (Direct labour hours)	80,000	50,000	10,000	40,000
Machine set ups (Number of setups)	1,50,000	5,000	3,000	2,000
Parts administration (Number of parts)	1,60,000	80	50	30
Production orders (Number of orders)	70,000	400	100	300
Material receipts (Number of receipts)	90,000	750	150	600
General factory (machine hours)	2,50,000	40,000	12,000	28,000



Total	8,00,000			
-------	----------	--	--	--

Required

Assume that the company applies overhead cost to products on the basis of direct labour hours. Compute the total cost for each product using activity based costing

Question 17 HOMEWORK SUM

DATE:-

A bank offers three products, viz., deposits, Loans and Credit Cards. The bank has selected 4 activities for a detailed budgeting exercise following activity based costing methods.

The bank wants to know the product wise total cost per unit for the selected activities, so that prices may be fixed accordingly.

The following information is made available to formulate the budget:

	Activity	Present Cost (Rs)	Estimation for the Budget Period
(I)	ATM Service		
	(a) Machine Maintenance	4,00,000	(all fixed, no change)
	(b) Rents	2,00,000	(fully fixed, no change)
	(c) Currency Replenishment Cost	1,00,000	(expected to double during budget period)
		7,00,000	(This activity is driven by



			no. of ATM transaction)
(ii)	Computer Processing	5,00,000	(Half this amount is fixed and no change is expected) (The variable portion is expected to increase to three times the current level) This activity is driven by the Computer transactions
	Issuing Statement	18,00,000	Presently 3 lacs statement are made. In the budget period, 5 lac statements are expected. For every increase of one lac statement, one lacs rupees is the budget increase (this activity is driven by the number of statements)
	Customer Inquiries	2,00,000	Estimated to increase by 80% during the budget period. (This activity is driven by telephone minutes).

The activity drivers and their budgeted quantifies are given below:



	Deposits	Loans	Credit Cards
No. of ATM Transactions	1,50,000	-	50,000
No. of Computer Processing Transactions	15,00,000	2,00,000	3,00,000
No. of Statements to be Issued	3,50,000	50,000	1,00,000
Telephone Minutes	3,60,000	1,80,000	1,80,000

The bank budgets a volume of 58,600 deposit accounts, 13,000 loan accounts.
Required:

- calculate the budgeted rate for each activity
- Prepare the budgeted cost statement activity wise
- Find the budgeted product cost per account for each product using (i) and (ii) above.

Question 18

The Excel Ltd. make and sell two products, V4 and V2. Both products are manufactured through two consecutive process-making and packing raw materials is input at the commencement of the making process. The following estimated information is available for the period ending 31 March

	Making	Packing
Conversion cost	Rs. (000)	Rs. (000)
Variable	350	280
Fixed	210	140



40% of fixed costs are product specific, the remainder are company fixed costs. Fixed Costs will remain unchanged throughout a wide activity range.

Product Information	V4	V2
Production time per unit		
Making (minutes)	5.25	5.25
Packing (minutes)	6	4
Production sales (units)	5,000	3,000
Selling price per unit (Rs.)	150	180
Direct material per unit (Rs.)	30	30

(iii) Conversion costs are absorbed by products using estimated time rates.

Required:

- Using the above information Calculate unit costs for each product analyzed as relevant.
- Comment on a management suggestion that the production and sale of one of the products should not proceed in the period ending 31 March
- Additional information is gathered for the period ending 31 March as follows:
 - The proportion of product specific conversion costs (variable and fixed) are analyzed as follows:
Making Process: moulding (60%); trimming (40%); Packing Process: conversion (70%), Packing material (30%)
 - The making process consists of two consecutive activities, moulding and trimming. The moulding variable and product fixed cost conversion costs are incurred in proportion to the temperature required in the moulds. The trimming conversion variable and product fixed costs are



incurred in proportion to the consistency of the material. The variable and Product fixed packing process conversion cost are incurred in proportion to the time required for each product. Packing materials (which are part of the variable packing cost) requirements depends on the complexity of packing specified for each product.

(iii) An investigation into the effect of the cost drivers on costs has indicated that the proportions in which total product specific conversion costs are related to V4 and V2 are as follows:

Particulars	V4	V2
Temperature (moulding)	2	1
Material consistency (trimming)	2	5
Time (packing)	3	2
Packing (complexity)	1	3

Company fixed costs is apportioned to product at an overall average rate per product unit based on the estimated figures.

Required: Calculate amended unit costs for each product where activity based costing is used and company fixed costs are apportioned as detailed above.



As an organisation grows, its customer-base size and locations, product and service offerings, level of technology, distribution channels, and number of employees change. To cope with such changes, managers must recognize when and how the company's authority structure should be altered to support decision making, communication, and employee motivation.

Global operations demand that managers in all regions effectively use corporate human and physical resources; product customization demands that managers be in close touch with customers; and co-ordination of larger and more diverse workforces demands that managers be more adept at employee training and development.

Decisions often need to be made rapidly at a "grass-roots" level rather than at "the top" of the organizational hierarchy. Thus, one of the most common progressions made by high-growth companies is from highly centralized organizational structures to highly decentralized structures.

When an organization has a centralized structure, top management retains the majority of decision-making authority. When top management delegates decision-making authority to sub-unit managers, decentralization exists. To increase overall efficiency, many companies choose to decentralize. The essence of decentralization



is decision-making freedom. In a decentralized organization, lower-level managers make and implement decisions, whereas in a centralized organization, lower-level managers are responsible only for implementing decisions.

Reasons for decentralization are numerous. Companies decentralize because local managers can make better decisions using local information.

Local managers can also provide a timelier response to changing conditions. Additionally, decentralization for large, diversified companies is necessary because of cognitive limitations—it is impossible for anyone central manager to be fully knowledgeable about all products and markets. Other reasons include training and motivating local managers and freeing top management from day-to-day operating conditions so that they can spend time on more long-range activities, such as strategic planning.

A decentralized company sets up responsibility centers. The four types of responsibility centers are cost centers, revenue centers, profit centers, and investment centers. The actual results for each responsibility center can be compared with expected results.

The degree of centralization can be viewed as a continuum. With centralization, a single individual (usually the company owner or president) makes all major decisions and retains full authority and responsibility for that organization's activities. Alternatively, a purely decentralized organization would have virtually no central authority, and each sub-unit would act as a totally independent entity.



Decentralization is a transfer of authority, responsibility, and decision-making rights from the top to the bottom of the organizational structure.

Decentralization has both advantages and disadvantages.

Either extreme of the centralization-decentralization continuum represents a clearly undesirable arrangement.

In the totally centralized company, a single individual would have neither the expertise nor sufficient and timely information to make effective decisions in all functional areas. In the totally decentralized firm, sub-units could act in ways that are inconsistent with the organization's goals. Organizations tend to structure themselves according to the pure centralization versus pure decentralization factors.

Most businesses are somewhere along the continuum. A company usually determines the appropriate degree of decentralization based on a combination of the:

- ☐ Managers' personal characteristics,
- ☐ Nature of decisions required for organizational growth, and
- ☐ Types of organizational activities in which the company is engaged.

Decentralization does not necessarily mean that a unit manager has the authority to make all decisions concerning that unit. Top management selectively determines the types of authority to delegate to, and withhold from, lower-level managers.

Decentralized companies often have certain organizational functions, such as cash management and purchasing, made at a central location. A survey found that one-



third of financial executives listed centralization of the treasury function as a top priority of their companies because centralization provided:

- ☐ *Better cash control,*
- ☐ *Better control of operational risk,*
- ☐ *A layer of oversight for reviewing information and transactions,*
- ☐ *Lower costs, and*
- ☐ *Reduction of redundant operations*

Even when functions and the decision-making authority for those functions are delegated, top management retains ultimate responsibility for decision outcomes. Thus, a sophisticated accounting and reporting system must be implemented to provide top management information about overall sub-unit accountability as well as the ability to measure it.

Disadvantages of Decentralization

The major disadvantages are as follows:

- *Can result in a lack of goal congruence or sub optimization by sub-unit managers.*
- *Requires more effective communication abilities because decision making is removed from the home office.*
- *Can create personnel difficulties upon introduction, especially if managers are unwilling or unable to delegate effectively.*



- *Can be extremely expensive, including costs of training and of making poor decisions.*

An organization is a group of people with a common purpose. The purpose is defined by the entity for which they work. In smaller businesses, such as partnerships and small companies, it is common for those who work for the organization to have created it, or to have had some part in creating it. By contrast, larger organizations have to employ or involve more people, the majority of which will have little or no connection with the founders or owners.

Every organization exists for the purpose of carrying out certain predetermined objectives and its structure must be necessarily to promote these objectives. Thus an organizational structure is not fixed, it can change as the need requires. It is also important to note that in different organizations one might find different organizational structures whilst one may also find different structures in the same organization.

In any given case the organization structure owes much to the historical background of the firm and to the personalities of those who managed it in its formative years.

Other influences which are equally relevant and possibly more persistent in determining organization structure are the type of markets and customers to which the business sells, the type of product sold and the system of technology in used to produce the product.

In small organizations, decision-making and management of a business are often done by a single individual.



However, in a large organization, especially organizations engaged in manufacturing/undertaking multiple products and activities, successful management of it by the top management becomes more difficult. In order to overcome this difficulty, the large organization may be decentralized or divisionalized.

Many large organizations have divisionalized structures. In these organizations, a vital part of the head office management's role is measuring the performance of the divisions and of divisional managers.

In this context, it is important to recognize the distinction between divisional performance and managerial performance. An important question is the extent to which a manager's performance should only be evaluated in relation to factors they can control, rather than the overall performance of their division.

Decentralization means decisions are made at divisional and departmental levels. In centralization, decisions are handed down from the top echelon of management and subordinates carry them out. The process of delegating decision authority and responsibility in an organization is known as decentralization. In any organization, in fact, some authority can be found delegated to lower level management. In this way almost every organization can be said to be 'decentralized.' However, decentralization or divisionalization is found in case of companies producing multiple products.

Divisions in companies mean different things in different companies. In some companies, divisions are organized on the basis of product lines whereas in some decentralized companies divisions may be created on the basis of geographical areas. Also, the term decentralization or divisionalization refers to those situations where



Individual managers of decentralized sub-units are given responsibility for profit and not just costs or revenues. In decentralized organizations, top management handles broad corporate policies, establishes long range plans, raises capital and conducts other coordinating activities.

Benefits of Decentralization:

- Decentralization helps in the following manner:
- Helps top management recognizes and develop managerial talent.
- Greater awareness of local problems
- Allows managerial performance to be comparatively evaluated.
- Decisions are delegated and resulting less stress for senior management
- Develops skill level of junior managers
- Can often lead to greater job satisfaction and provides job enrichment.
- Makes the accomplishment of organizational goals and objectives easier.
- Reduces decision-making time.
- Allows the use of management by exception.
- Separate responsibilities.



RETURN ON EQUITY (ROE)

The DuPont methodology (also known as the DuPont identification or DuPont model) is a model popularized by the DuPont Corporation for analyzing fundamental results. In 1920, the DuPont Corporation started the DuPont analysis as a means to measure assets at their gross book value rather than at net book value, thereby producing a higher 'Return on equity (ROE)'. DuPont analysis is a useful technique to break down the different return on equity (ROE) generators. The ROE decomposition helps investors to concentrate separately on key indicators of financial success to define strengths and weaknesses. This model analysis is considered useful to avoid misleading conclusions when it comes to corporate profit analysis. DuPont analysis is a multi-step framework of financial equations that provide insight into business's fundamental performance. The single most important ratio over which management has control is the 'Return on equity (ROE)', the other ratios are also important, but mainly because they affect the ROE. The objective is to identify the company's strong area that can be capitalized upon and/or its weak area that must be improved upon.

The DuPont analysis is an extended return on equity model, determined by multiplying the net profit margin with the asset turnover and the equity multiplier. The component parts of a firm's return on equity (ROE) are calculated using a DuPont analysis. This allows an investor to assess, which financial activities

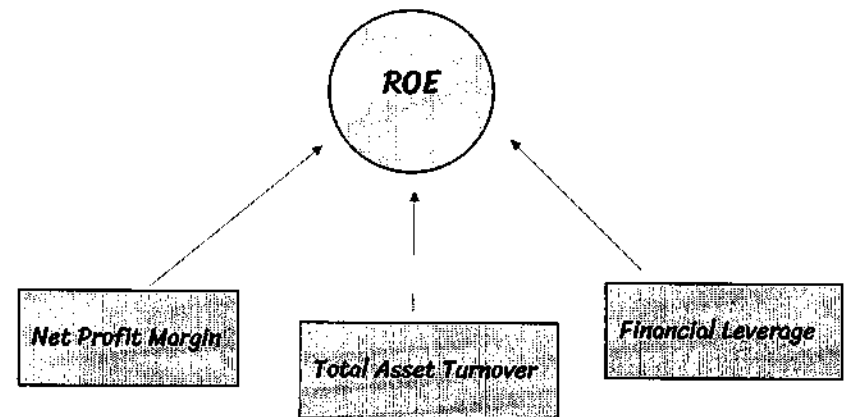


contribute the most to the ROE changes. The model was developed in order to analyze the current ROE and determine which area of the business is struggling. The DuPont Model can be used by management to pinpoint problem areas.

An investor may use these analyses to compare two identical firms' operating performance. The DuPont review may be used by managers to recognize strengths or weaknesses that should be tackled. In simple words, it breaks down the ROE to analyze how corporate can increase the return for their shareholders.

According to this analysis, the formula for calculation of the 'Return on Equity' can be presented as under:

Return on Equity = Net Profit Margin $\times$ Asset Turnover Ratio $\times$ Financial Leverage; or
= (Net Income $\div$ Sales) $\times$ (Sales $\div$ Total Assets) $\times$ (Total Assets $\div$ Total Equity).





According to DuPont methodology, three main financial parameters that drive Return on Equity (ROE) are:

- (1) Operating performance,
- (2) Asset usage performance, and
- (3) Financial leverage.

(1) Operating performance:

This is a very basic profitability ratio. This is calculated by dividing the net profit by total revenues. This resembles the profit generated after deducting all the expenses. The primary factor remains to maintain healthy profit margins and derive ways to keep growing it by reducing expenses, increasing prices, etc., which impacts 'Return on Equity (ROE)'. Net profit margin (operating performance), which measures operating efficiency.

(2) Asset usage performance:

This means, Total Asset Turnover ($\text{Turnover} \div \text{Total Assets}$). This ratio depicts the efficiency of the company in using its assets. This ratio differs across industries but is useful in comparing firms in the same industry. If the company's asset turnover increases, this positively impacts the ROE of the company.



(3) Financial leverage:

Financial leverage is the use of debt to acquire additional assets or fund projects. To create debt, individuals or businesses borrow money. In return, borrowers promise lenders to pay back the principal amount and interest on their loans. Financial leverage is also called leverage or trading on equity.

To determine the financial health and strength of a company, there are a variety of leverage ratios analysts and lending institutions can use. A leverage ratio is a financial measurement that examines how much capital a company has in the form of debt, or determines if a company can pay off its debts. Each ratio focuses on one or more of the following factors: debt, equity, assets and interest expenses.

Again, Financial Leverage refers to the debt used to finance the assets. The companies should strike a balance in the usage of debt. The debt should be used to finance the operations and growth of the company. However, usage of excess leverage to push up the ROE can turn out to be detrimental to the health of the company.



Significance of Du Pont Analyses

The company can increase its Return on Equity if it

1. Generates a high Net Profit Margin.
2. Effectively uses its assets so as to generate more sales
3. Has a high Financial Leverage

It is useful for company business heads to understand how their segment is contributing to the overall ROE of the company. In fact, this can be used as a reliable indicator of performance measurement of divisional managers.

For the top management this is useful in capital allocation decisions. After all, the capital has to be allocated to that business which contributes most to the ROE of the company with minimal risk. Increasing ROE by increasing leverage is not a good idea.

DuPont analysis helps the analyst tracking the stock to pin point the actual triggers that are driving the performance of the company and whether these factors are sustainable or not. That is what ultimately matters when it comes to valuation of the company.

Lastly, the fund manager will take a decision on comparative investments based on the ROE analysis. Over a longer period of time it is ROE that drives valuations and also the P/E ratio re-rating. That only happens when the ROE boost is sustainable. That is exactly what DuPont analysis captures



Disadvantage of DuPont Analysis

The main disadvantage of the DuPont analysis is that it still relies on accounting equations and data that can be manipulated despite being comprehensive.

However, the DuPont study, even with its comprehensiveness, lacks meaning as to why the individual ratios are high or low, or whether they should be considered high or low at all.

Illustration 1

An investor is interested to invest in any one of the two similar companies within the same industry. The investor wants to use the DuPont analysis method to compare each company's strengths and areas of opportunity and help him decide which company is the better investment option.

The following financial information about each company:

Company	A	B
Net income	₹2,000	₹2,500
Revenue	₹8,000	₹20,000
Average assets	₹5,000	₹8,000
Average equity	₹2000	₹1000

The investor uses each company's net income and revenue to calculate their net profit margins:

Company A's net profit margin = $(₹2,000 / ₹8,000) \times 100 = 0.25$

Company B's net profit margin = $(₹2,500 / ₹20,000) \times 100 = 0.125$

The investor uses each company's revenue and average assets to calculate their total asset turnover:



Company A's total asset turnover = ₹ 8,000 / ₹ 5,000 = 1.6 times

Company B's total asset turnover = ₹ 20,000 / ₹ 8,000 = 2.5 times

The investor uses each company's average assets and average equity to calculate their equity multiplier:

Company A's equity multiplier = ₹ 5,000 / ₹ 2,000 = 2.5

Company B's equity multiplier = ₹ 8,000 / ₹ 1,000 = 8

According to DuPont analysis:

Company A: ROE = 0.25 × 1.6 × 2.5 = 1

Company B: ROE = 0.125 × 2.5 × 8 = 2.5

Remarks:

DuPont analysis model allows the investor to see that although company B has a higher return on equity ratio than company A, a large portion of company B's ROE results from its equity multiplier. The investor can also see that a large portion of company A's ROE ratio results from its 25% net profit margin, because of this information, the investor invests with company A.



Illustration 2

An investor has been watching two similar companies, Lotus Inc., and ASA Inc. that have recently been improving their return on equity compared to the rest of companies in the industry. This could be a good thing if the two companies are making better use of assets or improving profit margins. But if the companies have increased the debt proportion in the capital structure, this would also be reflected in the ROE but would actually mean an increase in the financial risk perception of the companies.

In order to decide which company is a better opportunity, the investor decides to use DuPont analysis to determine the efforts of each company in improving its ROE and whether that improvement is sustainable.

The relevant calculation for DuPont analysis of Lotus Inc. and ASA Inc., over two-year period is presented which is based on the excerpts of financial data of the two companies.

		Lotus Inc.		ASA Inc.	
Sr.no.	Particulars	Year 1	Year 2	Year 1	Year 2
A	Net Income	1000	1200	2100	2100
B	Revenue from operation	10000	10000	17500	17500
C	Profit Margin (a ÷ b)	0.10	0.12	0.12	0.12
D	Revenue from operation	10000	10000	17500	17500
E	Average Assets	5000	4800	8750	8750



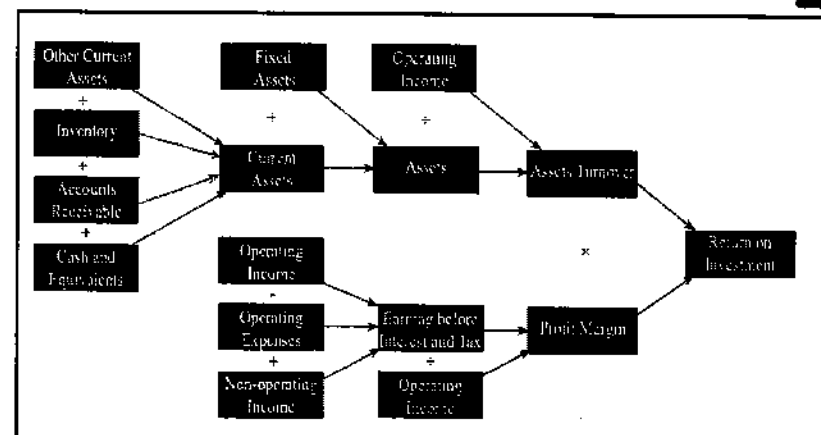
H	Average Equity	2000	2000	5000	3500
I	Equity Multiplier (g ÷ h)	2.5	2.4	1.75	2.5
J	ROE (c × f × i)	50%	60%	42%	60%

It is obvious from the above table that, Lotus Inc. improved its profit margins by increasing net income and reducing its total assets. Shareholders' equity has remained stable at ₹2000. The equity multiplier has marginally fallen as the average assets is reduced. Simply, Lotus Inc. improved its profit margin and asset turnover while equity remained constant. It can be also inferred that there is partial reduction of debt since average total asset has declined while equity has remained constant.

While the situation at ASA Inc. is very dissimilar. It may be observed that the profit margin and the asset turnover both has remained the same over the years.

ROE has significantly risen from 42% to 69% over the two-year period.

The entire change in ROE is due to an increase in equity multiplier which increased from 1.75 to 2.5. This is also projected in the fact that though the average asset remained same at ₹8750, equity decreased from ₹5000 to ₹3500 implying that there is debt instrument in the capital structure.



The DuPont equation can be further decomposed to have an even deeper insight where the net profit margin is broken down into EBIT Margin, Tax Burden, and Interest Burden.

It gives a broader view of the Return on Equity of the company. It highlights the company's strengths and pinpoints the area where there is a scope for improvement. Say if the shareholders are dissatisfied with the lower ROE, the company with the help of the DuPont Analysis formula can assess whether the lower ROE is due to low-profit margin, low asset turnover, or poor leverage.

Once the management of the company has found the weak area, it may take steps to correct it. The lower ROE may not always be a concern for the company as it may also happen due to normal business operations. For

instance, the ROE may come down due to accelerated depreciation in the initial years.



Five Step DuPont Model Analysis to Test Impact and Efficacy of Strategic Cost and Financial Management Initiatives.

ROE = $\frac{\text{Net income}}{\text{Shareholder Equity}}$

$$= \frac{\text{Net income}}{\text{Pre-tax Income}} \times \frac{\text{Pre-tax Income}}{\text{Operating Income}} \times \frac{\text{Operating Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets}} \times \frac{\text{Assets}}{\text{Shareholder Equity}}$$

= Tax burden $\times$ Interest burden $\times$ Operating margin $\times$ Asset Turnover $\times$ Financial Leverage.

Question 1

Sulekha Ltd is planning to take over the business of Krishna LLP. For the purpose they appoint Mr Dune, a professional accountant to analyse the profitability of Krishna LLP for the period ended 31st March 2021. The following balances are extracted from statement of Profit and Loss and Balance Sheet of Krishna LLP for the year ended 31st March 2021 and presented to Mr Dune for analysis.

Particulars	Amount (₹)
Sales	7100
Depreciation	200
Interest Expenses	20



Tax Expenses	900
Net Income	1650
Current Assets	4600
Fixed Assets, net	2650
Total Assets	7250
Current Liabilities	3000
Long term debt	150
Shareholders' Equity	4100
Total Liabilities and Shareholder's equity	7250
(current liabilities + long term debt + shareholders' equity)	

Mr Dune begins the profitability analysis with the calculation of the traditional financial ratio of return on equity (ROE). For the purpose he assumes that there is no preference dividend as no such data is presented to him.

$$\text{ROE} = \frac{\text{net return}}{\text{Equity}} \times 100 = \frac{1650}{4100} = 40.24\%$$

Conceptually, Net return = EBIT - (Interest + Taxes) = EAT

In order to get an in depth analysis of the ROE, Mr Dune proceeded with the 5 - component DuPont analysis which segregates the ROE into its five component. For the purpose, he proceeds as follows;

$$\text{DuPont ROE} = \frac{\text{EBIT}}{\text{Equity}}$$



A successful performance measure evaluates how well an organization performs in relation to its objectives. Since the primary objective of commercial organizations is normally assumed to be the maximization of the wealth of its shareholders, it follows that performance measures should evaluate this. In practice, many organizations use profit-based measures as the primary measure of their financial performance. Two problems relating to profit in this area are:

Profit ignores the cost of equity capital. Companies only generate wealth when they generate a return in excess of the return required by providers of capital – both equity and debt. In financial statements, the calculation of profit does take into account the cost of debt finance, but ignores the cost of equity finance. Profits calculated in accordance with accounting standards do not truly reflect the wealth that has been created, and are subject to manipulation by accountants.

In a divisional structure each division is self-contained and based on geography or product/service area. There is good communication between functions within the division but, crucially, divisional managers have more authority to act autonomously than in a functional structure where planning and control are exercised centrally.

Divisional organizations tend to be more decentralized than functional ones. In this respect, it is important that divisional managers are clear about an organization's strategy and objectives, so that they can ensure that their divisions perform



according to that strategy. Once again, the idea of goal congruence is very important here.

Equally, because managers throughout the organization have a key role in budgeting and monitoring performance, performance information needs to be available to all these managers (for example, so that they can monitor costs and revenues for their division).

Conversely, because divisional managers have a relatively high degree of autonomy, the corporate centre (head office) needs to have information about divisional performance, to assess whether the divisions are performing in line with head office's objectives. In this respect, performance will be measured on the basis of divisions or strategic business units, rather than according to business processes.

Managers will be accountable for, and rewarded on the basis of, divisional performance. Accordingly, divisional performance measures, such as return on investment (ROI) or residual income (RI) can be appropriate here.

Whereas in a functional structure performance information tends to be aggregated for the corporate centre to review and then give feedback to functions, in a divisional structure it is important that performance information is available at a lower level so that the divisions can provide feedback on performance upwards to senior management.



The relationship between short-term and longer-term objectives also has significant implications for the way organizations measure performance and the performance measures they use to do so. The phrase 'What gets measured, gets done' is an important one in relation to performance measurement, and its implications are important here as well. For example, if return on investment (ROI) is one of a company's key financial performance measures, then its managers will have a keen interest in maximizing the company's ROI.

As a result, however, this choice of performance measure may also encourage the managers to focus on short-term performance rather than longer-term performance. For example, they may decide to dispose of some machinery which is not currently in use, thereby reducing depreciation charges and asset values, and in doing so immediately increasing ROI. However, the potential flaw in such a short-term plan could be exposed if the managers later realize they need to use the machinery again and so have to buy some new equipment (at a higher cost than the equipment they had previously disposed of).

ROI:

Instead of focusing purely on the absolute size of a division's profits, most organizations focus on the return on investment (ROI) of a division. ROI expresses divisional profit as a percentage of the assets employed in the division. Assets employed can be defined as total divisional assets, assets controllable by the divisional manager or net assets.



This measure expresses divisional profit as a percentage of the firm's investment in the division and is similar to the widely accepted 'return on capital employed' measure used in the external analysis and interpretation of accounts. Measures relating to profit include sales margin, EBITDA and EPS. More sophisticated measures (ROCE, ROI) take the size of investment into account. A major attraction of ROI is that it can be used as a common denominator for comparing the returns of dissimilar businesses, such as other divisions within the group or outside competitors. ROI has been widely used for many years in all types of organization so that most managers understand what the measure reflects and consider it to be of considerable importance.

Return on Investment (ROI) is a form of ROCE and is calculated as:

(Profit before interest and tax ÷ Operations management capital employed) × 100

The ROI compares income with the operational assets used to generate that income. Profit is taken before tax and interest because tax is an appropriation of profit made from the use of the investment, and the introduction of interest charges introduces the effect of financing decisions into an appraisal of operating performance.

ROI is normally used to apply to investment centres or profit centres. These normally reflect the existing organization structure of the business.

The breakdown of ROI into turnover and margin gives management insight into planning for profit improvement.



Generally speaking, management can:

1. Improve margin
2. Improve turnover
3. Improve both

Use of ROI:

(a) Financial reporting:

It ties in directly with the accounting process, and is identifiable from the income statement and statement of financial position (balance sheet), the firm's most important communications media with investors.

(b) Aggregation:

ROI is a very convenient method of measuring the performance for a division or company as an entire unit.

Other advantages include its ability to permit comparisons to be drawn between investment centres that differ in their absolute size.

Measurement problems: non-current assets

(a) It is probably most common to use return on net assets.

(i) If an investment centre maintains the same annual profit, and keeps the same assets without a policy of regular non-current asset replacement, its ROI will increase year by year as the assets get older. This can give a false impression of improving 'real' performance over time.



Using ROI as a performance measure may also encourage short-termism, because managers may choose not to replace assets. ROI increases as the assets get older, because depreciation reduces the net book value of the assets.

(ii) It is not easy to compare fairly the performance of one investment centre with another. Non-current assets may be of different ages or may be depreciated in different ways.

(iii) Inflation and technological change alter the cost of non-current assets

(iv) Measuring ROI as return on gross assets ignores the age factor. Older non-current assets usually cost more to repair and maintain. An investment centre with old assets may therefore have its profitability reduced by repair costs.

If a group of companies sets a target return for the group as a whole, or if a company sets a target return for each strategic business unit, it might be company policy that no investment project should go ahead in any subsidiary or investment centre unless the project promises to earn at least the target return. Here is an example.

(a) There should be no new investment by any subsidiary in the group unless it is expected to earn at least a 15% return.

(b) Similarly, no non-current asset should be disposed of if the asset is currently earning a return in excess of 15% of its disposal value.



(c) Investments which promise a return of 15% or more ought to be undertaken.

Problems with such a policy include:

(a) Investments are appraised by discounted cash flow (DCF) whereas actual performance will probably be measured on the basis of ROI.

(b) The target return makes no allowance for the different risk of each investment centre.

(c) In a conglomerate, an identical target return may be unsuitable to many businesses in a group.

Since managers will be judged on the basis of the ROI that their centre earns each year, they are likely to be motivated into taking those decisions which increase their center's short-term ROI.

Summary:

(a) An investment might be desirable from the group's point of view, but would not be in the individual investment center's 'best interest' to undertake. Thus there is a lack of goal congruence.

(b) In the short term, a desire to increase ROI might lead to projects being taken on without due regard to their risk.

(c) Any decisions which benefit the company in the long term but which reduce the ROI in the immediate short term would reflect badly on the manager's reported performance.



Residual Income (RI)

To overcome some of the dysfunctional consequences of ROI, the residual income approach can be used. For the purpose of evaluating the performance of divisional managers, residual income is defined as controllable profit less a cost of capital charge on the investment controllable by the divisional manager. If residual income is used to measure the managerial performance of investment centres, there is a greater probability that managers will be encouraged, when acting in their own best interests, also to act in the best interests of the company.

Residual income also can be defined as the net income of a division, less the 'imputed' capital charge on the assets used by division. The capital charge is the minimum acceptable rate of return and is calculated by applying this required (or target) rate of return to the division's investment base. Theoretically, rate of return should be the division's cost of capital; in most cases, however it is a cut-off rate based on the firm's objectives and strategies and will be somewhat higher than the divisional cost of capital.

Residual Income (RI) attempts to overcome the weakness in ROI by measuring the rupees amount of return that is provided to the company by a department or division. RI for a division is calculated as the amount of return (operating income before taxes) that is in excess of a targeted amount of return on the investments employed by that division. Residual income is the operating income earned after the division has covered the required charge for the funds that have been invested by the company in its operations.



The following two items those are important in regard to the calculation of RI:

- (1) The targeted amount of return is usually some percentage of, or rate of return on, the total employed assets of the division, or the invested capital in the division, and*
- (2) The percentage used in the calculation is the required rate of return that management has set.*

Note:

If the required rate of return is not available in the question, use the company's weighted average cost of capital (which will be given in the question).

Any project that has a positive RI will be accepted, even if it will reduce the overall company or division ROI.

RI is calculated as under:

$RI = \text{Divisional profit} - (\text{Percent capital charge} \times \text{Divisional investment})$

Further reason cited in favour of residual income over the ROI measure is that residual income is more flexible, because different cost of capital percentage rates can be applied to investments that have different levels of risk.

Not only will the cost of capital of divisions that have different levels of risk differ - so may the risk and cost of capital of assets within the same division. The residual income measure enables different risk-adjusted capital costs to be incorporated in the calculation, whereas the ROI cannot incorporate these differences.



Advantages of RI:

The main advantages of RI are as:

- (1) It avoids suboptimal decisions as investments are not rejected merely because they lower the divisional manager's ROI.*
- (2) It maximizes growth of the company and increases shareholders' wealth by accepting opportunities which earn a rate of return in excess of the cost of capital.*
- (3) The cost of capital charge on divisional investments ensures that divisional managers are aware of the opportunity cost of funds.*
- (4) Charging each division with the company's cost of capital ensures that decisions taken by different divisions are compatible with the interests of the organization as a whole.*

The decision whether to use ROI or RI as a measure of divisional performance affects managers' investment decisions. Under the ROI method, division managers tend to accept only the investments whose returns exceed the division's ROI; otherwise, the division's overall ROI would decrease. Under the RI method, on the other hand, division managers would accept an investment as long as it earns a rate in excess of the minimum required rate of return. The addition of such an investment will increase the division's overall RI.

**Disadvantage of RI:**

Residual income suffers from the disadvantages of being an absolute measure, which means that it is difficult to compare the performance of a division with that of other divisions or companies of a different size. For example, a large division is more likely to earn a larger residual income than a small division. To overcome this deficiency, targeted or budgeted levels of residual income should be set for each division that are consistent with asset size and the market conditions of the divisions. Residual income, like ROI, can encourage a short-run orientation.

Illustration 1

Sales	₹4,80,000
Cost of goods sold	₹2,22,000
Gross margin	₹2,58,000
Selling and administrative expense	₹2,10,000
Operating income	₹48,000
January 1 net book value of operating assets	₹2,77,000
December 31 net book value of operating assets	₹3,23,000
Minimum rate of return 12%	

Residual Income = Operating income - (Minimum rate of return × Average operating assets)

$$= ₹48,000 - (0.12 \times ₹3,00,000)$$

$$= ₹48,000 - ₹36,000$$

$$= ₹12,000$$

**Question 2**

Acme, a division of Ace Manufacturing, has assets of ₹2,25,000 and an operating income of ₹55,000.

(I) What is the division's ROI?

(II) If the minimum rate of return is 12 percent, what is the division's residual income?

Solution 2

$$(I) ROI = (\text{₹} 55,000 \div \text{₹} 2,25,000) \times 100 = 24.44\%$$

$$(II) RI = \text{Operating Income } ₹55,000 - \text{Minimum required rate } (12\% \times ₹2,25,000) \\ ₹27,000 = ₹28,000$$

Question 3

Consider the following:

	Division A	Division B
Operating assets	₹50,00,000	₹1,25,00,000
Operating income	₹10,00,000	₹22,50,000
ROI	20%	18%

(I) Which is the more successful division in terms of ROI?

(II) Using 16 percent as the minimum required rate of return compute the residual income for each division. Which division is more successful under this rate?

**Solution**

(i) Division A is more successful as since it returns ₹0.20 for each rupee invested (as compare to ₹ 0.18 for Division B).

(ii) The residual income at 16 percent for each division is computed as follows:

	Division A	Division B
Operating income	₹10,00,000	₹ 22,50,000
Minimum required income	₹ 8,00,000	₹20,00,000
	(16% × 50,00,000)	(16% × ₹1,25,00,000)
RI	₹ 2,00,000	₹2,50,000

Division B is more successful.

Question 4

The following data are given for the Delhi division for 2022:

Return on Investment (ROI) 25%

Sales ₹ 12,00,000

Margin 10%

Minimum required rate of return 18%

(i) Compute the division's operating assets.

(ii) Compute the division's residual income (RI).

**Solution**

(i) By definition, $ROI = \text{Margin} \times \text{Turnover}$

$$25\% = 10\% \times \text{Turnover}$$

Therefore, the turnover must be 2.5 times.

Since, the turnover is sales/operating assets,

$$2.5 \text{ times} = ₹ 12,00,000 \div \text{Operating assets}$$

Therefore, Operating assets = ₹ 4,80,000

(ii) $RI = \text{Operating Income} - \text{Minimum required operating income}$

$$\text{Margin} = 10\% = \text{Operating income} \div \text{Sales} = \text{Operating income} \div ₹ 12,00,000$$

Therefore, the operating income must be ₹1,20,000.

$$RI = ₹1,20,000 - (18\% \times ₹4,80,000) = ₹1,20,000 - ₹86,400 = ₹33,600$$

Question 5

XYZ Corporation has three divisions whose income statements and balance sheets are summarized below:

	Division X	Division Y	Division Z
Sales	₹500000	(d)	(g)
Operating income	₹25000	₹30000	(h)
Operating assets	₹1,00,000	(e)	₹2,50,000
Asset Turnover	(a)	(f)	0.4
Margin	(b)	0.4%	5%
Return on investment (ROI)	(c)	2%	(i)

(i) Supply the missing data in the table above and summarize the results.

(ii) Comment on the relative performance of each division. What questions can be



raised as a result of their performance?

Solution 5

(i) Return on Investment (ROI) = Operating Income ÷ Operating assets
= (Operating Income ÷ Sales) × (Sales ÷ Operating assets) = Margin × Asset Turnover

(a) Asset Turnover = ₹5,00,000 ÷ ₹1,00,000 = 5 times

(b) Margin = (₹25,000 ÷ ₹5,00,000) × 100 = 5%

(c) ROI = Asset Turnover × Margin = 5 times × 5% = 25%

(d) Margin = 0.4% = 0.004 = Operating Income ÷ Sales (d); d = ₹30,000 ÷ 0.004 = ₹75,00,000

(e) ROI = 2% = Operating Income ÷ Operating assets (e) = 30,000 ÷ Operating assets (e) or, e = ₹30,000 ÷ 0.02 = ₹15,00,000

(f) Asset Turnover = d ÷ e = ₹75,00,000 ÷ ₹15,00,000 = 5 times

(g) Asset Turnover = 0.4 = Sales (g) ÷ ₹2,50,000 or, g = 0.4 × ₹2,50,000 = ₹1,00,000

(h) Margin = 5% = Operating Income (h) ÷ Sales (g) = (h) ÷ ₹1,00,000, h = ₹1,00,000 × 5% = ₹5,000

(i) ROI = 0.4 times × 5% = 2% or = 5,000 ÷ ₹2,50,000 = 2%

(ii) Division X performed best. It appears that Divisions Y and 2 are in trouble. Division Y turns over its assets as often as Division X, but Y's margin on sales is much lower. Thus, Division Y must work on improving its margin. The following questions are raised about Division Y Is the low margin due to inefficiency? Is it



due to excessive material, labour, and/or overhead costs? Division 2, on the other hand, does just as well as Division X in terms of profit margin- both divisions earn 5 percent on sales.

But Division 2 has a much lower turnover of capital than Division X. Therefore, Division 2 should take a close look at its investment. Is too much tied up in inventories and receivables? Are there unused fixed assets? Is there idle cash sitting around?

Question 6

An investment centre has reported a profit of ₹28,000. It has the following assets and liabilities:

		₹
Non-current assets (at NBV)		1,00,000
Inventory	20,000	
Trade receivables	30,000	
	50,000	
Less: Trade payables	8,000	42000
		142000

Required:

Calculate the ROI for the division. State any additional information that would be useful when calculating the ROI.

**Solution 6**

ROI might be measured as: $\text{₹} 28,000 \div \text{₹} 1,42,000 = 19.7\%$.

However, suppose that the centre manager has no responsibility for debt collection. In this situation, it could be argued that the centre manager is not responsible for trade receivables, and the centre's CE should be ₹1,12,000.

If this assumption is used, ROI would be $\text{₹} 28,000 \div \text{₹} 1,12,000 = 25.0\%$.

Question 7

Nielsen Ltd has two divisions with the following information:

	Division A	Division B
Profit (₹)	90,000	10,000
Capital employed (₹)	3,00,000	1,00,000
ROI	30%	10%

Division A has been offered a project costing ₹1,00,000 and giving annual returns of ₹20,000. Division B has been offered a project costing ₹1,00,000 and giving annual returns of ₹12,000. The company's cost of capital is 15%. Divisional performance is judged on ROI and the ROI related bonus is sufficiently high to influence the managers' behaviour.

Required:

- What decisions will be made by management if they act in the best interests of their division (and in the best interests of their bonus)?
- What should the managers do if they act in the best interests of the company as a whole?

**Solution**

	Division A	Division B
	₹000	₹000
Old ROI	90/300	10/100
	=30%	=10%
New ROI	(90 + 20)/ (300 + 100)	(10 + 12)/ (100 + 100)
	= 27.5%	=11%
Will manager want to accept project?	NO	YES

The manager of Division A will not want to accept the project as it lowers her ROI from 30% to 27.5%. The manager of Division B will like the new project as it will increase their ROI from 10% to 11%.

Although the 11% is bad, it is better than before.

(b) Looking at the whole situation from the group point of view, we are in the ridiculous position that the group has been offered two projects, both costing ₹1,00,000. One project gives a profit of ₹20,000 and the other ₹12,000. Left to their own devices then the managers would end up accepting the project giving only ₹12,000.

This is because ROI is a defective decision-making method and does not guarantee will be made.

**Question 8**

An investment centre has net assets of ₹8,00,000, and made profits before interest and tax of ₹1,60,000. The notional cost of capital is 12%.

Required:

Calculate and comment on the RI (Residual Income) for the period

SOLUTION

If performance is measured by RI, the RI for the period is:	₹
Profit before interest and tax	1,60,000
Less: Notional interest (12% × ₹8,00,000)	96000
RI	64000

(Note: Capital employed is not available in this question and therefore net assets should be used as a substitute value).

Investment centre managers who make investment decisions on the basis of short-term performance will want to undertake any investments that add to RI, i.e. if the RI is positive.

**Question 9**

An investment centre has net assets of ₹8,00,000, and made profits before interest of ₹1,60,000. The notional cost of capital is 12%. This is the company's target return.

An opportunity has arisen to invest in a new project costing ₹1,00,000.

The project would have a four-year life, and would make profits of ₹15,000 each year.

Required:

(a) What would be the ROI with and without the investment? (Base your calculations on opening book values). Would the investment centre manager wish to undertake the investment if performance is judged on ROI?

(b) What would be the average annual RI with and without the investment? (Base your calculations on opening book values). Would the investment centre manager wish to undertake the investment if performance is judged on RI?

SOLUTION

	Without the investment	With the investment
Profit	₹160000	₹175000
Capital employed	₹800000	₹900000
ROI (profit/ capital employed)	20.0%	19.40%

ROI would be lower; therefore the centre manager will not want to make the investment. Since his performance will be judged as having deteriorated. However, this result in dysfunctional behaviour since the company's target is only 12%.



	Without the investment	With the investment
Profit	₹160000	₹175000
Less: Notional Interest	96000	108000
RI (₹8,00,000 × 12%)	64000	67000 (₹9,00,000 × 12%)

The investment centre manager will want to undertake the investment because it will increase RI. This is the correct decision for the company since RI increases by ₹3,000 as a result of the investment.

Question 10

A Company had the best year ever, with sales of ₹45,00,000 and operating profit of ₹9,50,000. The balance sheet at the beginning of the year showed assets used in production with a cost of ₹2,00,00,000 and accumulated depreciation of ₹50,00,000. The company didn't buy any assets during the year but did have depreciation expense of ₹10,00,000. Calculate the ROI for the year.

Calculate ROI by dividing operating profit by the average book value of assets.

Average assets are the sum of the book values divided by 2. The book value is cost less accumulated depreciation.



SOLUTION

Beginning of the year book value:

$$2,00,00,000 - 50,00,000 = ₹1,50,00,000$$

End of year book value:

$$2,00,00,000 - (50,00,000 + 10,00,000) = ₹1,40,00,000$$

So, the average book value of assets is = $1,50,00,000 + 1,40,00,000 / 2 =$

$$₹1,45,00,000$$

$$ROI = \text{Operating Profit} \div \text{Average Book Value of Assets} = 9,50,000 \div 1,45,00,000$$

$$= 0.0655 \text{ or, ROI of } 6.55\%$$



A Company as an organization has the objectives to achieve some goals planned with the staff. They can determine whether the Company has achieved its objectives or not by understanding the performance. A firm's management creates value when it makes decisions that provide benefits exceeding costs. These benefits may be received in the near or distant future, and the costs include the direct cost of the investment and a less obvious cost, the cost of capital.

In a market-driven economy many Companies will create wealth. Other firms however will undoubtedly destroy it. Discovering those economic factors that lead to wealth creation and destruction among Companies is important to many constituencies, not the least of which is corporate officials and investment managers. For corporate managers, wealth creation is fundamental to the economic survival of the firm.

Managers who fail (or refuse) to see the importance of this imperative in an open economy do so at the peril of the organization and their own careers of finding the "best" Companies and industries in the marketplace is of primary importance to investment managers.

With the proper financial tools, portfolio managers may be able to enhance their active performance over-and-above the returns available on similar risk indexed passive strategies. A new analytical tool called EVA is now assisting this wealth-



discovery and Company-selection process. The innovative changes that this financial metric have spawned in the twin areas of corporate finance and investment management is the driving force behind what can be formerly called the EVA revolution.

EVA is a value based financial performance measure, an investment decision tool and it is also a performance measure reflecting the absolute amount of shareholder value created. It is computed as the product of the "excess return" made on an investment or investments and the capital invested in that investment or investments.

A refinement of the residual income measure that incorporates adjustments to the divisional financial performance measure. EVA was developed by the US consulting firm Stern Stewart & Co, and it has gained widespread use among many well-known companies such as Siemens, Coca Cola and Herman Miller.

EVA measures the firm's ability to earn more than the true cost of capital. EVA is a measure of economic profit that exceeds investor expectations, and as such is a performance measure that, by removing accounting anomalies, enables a direct comparison of companies of similar risk profiles. As examples of anomalies, through the EVA calculation expenses such as research and development and training are expensed: according to the theory these are investments and should be treated as such.



Economic value (or 'shareholder value') is defined as 'the present value of the future cash flows of a company, of a particular project or decision'. That means the calculation of economic value may be applied to something much smaller than an entire business's valuation, such as a specific commercial decision. Such a decision could be whether to invest in a brand, whether to make some organizational change or simply whether to hire in some special skills. It is often referred to as EVA or 'economic value added'.

Central to the ability to compare performance accurately is the focus on the cost of capital. According to the EVA approach, organizations only make a profit when they take the cost of capital into the calculation of their financial performance. Capital is not free. There is an opportunity cost of capital, in that investors can put their money in many places (for instance into government bonds, the bank or equity markets). It is important to deduct the cost of capital in order to see the actual profitability of the enterprise, so a charge for the cost of capital is made. Capital accounts for both debt and equity. Capital is a measure of all the cash that has been deposited in a company over its lifetime, irrespective of its financing source.

Positive EVA indicates that a company surpassed the expectations of its shareholders. On the other hand, if the EVA is zero, this should be treated as sufficient achievement because the shareholders have earned a return that compensates the risk. The concept of EVA is based on common accounting items like interest-bearing debt, equity capital and net operating profit. It differs from traditional measures mainly in that it takes into account the cost of equity.



EVA overcomes some of the limitations associated with ROI and other measures of performance. It considers incremental wealth that a particular investment division creates or destroys. EVA provides more useful information to the managers for making correct decisions. Investment centre managers are encouraged to use EVA as a tool of performance measurement to take decisions and formulate strategies that enhances EVA.

EVA is also used extensively as a measure by which to set and assess incentive compensation payments to managers. Particularly interesting in this post-credit crunch world is that the bonus structure encourages the careful balancing of the delivering of short-term financial results and longer-term performance (thus safeguarding the interests of shareholders that have made long-term investments in the enterprise)

$$EVA = NOPAT - (C \times K)$$

Where:

NOPAT is net operating profit after tax 'C' is the weighted average cost of capital (WACC), which represents the rate that a company is expected to pay on average to all its security holders to finance its assets 'K' is the economic capital employed.

Normally, the equity cost of capital for an organization is measured through the Capital Asset Pricing Model (CAPM). A firm's nominal equity cost of capital is calculated as a base risk-free rate plus 'beta' - the latter being a general equity risk premium adjusted for a firm-specific risk measure. In short, therefore, the equity rate is



the return investors are seeking to achieve when buying a company's common shares. This is expressed as: the firm's equity investors' expected return (future) = risk-free return (future) + the firm's beta (a relative measure of volatility) × general equity risk premium (history).

The equity risk premium represents the excess return above the risk-free rate that investors demand for holding risky securities. So, with a risk-free rate of 7%, a beta of 1.1 and an assumed equity risk premium of 4%, a company would have the following cost of equity: $\text{Cost of equity} = 7\% + (1.1 \times 4\%) = 11.4\%$.

The cost of debt is the rate of return that debt-holders require in order to hold debt. To determine this rate, the yield has to be calculated. This is typically worked out using discounted cash flow analysis, i.e. the internal rate of return.

The cost of tax should be calculated after tax as follows:

$\text{Cost of debt after tax} = \text{Cost of tax before tax} \times (100 - \text{marginal tax rate})$.

Question 1

A person made a Capital Investment of ₹2,00,000 in a company. Operating profit, after taxes, is ₹28,000. The opportunity cost of that investment is 10%. Calculate EVA.



Solution

$\text{EVA} = \text{Net Operating Profit after taxes} - \text{Cost of Capital}$

i.e. $₹28,000 - 10\% \text{ of } ₹2,00,000 = ₹8,000$.

The goal of EVA is to take into account the cost of capital invested in the company.

Enhancing EVA:

1. Increasing operating profits without adding further capital in the business.
2. Ensuring that ROI on additional funds invested is more than weighted average cost of capital.
3. Liquidating non-productive capital by releasing capital from those activities that do not cover even the cost of capital.

EVA Centre

This comprises of the following:

- (1) Divisionalization of an organization allows performance measurement through responsibility accounting.
- (2) Responsibility accounting segregates costs and revenues into areas of responsibility, and a specific manager is made responsible for each area.
- (3) This assigning of different aspects of the budget to different managers is known as responsibility accounting, and the area of operations assigned to a manager is known as a responsibility centre.



Types of responsibility centres:

- **Cost centre:** a responsibility centre where only costs are aggregated. The manager of the cost centre will be responsible for the costs under his charge.
- **Profit centre:** a responsibility centre where not only costs but also revenues are accumulated and accounted for. Thus, the manager of this centre will be responsible for the profits of his area.
- **Investment centre:** a responsibility centre where the manager will be accountable for costs, revenues and the investment decisions made. The manager is held responsible for both profits and return on investment.
- **Note:** There can be several cost centres within a profit centre and several profit centres within each investment centre, each centre having its own budget and performance targets.

EVA Drivers

These are as under:

1. Decisions with impact on EVA
2. Overview
3. Operative decisions
4. Investment decisions
5. Financing decisions



Behavioral Aspects of EVA

EVA helps to encourage the right kind of behavior from their divisions in a way that emphasis on operating income alone cannot. The underlying reason is EVA's reliance on the true cost of capital. In many companies the responsibility for investment decisions rests with corporate management. As a result, the cost of capital is considered a corporate expense. If a division builds inventories and investment, the cost of financing that investment is passed along to the overall income statement and does not show up as a reduction from the division's operating income. The result is to make investment seem free to the divisions, and of course, they want more.

Question 2

The following information is available of a concern. Calculate Economic Value Added (EVA).

12% Debt ₹ 2,000 crores

Equity capital ₹500 crores

Reserves and Surplus ₹7,500 crores

Risk-free rate 9%

Beta factor 1.05

Market rate of return 19%

Equity (market) risk premium 10%

Operating profit after tax ₹ 2,100 crores

Tax rate = 30%

**Solution**

Capital Employed = 2000 + 500 + 7500 = ₹10,000 Crores

Cost of Debt (K_d) = Interest $\times$ (1 - Tax Rate) = $12\% \times (1 - 0.3) = 8.40\%$

Cost of Equity (K_e) = Risk free rate + (Beta $\times$ Market Risk Premium)
= $9\% + 1.05(19\% - 9\%) = 19.5\%$

Debt equity ratio (as given in the question) 20% & 80%

WACC = [$(K_d) \times \text{Debt \%} + (K_e) \times \text{Equity \%}$] = $(8.40\% \times 20\%) + (19.5\% \times 80\%) = 17.28\%$

Operating Profit after tax ₹2,100 crores.

EVA = NOPAT - Cost of Capital Employed

= [$(\text{₹2,100 crores}) - (17.28\%) \times \text{₹10,000 crores}$]

= ₹2,100 crores - ₹1,728 crores

= ₹372 crores

Question 3

H Ltd.'s current financial year's income statement reports its net income as ₹15,00,000. H's marginal tax rate is 40% and its interest expense for the year was ₹15,00,000. The company has ₹1,00,00,000 of invested capital, of which 60% is debt.

In addition, H Ltd. tries to maintain a Weighted Average Cost of Capital (WACC) of 12.6%.

(i) Compute the operating income or EBIT earned by H Ltd. in the current year.

(ii) What is H Ltd.'s Economic Value Added (EVA) for the current year?

**Solution**

(i) Taxable income = Net Income $\div$ (1 - Tax Rate) or, Taxable Income = ₹15,00,000 $\div$ (1 - 0.40) = ₹25,00,000

Again, taxable income = EBIT - Interest or, EBIT = Taxable Income + Interest = ₹25,00,000 + ₹15,00,000 = ₹40,00,000

(ii) EVA = EBIT (1 - T) - (WACC $\times$ Invested capital)

= ₹40,00,000 (1 - 0.40) - (0.126 $\times$ ₹1,00,00,000)

= ₹24,00,000 - ₹12,60,000 = ₹11,40,000.

Question 4

The following information is supplied by ABC Ltd. for the year 31-03-2022:

Sl. No.	Particulars	(₹ In Crores)	(₹ In Crores)
i.	Profit after tax (PAT)		205.90
ii.	Interest		4.85
iii.	Equity Share Capital	40.00	
	Accumulated Surplus	700.00	
	Shareholders fund	740.00	
	Loans (Long term)	37.00	
	Total long term funds		777.00
iv.	Market Capitalization		2892.00
	Risk free rate		12.00%
	Long Term Market Rate (Based on BSE		15.50%



	Sensex)		
	Effective tax rate for the company		25%
	Beta (β) for last few years		
	Year		
	1	0.48	
	2	0.52	
	3	0.60	
	4	1.10	
	5	0.99	

You are required to calculate the Economic Value Added of ABC Ltd. as on 31st March, 2022

Solution 4

Net Operating Profit after Tax (NOPAT) = Profit After Tax (PAT) + Interest (net of tax)

$$= 205.90 + 4.85 \times (1 - 0.25)$$

$$= ₹209.54 \text{ crores}$$

Debt Capital		₹37 crores
Equity capital (40 + 700)	=	₹740 crores
Capital employed	=	₹37 + 740 = ₹777 crores
Debt to capital employed	=	₹37 crores / ₹777 crores = 0.0476
Equity to capital employed	=	₹740 crores / ₹777 crores = 0.952
Interest cost before tax	=	₹4.85 crores
Less: Tax (25% of ₹4.85		(₹1.21 crores)



crores)		
Interest cost after tax	=	₹3.64 crores
Cost of debt	=	(₹3.64 crores / ₹37 crores) × 100
	=	9.83%

According to Capital Asset Pricing Model (CAPM)

Beta for calculation of EVA should be the highest of the given beta for the last few years.

Accordingly,

$$\text{Cost of Equity Capital} = \text{Risk Free Rate} + \text{Beta} (\text{Market Rate} - \text{Risk Free Rate})$$

$$= 12\% + 1.10 \times (15.50\% - 12\%)$$

$$= 12\% + 1.10 \times 3.5\%$$

$$= 15.85\%$$

Weighted Average Cost of Capital (WACC) = Equity to Capital Employed (CE) × Cost of Equity capital + Debt to CE × Cost of Debt

$$= 0.952 \times 15.85\% + 0.0476 \times 9.83\%$$

$$= 15.09\% + 0.47\%$$

$$= 15.56\%$$

Cost of Capital Employed (COCE) = WACC × Capital Employed

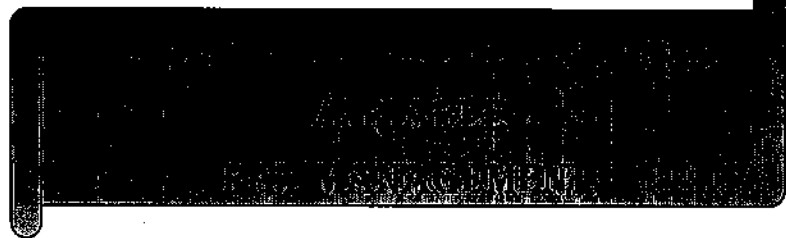
$$= 15.56\% \times ₹777 \text{ crores}$$

$$= ₹120.90 \text{ crores}$$

Economic Value Added (E.V.A.) = NOPAT – COCE

$$= ₹209.54 \text{ crores} - ₹120.90 \text{ crores}$$

$$= ₹88.64 \text{ crores}$$



Organization in today's change-filled, highly competitive environment must devote significant time, energy, and human and financial resources to measuring their performance in achieving strategic goals. Most do just that, but despite the substantial effort and related costs, many are dissatisfied with their measurement efforts. In fact, at any given time, as many as 50 percent of organizations are making changes to their performance measurement systems.

The Balanced Scorecard has emerged as a proven and effective tool in our quest to capture, describe, and translate intangible assets into real value for all of an organization's stakeholders and, in the process, to allow organizations to implement their differentiating strategies successfully.

Characteristics

Balanced scorecards to be effective and useful should have the following characteristics:

1. Balanced scorecards should highlight a company's strategy by focusing on cause-and-effect relationship. Assume LG Ltd. aims to be a low-cost manufacturer and accelerate growth. The balanced scorecards should pinpoint specific objectives and measures in 'learning and growth perspective' which could improve internal



business processes. These, in turn, would result into greater customer satisfaction, larger market share, higher operating income and shareholder wealth.

2. Balanced scorecards should help in communicating the strategy formulated to all members of an organization by translating the strategy into a coherent and linked set of understandable and measurable operational targets.

Subsequently, managers and employees take actions, based on scorecard, to achieve the firm's strategy. To facilitate decisions and actions in accordance with scorecards, it is preferable to develop scorecards at the division and department levels.

3. In profit-seeking companies, the balanced scorecard gives strong emphasis on financial objectives and measures. Sometimes managers give too much importance to innovation, quality and customer satisfaction though they may not produce tangible benefits. A good balanced scorecard considers non-financial measures as a part of a strategy or programme to achieve and improve future financial performance. When financial and non-financial performance measures are properly linked in balanced scorecards, many non-financial measures serve as leading indicators of future financial performance.

4. The balanced scorecard limits the number of measures used by identifying only the most critical ones. Avoiding a proliferation of measures focuses management's attention on those that are key to the implementation of strategy.

5. The scorecard highlights sub-optimal trade-offs that managers may make when they fail to consider operational and financial measures together. For example, a



company for which innovation is key, could achieve superior short-run financial performance by reducing spending on R&D. A good balanced scorecard would signal that the short-run financial performance may have been achieved by taking actions that hurt future financial performance because a leading indicator of that performance, R&D spending and R&D output, has declined.

A Scorekeeper, the management accountant designs reports to help managers track progress in implementing strategy. Many organizations have introduced a balanced score card approach to manage the implementation of their strategies.

The balanced scorecard does not focus solely on achieving financial objectives. It also highlights the nonfinancial objectives that an organization must achieve to meet its financial objectives. The Scorecard measures an organization performance from four perspectives:

- Financial
- Customer
- Internal business processes
- Learning and growth

A Company's strategy influences the measures it uses to track performance in each of this perspective. It's called the balanced scorecard because it balances the use of financial and non-financial performance measures to evaluate short-run and long-run performance in a single report. The balanced scorecard reduces managers'



emphasis on short-run financial performance such as quarterly earnings. That is because the non-financial and operational indicators, such as product quality and customer satisfaction measure changes that a company is making for the long run. The financial benefits of these long-run changes may not appear immediately in short-run earnings, but strong improvement in non-financial measures is an indicator of economic value creation in the future. For example, an increase in customer satisfaction, as measured by customer surveys and repeat purchases, is a signal of higher sales and income in the future. By balancing the mix of financial and non-financial measures, the balanced scorecard broadens management's attention to short-run and long-run performance.

The four Perspectives of the Balanced Scorecard:

1. Financial Perspective:

This perspective evaluates the Profitability of the strategy. Because cost reduction relative to competitors, costs and sales growth are key strategic initiatives, the financial perspectives focuses on how much of operating income and return on capital results from reducing costs and selling more units.

2. Customers Perspective:

This perspective identifies the targeted market segments and measures the company's success in these segments. To monitor its growth objectives, number of new customers and customer's satisfaction.



3. Internal business process Perspective:

This perspective focuses on internal operations that further the customers' perspective by creating value for customers and further the financial perspective by increasing shareholder value. Chipset determines internal business process improvement targets after benchmarking against its main competitors.

The internal business process perspective comprises three sub processes:

1. The Innovation process:

Creating products, services and processes that will meet the needs of customers, aiming at lowering costs and promote growth by improving the technology of its manufacturing.

2. The operations process:

Producing and delivering existing products and services that will meet the needs of customers. The strategic initiatives are (a) improving manufacturing quality reducing delivery time to customers and (b) Meeting specified delivery dates.

3. Post sales service providing service and support to the customer after the sale of a product of service. Although customers do not require much post sales service.



4. Learning & Growth Perspectives:

This perspective identifies the capabilities of the organization must excel at to achieve superior internal processes that create value for customers and shareholders.

A Company's learning and growth perspectives emphasize three capabilities:

- 1. Employee Capabilities measured using employee education and skill levels.*
- 2. Information system capabilities, measured by percentage of manufacturing processes with real-time feedback and*
- 3. Motivation measured by employee satisfaction and percentage of manufacturing and sales employees (line employees) empowered to manage processes.*

Balanced Scorecard: Implementation

Implementation of a balanced scorecard system of performance measurement is most successful when the entire organization is aware of it and supports it. The manner in which the organization's management communicates the role, the use, and the benefits of the balanced scorecard to its employees is one of the most important factors in successful implementation of a balanced scorecard. The balanced scorecard needs to be introduced by illustrating the sequence of cause-and-effect relationships, the way the perspectives are linked, and the reasons why meeting the goals at the bottom level make it possible to meet the goals at the next level up, which in turn make the next level of goals possible, and so forth.



It is important for senior management to support the program, even as high as the board of directors. The board of directors can also have balanced scorecard goals. Having balanced scorecard goals for the board of directors creates support at the very top of the organization, and the support filters down.

Each business unit and division should be involved in developing its own customized scorecard, based on the company's overall objectives and the action items that the unit needs to achieve in order to contribute to those objectives. Involvement of the scorecard users builds their support. However, the scorecards as developed by middle managers need to be reviewed and approved with input from senior management to make sure they are congruent with the company's goals.

The actual scorecard report for a business unit should be organized according to the four perspectives, with each selected scorecard measure on a line and classified within its perspective. The target can be in one column followed by the actual results in the next column. Results that are in line and out of line can be identified, perhaps by color. Each manager should be accountable for specific lines on each report, and a division head is accountable for all the lines on the divisional report. A good, balanced scorecard report can also identify tradeoffs that managers might make, for instance by reducing R&D spending to achieve short-run financial goals, or making other trade-offs that could hurt future financial performance. The decline of R&D spending or other problems would be signaled.



The balanced scorecard needs to be marketed to both management and staff to garner support. Internal promotion of the program should take place through various media, such as print, verbal, and electronic means.

Balanced Scorecard: Reporting

Software can be used to provide balanced scorecard performance information to interested parties. However, installing dedicated balanced scorecard software does not mean that the balanced scorecard has been implemented.

Specialized software merely tracks the results of a balanced scorecard program. A business must develop its own balanced scorecard for each unit, undertake the implementation project, and follow up on the results.

Difficulties with Balanced Scorecard for measuring Performance

There are several problems with the balanced scorecard:

- *The efficacy of the balanced scorecard in achieving the organization's strategic goals must be monitored closely. If all of the non-financial targets are achieved but the financial targets are not achieved, then probably a strong causal relationship does not exist between the non-financial indicators chosen for monitoring and the financial goals. The non-financial indicators may need to be re-evaluated and changed.*
- *In order to implement balanced scorecard performance measurement, a firm must have extensive enterprise resource planning.*



- If the balanced scorecard is used as a "command and control" document that is used to control behaviour, employees may "make the numbers" but not be committed to achieving the organization's goals. Instead, the balanced scorecard should be used to create an environment in which everyone can learn and grow.
- Non-financial data is not subject to control or audit and thus its reliability could be questionable.
- It is difficult to use scorecards for comparisons across business units because each business unit has its individualized scorecard. Scorecard evaluation is more effective when it is used to judge the progress of an individual business unit relative to the prior year or relative to its goals rather than when used to compare a manager's performance with that of other managers or a segment's performance with that of other segments.

Remark and Conclusion:

If developed and used properly, the balanced scorecard is an effective method of developing strategies and evaluating progress toward meeting goals.

The balanced scorecard is a performance evaluation technique that takes into consideration a number of financial and non-financial performance indicators. When combined with a pay for performance system, the balanced scorecard provides a strong management tool for driving organizational success.

The Balanced Scorecard states that linkage with compensation plans brings cultural change, improved financial performance and increased employees' understanding of strategic objectives, resulting in improved organizational performance. Though



creating this linkage is a complex process, it is essential for successful and efficient implementation of the Balanced Scorecard. There is an increasing trend in firms to shift from traditional financial based performance measurement and incentive compensation system to integrating financial and nonfinancial measures.

Use of Balanced Scorecard for this purpose is an example of this trend. Kaplan and Norton suggest that the Balanced Scorecard should be aligned with the organizational incentive or reward management system at the final stage of its implementation. Others also support the claim for consistency and alignment of the performance measurement system with reward and incentive structure in organization. Traditional compensations systems focus on short-term goals and objectives making it impossible to achieve long-term strategic objectives. Linking the rewards and incentives to Balanced Scorecard would allow better alignment of organization towards its strategies. This would also result in coherence of individual's personal goals and objectives with the overall goals and objectives of the organization.

Employee compensation, one of the largest expenses in any organization, is also one of the least managed. While transparent data and scorecards have improved the management of other aspects of performance greatly, compensation often goes unevaluated beyond the fundamental measure of incremental costs. The invisible nature of compensation leads to problems. These include failing to differentiate pay for performance, over- and/or underpaying jobs relative to the market, having compensation spending grow faster than revenue and allowing employees to suspect that they are not being paid fairly.





A compensation scorecard collects and displays the results for all the measures that an organization uses to monitor compensation and compare compensation among internal departments or units. It can be used to:

- ☐ *Help organizations detect and prevent compensation problems.*
- ☐ *Make compensation decisions and actions more transparent.*
- ☐ *Improve the quality of compensation decisions.*

While the process of measuring and communicating results on a balanced scorecard of performance metrics likely will drive a degree of organizational success, many organizations add to this motivation by linking the scorecard to pay rewards.

The final step in the process of building a pay-for-performance program from the balanced scorecard foundation is to develop a reward structure. In the conceptual reward structure, a variable pays reward structure (red line) is built around the achievement of goals ranging from a threshold to maximum level of performance.

Performance at the target level results in a market level of reward. Performance at the threshold results in a below-market reward. Performance at a maximum level results in an above-market reward.

Companies using this concept of a reward structure predetermine the threshold, target and maximum performance levels they want to reward, and the range of market level rewards they intend to provide matched to the range of performance levels.



Typically, the pay-for-performance reward is in the form of a lump-sum cash award so that rewards have to be re-earned each year; however, some companies have factored the balanced scorecard results into the determination for making annual salary increases, as well.

Because most organizations have a salary structure with ranges built around market-based midpoints, the reward structure above may be designed as a mix of salary increases and lump-sum payments. A greater mix of salary increases are provided when an employee's salary is below the midpoint; and a greater mix of lump sums are provided when an employee's salary is above the midpoint.

Using a compensation scorecard can greatly increase an organization's compensation effectiveness. Because it is true that what gets measured gets done, it is critically important to measure and manage compensation. With the right measures, organizations can use what they spend on compensation more effectively to help execute their strategy.



PERSPECTIVE	QUESTION	EXPLANATION
Customer	What do existing and new customers value from us?	Gives rise to targets that matter to customers: Cost, Quality, Delivery, Inspection, Handling and so on.
Internal	What processes must we excel at to achieve our financial and customer objectives?	Aims to improve internal processes and decision making.
Innovation and Learning	Can we continue to improve and create future value?	Considers the business's capacity to maintain its competitive position through the acquisition of new skills and the development of new products.
Financial	How do we create value for our shareholders?	Considers traditional measures such as growth, profitability and shareholder value but through talking to the shareholder or shareholders director.

Question 1

"Taj Laguna Royal" is an exclusive resort located in a famous place of Andaman & Nicobar Island that vows to isolate its guests from the hustle and bustle of everyday life. Its leading principle is "all contemporary amenity wrapped in old-world charisma". Each of the resort's 20 villas has a separate theme like Castle, Majestic, Ambassador, Royal Chateau, Coconut, Lemon, Balinese etc. and guests often ask for a specific villa when they make reservations. Villas are ideal for families or friends travelling together and these villas feature luxurious accommodation spanning two floors. Since it is located within a 100-acre estate on white sand beach, the resort offers its guests a wide variety of outdoor activities such as horseback riding, hiking, diving, snorkeling, sailing, golf and so on. Guests could also while away the day relaxing in the pool and



availing themselves of the resort's world-famous spa "Taj Heaven Spa". The dining room, which only has three tables for the public, is acceptable proud of its 5-star rating.

Required

Develop a Balanced Scorecard for "Taj Laguna Royal". It is sufficient to give two measures in each of the four perspectives.

Solution 2

Balanced Scorecard of "Taj Laguna Royal"

Objectives	Performance Measures
Financial Perspective	(I) Economic Value Added (II) Revenue generation per villa
Customer Perspective	(I) Percentage of repeat customers (II) Customers' complaints
Internal Business	(I) Rating of Spa for its services (II) Staff hours per guest (III) % cost spent for maintenance (IV) Rank for restaurant in the context of services
Innovation and Learning	(I) Retention of employees (II) New types of services to offered in near future



Question 2

The usual learning curve model is $y = ax^b$

where, 'y' is the average time per unit for x units; 'a' is the time for first unit; x is the cumulative number of units; b is the learning coefficient and is equal to $\log 0.8 \div \log 2 = -0.322$ for a learning rate of 80%. Given that a = 10 hours and learning rate 80%, you are required to calculate:

(i) The average time for 20 units.

(ii) The total time for 30 units.

(iii) The time for units 31 to 40.

Given that $\log 2 = 0.301$, Antilog of 0.5811 = 3.812; $\log 3 = 0.4771$, Antilog of 0.5244 = 3.345, $\log 4 = 0.6021$,
Antilog of 0.4841 = 3.049.

Solution 2

$$(i) y = ax^b \text{ or, } y = 10(20)^{-0.322}$$

Taking log on both sides

$$\log y = \log 10 + \log 20^{(-0.322)}$$

$$\log y = \log 10 - (0.322) \log 20 = 1 - (0.322) \log 20 = 1 - (0.322) \times \log (2 \times 10) = 1 - (0.322) \times (\log 2 + \log 10)$$

$$= 1 - (0.322) \times (1.3010) = 1 - 0.41892 = 0.5811$$

$$\log y = 0.5811$$

$$y = \text{Anti log } (0.5811) = 3.812 \text{ hrs (average time)}$$

$$\text{Total Time} = 3.812 \times 20 = 76.24 \text{ hours}$$



$$(ii) \log y = \log 10 + \log 30^{(-0.322)}$$

$$\log y = 1 - (0.322) \times (1.4771)$$

$$= 1 - (0.4756) = 0.5244$$

$$y = \text{anti log } (0.5244) = 3.345 \text{ hrs (average time)}$$

$$\text{Total time} = 3.345 \times 30 = 100.35 \text{ hrs}$$

$$(iii) \log y = \log 10 + \log 40^{(-0.322)}$$

$$= 1 - (0.322) \times (1.6021)$$

$$\log y = 0.4841$$

$$y = \text{anti log } (0.4841) = 3.049 \text{ hrs}$$

$$\text{Total time} = 40 \times 3.049 = 121.96 \text{ hrs}$$

$$\text{Time from 31 to 40 units} = 121.96 - 100.35 = 21.61 \text{ hrs}$$

Question 3

Division X of ABB Company currently has capital employed of ₹1,00,000 and earns an annual profit after depreciation of ₹18,000. You as a divisional manager is considering an investment of ₹10,000 in an asset which will have a 10 years life with no residual value and will earn a constant annual profit after depreciation of ₹1,600.

The cost of capital is 15%.

President of the Company has asked you to evaluate the above, for necessary evaluation of the investment, so that he can approve the same.

**Solution 4**

The evaluation process should consider the following important points and necessary calculation:

- (1) The return on divisional investment, before and after the new investment
- (2) The divisional residual income before and after the new investment

The residual income (RI) for a division is calculated by deducting from the divisional profit an imputed interest charge, based on the investment in the division.

The return on investment (ROI) is the divisional profit expressed as a percentage of the investment in the division.

Both methods use the same basic figure for profit and investment, but residual income produces an absolute measure whereas the return on investment is expressed as a percentage.

Both methods suffer from disadvantages in measuring the profit and the investment in a division which include the following.

- (i) Assets must be valued consistently at historical cost or at replacement cost. Neither valuation basis is ideal.
- (ii) Divisions might use different bases to value inventory and to calculate depreciation.
- (iii) Any charges made for the use of head office services or allocations of head office assets to divisions are likely to be arbitrary.

In addition, return on investment suffers from the following disadvantages.

- (i) Rigid adherence to the need to maintain ROI in the short term can discourage managers from investing in new assets, since average divisional ROI tends to fall in the early stages of a new investment. Residual



income can overcome this problem by highlighting projects which return more than the cost of capital.

- (ii) It can be difficult to compare the percentage ROI results of divisions if their activities are very different:

residual income can overcome this problem through the use of different interest rates for different divisions.

(1) Return on Divisional Investment (ROI)

	Before investment	After investment
Divisional profit	₹ 18,000	₹ 19,600
Divisional investment	₹ 1,00,000	₹ 1,10,000
Divisional ROI	18.0%	17.8%

The ROI will fall in the short term if the new investment is undertaken. This is a problem which often arises with ROI

	Before investment	After investment
Divisional profit	18,000	19,600
Less imputed interest:		
₹1,00,000 × 15%	₹ 15,000	-
₹1,10,000 × 15%	-	16,500
Residual income	₹3,000	₹3,100

The residual income will increase if the new investment is undertaken. The use of residual income has highlighted the fact that the new project returns more than the cost of capital (16% compared with 15%).



Decision making is the most significant aspect of the management process. Efficacy of every aspect of management (planning, organizing, control, etc.) is pivoted on the effectivity of the decision making process. Effective decision making is linked to fulfilment of the objectives of the organization. An elaborately designed decision making process helps to make a more deliberate and effective decision.

The steps of the process are discussed below:

Step 1: Identify the decision – It is important to identify the nature of decision that the decision maker is faced with. This paves way for making effective decisions.

Step 2: Gather relevant information – Before decision making, it is important to gather all relevant information.

The source of information can be two types,

- *Internal source- information available within the organisation.*
- *External source – information that are available beyond the scope of the organisation.*

Step 3: Identify the alternatives – on the basis of the information collected the alternatives are zeroed upon. At this juncture it is important to make a list of all possible alternatives in order to make a correct and effective decision.



Step 4: Consider the evidence - In this step, the decision maker uses his knowledge and emotion to imagine what it would be like if one particular alternative is chosen and carried out. This would have to be thought about for all the possible alternatives. As the decision maker goes through this process (often with subtlety), he starts developing a notion as to which alternative results in the achievement of the organisational goal.

Step 5: Take action - In this step the decision maker is ready to make his call which is decided upon in the previous step.

Step 6: Review of the decision - After the above steps are undertaken and a decision is arrived at, the process of evaluation has to begin where the impact of the decision is considered. If the desired result is not achieved, the whole process has to be revisited.

The theoretical underpinnings of the decision making process is the subject matter of Decision Theory. The following aspects are noteworthy:

- *Decision theory involves economic and statistical approaches for studying an individual's choices. Because it is based on ideas, attitudes, and wishes, analysts refer to it as a theory of choice.*
- *Decision theory enables the entity to make the most rational decision feasible in unknown and uncertain conditions, repercussions, and behaviours.*
- *In order to make better business decisions, companies worldwide use this theory to understand how customers and markets operate.*



- Mathematicians, economists, marketers, data and social scientists, biologists, psychologists, philosophers, and politicians use two theory forms: normative and descriptive¹.

Though decision theory deals with the methods for determining the optimal course of action when a number of alternatives are available, given that the consequences cannot be forecast with certainty², for the purpose of this section of the study note, discussion is restricted to problems occurring in business, with consequences that can be described in Rupees of profit or revenue, cost or loss. For these problems, it is reasonable to consider that the best alternative is the one which results in the highest profit or revenue, or lowest cost or loss, on the average, in the long run.

Certainty³, Uncertainty and Risk

It is obvious from the above discussion that the decision maker has to choose between alternatives. There are several possible alternatives (or outcomes) of an act (choosing between alternatives) which has to be endorsed in favour of, such that the end result, in terms of Rupees, is optimised. This is the fundamental aspect of decision theory. Now, the moot question is whether there is information regarding happening/ not happening of the outcomes. There can be as such two extreme cases; one where there is perfect information of happening/ not happening of the outcome. This is a situation where there is relevant past experience to enable statistical evidence for predicting the possible outcomes. This is the case of decision making under certainty. The other extreme is a situation where there are several possible outcomes, but there is no previous statistical evidence to enable the possible outcomes to be predicted. This is the case of decision making under uncertainty. In



this particular situation probabilities cannot be assigned to the various states of nature (condition of happening/not happening of a particular state of the future). Thus there arises a third situation where there is predictability of happening/ not happening of future state of nature (condition of happening/not happening of a particular state of the future). This is the case of decision making under condition of risk. The terms 'risk' and 'uncertainty' are used interchangeably but there is significant difference between the two. A comparison chart is presented in the following lines which helps to understand the basic difference between the two. In making decisions under risk, the decision maker can predict the possibility of a future outcome, but when making decisions under uncertainty, the decision maker cannot. Risks can be managed while uncertainty is uncontrollable. The decision maker can assign a probability to risks events.

BASIS FOR COMPARISON	RISK	UNCERTAINTY
Meaning	The probability of winning or losing something worthy is known as risk.	Uncertainty implies a situation where the future events are not known.
Ascertainment	Measurable	Not Measurable
Outcome	Chances of outcomes are known.	The outcome is unknown.
Control	Controllable	Uncontrollable
Minimization	Yes	No
Probabilities	Assigned	Not assigned

**NOTES:**

1 This aspect of the study of Decision Theory is beyond the scope of the study note.

2 It is important to note that most of the academic discussions on short term decision making occurs under conditions of certainty.

3 It is important to note that the distinction between risk and uncertainty is not essential for analysis in cost and management accounting and the terms are often used interchangeably in courses on Cost and Management accounting. But the distinction is essential part of Decision Theory as discussed in books on Operations Research.

In the following lines the conditions are introduced briefly:

1. Decision making under conditions of certainty

Decision making is about selecting the best alternative from among an array of alternatives. The 'best' alternative refers to that particular alternative which helps a firm to maximise its profit⁴ or minimise its cost. In decision theory, the alternatives are referred as acts and the possible events are referred as states of nature (outcomes of a random process).

The condition of certainty imply that the future is known and thus the probability of happening/ not happening of an event is one. All the models of short term decision making discoursed in Module 4 of this study note are under conditions of certainty⁵.



In simple words, the decision-maker is conformed to what will happen when a decision is being made. It is a condition where the future is cent percent definite. This situation is conformed because of the availability of all reliable information. Thus the cause and effect are known with certainty. Due to known conditions, there are no conflicts in decision-making. This condition exists in routine decisions such as day-to-day activities, payment of wages, salaries, etc. Another example is when a person is going to buy a car, he can collect all the relevant information about that car, and he gets confirmed as to what type of car he is buying.

This is erroneous as the terms 'uncertainty' and 'future' are fabricated into each other. It is a well-accepted fact that the future is uncertain. In the ever changing business environment, even in the short term, nothing can be assumed to be cent percent assured, even under conditions of perfect information. As such, the notion of perfect information is also a misnomer.

The entire gamut of short term decision making that operate under conditions of certainty is often referred as the deterministic model. Though there are severe criticism for the models, they exist in the world of academia because of their simplicity and significant contribution to the knowledge base.

2. Decision making under condition of uncertainty

Uncertainty lies on the other end of the continuum⁶. In certainty, as discussed in the previous paragraph, the future is known and the decision maker, thus, need not worry



about the happening /not happening of a particular state of nature as the future is cent percent assured. Whereas under condition of uncertainty, the future states of nature are unknown. There is no information available on the happening /not happening of the future state of nature. In decision making under uncertainty, the probability distribution associated with the states is either unknown or cannot be determined. This lack of information has led to the development of special decision criteria which would be discussed in brief, in later section of this module.

3. Decision making under condition of risk.

The term 'risk' is one of the most discoursed terms in finance literature. Various aspects of financial risk and its management is taken up for discussion in a later paper². In simple terms, risk is a situation, where the decision maker is neither certain nor uncertain about the future states of nature. Thus there is imperfect information about the happening/ not happening of the future events. In mathematical terms, probabilities may be assigned to happening/ not happening of the future events. The probabilities may be either priori probabilities, derived from inherent symmetries, like the throw of a dice (the probability of throwing a four is one -sixth as there is one event favourable and six events that may occur) or statistical probabilities, obtained through analysis of homogenous data (for example, the chance of rain on 16th August 2022 may be assigned by looking into the weather report of last two hundred years. If rain had occurred on 60 days out of 200 days, then it may be said that the probability of rain on 16th August 2022 is $60/200=0.3$ and the probability of rain not happening on 16th August 2022 is 0.7).

NOTES:



4 In corporate finance, maximisation of shareholders' wealth (SWM) is preferred objective of the firm.

5 This is seldom true under conditions of long term where the impact of the uncertain future is obvious.

6 Today, the complex business environment is referred as VUCA environment which is an acronym for (V)Volatility, (U) Uncertainty, (C) Complexity and (A) Ambiguity. It applies to applied to assess the complex environments where tasks may vary and change as fast as the environment around them. Under such conditions the deterministic models (conditions of certainty) losses much of their lustre and decision making under uncertainty is considered as more significant.

Decision Making under Certainty



In decision theory, utility matrices are combined with various types of information about states of nature. The decision maker may or may not be able to gather prior information about the states of nature. In cases when only one state of nature is to be considered because of the nature of the problem or because of lack of information⁷ are called decision-making under certainty. If the decision maker is certain as regards to the probability of happening/ not happening of an outcome, he is said to operate under condition of certainty. On the contrary, if the decision maker has imperfect information or no information about the happening/ or not happening of an event he is said to operate under conditions of uncertainty or risk. Thus it may be stated that in the realm of decision making, under condition of certainty each action will lead invariably to a specific outcome. In this situation only one state of nature exists and its probability is one. The following illustrates the understanding.

CASE STUDY 1

Mr Pratap is considering setting up his stall in the playground in the evening of a particular day, say 20th August 2022. He has the option of selling ice creams or coffee. He has the option of buying Ice creams⁸ from a whole seller @ ₹56 each and selling them for @ ₹60 each. Thus he would make a profit of ₹4 on each Ice cream cone. On a sunny day he sales 200 cones, but if it is a rainy day then sales fall and thus he is able to sell only 80 cones. On the contrary, he can sell coffee whereby he can make a profit of ₹6 per cup. On a sunny day he sales 100 cones, but if it is a rainy day then sales increases and thus he is able to sell 160 cups.

This can be represented in the following pay off matrix:



Particulars	States of Nature	
	Sunny Day	Rainy Day
Sale Ice Cream	₹800 ⁹	₹320
Sale Coffee	₹600	₹960

Now, on the morning of 20th August 2022 he wakes up and find that it has been raining from the previous day night and for clarification he calls the met office and they confirm that it would rain for the whole day. Thus he faces a situation of certainty as there is only one state of nature and that is it being a rainy day. Thus his decision whether he would sell Ice cream or Coffee is based on one certain information and thus the above payoff matrix may be reduced to one with a single state of nature (Rainy Day).

Particulars	States of Nature
Acts	Rainy Day
Sale Ice Cream	₹320
Sale Coffee	₹960

Thus Mr Pratap is better off if he sales Coffee on 20th August 2022, at the playground as the payoff (₹960) from selling coffee is higher than the payoff from selling ice cream. This is particularly because of the fact that it is known with certainty that the 20th August 2022 would be a rainy day.

**NOTES:**

7 This is the case for various deterministic models of decision making like make or buy, shutting down of a product line, replacement of a machinery etc. This are discoursed in details in Module 4 of this study note.

8 For simplicity it is assumed that only one type of ice creams is bought and sold namely, Strawberry ice creams in cones.

9 This is calculated as profit per cone of ice cream (₹) $\times$ number of cones sold (200). The other values in the payoff matrix are calculated in the same manner.

Decision Matrix

The standard format for the evaluation of alternatives in decision theory is that of a decision matrix. In a decision matrix, the alternatives open to the decision-maker are tabulated against the possible states of nature. The alternatives (acts) are represented by the rows of the matrix, and the states of nature by the columns. The decision matrix is also referred as the payoff matrix when the cell values are presented in terms of net benefit. For the purpose of understanding a payoff table, or decision matrix, is shown below. The decision will be made among m of alternatives, identified as $A_1, A_2, A_3, \dots, A_m$. There may be more than one future "state of nature" N . The model considered here allows for n different futures. These future states of nature may not be equally likely, but each state will have some (known or unknown) probability of occurrence. Since the future must take on one of the n values of the sum of the n values of must be 1.0. The outcome (or payoff, or benefit gained) will



depend on both the alternative chosen and the future state of nature that occurs. For example, if the alternative A_i is chosen and state of nature N_j takes place (as it will with probability p_j), the payoff will be outcome O_{ij} . A full payoff table will contain m times n possible outcomes.

Table: Decision Matrix

Alternative	States of Nature/Probability					
	N_1	N_2	-----	N_j	-----	
	P_1	P_2	-----	P_j	-----	
A_1	O_{11}	O_{12}	-----	O_{1j}	-----	O_{1n}
A_2	O_{21}	O_{22}	-----	O_{2j}	-----	O_{2n}
A_i	O_{i1}	O_{i2}	-----	O_{ij}	-----	O_{in}
A_m	O_{m1}	O_{m2}	-----	O_{mj}	-----	O_{mn}

Under condition of certainty there would be only one state of nature as the future is known with certainty. Thus the decision matrix or payoff matrix would be as given below.

Pay off Matrix (under condition of certainty)

Alternative	State of nature ($p_j = 1$)
-------------	-------------------------------



A1	O1
A2	O1
A3	O1
A4	O1
Am	Om

Decisions Making under Risk

In finance literature, there are various connotation of the term 'Risk'. The most frequently used has a negative, 'a condition in which there is a possibility of an adverse deviation from a desired outcome'.



In a risky environment, the decision maker operates under condition of imperfect information. A manager may understand the problem and the alternatives, but has no guarantee how each solution will work. This is a fairly common condition under which the decision maker operates.

When new and unfamiliar problems arise, non-programmed decisions are specifically tailored to the situations at hand. The information requirements for defining and resolving non-routine problems are typically high. Although computer support may assist in information processing, the decision will most likely involve human judgment. Most problems faced by higher-level manager's demand non-programmed decisions. This fact explains why the demands on a manager's conceptual skills increase as he or she moves into higher levels of managerial responsibility.

When a manager lacks perfect information risk arises. Under a state of risk, the decision maker has incomplete information about available alternatives but has a good idea of the probability of outcomes for each alternative. While making decisions under a state of risk, managers must determine the probability associated with each alternative on the basis of the available information and his experience.

In decision theory, under risk the decision maker assumes that there exist a number of possible future states of nature as is presented in the previous table. Each has a known (or assumed) probability of occurring, and there may not be one future state that results in the best outcome for all alternatives. Examples of future states and their probabilities are as follows:



- *Weather will affect the profitability of alternative construction schedules. In this case the probabilities of rain and of good weather can be estimated from historical data.*
- *Alternative economic futures (boom or bust) determine the relative profitability of conservative versus high- risk investment strategy. In this case the assumed probabilities of different economic futures might be based on the judgment of the experts.*

Probabilities

Probabilities are mathematical expression which is used to denote the likelihood that an event or state of nature will occur. It is expressed in decimal and varies between 0 and 1. When the probability of occurrence of an event is 0, it denotes nil likelihood of occurrence whereas a value of 1 signifies absolute certainty – a definite occurrence. For example, the chance that 8 would come up in a throw of a dice is 0 as there are no faces of 8 in a dice. And the chance that a head or a tail would come up in a throw of a coin is 1 as those are the two events possible in a throw of a coin¹⁰. A probability of 0.6 means that the event is expected to occur six times out of ten.

NOTE:

10 Ignoring the chance that the coin would land vertically on its edge in a throw



The total of the probabilities for events that can possibly occur must sum to 1.0. For example, if a tutor indicates that the probability of a student passing an examination is 0.6 then this means that the student has a 60 per cent chance of passing the examination. Given that the pass/fail alternatives represent an exhaustive listing of all possible outcomes of the event, the probability of not passing the examination is 0.4. The information can be presented in a probability distribution. A probability distribution is a list of all possible outcomes for an event and the probability that each will occur. The probability distribution for the above illustration is as follows:

Outcome	Probability
Pass examination	0.6
Do not pass examination	0.4
Total	1.0

Objective and Subjective Probabilities

Probabilities are categorised either as objective and subjective. Glyn A. Holton posits 'according to objective interpretations, probabilities are real. We may discover them by logic or estimate them through statistical analyses. According to subjective interpretations, probabilities are human beliefs'. Objective probabilities are either pre-defined or are arrived at from statistical inferences. This is corroborated in the



works of Frank Knight who in 1921 stated that probabilities (objective) may be obtained in two manners:

- A priori probabilities are derived from inherent symmetries, as in the throw of a die.
- Statistical probabilities are obtained through analysis of homogenous data.

As such, objective probabilities are established mathematically or compiled from historical data. Tossing a coin and throwing a dice are examples of objective probabilities. For example, the probability of heads occurring when tossing a coin logically must be 0.5. This can be proved by tossing the coin many times and observing the results. And the chance of getting a 1 in a throw of dice is $1/6$.

In business decisions, the probabilities (chances of a particular state of nature of happening/not happening) are often estimated based on managerial judgement. Probabilities established in this way are known as subjective probabilities because no two individuals will necessarily assign the same probabilities to a particular outcome. Subjective probabilities are also known as uncertainty¹⁶ and are based on an individual's perspectives of future events and their impact on operations of the entity.

Two Important aspects of Probability



When the weather forecaster says there is a 40% probability that it will rain today, it also implicitly means there is a 60% probability that it will not rain. This illustrates the two basic requirements of probability:

1. The probability values assigned to each of the possible outcomes must be between 0 and 1; and
2. The probable values assigned to all of the possible outcomes must total 1.

Independent Events and Mutually Exclusive Events

If the occurrence or non-occurrence of one event does not change the probability of the occurrence of the other event, the two events are said to be independent.

The addition law can be used when there are two possible events and we want to know the probability that at least one of the events will occur. In other words, for events A and B, we want to know the probability that event A or event B or both events will occur.

Events that are independent and not mutually exclusive can have sample points in common. That is, in some cases both A and B can occur. We need to include those cases in our calculation of the probability that at least one of the events will occur; but we do not want to double count them because of counting them once with A's probability and again with B's probability.

The union of events A and B is the event containing all the sample points belonging to A or B or both. It represents the probability that either A or B will occur, including the probability that both will occur.



Calculating the Joint Probability of two Independent Events

The area of the overlap—the joint probability—is the probability that both events will occur. That area qualifies to be included in the probability that either one of the events will occur, because one of the events certainly occurs in the area of the overlap. But we want to include it once, not twice, so we subtract it from the sum of the two events' probabilities.

For example, if the probability of Event X occurring is 20% and the probability of Event Y occurring is 25% and they are independent and not mutually exclusive events, the probability of both X and Y occurring is 0.20×0.25 , or 0.05 or 5%.

Mutually Exclusive Events

If events are mutually exclusive, it means that if one of them occurs, the other event cannot occur. Either one or the other can occur but not both.

CASE STUDY 2 (Independent Events and Mutually Exclusive Events)

In its sales forecasting, an appliance retailer develops a set of probabilities for sales in each of its product lines for the coming year. Sales forecasts for two of these product lines are as follows:

Refrigerators: There is a 30% probability that sales of refrigerators will be ₹50,00,000; a 50% probability that sales will be ₹75,00,000; and a 20% probability that sales will be ₹1,00,00,000.



Electric Ranges: There is a 25% probability that sales of electric ranges will be ₹20,00,000; a 55% probability that sales will be ₹30,00,000; and a 20% probability that sales will be ₹50,00,000.

The forecasts for these appliances relate to sales for the following year. Therefore, the actual events (sales of refrigerators and ranges) will both be occurring at the same time. The forecast for sales of refrigerators is not dependent on sales of electric ranges occurring, and the forecast for sales of electric ranges is not dependent on sales of refrigerators occurring. Thus sales of refrigerators and sales of ranges are independent of each other.

What is the probability that sales of refrigerators will be ₹75,00,000 or sales of electric ranges will be ₹30,00,000

next years? According to the above information:

- The probability that sales of refrigerators will be ₹75,00,000 next year is 50%.
- The probability that sales of electric ranges will be ₹30,00,000 next year is 55%.
- The probability that sales of refrigerators will be ₹75,00,000 and that sales of electric ranges will be

₹30,00,000 is 0.50×0.55 , which equals 0.275 or 27.5%.

Therefore, the probability that sales of refrigerators will be ₹75,00,000 or sales of electric ranges will be ₹30,00,000 next year or that both events will occur next year is $0.50 + 0.55 - 0.275 = 0.775$ or 77.5%

In the example above, refrigerator sales of ₹75,00,000 and electric range sales of ₹30,00,000 are not mutually exclusive. In other words, it is possible for refrigerator sales to be ₹75,00,000 and for electric range sales to be ₹30,00,000. In fact, we calculated the probability of that occurring as 27.5%.



What if instead the retailer wanted to know the probability of refrigerator sales being either ₹50,00,000 or ₹75,00,000? That makes our probability question one of mutually exclusive events. Refrigerator sales cannot be ₹50,00,000 and ₹75,00,000 at the same time.

- (i) The probability that sales of refrigerators will be ₹ 50,00,000 next year is 30%.
- (ii) The probability that sales of refrigerators will be ₹ 75,00,000 next year is 50%.

Therefore, the probability that sales of refrigerators will be ₹ 50,00,000 or ₹ 75,00,000 next year is $0.30 + 0.50$
 $= 0.80$ or 80%

Note: Independent events and mutually exclusive events are very different.

Two events A and B are independent if the occurrence or non-occurrence of one event does not change the probability of the occurrence of the other event.

Two events A and B are mutually exclusive if only one of them can occur, that is, when one of them occurs, the other event cannot occur.

Dependent Events and Conditional Probability

When there are two events, A and B, and the occurrence of B depends upon the occurrence of A, the probability that both events will occur is the probability that the first event will occur, multiplied by the conditional probability that the second event will occur given that the first event has already occurred.

Three Methods of Assigning Probable Values

Three methods are used to assign probable values to possible outcomes: The Classical Method, the Relative Frequency Method, and the Subjective Method.



1. **Classical Method:** This method assumes that each possible outcome has an equal probability of occurring. Thus, if there are ten possible outcomes, each outcome is assumed to have a 10% probability of occurring. This is the method used to assign probabilities to coin tosses or dice rolls. Business decisions don't usually involve coin tosses or dice rolls, so the classical method is seldom used in situations of business uncertainty.
 2. **Relative Frequency or Objective Method:** When factual information is available that can be used to determine the probability of something occurring; the use of that information to assign probabilities is called the relative frequency method. The information may come from a sample, analytical data, or any other reliable source.
 3. **Subjective Method:** This method is used when neither the classical nor the relative frequency methods can be used because the possible outcomes are not equally likely and relative frequency data is not available. With the subjective method of assigning probabilities, we use whatever data is available and add to that data our own experience and intuition. After considering all available information, we assign a probable value that expresses our degree of belief that the outcome will occur. Subjective probability is personally determined, and different people will assign different probabilities to the same event. Despite this relative freedom in assigning probabilities, the two necessary requirements for all probabilities must nevertheless be met:
 - (i) The probable value for each possible outcome must be between 0 and 1; and
 - (ii) All the probabilities for all the possible outcomes must total 1.
- Sometimes the various methods are used in combination, such as when probabilities are determined by



combining estimates from the classical or relative frequency methods with subjective probability estimates.

Expected Value (or Expected Return)

The concept of expected value is very important. The expected value of an action is found by multiplying the probability of each potential outcome by its payoff.

Therefore, expected value, or expected return, is a weighted average of the possible returns, with the weights being the probabilities of occurrence. The expected value of a discrete random variable is the weighted average of all the possible values of the random variable. The weights are the probabilities for each of the values. The expected value is the mean value, also known as the average value.

A weighted average can be calculated only for discrete probability distributions. It is not possible to calculate a

weighted average for a continuous probability distribution because the number of possible variables is infinite.

The general model of decision making under risk when probabilities may be assigned in an objective manner to the states of nature is through the Expected Value criterion. In the below mentioned lines a Caselet is furnished for conceptualisation of the model.

CASE STUDY 3

Subbuji is a small vendor who is undecided on what to sell in the fairground as a fair is to be organized in ten days. He has the option of selling tea or ice creams on a day



one (16th August 2022) of the fair. He has made a projection that selling tea would fetch him a profit of ₹300 if it rains on 16th August 2022, but if it is sunny and humid on the day, he would not have much customers and then he would make a profit of ₹30. If he sells ice cream his profit is much higher (₹150) if 16th August 2022 is hot and humid, but if he decides to sell ice cream and it rains on that day then his profit would be ₹10. How would he make the decision of what to sell (tea or ice cream) on 16th August 2022?

Solution:

Subbuji has to decide on selling tea or ice - cream on 16th August 2022. These are termed as acts. On 16th August 2022 when these acts are to take place it can either be sunny and humid or rainy. These are called states of nature. Subbuji's decision (to sell tea or ice - cream) is reliant on the information he can garner on the states of nature. The information on chance of the day being 'sunny and humid' or being 'rainy' can be got from data of the last years. Subbuji can visit the met office and check the data of the last 200 years¹². This would mean 200 data points about whether 1st June 2022 would be 'sunny and humid' or 'rainy'. After collection of the data, Subbuji finds that out of 200 days (past data) it rained for 30 days. From this he can infer that the probability of rain on 16th August 2022 as 0.15 (30/200). And the probability of the day being 'sunny and humid' is 0.85 (1 - 0.15). Once Subbuji has got this information about the state of nature he can frame the expected pay off matrix and take his decision based on expected value criterion.



Probability of Occurrence		States of Nature	
		Hot and Humid	Rainy
		0.85	0.15
Acts	Sell Tea	30	300
	Sell Ice-Cream	150	10
The 2x2 Matrix (for expected value ¹³ calculation)			

The expected value (on the basis of which the decision is to be taken) is given as

$$EV = \sum P(X_i) \times X_i$$

Where $P(X_i)$ = Probability of occurrence of event i and X_i is the payoff related to the event i in the given case, the EV (tea) = $30 \times 0.85 + 300 \times 0.15 = 70.5$ and

$$EV \text{ (Ice -cream)} = 150 \times 0.85 + 10 \times 0.15 = 129.$$

Since this is pay off, Subbuji would choose that act which gives the highest pay off. Thus Subbuji takes his decision about which act to consider based on the highest expected value in case of pay off. This is only possible if the decision maker has access to information about the probability of occurrence of the various states of nature. Such a situation is referred as a risky situation. Information about the probability of occurrence of the state of nature is got either through statistical inference as Subbuji did, or are priori (defined from previous like in a throw of dice).



Other aspects of decision making under conditions of risk are discoursed in details in later section of this study note.

However, in a very real sense risk does not always implicitly carry a negative connotation. Where investments are concerned (both capital investments and security investments), risk is the possibility that an investment's actual return will differ from its expected return. This difference may be either positive or negative.

Investment Appraisal and Risk¹⁴

Condition of risk denotes situation where the decision maker have information about happening/ not happening of an event. The decision maker denotes the likelihood of happening/ not happening of an event in terms of probabilities. For example, a decision maker can assign 70 per cent probability that returns from a project will be in excess of ₹1,00,000. This also means that there is a 30 per cent probability that returns will be less than

₹1,00,000.

Risk for an investment can be measured by the variability, or dispersion, of its potential returns around the mean return. The mean return is given by the expected value of the returns. The variance and the standard deviation of a set of potential returns are measurements of their dispersion about the mean. Thus, the risk of an investment is measured by the variance and standard deviation of its potential returns.

In everyday usage the terms risk and uncertainty are not clearly distinguished. If one is asked for a definition, one should not make the mistake of believing that the latter



is a more extreme version of the former. It is not a question of degree; it is a question of whether or not sufficient information is available to allow the lack of certainty to be quantified.

Such type of environment is very sure and certain by its nature. This means that all the information is available and at hand. Such data is also easy to attain and not very expensive to gather.

So the manager has all the information he may need to make an informed and well thought out decision. All the alternatives and their outcomes can also be analysed and then the manager chooses the best alternative.

Another way to ensure an environment of certainty is for the manager to create a closed system. This means he will choose to only focus on some of the alternatives. He will get all the available information with respect to such alternatives he is analysing. He will ignore the other factors for which the information is not available. Such factors become irrelevant to him altogether.

NOTES:

12 Any number of years is possible. And it is to be noted that greater the data, higher is the accuracy of statistical inference. But collection of more data involves more cost. Thus it is to be noted that there is a cost of information. And there is a trade-off between more data and more cost of gathering data.

13 Expected Value of an Opportunity (EV) is a term used to describe the expected value of a business opportunity.



14 This aspect is discoursed in details in Module 2 of Paper 14. For comprehensive understanding of the topic, students may look into the said module.

Standard Deviation and Variance as a Measure of Risk

The variance and standard deviation both give an idea of the variability of the possible values about the mean. The variance and the standard deviation measure how far from the mean (the expected value) the various possible values lie. The variance is used to summarize the variability in the values of a random variable. Another word for this variability is dispersion. The amount of variability in the values of the random variable around their mean (or average) is the amount by which they are dispersed, or the amount of their dispersion. The amount of dispersion is important because it is a measurement of risk. The greater the dispersion of the values around their mean, the greater the risk associated with the values because there is a larger chance that the actual results will be different from the expected value. If the values are highly dispersed about their mean, then they vary widely from their expected value.

The variance of a population is represented by σ^2 (sigma squared). The variance is the sum of the squares of all the differences or deviations from the mean (average), weighted according to their probabilities. The difference from the mean of each result is important because it indicates the distance that particular measurement is from its expected value. The variance is actually a weighted average of the squared deviations. The standard deviation is the positive square root of the variance. It is represented by σ (sigma).



Variation within the possible cash flows for each project is also important because a project with a high variability of cash flows has more risk than a project for which all the possible cash flows are close together.

The standard deviation of the probability distribution of these subjectively determined potential cash flows expresses the dispersion, or variability, of possible returns around the expected return. If the standard deviation is large, it means the variability of returns is large and the risk of the project is higher. Thus, standard deviation is a measure of risk. By expressing differences from the expected return in terms of numbers of standard deviations from the mean (expected return), we can state the probability that the actual return will fall within an interval relative to the mean, or expected return. The greater the standard deviation, the greater is the potential for loss or gain.

Standard deviation is always expressed in the same units as the distribution. Thus, if the distribution is a distribution of annual rates of return on an investment, the returns and the standard deviation of the returns are both expressed as annual percentages. If the distribution is a distribution of annual cash flows in units of currency, both the cash flows and the standard deviation of the cash flows will be expressed as currency amounts.

The variance and standard deviation of each of the expected cash flows is calculated in the same way as the variance and standard deviation. The narrower the distribution of the data, the lower the standard deviation will be. The lower the standard deviation, the lower the risk. The wider the distribution of data, the higher the standard deviation and the higher the risk. Standard deviation is a measure of the



dispersion of a probability distribution and thus a measure of the riskiness of a project.

Again coefficient variation also measures the risk. Coefficient of variation is the relative measure of dispersion. It measures the standard deviation relative to the mean in percentages. The coefficient of variation is calculated simply by dividing the standard deviation by the expected return (or mean):

$$\text{Coefficient of variation} = \frac{\text{Standard Deviation of Return}}{\text{Expected Return}}$$

For example, assume that investment in financial instrument A has an expected return of 20% and a standard deviation of 15%, whereas investment in financial instrument B has an expected return of 25% and a standard deviation of 20%. The coefficients of variation for the two investments will be:

$$\text{COEFFICIENTS OF VARIATION (A)} = \frac{\text{STANDARD DEVIATION OF RETURN} - 15\%}{\text{EXPECTED RETURN} - 20\%} = 0.75$$



COEFFICIENTS OF VARIATION (CV) - STANDARD DEVIATION OF RETURN - 20% - 0.80
EXPECTED RETURN 25%

The interpretation of these results would be that investment in financial instrument A is less risky, as the coefficient of variation of the investment is lower. Another test statistic relating to dispersion is the standard error which is a measure often confused with standard deviation. Standard error is the measure of variability of a sample, used as an estimate of the variability of the population from which the sample is drawn. When we calculate the sample mean, we are usually interested not in the mean of this particular sample, but in the mean of the population from which the sample comes. The sample mean will vary from sample to sample and the way this variation occurs is described by the 'sampling distribution' of the mean. We can estimate how much a sample mean will vary from the standard deviation of the sampling distribution. This is called the standard error (SE) of the estimate of the mean.

QUESTION 1

We are comparing two investment projects. Both have expected returns of 20%, but the standard deviation of Project A's returns is 15%, while the standard deviation of Project B's returns is 9%. Which one is relatively riskier?



Solution 1:

$$CV \text{ of Project A} = 0.15 \div 0.20 = 0.75$$

$$CV \text{ of Project B} = 0.09 \div 0.20 = 0.45$$

Because it has a higher Coefficient of Variation (CV), Project A is the relatively riskier project.

QUESTION 2

Two investments have different expected returns. Project A's expected return is 20% and the standard deviation of its returns is 15%. Project B's expected return is only 10%, while the standard deviation of its returns remains at 9%. Which project is relatively riskier?

Solution 2:

$$CV \text{ of Project A} = 0.15 \div 0.20 = 0.75$$

$$CV \text{ of Project B} = 0.09 \div 0.10 = 0.90$$

Because Project B's expected return has decreased from 20% to 10%, as compared to example 1, above Project B's coefficient of variation has increased from 0.45 to 0.90. Therefore, Project B is now the relatively riskier project.



QUESTION 3

You are required to select from the following two Projects, which are mutually exclusive:

Project X:

Estimated Net Cash Flows (₹)	Probability
2,000	0.3
3,000	0.4
4,000	0.3

Project Y:

1,000	0.2
2,000	0.2
3,000	0.2
4,000	0.2
5,000	0.2

The Expected value of both the Projects = ₹3,000

Solution 3:

Since, Expected Value of both the Projects are same, hence, we are required to compute Standard Deviation and Co-efficient of Variations of both the Projects:

Computation of SD of Project X

Cash Flow(X)	Probability (p)	EV (Xp)	X - $\bar{X}$ Variance	p (X - $\bar{X}$) ²
₹		₹		₹
2,000	0.3	600	-1,000	3,00,000
3,000	0.4	1,200	0	0
4,000	0.3	1,200	+1,000	3,00,000



SD of Project X = ₹ 775 $\sqrt{p(X - \bar{X})^2}$

On the basis of similar calculations, the SD of Project Y = ₹ 1,414. $\sqrt{p(Y - \bar{Y})^2}$

Decision:

Project X is selected, since SD is less, having less variability. We can also calculate Co-efficient of Variation (CV):

Project X = $(SD \div \text{Mean}) \times 100 = (\text{₹ } 775 \div \text{₹ } 3,000) \times 100 = 25.83 \%$ Project Y = $1,414 \div 3,000 = 47.13 \%$.

Decision:

Project X is selected, since its CV is less.

Expected Value in Estimating Future Cash Flows

Expected value is a term that means a weighted average of the possible values using the probabilities as the weights. Any time the word "expected" is used in the context of an "expected value" or an "expected cash flow," it refers to the idea of calculating a weighted average of the possible values using the probability of each value as its weight.

Estimating, or projecting, future cash flows are an important application of expected value. It is used in capital budgeting analysis for evaluating potential projects. It is



Important to know how to calculate estimated future cash flows from a potential project for use in a capital budgeting analysis.

A budgeted amount of future cash flow is often thought of as an absolute number. Unfortunately, though, future cash flows cannot be accurately ascertained because there are many events that can affect a project's net cash flows. Every project has numerous possible future cash flows. A project has a range of estimated cash flows that reflect different possibilities that management can foresee.

In determining the various possible cash flows, management must:

- 1) To determine which influences have affected the net cash flows of similar projects in the past, such as economic conditions, labour conditions, or international conditions, and then
- 2) To make assumptions about each of those events and the manner in which those events might affect the project. For instance, if a recession is expected, management might assume that demand for the project's product will be below normal.
- 3) Once these specific assumptions have been formulated, the management accountant then estimates the impact that each assumption could have on the net cash flow in each year of the project's life. The manager develops several possible cash flow levels for each year, along with probabilities of each cash flow level occurring. This will be a discrete probability distribution (not a continuous one), and the probabilities for each year will all sum to 1 or 100%.
- 4) The management accountant will then calculate the expected value for the net cash flow for each year of the project's life by calculating the weighted average of all the possible cash flows for each year.



- 5) These calculated expected values of future cash flows will be the cash flows used in the capital budgeting analysis for each year.

Approaches have been developed to choose the best option when the decision maker has several alternatives and there is uncertainty with respect to future events.

Decision Models

Let us consider the case of a manufacturing company, which is interested in increasing its production to meet the increasing market demand. The following steps are required to be considered in the context of Decision Model:

Step 1. To determine all possible alternatives

The first obvious step involved before making a rational decision is to list all the viable alternatives available in a particular situation. The following options are available to the manufacturer:

- (a) To expand the existing manufacturing facilities (Expansion);



(b) To setup a new plant (New facilities);

(c) To engage other manufacturers to produce for him as much as is the extra demand (Sub- contracting).

Step II. To identify the future scenario

It is very difficult to identify the exact events that may occur in future. However, it is possible to list all that can happen. The future events are not under the control of the decision-maker. In decision theory, identifying the future events is called the state of nature. In the case which we have taken of a particular manufacturing company, we can identify the following future events:

- (a) Demand continues to increase (High demand)
- (b) Moderate demand
- (c) Demand starts coming down (Low demand)
- (d) The product does not remain in demand (No demand).

Step III. To prepare a pay-off table

The decision-maker has to now find out possible payoffs, in terms of profits, if any, of the possible events taking place in future. Putting all the alternatives together (Step I) in relation to the state of nature (Step II) gives the payoff table. Let us prepare the payoff table for our manufacturing company.

STATE OF NATURE

	High Demand	Moderate Demand	Low Demand	No Demand
--	-------------	-----------------	------------	-----------



Expansion	1	2	3	4
New Facilities	5	6	7	8
Sub-Contract	9	10	11	12

Pay-off Table

If expansion is carried out and the demand continues to be high (one of the 12 alternatives), the payoff is going to be maximum in terms of profit of say ₹ X. However, if expansion is carried out and there is no demand (situation 4), the company will suffer a loss.

Step IV. Selecting the best alternative

The decision-maker will, of course, select the best course of action in terms of payoff. However, it must be understood that the decision may not be based on purely quantitative payoff in terms of profit alone, the decision-maker may consider other qualitative aspects like the goodwill generated which can be encashed in future, increasing market share with an eye on specially designed pricing policy which ultimately gives profits to the company, etc.

Decision Making with Probabilities



If a decision maker can estimate the probabilities of the future events, these should be incorporated into the decision model. In the steps in constructing payoff tables or decision trees, probabilities are used in determining payoffs. A common approach to decision making under uncertainty is the expected value criterion. The expected value (EV) of a decision alternative is calculated as follows:

$EV(\text{alternative}) = (\text{probability of first state of nature}) \times (\text{outcome of that state of nature}) + (\text{probability of second}$

$\text{state of nature}) \times (\text{outcome of the second state of nature}) + \dots$ for all states of nature.

In essence, the EV represents a weighted average of the outcomes, using probabilities as weights. The alternative selected is the one with the highest EV for maximization problems and the lowest EV for minimization problems.



QUESTION 4

Building Ltd. owns land in Noida and intends to build a condominium development on the site. The company is deciding on whether to build a small, medium or large development. Demand is uncertain and fluctuates; demand could be low, medium or high. Management at Building Ltd. has determined profit payoffs will be:

Alternatives	Demand (all amounts in ₹ 000s)		
	Low	Medium	High
Small D_1	1,400	1,400	1,400
Medium D_2	1,100	1,600	1,600
Large D_3	(1,300)	1,200	2,100

Management has determined the probabilities of demand to be:

Low =	P (low) =	0.20
Medium =	P (medium)	0.35
	=	
High =	P (high) =	0.45

**Solution 4:**

The expected value of each alternative is calculated as:

Alternatives:

$$\text{Small EV} = 0.2(1400) + 0.35(1400) + 0.45(1400) = ₹ 1,400$$

$$\text{Medium EV} = 0.2(1100) + 0.35(1600) + 0.45(1600) = ₹ 1,500$$

$$\text{Large EV} = 0.2(-1300) + 0.35(1200) + 0.45(2100) = ₹ 1,105$$

Conclusion

Using the expected value criterion and absent of any qualitative considerations, the best alternative is to build a medium condominium complex as this provides the highest expected value.

**QUESTION 5**

The following information is available for a Company:

Sales Volume (units)	Probability (%)
10,000	10
12,000	15
14,000	25
16,000	30
18,000	20

Projected sales and costs are as under:

Sales Price per unit: ₹ 6; Variable Cost per unit: ₹ 3.50; Fixed Costs: ₹ 34,000

Required:

- Probability that the Company will at least Break-even
- Probability that the Profit will be at least ₹ 10,000.

**Solution 5:**

(i) *Contribution per unit* = ₹ 2.50 (₹ 6 - ₹ 3.50)

BEP (units) = $\text{Total Fixed Costs} \div \text{Contribution per unit}$ = ₹ 34,000 ÷ ₹ 2.50 = 13,600 units.

The probability that at least Break-even = $0.25 + 0.30 + 0.20 = 0.75 = 75\%$.

(ii) The Profit will be at least ₹ 10,000:

Then, *BEP (units)* = ₹ 34,000 + ₹ 10,000 ÷ ₹ 2.50 = 17,600 units.

The required Probability = 20%

Limitations of the Expected Value Model:

- Not all future events are foreseeable and, therefore, may be omitted from the model
- The model assumes future events are independent of each other. There can be overlap between future events.
- It is difficult to accurately assess the probability of future events.
- The model ignores qualitative considerations in making a decision.
- The model ignores the decision maker's attitude towards risk. The expected value model assumes the decision maker is risk neutral. If the decision maker is risk seeking or risk averse, both the expected value of the decision and its dispersion become relevant in choosing the best decision.

**Expected Value of Perfect Information (EVPI)**

If we assume that an economic forecasting service is available that can reveal the future state of the economy with absolute certainty. This service has a proprietary computer model that has never been wrong, but the service costs ₹ 35,000. Should we purchase it?

Perfect Information is knowledge about the future that would enable us to make the best choice today for any possible situation in the future. If we knew in advance the future state of the economy, we could make a much more informed choice between say, Project X and Project Y.

As we calculate the expected value of this perfect information, keep in mind that we do not know in advance what the perfect information will be. In other words, we must determine what it would be worth to us to know this perfect information before we know what we are buying.

Companies can sometimes obtain information that reduces or eliminates the uncertainty associated with the different future events/states of nature of a problem. The EVPI refers to the maximum amount a company would pay to obtain this information.

Formula to calculate EVPI:

EVPI = EV of best alternative with perfect information - EV of best alternative without perfect information

**QUESTION 6**

In QUESTION 4, the best alternative was to build a medium condominium complex as this resulted in the highest expected value (EV = ₹1,500). If perfect information were available, that is, the probabilities were known with certainty, the optimal decision strategy is:

If low demand occurs, build a small complex.

If medium demand occurs, build a medium complex. If high demand occurs, build a large complex.

Findout EVPI.

Solution 6:

The expected value of this optimal decision strategy is:

$$0.20(1,400) + 0.35(1,600) + 0.45(2,100) = ₹1,785$$

Therefore, the EVPI is:

$$\begin{aligned} \text{EVPI} &= \text{EV of best alternative with perfect information} - \text{EV of best alternative without perfect information} \\ &= ₹1,785 - ₹1,500 = ₹285 \end{aligned}$$

Limitations of EVPI

Perfect information is rarely, if ever, available. When determining whether to obtain additional information, the decision maker must weigh the additional expected value arising from perfect information against the costs of obtaining this information.

Pay-off tables

Pay-off tables identify and record all possible outcomes (or pay-offs) in situations where the action taken affects the outcomes.

QUESTION 7

ABC Company Co is trying to set the sales price for one of its products. Three prices are under consideration, and expected sales volumes and costs are as follows.

Price per unit	₹4	₹4.30	₹4.40
Expected sales volume (units)			
Best possible	16,000	14,000	12,500
Most likely	14,000	12,500	12,000
Worst possible	10,000	8,000	6,000

Fixed costs are ₹ 20,000 and variable costs of sales are ₹ 2 per unit.

Which price should be chosen?

**Solution 7:**

Here we need to prepare a pay-off table showing pay-offs (contribution) dependent on different levels of demand and different selling prices.

A. Price per unit	₹ 4	₹ 4.30	₹ 4.40
B. Contribution per unit (A - ₹2)	₹2	₹2.30	₹2.40
C. Total contribution towards fixed costs (₹) (B x units):			
Best possible	32,000	32,200	30,000
Most likely	28,000	28,750	28,800
Worst possible	20,000	18,400	14,400

- (a) The highest contribution based on most likely sales volume would be at a price of ₹4.40 but arguably a price of ₹4.30 would be much better than ₹4.40, since the most likely profit is almost as good, the worst possible profit is not as bad, and the best possible profit is better.
- (b) However, only a price of ₹4 guarantees that the company would not make a loss, even if the worst possible outcome occurs. (Fixed costs of ₹20,000 would just be covered.) A risk averse management might therefore prefer a price of ₹4 to either of the other two prices.

Decision Making under Uncertainty

In the absence of homogenous data, neither priori probabilities nor statistical inferences can be used to define an opinion about a data set. Frank Knight (1921) used the term 'measureable uncertainty' to describe opinions based on probabilities. On the other, he used the term 'unmeasurable uncertainty' to describe opinions based on human judgements¹⁶. In simple terms, situations where objectives probabilities cannot be assigned to the states of the nature as no prior information is available gives rise to the condition of decision making under uncertainty.

Uncertainty, in common parlance, is a state of not knowing whether a proposition is true or false. Suppose Mr ASA went to a casino. There the dealer is about to roll a dice. If the result is a six, Mr ASA is going to lose ₹100.

What is Mr ASA's risk? What, is the subjective opinion (subjective probability) that Mr ASA will lose ₹100?

It may seem to be one chance in six (which is a general answer). But it is not known from previous how many sides the dice have. The information that the die is 10 sided one changes the perspective about probability of throwing a six. This example illustrates how one can be uncertain but not realize it. To clarify, an individual is uncertain of a proposition if she

- does not know it to be true or false or
- is oblivious to the proposition.

Probability is often used as a metric of uncertainty, but its usefulness is limited. At best, probability quantifies perceived uncertainty.



A decision problem, where a decision-maker is aware of various possible states of nature but has insufficient information to assign any probabilities of occurrence to them, is termed as decision-making under uncertainty. A decision under uncertainty is when there are many unknowns and no possibility of knowing what could occur in the future to alter the outcome of a decision.

The decision maker feels the uncertainty about a situation when he can't predict with complete confidence what the outcomes of the actions will be. The decision maker experiences uncertainty about a specific question when he can't give a single answer with complete confidence.

Launching a new product, a major change in marketing strategy or opening the first branch could be influenced by such factors as the reaction of competitors, new competitors, technological changes, changes in customer demand, economic shifts, government legislation and a multitude of conditions which are beyond the control of the decision maker. These are the type of decisions facing the senior executives of large corporations who commits huge resources often on gut feeling.

A situation of uncertainty arises when there are more than one possible consequences of selecting any course of action.

Decision making under uncertainty, as under risk, involves alternative actions whose payoffs depend on the states of nature. Specifically, the payoff matrix of a decision problem with m alternative actions and n states of nature can be represented by a



$m \times n$ matrix, as follows;

	s_1	s_2	s_3	s_n
a_1	$p(a_1, s_1)$	$p(a_1, s_2)$	$p(a_1, s_3)$	$p(a_1, s_n)$
a_2	$p(a_2, s_1)$	$p(a_2, s_2)$	$p(a_2, s_3)$	$p(a_2, s_n)$
a_3	$p(a_3, s_1)$	$p(a_3, s_2)$	$p(a_3, s_3)$	$p(a_3, s_n)$
$\vdots$				
a_m	$p(a_m, s_1)$	$p(a_m, s_2)$	$p(a_m, s_3)$	$p(a_m, s_n)$

The element a_i represents action i and the element s_j represents state of nature j . The payoff or outcome associated with action a_i and state s_j is $p(a_i, s_j)$. In decision making under uncertainty, the probability distribution associated with the states $s_j, j = 1, 2, \dots, n$, is unknown as it cannot be determined. This absence of information has led to the development of some special decision criteria which may be categorised as

1. Maximin (Minimax)
2. Laplace
3. Savage
4. Hurwicz

Each of the above are discussed briefly with illustration

1. The Minimax (Maximin) Criterion



The maximin (minimax) criterion is based on the conservative attitude of making the best of the worst-possible conditions. The logic is simple. The decision maker would zero upon such a decision which will give him optimum results under the given condition.

If $p(a_i, s_j)$ is loss or cost, then selection of an action is made on the basis of minimax criterion as the objective would be to minimise loss or cost (as the payoff denotes loss or cost)

On the contrary, If $p(a_i, s_j)$ is profit or revenue, then selection of an action is made on the basis of maximin criterion as the objective would be to maximise profit or revenue (as the payoff denotes profit or revenue).

2. The Laplace Criterion

This is based on the principle of insufficient reason. The simple argument is that because the probability distributions are not known, there is no reason to believe that the probabilities associated with the states of nature are different. The alternatives are thus evaluated on the basis of the assumption that all states of nature are equally likely to occur. Given that the payoff $p(a_i, s_j)$ represents gain, the best alternative is the one that yields the maximum expected value (using equal probability). And in situation payoff $p(a_i, s_j)$ represents loss the minimum value represents the best alternative.

3. The Savage Criterion

Under this rule, the degree of conservatism in the minimax (maximin) is moderated by replacing the (gain or loss) payoff matrix $p(a_i, s_j)$ with a loss (or regret) matrix, $r(a_i,$



s_j). The following illustration is given as to why the transformation is suggested and how it is undertaken. This is also known as minimax regret criterion.

The following loss matrix is noted from a particular decision problem. The $p(a_i, s_j)$, where the payoff is loss, is given as

a_1	`11,000	`90
a_2	`10,000	`10,000

Since the payoff matrix represents cost, Minimax criterion is to be applied on the basis of the conservative principle. Thus maximum values of each row is considered and the minimum of them is considered and the action representing the minimax value is the best decision.

	s_1	s_2	Row Max
a_1	`11,000	`90	`11,000
a_2	`10,000	`10,000	`10,000

← Minimax

The application of the minimax criterion shows that a_2 , with a definite loss of `10,000, is the preferred alternative. However, it may be better to choose  $a_1$  because there is a chance of limiting the loss to `90 given that s_2 occurs. This is the situation which is posited by the Savage rule. Transforming the above payoff matrix into a



regret would be helpful to moderate the degree of conservatism. Transforming the above payoff into a regret matrix, the following is derived at. The regret is arrived at deducting the minimum value of a column from all the values of that column. This is on the basis of the opportunity cost principle.

	s1	s2	Row Max
a1	1,000	0	1,000
a2	0	9,910	9,910

← Minimax

4. The Hurwicz Criterion

The minimax and the maximin criteria, discussed above, assumes that the decision-maker is either optimistic or pessimistic. These are, as such, two extreme cases and a more realistic approach would be to consider the degree of optimism or pessimism of the decision-maker. The Hurwicz criterion, is designed to represent different decision-making attitudes, ranging from the most liberal (optimistic) to the most conservative (pessimistic). This is also referred as condition of equal likelihood.

One parameter α is used as the index of optimism. If $\alpha = 0$, then the criterion reduces to conservative minimax criterion, on the basis of the best of the worst conditions. If $\alpha = 1$, then the criterion is generous because it is based on the underlying assumption of the best of the best conditions. The degree of optimism (or pessimism) can be adjusted by selecting a value of α between 0 and 1. In the absence of strong feeling



regarding extreme optimism and extreme pessimism, $\alpha = 0.5$ which indicates a fair choice, neither.

QUESTION 8

Given the following Payoff table of profits generated by an entity under differing condition of the future state of nature.

Alternatives	States of Nature			
	S1	S2	S3	S4
A1	3	5	8	-1
A2	6	5	2	0
A3	0	5	6	4

State which can be chosen as the best act using:

- (a) Maximax,
- (b) Maximin,
- (c) Minimax regret (Savage criterion),
- (d) Equal likelihood (Laplace criterion),
- (e) Hurwicz Alpha criterion $\alpha=0.4$

**Solution 8:****a) Maximax:**

$$\text{Max (Max AI)} = \text{Max (8, 6, 6)} = 8$$

Decision: Select A1

b) Maximin:

$$\text{Max (Min AI)} = \text{Max (-1, 0, 0)} = 0$$

Decision: Select A2 or A3

c) Savage Criterion (Minimax regret)**i. Formulation of the regret table****The Regret Table**

Alternatives	States of Nature			
	S1	S2	S3	S4
A1	-3	0	0	-5
A2	0	0	-6	-4
A3	-6	0	-2	0

ii. The negative signs are dropped as the table represents loss (regret) matrix while the original matrix is a profit matrix.

**The Regret Table**

Alternatives	States of Nature			
	S1	S2	S3	S4
A1	3	0	0	5
A2	0	0	6	4
A3	6	0	2	0

$$\text{III. Min (Max AI)} = \text{Min (5, 6, 6)} = 5$$

Decision: Select A1

d) Laplace: Under this condition, the associated probabilities are considered to be equal for each state of nature i.e., $1/4$ (as there are four states of nature).

Expected pay-offs are :

Alternatives	States of Nature				Expected Value = $\sum P(X_i) \times X_i$
	S1	S2	S3	S4	
	0.25	0.25	0.25	0.25	
A1	3	5	8	-1	3.75
A2	6	5	2	0	3.25
A3	0	5	6	4	3.75

From the above calculation of expected value, it is noted that A1 and A3 has the maximum expected pay-off.

Decision: Select A1 or A2

e) The Hurwicz Criterion¹⁹

$$D = \alpha (\text{Maximum in } A_i) + (1 - \alpha) (\text{Minimum in } A_i) [\alpha = 0.4]$$

$$D(A1) = (0.4 \times 8) + (0.6 \times -1) = 2.6$$

$$D(A2) = (0.4 \times 6) + (0.6 \times 0) = 2.4$$

$$D(A3) = (0.4 \times 6) + (0.6 \times 0) = 2.4$$

$D(A1)$ has the maximum Expected Value.

Decision: Select A1

QUESTION 9

Julien Point School (JPS) is preparing a summer camp in the jungles of Bagora, District Darjeeling to train individuals in wilderness survival. JPS estimates that attendance can fall into one of four categories: 200, 250, 300, and 350 persons. The cost of the camp will be the smallest when its size meets the demand exactly. Deviations above or below the ideal demand levels incur additional costs resulting from constructing more capacity than needed or losing income opportunities when the demand is not met. Letting a_1 to a_4 represent the sizes of the camp (200, 250, 300, and 350 persons) and s_1 to s_4 the level of attendance, the following table summarizes the cost matrix (in thousands of Rupees) for the situation.

	s_1	s_2	s_3	s_4
a_1	5	10	18	25
a_2	8	7	12	23
a_3	21	18	12	21



a_4	30	22	19	15
-------	----	----	----	----

State the best alternative using: (i) Minimax, (ii) Laplace, (iii) Savage Criterion (Minimax Regret), (iv) Hurwicz Criterion.

Solution 9:

The problem is analyzed using the following:

I. The Minimax Criterion

	s_1	s_2	s_3	s_4	Row Max
a_1	5	10	18	25	25
a_2	8	7	12	23	23
a_3	21	18	12	21	21
a_4	30	22	19	15	30

← MINIMAX

II. The Laplace Criterion

Assume equal probabilities (1/4) as there are four states of nature.

	s_1	s_2	s_3	s_4	$EV = \sum P(X_i) \times X_i$	Figures in thousand
a_1	5	10	18	25	$1/4$ $(5+10+18+25)/4=14.5$	14,500



a2	8	7	12	23	$1/4 (8+7+12+23) = 12.5$	₹12,500
a3	21	18	12	21	$1/4 (21+18+12+21) = 18.0$	₹18,000
a4	30	22	19	15	$1/4 (30+22+19+15) = 21.5$	₹21,500

Since it is a cost minimisation problem, decision a_2 would be selected which implicates the lowest cost of ₹12,500.

III. The Savage Criterion

This criterion posits the formulation of a regret matrix. The regret matrix is determined by subtracting 5, 7, 12, and 15 from columns 1 to 4, respectively, and so the following regret matrix is obtained.

	s1	s2	s3	s4	Row Max
a1	0	3	6	10	10
a2	3	0	0	8	8
a3	16	11	0	6	16
a4	25	15	7	0	25

← Minimax

iv. The Hurwicz Criterion



The following table summarizes the computation

Alternative	Row Min	Row Max	$\alpha(\text{Row Min}) + (1-\alpha)(\text{Row Max})$
a1	5	25	$25 - 20\alpha^{21}$
a2	7	23	$23 - 16\alpha$
a3	12	21	$21 - 9\alpha$
a4	15	30	$30 - 15\alpha$

The decision maker will have to decide upon the appropriate α , and thus he can decide upon the optimum alternative.

Decision Tree



A decision tree shows a complete picture of a potential decision and allows a manager to graph alternative decision paths. Decision trees are a useful way to analyse hiring, marketing, investments, equipment purchases, pricing, and similar decisions that involve a progression of smaller decisions. Generally, decision trees are used to evaluate decisions under conditions of risk. Decision making is the core

function of management. New tools for analysis that aid decision making are being developed. One such tool is the decision tree. It is essentially a visual graph that uses the branching method to map every possible outcome of a particular decision.

The term decision tree comes from the graphic appearance of the technique that starts with the initial decision shown as the base. The various alternatives, based upon possible future environmental conditions, and the payoffs associated with each of the decisions branch from the trunk.

Decision trees force a manager to be explicit in analysing conditions associated with future decisions and in determining the outcome of different alternatives. The decision tree is a flexible method. It can be used for many situations in which emphasis can be placed on sequential decisions, the probability of various conditions, or the highlighting of alternatives.

Decision trees are diagrams which illustrate the choices and possible outcomes of a decision. A decision tree is a pictorial method of showing a sequence of interrelated decisions and their expected outcomes. Decision trees can incorporate both the probabilities of, and values of, expected outcomes, and are used in decision-making.



More complex probability questions, although solvable using the basic principles, require a clear logical approach to ensure that all possible choices and outcomes of a decision are taken into consideration.

Decision trees are a useful means of interpreting such probability problems.

Merits of Decision Trees

- All the possible choices that can be made are shown as branches on the tree.
- All the possible outcomes of each choice are shown as subsidiary branches on the tree.

Constructing a decision tree

There are two stages in preparing a decision tree.

- Drawing the tree itself to show all the choices and outcomes
- Putting in the numbers (the probabilities, outcome values and EVs)

Every decision tree starts from a decision point with the decision options that are currently being considered.

- (a) It helps to identify the decision point, and any subsequent decision points in the tree, with a symbol. Here, we shall use a square shape.
- (b) There should be a line, or branch, for each option or alternative.

It is conventional to draw decision trees from left to right, and so a decision tree will start as follows:

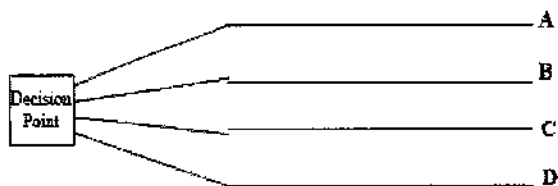


Figure : Conventional decision tree

The square is the decision point, and A, B, C and D represents four alternatives from which a choice must be made (such as buy a new machine with cash, hire a machine, continue to use existing machine, raise a loan to buy a machine).

If the outcome from any choice is certain, the branch of the decision tree for that alternative is complete.

If the outcome of a particular choice is uncertain, the various possible outcomes must be shown.

We show the various possible outcomes on a decision tree by inserting an outcome point on the branch of the tree. Each possible outcome is then shown as a subsidiary branch, coming out from the outcome point. The probability of each outcome occurring should be written on to the branch of the tree which represents that outcome.

To distinguish decision points from outcome points, a circle will be used as the symbol for an outcome point.

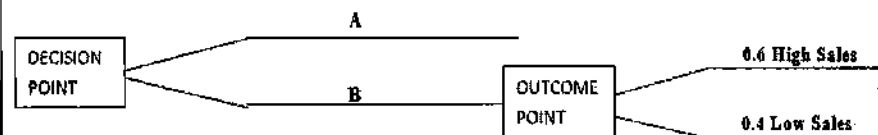


FIGURE: Decision points and Outcome points

It is assumed that, there are two choices facing the decision-maker, A and B. The outcome if A is chosen is known with certainty, but if B is chosen, there are two possible outcomes, high sales (0.6 probability) or low sales (0.4 probability).

When several outcomes are possible, it is usually simpler to show two or more stages of outcome points on the decision tree.

QUESTION 10

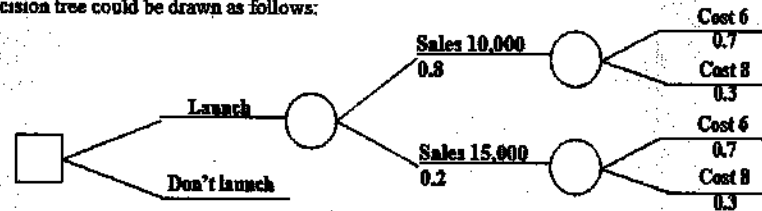
Several possible outcomes

A company can choose to launch a new product XYZ or not. If the product is launched, expected sales and expected unit costs might be as follows:

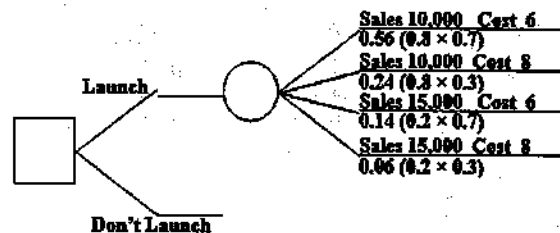
Units	Sales		Unit costs
	Probability	₹	Probability
10,000	0.8	6	0.7
15,000	0.2	8	0.3

**Solution 10:**

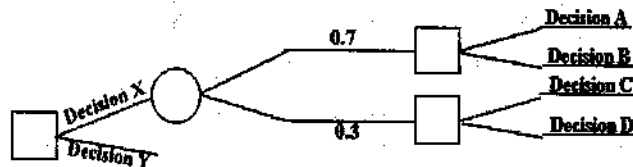
a) The decision tree could be drawn as follows:



(b) The layout shown above will usually be easier to use than the alternative way of drawing the tree, which is as follows:



Sometimes, a decision taken now will lead to other decisions to be taken in the future. When this situation arises, the decision tree can be drawn as a two-stage tree, as follows:



In this tree, either a choice between A and B or else a choice between C and D will be made, depending on the outcome which occurs after choosing X.

The decision tree should be in chronological order from left to right. When there are



two-stage decision trees, the first decision in time should be drawn on the left.

QUESTION 11

LT Ltd. owns land in Bangalore and intends to build a project development on the site. The company is deciding on whether to build a small, medium or large development. Demand is uncertain and fluctuates; demand could be low, medium or high. Management at LT Ltd. has determined profit payoffs will be:

Alternatives	Low	Demand	(all amounts in ₹ 000s)
		Medium	High
Small d1	1,400	1,400	1,400
Medium d2	1,100	1,600	1,600
Large d3	(1,300)	1,200	2,100

Management has determined the probabilities of demand to be:

Low = $P(\text{low}) = .20$

Medium = $P(\text{medium}) = .35$

High = $P(\text{high}) = .45$

Then Decision Tree Approach can be applied as under:

**Solution 11:****Decision Tree Approach**

Payoff table in decision tree format

small (d_1)	low $P(\text{low}) = 0.20$	$1,400 \times 2$	=	280
	medium $P(\text{medium}) = 0.35$	$1,400 \times 35$	=	490
	high $P(\text{high}) = 0.45$	$1,400 \times 45$	=	630
	EV		=	1,400
medium (d_2)	low $P(\text{low}) = 0.20$	$1,100 \times 2$	=	220
	medium $P(\text{medium}) = 0.35$	$1,600 \times 35$	=	560
	high $P(\text{high}) = 0.45$	$1,600 \times 45$	=	720
	EV		=	1,500
large (d_3)	low $P(\text{low}) = 0.20$	$(1,300) \times 2$	=	(260)
	medium $P(\text{medium}) = 0.35$	$1,200 \times 35$	=	420
	high $P(\text{high}) = 0.45$	$2,100 \times 45$	=	945
	EV		=	1,105

Conclusion: Build a medium complex as this alternative provides the highest expected value

**QUESTION 12**

B Ltd. has a new wonder product, the V, of which it expects great things. At the moment the company has two courses of action open to it, to test market the product or abandon it.

If the company test markets it, the cost will be ₹ 1,00,000 and the market response could be positive or negative with probabilities of 0.60 and 0.40.

If the response is positive the company could either abandon the product or market it full scale.

If it markets the V in full scale, the outcome might be low, medium or high demand, and the respective net gains/ (losses) would be (200), 200 or 1,000 in units of ₹1,000 (the result could range from a net loss of ₹ 2,00,000 to a gain of ₹10,00,000). These outcomes have probabilities of 0.20, 0.50 and 0.30 respectively.

If the result of the test marketing is negative and the company goes ahead and markets the product, estimated losses would be ₹ 6,00,000.

If, at any point, the company abandons the product, there would be a net gain of ₹ 50,000 from the sale of scrap. All the financial values have been discounted to the present.

Required



- (a) Draw a decision tree.
- (b) Include figures for cost, loss or profit on the appropriate branches of the tree.

Solution 12:

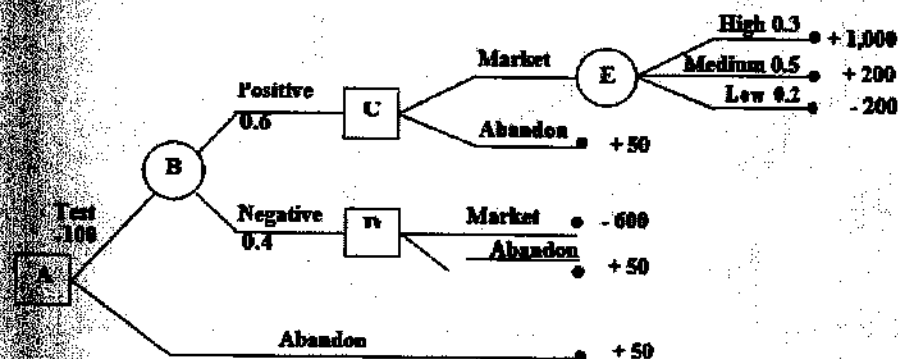
The starting point for the tree is to establish what decision has to be made now.

What are the options?

- (a) To test market
- (b) To abandon

The outcome of the 'abandon' option is known with certainty. There are two possible outcomes of the option to test market, positive response and negative response.

Depending on the outcome of the test marketing, another decision will then be made, to abandon the product or to go ahead.



Evaluating decisions by using decision trees has a number of limitations as follows:

- (a) The time value of money may not be taken into account.
- (b) Decision trees are not very suitable for use in complex situations.
- (c) The outcome with the highest EV may have the greatest risks attached to it.
Managers may be reluctant to take risks which may lead to losses.
- (d) The probabilities associated with different branches of the 'tree' are likely to be estimates, and possibly unreliable or inaccurate.

QUESTION 13

TT Newsagents stocks a weekly health magazine. The owner buys the magazines for ₹ 0.30 each and sells them at the retail price of ₹ 0.50 each.

At the end of the week unsold magazines are obsolete and have no value.

The estimated probability distribution for weekly demand is shown below.

Weekly demand in units	Probability
20	0.20
30	0.55
40	0.25
	1.00



You are required to calculate the following:

- What is the expected value of demand?
- If the owner is to order a fixed quantity of magazines per week how many should that be?

Assume no seasonal variations in demand.

Solution 13:

EV of demand (units per week) = $(20 \times 0.20) + (30 \times 0.55) + (40 \times 0.25) = 30.5$ units per week. The next step is to set up a decision matrix of possible strategies (numbers bought) and possible demand.

The 'pay-off' from each combination of action and outcome is then computed.

No sale = Cost of ₹ 0.30 per magazine

Sale = Profit of ₹ 0.20 per magazine (₹ 0.50 - ₹ 0.30)

Probability	Outcome (Numbers demanded)	Decision (Profit) (Numbers bought)		
		20	30	40
		₹	₹	₹
0.20	20	4.00	1.00*	(2.00)
0.55	30	4.00	6.00	3.00
0.25	40	4.00	6.00	8.00
	EV	4.00	5.00**	3.25

* Buy 30 and sell only 20 gives a profit of $(20 \times ₹ 0.5) - (30 \times ₹ 0.3) = ₹ 1$

** $(0.2 \times 1) + (0.55 \times 6) + (0.25 \times 6) = 5$



The strategy which gives the highest expected pay-off is to stock 30 magazines each week.

Conclusion:

Probability is a numerical measurement of uncertainty. When a probability is based on counting and observed frequencies, it is objective. When a probability is an expression of whether an event in business will or will not occur, it may be based on the relative frequency of similar events having occurred in the past, or it may be based on someone's judgment. Either way, the determination of probability has strong subjective elements.

Therefore, the concept of probability as it is used in business is a numerical measure of the belief of an individual in the occurrence or non-occurrence of an event. The probability assigned to an event depends upon the information and knowledge that the decision-maker has and uses in assessing the probability. As such, probability assessment is clearly subjective, individual, and dependent upon information. In fact, it has been said that probability does not exist in any absolute or objective sense.

Thus, these statistical methods of dealing with risk and uncertainty are only means of obtaining a recommended decision alternative or an optimal strategy for the purpose of planning, budgeting, and decision-making. The actual results from the implementation of the decision will probably be quite different from the calculated expected value. The decision-maker's judgment is the deciding factor.



QUESTION 14

The Profit Budget of ABC Company is given below:

Profit Budget for year ending 31st March 2022

		₹
Sales (1,00,000 units @ ₹10)		10,00,000
Variable costs:		
Manufacturing (₹ 5 per unit)	5,00,000	
Marketing (₹0.50 per unit)	<u>50,000</u>	<u>5,50,000</u>
Contribution:		4,50,000
Fixed costs:		
Manufacturing	2,00,000	
Marketing	50,000	
Administrative	<u>1,00,000</u>	<u>3,50,000</u>
Profit Before Tax		1,00,000
Tax (assumed at 50%)		<u>50,000</u>
Profit after Tax		<u>50,000</u>

Note: Manufacturing variable cost is:

₹ 5.10 per unit at volume of 80,000 units

₹ 5.00 per unit at volume of 1,00,000 units

₹ 4.80 per unit at volume of 1,10,000 units



The marketing manager has given the sales forecast as follows.

Probability 0.3 - 80,000 units

Probability 0.5 - 1,00,000 units

Probability 0.2 - 1,10,000 units

The production manager has indicated the variable manufacturing cost to be as follows:

Probability 0.2 - ₹ 5.10 per unit

Probability 0.6 - ₹ 5.00 per units

Probability 0.2 - ₹ 4.80 per units

The Management Accountant is to work out the profit Budget taking the above factors into account.

All other costs are as given earlier.

Prepare a Probabilistic Budget.

Solution 14:

In the table below, a three-way forecast is given:

Description	Pessimistic	Most Likely	Optimistic
	₹	₹	₹
Sales	8,00,000	10,00,000	11,00,000
Variable Costs:			
Manufacturing	4,08,000	5,00,000	5,28,000
Marketing	<u>40,000</u>	<u>50,000</u>	<u>55,000</u>
Contribution	3,52,000	4,50,000	5,17,000

**Fixed Costs:**

Manufacturing	2,00,000	2,00,000	2,00,000
Marketing	50,000	50,000	50,000
Administration	1,00,000	1,00,000	1,00,000
Profit Before Tax	2,000	1,00,000	1,67,000
Tax (assumed 50%)	1,000	50,000	83,500
Profit after Tax	1,000	50,000	83,500

The Probabilistic Profit Budget is shown below:

		Budget		
Volume	Variable Cost per unit	PAT	Joint probability (JP)	PAT×JP
80,000				
P = 0.3	5.10 (P=0.2)	1,000	0.06	60
	5.00 (P=0.6)	5,000	0.18	900
	4.80 (P=0.2)	13,000	0.06	780
1,00,000				
P = 0.5	5.10 (P=0.2)	45,000	0.10	4,500
	5.00 (P=0.6)	50,000	0.30	15,000
	4.80 (P=0.2)	60,000	0.10	6,000
1,10,000				
P = 0.2	5.10 (P=0.2)	67,000	0.04	2,680
	5.00 (P=0.6)	72,500	0.12	8,700
	4.80 (P=0.2)	83,500	0.04	3,340
EV				41,960

Thus, it can be observed that a realistic profit estimate will be ₹ 41,960 and not ₹ 50,000.

QUESTION 15

When forecasting cash flows for investment projects, we might make several sets of forecasts for each project to reflect the various alternative states of the economy that might ensue. If we are comparing two project proposals, both for one-year projects, we might make several forecasts for the cash flows, as follows:

	Project X	Project Y
	₹	₹
Economy in a deep recession	2,00,000	1,00,000
Economy in a mild recession	2,50,000	2,00,000
Economy stable	3,00,000	3,00,000
Economy in a minor expansion	3,50,000	4,00,000

Suppose economists forecast that the probability of a deep recession occurring next year is 5%, a mild recession is 10%, a stable economy is 50%, a minor expansion is 25%, and a major expansion is 10%.

**Solution 15:**

Using these projections, we can calculate the expected value of the cash flows for both projects:

	Probability	Project X		Project Y	
	(P)	Cash Flow	CF x P	Cash Flow	CF x P
		₹	₹	₹	₹
Economy in a deep recession	5%	2,00,000	10,000	1,00,000	5,000
Economy in a mild recession	10%	2,50,000	25,000	2,00,000	20,000
Economy stable	50%	3,00,000	1,50,000	3,00,000	1,50,000
Economy in a minor expansion	25%	3,50,000	87,500	4,00,000	1,00,000
Economy in a major expansion	10%	4,00,000	40,000	5,00,000	50,000
Expected Value			3,12,500		3,25,000

The expected value of the cash flows for each of the two projects is simply a weighted average of the possible cash flows, with the weights being the probabilities of each occurrence. The expected value of Project Y's cash flows is higher than the expected value of Project X's cash flows.

The expected value is the average value, or mean, of the possible values. According to the data above, if the same cash flow could be repeated over and over again, 5% of the time the cash flow would be ₹ 2,00,000, 10% of the time it would be ₹ 2,50,000, and so forth. The weighted average of these potential cash flows is the



expected value.

The problem with using expected value as a forecast for a specific project is that any given project has only one opportunity to achieve its cash flow for its duration and then the project is complete. The cash flow actually achieved for Project X could be anywhere from ₹ 2,00,000 to ₹ 4,00,000. Once one of the possible cash flows has been achieved, we will know that the probability of that cash flow occurring was 100% while the probability of the other cash flows occurring was zero.

An expected value is a "long-run" average value for a random variable. As a result, an expected value is more reliable as a long-run average forecast and less reliable as a forecast for the net cash flow for an individual project at any given moment in time.

Despite not being a reliable forecast, expected value is often used to project future cash flow from individual projects because it is the best method available for obtaining a forecast.

QUESTION 16

A manager is considering whether to make product X or product Y, but only one can be produced. The estimated sales demand for each product is uncertain. A detailed investigation of the possible sales demand for each product gives the following probability distribution of the profits for each product.



Product X probability distribution		
Outcome	Estimated Probability	Weighted Profit (₹)
Profits of ₹6,00,000	0.10	60,000
Profits of ₹7,00,000	0.20	1,40,000
Profits of ₹8,00,000	0.40	3,20,000
Profits of ₹9,00,000	0.20	1,80,000
Profits of ₹10,00,000	0.10	1,00,000
Expected value		<u>8,00,000</u>

Product Y probability distribution		
Outcome	Estimated probability	Weighted Profit (₹)
Profits of ₹4,00,000	0.05	20,000
Profits of ₹6,00,000	0.10	60,000
Profits of ₹8,00,000	0.40	3,20,000
Profits of ₹10,00,000	0.25	2,50,000
Profits of ₹12,00,000	0.20	2,40,000
Expected value		<u>8,90,000</u>

**Solution 16:**

Based on the information given, assumed to be perfect, the manager should make Product X, having higher expected value.

Since decision problems exist in an uncertain environment, it is necessary to consider those uncontrollable factors that are outside the decision-maker's control and that may occur for alternative courses of action. These uncontrollable factors are called events or states of nature. For example, in a product launch situation, possible states of nature could consist of events such as a similar product being launched by a competitor at a lower price, at the same price, at a higher price or no similar product being launched at all.

The likelihood that an event or state of nature will occur is known as its probability, and this is normally expressed in decimal form with a value between 0 and 1. A value of 0 denotes a nil likelihood of occurrence, whereas a value of 1 signifies absolute certainty – a definite occurrence. A probability of 0.4 means that the event is expected to occur four times out of ten. The total of the probabilities for events that can possibly occur must sum to 1.0.

For example, if an examiner indicates that the probability of a student passing an examination is 0.7 then this means that the student has a 60 per cent chance of passing the examination. Given that the pass/fail alternatives represent an exhaustive listing of all possible outcomes of the event, the probability of not passing the examination is 0.4.

The information can be presented in a probability distribution. A probability



distribution is a list of all possible outcomes for an event and the probability that each will occur. The probability distribution for the above example is as follows:

Outcome	Probability
Pass the examination	0.6
Do not pass examination	0.4
Total	1.0

Some probabilities are known as objective probabilities because they can be established mathematically or compiled from historical data. Tossing a coin and throwing a dice are examples of objective probabilities.

For example, the probability of heads occurring when tossing a coin logically must be 0.5. This can be proved by tossing the coin many times and observing the results. Similarly, the probability of obtaining number 1 when a dice is thrown is 0.166 (i.e. one-sixth). This again can be ascertained from logical reasoning or recording the results obtained from repeated throws of the dice.

It is unlikely that objective probabilities can be established for business decisions, since many past observations or repeated experiments for particular decisions are not possible; the probabilities will have to be estimated based on managerial judgement. Probabilities established in this way are known as subjective probabilities because no two individuals will necessarily assign the same probabilities to a particular outcome. Subjective probabilities are based on an individual's expert knowledge, past experience and observations of current variables



that are likely to have an impact on future events. Such probabilities are unlikely to be estimated correctly, but any estimate of a future uncertain event is bound to be subject to error.

The advantage of this approach is that it provides more meaningful information than stating the most likely outcome.



Concept of Cost, Revenue, Profit and Responsibility Centres

Introduction:

A responsibility accounting system facilitates decentralization by providing information about the performance, efficiency, and effectiveness of organizational subunits and their managers. Responsibility accounting is the key management control tool in a decentralized organization.

The term 'responsibility accounting' refers to the accounting process that reports how well managers (of responsibility centres) have fulfilled their responsibility. It is a system that measures the plans (by budgets) and actions (by actual results) of each responsibility centre. Also known as activity or profitability accounting, it is an information system that personalizes control reports by accumulating and reporting cost and revenue information according to defined responsibility centres within a company. Responsibility accounting systems are tailored to the organizational structure so that revenue and costs are accumulated and reported by centres of responsibility within the organization.



Responsibility accounting is the system for collecting and reporting revenue and cost information by areas of responsibility. It operates on the premise that managers should be held responsible for their performance, the performance of their subordinates, and all activities within their responsibility center. Responsibility accounting, also called profitability accounting and activity accounting.

A responsibility accounting system produces responsibility reports that assist each successively higher level of management in evaluating the performances of subordinate managers and their respective organizational units. The reports should be tailored to fit the planning, controlling, and decision-making needs of subordinate managers and should include both monetary and nonmonetary information.

In the past, the major emphasis in organizational planning was on optimizing economic resources to achieve company objectives. However, in recent years the value of human resources has been recognized and become an important consideration in planning. In general, a company is organized along lines of responsibility. The traditional organizational chart, with its pyramid shape, illustrates the lines of responsibility flowing from the CEO down through the vice presidents to middle- and lower-level managers. It indicates, as organizations grow larger, these lines of responsibility become longer and more numerous. The structure becomes cumbersome. Contemporary practice is moving toward a flattened hierarchy. This structure—emphasizing teams—is consistent with decentralization. Organizing divisions as responsibility centers creates the opportunity to control



the divisions through the use of responsibility accounting. Revenue center control is achieved by evaluating the efficiency and the effectiveness of divisional managers on the basis of sales revenue.

Organizational planning may thus be defined as "the process of logically grouping activities, delegating authority and responsibility, and establishing working relationships that will enable both the company and the employee to realize their mutual objectives."

Responsibility accounting is the key management control tool in a decentralized organization.

A key task of the management accountant is to create accounting systems that ensure that costs are incurred in accordance with expectations. The best way to do so is through the concept of responsibility accounting, which is the assumption that every cost incurred must be the responsibility of one person somewhere in the company. For example, the cost of rent can be assigned to the person who negotiates and signs the lease, while the cost of an employee's salary is the responsibility of that person's direct manager. This concept also applies to the cost of products, for each component part has a standard cost (as listed in the item master and bill of materials), which it is the responsibility of the purchasing manager to obtain at the correct price. Similarly, scrap costs incurred at a machine are the responsibility of the shift manager.



By using this approach, cost reports can be tailored for each recipient. For example, the manager of a work cell will receive a financial statement that itemizes only the costs incurred by that specific cell, whereas the production manager will receive a different one that itemizes the costs of the entire production department, and the president will receive one that summarizes the results of the entire organization.

As one moves upward through the organizational structure, it is common to find fewer responsibility reports being used. For example, each person in a department may be placed in charge of a separate cost, and so each one receives a report that itemizes his or her performance in controlling that cost. However, when the more complex profit center approach is used, these costs are typically clumped together into the group of costs that can be directly associated with revenues from a specific product or product line, which therefore results in fewer profit centers than cost centers. Then, at the highest level of responsibility center, that of the Investment center, one must make investments that may cut across entire product lines, so that the investment center tends to be reported at a minimal level of an entire production facility. Thus, there is a natural consolidation in the number of responsibility reports generated by the accounting department as more complex forms of responsibility reporting are used.

**Information for Responsibility Reports****1. Monetary**

Monetary responsibility report are as follows

- Budgeted and actual revenues
- Budgeted and actual costs (computed on a comparable basis)
- Variance computations for revenues and costs
- Asset investment base

2. Non-monetary

- Capacity measures (theoretical and that used to compute predetermined overhead rates)
- Target rate of earnings on investment base
- Desired and actual market share
- Departmental or divisional throughput
- Number of defects (by product, product line, and supplier)
- Number of orders backlogged (by date, cost, and selling price)
- Number of customer complaints (by type and product); method of complaint resolution
- Percentage of orders delivered on time
- Manufacturing (or service) cycle efficiency
- Percentage of reduction of non-value-added time from previous reporting period (broken down by idle time, storage time, move time, and quality control time)



- Number and percentage of employee suggestions considered significant and practical
- Number and percentage of employee suggestions implemented
- Number of unplanned production interruptions
- Number of schedule changes
- Number of engineering change orders; percentage change from previous period
- Number of safety violations; percentage change from previous period
- Number of days of employee absences; percentage change from previous period

The principal approaches to arranging company activities are by (1) function, (2) product, and (3) geographic location.

Manager's responsibility report should reflect his or her degree of influence and should include only the revenues and/or costs under that manager's control.

Normally, some of an organizational unit's revenues or costs are not controllable (or are only partially or indirectly controllable) by the unit manager. In such instances, the responsibility accounting report should separately classify all reported monetary information as controllable or non-controllable by the manager. Alternatively, separate reports should be prepared for the organizational unit (showing all monetary amounts) and for the unit manager (showing only those monetary amounts under his or her control).



A responsibility accounting system helps organizational unit managers to conduct the five basic control functions:

- 1. Preparing a plan (e.g., using budgets and standards) and use it to communicate output expectations and delegate authority.*
 - 2. Gathering actual data classified in accordance with the activities and categories specified in the plan. The responsibility accounting system can be used to record and summarize data for each organizational unit.*
 - 3. Monitoring the differences between planned and actual data at scheduled intervals.*
- Responsibility reports for subordinate managers and their immediate supervisors normally include comparisons of actual results with flexible budget figures. In contrast, responsibility reports can provide comparisons of actual performance to the master budget.*
- 4. Exerting managerial influence in response to significant differences. Because of day-to-day contact with operations, unit managers should be aware of any significant variances before they are reported, identify the variance causes, and attempt to correct them. Top management, on the other hand, might not know about operational variances until it receives responsibility reports. By the time top management receives the reports, the problems causing the variances should have been corrected,*



or subordinate managers should have explanations as to why the problems were not or could not be resolved.

- 5. Continuing comparing data and responding; then, at the appropriate time, the process will begin again.*

Responsibility reports reflect the upward flow of information from operational units to company top management and illustrate the broadening scope of responsibility. Managers receive detailed information on the performance of their immediate areas of control and summary information on all organizational units for which they are responsible. Summarizing results causes a pyramiding of information. Reports at the lowest-level units are highly detailed, whereas more general information is reported to the top of the organization.

Upper-level managers desiring more detail than is provided in summary reports can obtain it by reviewing the responsibility reports prepared by their subordinates.

Each area's budget is presented for comparative purposes. Production department data are aggregated with data of the other departments under the production vice president's control.

Variances are itemized in performance reports at the lower levels so that the appropriate manager has the necessary details to take any required corrective action related to significant variances. Under the management-by-exception principle, major deviations from expectations are highlighted under the subordinate manager's



reporting section to assist upper-level managers in determining whether they need to become involved in subordinates' operations. In addition, such detailed variance analyses alert operating managers to items that require explanations for superiors.

Responsibility accounting creates some managerial issues. For instance, the "rolling up" (or aggregating) of information to each successively higher level allows potentially important details to be buried. If different units within the responsibility accounting system compete with each other for resources, managers could try to "promote their own agendas" by blaming other organizational units for problems. Alternatively, the competition could lead to a lack of goal congruence between or among organizational units. (Goal congruence exists when the personal and organizational goals of decision makers throughout the firm are consistent and mutually supportive.) Additionally, by partitioning each responsibility unit as a separate part of the report, interdependencies among units might be obscured.

In the functional approach, company activities and responsibilities are organized according to major functions, such as marketing, manufacturing, and finance. Generally, control for each function resides at the vice-president level. For example, the marketing employees report upward from the lowest operating level to the vice-president of the Marketing Division. An important disadvantage is that key decisions are made at the top and passed downward, which a time-consuming process is often.



Originally, most cost systems were established to determine product costs. The emphasis in responsibility accounting is on who spent the money and why it was spent, rather than on what the expense was. Thus we can define responsibility accounting as "a system designed to accumulate and report costs by individual levels of responsibility, each supervisory area is charged only with the cost for which it is responsible and over which it has control".

Assumptions of Responsibility Accounting

The responsibility accounting system makes the following important assumptions:

1. The areas of responsibility are defined for which managers should be held responsible.
2. Managers are only charged with the items and responsibility over which they can exercise a significant degree of direct control.
3. Managers should actively participate in establishing the goals or budgets against which their performance is measured.
4. Goals defined for each area of responsibility should be attainable with efficient and effective performance.
5. Control (performance) reports should contain significant information related to each area of responsibility.
6. Responsibility centre managers should try to accomplish the budgets and objectives established for their respective areas of responsibility.



The proper focus of a responsibility accounting system is information. The system should identify the individual in the organization who is in the best position to explain each particular event or financial result. The emphasis should be on providing that individual and higher-level managers with information to help them understand the reasons behind the organization's performance. When properly used, a responsibility accounting system does not emphasize blame. If managers feel they are beaten over the head with criticism and rebukes when unfavorable variances occur, they are unlikely to respond in a positive way. Instead, they will tend to undermine the system and view it with skepticism. But when the responsibility accounting system emphasizes its informational role, managers tend to react constructively, and strive for improved performance.

Managerial accountants often use the responsibility accounting system to motivate actions considered desirable by upper-level management. Sometimes the responsibility accounting system can solve behavioural problems as well.

Responsibility accounting is closely related with the goal of controllability. Controllability is the degree of influence that a specific manager has over costs, revenues, or other items in question.

Accordingly, in responsibility accounting, those elements in a certain area of activity are identified which are controllable and then a person is given the responsibility for managing such elements.



Responsibility accounting implies that individuals in an organization cannot be responsible for those items which they cannot control. They should also not claim any authority over those revenues which are not the result of their actions and performances. For instance, a foreman in a production department can be held responsible only for direct material and direct labour costs, because these are the costs which are controllable by him. On the other hand, divisional manager of the production division can be held accountable for all direct and indirect costs incurred in his division. Generally, those decisions makers who are placed higher in the authority hierarchy are held responsible for a greater number of activities and financial elements. In the long run, however, all costs are controllable by someone in the organization.

According to Horngreen, Datar and Foster, "Managers should avoid overemphasizing controllability. Responsibility accounting is more far-reaching.

It focuses on information and knowledge, not control. The key question is, who is the best informed? Put another way, who is the person who can tell us the most about the specific item in question regardless of that person's ability to exert personal control? For instance, purchasing managers may be held accountable for total purchase costs, not because of their ability to affect market prices, but because of their ability to predict uncontrollable prices and explain uncontrollable price changes—performance reports for responsibility centres also may include uncontrollable items because this approach could change behaviour in the direction top management desires. A cost centre manager may emphasize production efficiency and



deemphasize the pleas of sales personnel for faster service and rush orders. In a profit centre, the manager is responsible for both costs and revenues. Thus, even though the manager still has no control over sales personnel, the manager will now more likely weigh the impact of his or her decisions on costs and revenues, rather than solely on costs."

Advantages of Responsibility Accounting:

1. *It facilitates delegation of decision making.*
2. *It helps management promote the concept of management by objective. In management by objective, managers agree on a set of goals. The manager's performance is then evaluated based on his or her attainment of these goals.*
3. *It provides a guide to the evaluation of performance and helps to establish standards of performance which are then used for comparison purposes.*
4. *It permits effective use of the concept of management by exception, which means that the manager's attention is concentrated on the important deviations from standards and budgets.*

There should be a direct relationship between responsibility and authority. If an individual is answerable for his or her actions (responsible), that individual must have the authority to carry out actions and execute decisions. There is an undermining of a person's performance and incentive when authority is not given while the person is still held accountable.



There must be a clear chain of command. Individuals must know to whom they are responsible and for what tasks or jobs they are responsible. Ideally, each individual in the organization should have only one boss. If an individual has more than one boss, the tasks for which the individual is responsible to each boss should be defined.

Responsibility Centre

A responsibility centre may be defined as an area of responsibility which is controlled by an individual. A responsibility centre is an activity such as department over which a manager exercises responsibility. Responsibility areas may be departments (drilling or maintenance department), product lines (chemicals or fertilizers), territories (North or South) or any other type of identifiable unit or combination of units.

The specific types of responsibility areas depend on the nature of the firm and its activities. A plant manager is in charge of a plant and is usually responsible for producing budgeted quantities of specific products within budgeted cost limits. A sales manager is responsible for getting orders from customers, and so on. In most cases, it is relatively easy to identify activities with specific managers. However, in some cases it is not a simple task to isolate the responsibilities of managers.

It should be noted that effective planning and control systems are structured around the implicit or explicit areas of responsibility within the organization. Further, to be held accountable for performance, managers must have clearly defined areas of responsibility—activities they control.



When an entity is divided into segments with managers having responsibility over specific areas, the segmented areas are known as responsibility centers. Four types of responsibility centers are commonly identified:

- 1. Cost or Expense Center,*
- 2. Profit Center or Earnings Center, and*
- 3. Revenue Center*
- 4. Investment Center.*

1. Cost or Expense Center

The most elementary form of responsibility center is the cost center, which itemizes all of the expenses incurred to run a specified function, but ignores the cost of capital invested in it, as well as any associated revenues. The primary form of control in a cost center is against a fixed or semi variable budget that is determined at the beginning of the year. It is not common to see a variable budget being used in a cost center, since purely variable costs tend to be most closely associated with production, for which there are associated sales; this relationship means that variable budget costs are more commonly found in profit centers than in cost centers. Though this is a good start for a company that wants to implement controls over its expenditures, it suffers from one main flaw—those responsible for cost centers are concerned only with the tight control of costs, rather than other key company goals, such as customer service, creating new products, or acquiring new customers. This can lead to counterproductive behavior. For example, the manager of



the computer services department, which is operated as a cost center, is determined to avoid any cost overruns. The sales manager, who is trying to increase profits, asks that a customized report be created that lists the margins for each existing customer, so that the sales team will know which customers are the best ones to sell to. However, the computer services manager refuses this request, for it will result in extra costs that will exceed his budget. This problem occurs regularly when a company is structured into many cost centers, each of which looks out for its own self-interest.

A cost center is an organizational unit whose manager has the authority only to incur costs and is specifically evaluated on the basis of how well costs are controlled. Cost centers commonly include service and administrative departments. For example, a company's human resources and accounting departments could be considered cost centers because these units do not generate revenues or charge for services, but they do incur costs.

In the traditional manufacturing environment, the production department is the largest cost center. Managers of cost centers often concentrate only on the unfavorable standard cost variances and ignore the efficient performance indicated by favorable variances. However, significant favorable variances should not be disregarded if the management-by-exception principle is applied properly. Using this principle, top management should investigate all variances (both favorable and unfavorable) that fall outside the range of acceptable deviations.



This is a segment of the organization that has been assigned control over only the incurrence of expenses or costs. A cost or expense center has no control over sales or marketing activities.

For example, a department within a factory may be considered a cost or expense center if the manager is responsible only for controlling costs and has no responsibility over revenues.

In some instances, a cost center can generate revenues, but the revenues are either not under the manager's control or not effectively measurable. The first situation exists in a community library that is provided a specific proration of property tax but has no authority to levy or collect the related taxes. The second situation exists in cost centers, such as research and development centers, in which the outputs (revenues or benefits generated from the cost inputs) are not easily measured. In these situations, the revenues should not be included in the manager's responsibility accounting report.

2. Profit Center or Earnings Center

A profit center is an organizational unit whose manager is responsible for generating revenues and managing expenses related to current activity. Thus, profit centers should be independent organizational units whose managers have the ability to obtain resources at the most economical prices.

- *Sell products at prices that will maximize revenue.*
- *Have a goal of maximizing the center's profit.*



The profit center resolves many of the problems just noted for the cost and revenue center concepts by combining the two. The manager of a profit center is primarily responsible for generating the highest possible profit (or least possible loss). This results in a strong incentive to pursue only those sales that have a sufficient margin, while also incurring expenses only if they will result in an incremental increase in revenue.

Costs not under a profit center manager's control are those related to long-term investments in plant assets; as such, separate evaluations should be made for the subunit and its manager.

The profit center concept is highly recommended, since it results in the strongest possible management attention to profitability. However, there are some cases where it is difficult to convert a cost center to a profit center, because there is no way for it to gain revenues by directly selling its services. Examples of such cost centers are the computer services, engineering, and production departments. These groups are all involved in the production or support of products, but it can be difficult to attribute sales directly to them. One way around this problem is to have each department charge other departments for its services. A good example is the computer services function, where many organizations create a programming cost per hour that is charged to all other departments that request changes to computer programs; it is also common to charge for the processing time used by each department's programs, as well as the cost of report processing, generation, and distribution.



This segment of the organization is assigned control over both costs and revenues. Net income and contribution margins can therefore be computed for a profit center. For example, an entity that makes wood furniture may cut lumber in one department and assemble the furniture in another department. The first department can be considered a profit center if the cut lumber is "sold" to the second department. The selling price of this internal sale is called the transfer price and may be used as revenue for the first department.

3. Revenue Center

A revenue center is strictly defined as an organizational unit that is responsible for the generation of revenues and has no control over setting selling prices or budgeting costs. For instance, in many retail stores, each sales department is considered an independent unit and managers are evaluated based on their departments' total revenues. Departmental managers, however, might have no authority to adjust selling prices to affect volume, and often they do not participate in the budgeting process. Additionally, the departmental managers might have no ability to affect costs.

A revenue center is one where the employees located in a specific functional area are solely responsible for attaining preset revenue levels. The sales department is sometimes considered to be a revenue center. In this capacity, employees are essentially encouraged to obtain new sales without regard to the cost of obtaining them. This can be a dangerous way to run a function, unless strict guidelines are set up that control the overall spending limits allowed, the size and type of customer solicited, and the size and type of orders obtained. Otherwise, the sales staff will



obtain orders from all kinds of customers, including those with poor credit records or histories of returning goods, not to mention orders that are so small that the cost of processing the order exceeds the profit gained from the sale. Other counterproductive activities associated with revenue centers are the inordinate use of travel funds to meet with customers, selling products at large discounts from the standard price, offering special promotional guarantees to customers, allowing credits on previously purchased products if the price subsequently declines, and offering to extend payment terms. For all of these reasons, revenue centers are not recommended without the addition of stringent controls to ensure that the sales staff obtains only revenues that will result in adequate levels of profitability. In a revenue center, performance evaluations are limited because the manager has control over only one item: revenues. Actual performance in revenue centers (as well as in any other area that has revenue control) should be compared against budgeted performance to determine variances from expectations. Budgeted and actual revenues may differ because of either volume of units sold or price of units sold. To compare budgeted and actual revenues, the price and volume components of revenue must be distinguished from one another. The sales price variance is calculated by multiplying the actual number of units sold by the difference between actual and budgeted sales prices. This variance indicates the portion of the total revenue variance that is related to a change in selling price. The sales volume variance is calculated by multiplying the budgeted sales price by the difference between the actual and budgeted sales volumes.



4. Investment Center

An investment center is an organizational unit whose manager is responsible for managing revenues and current expenses. This center differs from a profit center in that it has control not only over revenues and costs but also over invested funds. If the manager of the lumber-cutting department also had control over how much was invested in the department, this segment would then be considered an investment center. In addition to net income and contribution margin, the return on investment can be computed for investment centers.

A step beyond the profit center in its level of sophistication is the investment center. This is the same as a profit center, but now the responsible manager is also held accountable for any investments in the business. This added responsibility means that one additional measure is added to the normal set of measures used for a profit center: return on investment. This measures the ability of a manager not only to generate a profit, but to also create one at a sufficiently high level to offset the cost of capital on any newly invested funds.

The investment center is particularly appropriate for those cases where investment decisions must be made very rapidly in order to take advantage of changes in local business conditions. This is a particularly important issue for those companies in rapidly expanding markets, or where consumer needs change rapidly, where waiting for investment approval from a central authority may result in lost sales.



In addition, the center's manager has the authority to acquire, use, and dispose of plant assets to earn the highest feasible rate of return on the center's asset base. Many investment centers are independent, free standing divisions or corporate subsidiaries. This independence gives investment center managers the opportunity to make decisions about all matters affecting their organizational units and to be judged on the outcomes of those decisions. Because of their closeness to daily divisional activities, investment center managers should have more current and detailed knowledge than top management has about sales prices, costs, and other market information.

After top management has delegated authority to lower-level responsibility center managers, the possibility exists that those managers will not act harmoniously to accomplish the organization's goals. Rather, each responsibility center manager may act to optimize only his or her own isolated performance and that of his or her responsibility center. Losing sight of the organizational goals while working to achieve an independent responsibility center's conflicting goal results in sub optimization or the pursuit of goals and objectives that are in the interests of individual managers and/or their segments rather than in the company's best interests.

A unique challenge for the design of responsibility centers arises from the instance in which one responsibility center supplies its outputs largely to other internal responsibility centers. In determining the responsibility classification of such an organizational unit, top management often makes judgments about the nature and



extent of the costs and revenues to include in those responsibility centers. Frequently, rather than attempting to make performance assessments about cost centers, management assigns the costs incurred in cost centers to operating areas through a process of support department cost allocation. Alternatively, management can attempt to "create" revenues for the cost center by using an internal transfer pricing system for the center's tangible or intangible output that is used by other company units.



Preparation of Responsibility Report

Responsibility performance reporting implies the reporting phase of responsibility accounting.

Responsibility reporting has two purposes:

- (i) To determine the degree of performance in the area of responsibility for which the responsibility manager is directly responsible.*
- (ii) To formulate measures to improve the performance of the responsibility centre manager.*

The responsibility reporting should be suitable and relevant with respect to content, frequency of reporting and level of details required. In order to provide relevant contents in the report, only those items that are controlled by the particular responsibility centre manager should be reported. Frequency of reporting and the quantum of details in the report can be decided in terms of requirements. Generally, in a production department of a manufacturing enterprise, detailed data on production, direct costs, and indirect costs needs to be gathered and reported to foreman quite frequently. However, the same data is reported to senior management in a summarized form and at less frequent intervals. The difference in the frequency of reporting in this situation is due to the fact that the foreman has direct responsibility whereas senior managers have overall responsibility for long-term



and strategic decisions. Usry and Hammer have mentioned the following as characteristics of responsibility reporting:

1. Reports should fit the organization chart, that is, the report should be addressed to the individual responsible for the items covered by it, who, in turn, will be able to control those costs under his jurisdiction. Managers must be educated to use the results of the reporting system.
2. Report should be prompt and timely. Prompt issuance of a report requires that cost records be organized so that information is available when it is needed.
3. Reports should be issued with regularity. Promptness and regularity are closely tied up with the mechanical aids used to assemble and issue reports.
4. Reports should be easy to understand. Often they contain accounting terminology that managers with little or no accounting training find difficult to understand, and vital information may be incorrectly communicated. Therefore, accounting terms should be explained or modified to fit the user. Top management should have some knowledge of the kind of items chargeable to an account as well as the methods used to compute overhead rates, make cost allocations and analyze variances.
5. Reports should convey sufficient but not excessive details. The amount and nature of the details depend largely on the management level receiving the report. Reports to management should neither be flooded with immaterial facts nor so condensed that management lacks vital information essential to carrying out its responsibilities.



6. Reports should give comparative figures, i.e., a comparison of actual with budgeted figures or of predetermined standards with actual results and the isolation of variances.
7. Reports should be analytical. Analysis of underlying papers, such as time tickets, scraps tickets, work orders, and materials requisitions, provide reasons for poor performance which might have been due to power failure, machine breakdown, an inefficient operator, poor quality of materials, or many other similar factors.
8. Reports for operating management should, if possible, be stated in physical units as well as in terms of money since monetary information may give a foreman not trained in the language of the accountant a certain amount of difficulty.
9. Reports may tend to highlight departmental efficiencies and inefficiencies, results achieved future goals or targets.

Responsibility reports help each successively higher level of management in evaluating the performances of subordinate managers and their respective organizational units. The reports should be tailored to fit the planning, controlling and decision making needs of subordinate managers and should include both monetary and nonmonetary information.



Responsibility Report for Cost Centres

(₹)

Manager	Actual Cost	Budgeted Cost	Variance
Sales Department	3,65,000	3,75,000	(+)10,000
Production Department	3,75,000	3,75,000	-
Office and Administration	1,10,000	1,15,000	(+) 5,000
Interest on loans	20,000	15,000	(-) 5,000
Total	8,70,000	8,80,000	(+)10,000

Manager	Actual Cost	Budgeted Cost	Variance
Mfg. section	94,000	96,000	(+) 2,000
Testing section	1,20,000	1,21,000	(+) 1,000
Assembly section	1,61,000	1,58,000	(-) 3,000
Total	3,75,000	3,75,000	-



Foreman (Manufacturing Division)	Actual Cost	Budgeted Cost	Variance
Direct materials	50,000	48,400	(-) 1,600
Direct labour	31,000	34,000	(+) 3,000
Indirect labour	12,000	12,000	-
Supplies	1,000	1,600	(+) 600
Total	94,000	96,000	(+) 2,000

Analysis: It is observed from the above that, each responsibility report contains items and information which are required by the concerned responsibility centre manager and which are within his responsibility area. Similarly, Responsibility Reports can also be prepared for other centres.

**QUESTION 1**

The processing department of a large company informs the marketing department that the price of processing 2,00,000 items will be ₹50,00,000. The marketing department submits the material for the item two weeks later than originally planned and tells the processing department that the scheduled date of completion has been advanced two weeks. In order to achieve the new schedule, the processing department incurs an additional production cost of ₹16,00,000.

- (i) In an organization using responsibility accounting, where would the additional costs be assigned? Would these costs be considered controllable costs? What effect might this have on future printing orders from the marketing department?
- (ii) In an organization that does not use responsibility accounting, where would the various costs be assigned? What effect might this have on future printing orders from the marketing department?

Solution 1:

- (i) In an organization using responsibility accounting, the originally quoted price of ₹50,00,000 plus the additional cost of ₹16,00,000 would be assigned to the marketing department. This would be considered a controllable cost. The long-range effect might be that the marketing department will become more costconscious and will plan activities better.



- (ii) In an organization that does not employ responsibility accounting, the additional production costs most probably would be assigned to the processing department. There would be no motivation by the marketing department to adhere to scheduled dates or to plan processing needs in a better fashion.

QUESTION 2

The receipt of raw materials used in the manufacture of products and the shipping of finished goods to customers are under the control of the warehouse supervisor. Approximately 60% of the warehouse supervisor's time is spent on receiving activities and 40% on shipping activities. Separate employees handle the receiving and shipping operations. The labour-related costs for the warehousing function are as follows:

Warehouse supervisor's salary	₹40,000
Receiving clerks' wages	₹75,000
Shipping clerks' wages	₹55,000
Employee benefit costs (30% of wage and salary costs)	<u>₹51,000</u>
	<u>₹2,21,000</u>

The company employs a responsibility accounting system for performance reporting purposes. The costs are classified on the report as period or product costs. You are required to state the total labour-related costs to list on the responsibility accounting performance report as product costs under the control of the warehouse supervisor for the warehousing function.

**Solution 2:**

This question focuses on product costs that are under the control of the warehouse supervisor. The supervisor controls both receiving and shipping, but shipping is a selling cost. Thus shipping is a period cost that is expensed in the period in which it is incurred, so shipping costs are not product costs. Therefore, the costs for the shipping department are not part of the answer, even though they are controllable by the warehouse supervisor. The supervisor's salary is not controlled by the supervisor, so that is not a part of the answer, either. The labour-related product costs that the supervisor can control include only the wages and benefits of the receiving department. The receiving clerks' wages are ₹75,000 and their benefits are 30% of this amount (₹22,500). Therefore, the supervisor controls ₹ 97,500 of costs (₹75,000 + ₹ 22,500).

**QUESTION 3**

The following information for R & Co. for the prior year:

- *The company produced 1,000 units and sold 900, both as budgeted.*
- *There were no beginning or ending work-in-process and no beginning finished goods inventory.*
- *Budgeted and actual fixed costs were equal, all variable manufacturing costs were affected by production volume only, and all selling variable costs were affected by sales volume only.*
- *Budgeted per unit revenues and costs were as follows:*

Sales price	₹100
Direct materials	₹30
Direct labour	₹20
Other variable manufacturing costs	₹10
Fixed manufacturing costs	₹5
Variable selling costs	₹12
Fixed selling costs (₹3,600 total)	₹4
Fixed administrative costs (₹1,800 total)	₹2

Calculate the contribution margin earned by R & Co. for the prior year

**Solution 3:**

Contribution margin is calculated as sales revenue minus the variable costs for the units sold. The sales price is ₹100 per unit and the variable costs total ₹72 per unit:

Direct Material - ₹30; Direct Labour - ₹20; other variable manufacturing costs - ₹10;

Variable selling costs - ₹12. Thus, contribution is ₹28 per unit ($₹100 - ₹72$). 900 units were sold, giving a contribution margin of ₹25,200.

QUESTION 4

The Hind Company allocates national magazine advertising cost to territories on the basis of circulation, which is determined by an index that measures relative buying power in the territories. Top management wants to know if this method of allocation gives appropriate cost and benefit figures to make the following decisions:

- (a) For deciding whether or not to close an unprofitable territory
- (b) For deciding whether or not a territorial manager has obtained sufficient sales volume
- (c) For determining how efficiently the territorial manager has operated the territory
- (d) For determining whether or not advertising costs are satisfactorily controlled

**Solution 4:**

The answers are as follows.

- (a) It is not appropriate for deciding to close the territory. Closing the territory will not change the amount of national advertising expenses. For deciding what action to take with respect to the territory, the segment margin (sales less variable expenses less direct territorial fixed expenses) should be compared with the amount of cost that can be saved by closing that territory. This will show whether or not the territory is making a contribution to costs that will continue regardless of the decision.
- (b) It may be appropriate for concluding that a territorial manager has obtained sufficient sales volume. National advertising is one of the general distribution costs to be allocated to territories if there is evidence of cause-and-effect relationships.
- (c) The method is not appropriate. A territorial manager should be judged on the basis of expenses that he or she has to control. By its nature, national advertising must be centrally controlled.
- (d) It is not appropriate to allocate national advertising costs to territories from a control standpoint. Control can be exercised only over the total expenditure for national advertising and at the source; control is not aided by allocating this total to territories.



The following concepts are highlighted in the contribution approach to cost allocation:

- Contribution margin - Sales less variable costs.
- Contribution controllable by segment managers - Contribution margin less direct fixed costs controllable by segment managers. Direct fixed costs include discretionary fixed costs such as certain advertising, research and development, sales promotion, and engineering.
- Segment margin - Contribution controllable by segment managers less fixed costs controllable by others. Fixed costs controllable by others include such traceable and committed fixed costs as depreciation, property taxes, insurance, and the segment managers' salaries.
- Net income - Segment margin less unallocated common fixed costs.

QUESTION 5

You have a client who operates a large retail self-service grocery store that has a full range of departments. Management has encountered difficulty in using accounting data as a basis for making decisions concerning possible changes in departments operated, products, marketing methods, and so forth. List several overhead costs, or costs not applicable to a particular department, and explain how the existence of such costs (sometimes called common costs or joint costs) complicates and limits the use of accounting data in making decisions in such a store.



Solution 5:

There are many examples of "common" costs to the sales department of a self-service grocery store. Some are rent, supervision, trucking, and advertising.

Common costs are usually apportioned on various arbitrary bases to the sales departments, but for numerous managerial decisions such apportionments produce misleading results. Decisions as to discounting a department, adding a department, enlarging a department, or decreasing a department cannot be made based on the data produced from the apportionments. For example, if a department is discontinued because it appears to be unprofitable, it may be determined that the costs of other departments will increase as a result of having to absorb more of the shared common costs. Thus, the overall operating results will be less favorable if the "unprofitable" department is discontinued.

QUESTION 6

The monthly service charge a bank makes on a customer's checking account is based on the cost of handling each account. A customer disagrees with this policy because she cannot see how it is possible to determine the exact cost of handling her account. Do you agree with the customer? Discuss fully the problems involved in determining cost for such a service, including the limitations of the cost figures obtained.

**Solution 6:**

This is a problem involving fixed and common costs. Within considerable limits, the cost of operating a bank would not change because of the addition of new accounts or the loss of old ones. The depreciation and other costs associated with the bank building, fixtures and equipment, salaries of officers, and other such items are fixed costs of operation within very wide limits. There would have to be a considerable change in the number of accounts before there would be any noticeable impact on those fixed costs. There is also a question of joint use of facilities among the various phases of bank operations. For example, the vault houses not only the files of commercial accounts, but also the savings account records, collateral on loans, coins and bills, and many other types of property and records. Unless the bank is large and the work highly specialized, a teller will handle a good many types of operations during a working day. A given official may make loans, open new accounts, advise customers as to investments, and so on. It would be extremely difficult to assign many of such operating expenses to any particular type of operation, let alone any account.

The problem of determining a reasonable and useful cost for handling an account involves obtaining data related to costs of functions and number of transactions handled, so that the direct or semi direct costs may be determined. The average labour cost per transaction for tellers and for transit, clearings, and bookkeeping functions can be obtained with considerable accuracy. Then it becomes necessary to allocate costs of all other necessary functions to these and other principal banking



operations. Like all allocations of fixed or indirect overhead, the allocations will be arbitrary, but they can be made in a reasonable and logical manner by using appropriate bases.

While the costs obtained from such an accounting procedure may be useful for setting service charges, it must be recognized that they do have one important limitation. They are average costs and not "differential costs." Therefore, they have limited usefulness for certain types of management decisions relating to expansion or contraction of services or changes in operations.

QUESTION 7

Consider each of the following scenarios:

- i. Mr. P K. Dhawan, plant manager for the laser printer factory of Bharat Co. brushed his hair back and sighed. December had been a bad month; two machines had broken down, and some direct labourers (all on salary) were idled for part of the month. Materials prices increased, and insurance premiums on the factory increased. No way out of it — costs were going up. He hoped that the marketing VP would be able to push through some price increases, but that really wasn't his department.*
- ii. Ms. Sonam Kapoor was delighted to see that her ROI figures had increased for the third straight year. She was sure that her campaign to lower costs and use machinery more efficiently (enabling her factories to sell several older machines) was the reason why she planned to take full credit for the*



Improvements at her semiannual performance review. For each of the above independent scenarios, indicate the type of responsibility center involved (cost, revenue, profit, or investment).

Solution 7:

(i) Cost center — Total cost

(ii) Profit center — Operating Income

Hint: For explanation of the same, please read the relevant portion of the Study Module.

INDEX

SR. NO.	CHAPTER	PAGE NUMBER
1	MARGINAL COSTING	1-21
2	STANDARD COSTING	22-53
3	BUDGET & BUDGETARY COSTING	54-57



BB-1

BLOCK NO 1: What is absorption costing and**Marginal costing.**

According to Absorption costing, we consider both variable cost and fixed cost while taking decision.

According to Marginal costing techniques, only variable cost is considered while taking decision. i.e. Fixed cost is not considered while taking decision.

Eg: A company produces product A.

Normal Production capacity = 2,00,000 units

Actual Production = 2,00,000 units

Max Production Capacity = 2,30,000 units.

Total fixed cost = 20,00,000

Variable cost p.u. = ₹6

Selling Price p.u. = ₹25

Now suppose this company gets an offer to sell Mr. Lalla 20,000 units @

₹11 p.u. Should company accept the offer?

Solution: F. cost p. u.

$$= \frac{₹20,00,000}{2,00,000 \text{ units}} = ₹10 \text{ p.u.}$$

$$+ \text{V. C. p.u.} = ₹6 \text{ p.u.}$$



BB-2

$$\therefore \text{Total cost p.u.} = ₹16 \text{ p.u.}$$

As per Absorption costing techniques, offer should not be accepted because offered selling price p.u. (₹11) is less than cost p.u. (₹16).

As per Marginal costing only variable cost. (₹6 p.u.) shall be incurred in producing addition 20,000 units to Mr. Lalla offered selling price p.u. is ₹11 is more than variable cost p.u. (₹6). Hence it provides benefit of ₹5 p.u. Therefore offer should be accepted.

NOTE: Fixed cost is not considered in decision making as per Marginal costing technique but FC is reduced to calculate Profit.

BLOCK NO 2: Meaning of contribution.

Under Marginal costing Excess of Selling Price p.u. over variable cost p.u. is called as contribution.

$$\text{Contribution p.u.} = \text{Selling price p.u.} - \text{variable cost p.u.}$$

$$\text{Total contribution} = \text{Total sales value} - \text{Total variable cost}$$

In layman language, contribution means profit before reducing fixed cost.

BLOCK NO 3: Derivations of other formulas of total contribution.

We know that,

$$\text{Total Sales} - \text{Total variable cost} - \text{Total fixed cost} = \text{Total profit}$$

$$\text{Total Contribution} = \text{Total fixed cost} - \text{Total loss}$$

In case of loss:

$$\text{Total Contribution} = \text{Total fixed cost} - \text{Total loss}$$

BLOCK NO 4: Marginal cost equation.

Particulars	Amt ₹
Sales	xxx
(-) Variable cost	(xx)
Contribution	xx
(-) Fixed cost	(xx)
Profit	xx



BLOCK NO 5:

$$\text{Contribution to sales ratio} = \frac{\text{Total contribution}}{\text{Total sales}} \times 100$$

OR

$$= \frac{\text{Contribution p.u.}}{\text{selling price p.u.}} \times 100$$

Contribution to sales ratio is always expressed in %.

It is also called as, "PROFIT VOLUME RATIO" (P/V Ratio)

CONTRIBUTION TO SALES RATIO.

(FC ignored)
 Profit → Sales value/ volume
 i.e. why P/V Ratio.

BLOCK NO 6: Break - Even point

BEP is that level of sales at which company earns 'no Profit no loss'

BEP Sales are expressed in units or in value.

We know that,

$$\text{Total sales} - \text{Total variable cost} - \text{Total fixed cost} = \text{Total profit}$$





At BEP,

Total Profit is Zero,

$$\text{units} \times \text{s.p.p.u.} - \text{units} \times \text{v.c.p.u.} - \text{Total FC} = 0$$

$$\text{Units (s.p.p.u. - v.c.p.u.)} = \text{Total FC}$$

$$\text{Units} \times \text{contribution p.u.} = \text{Total FC}$$

$$\text{Unit is (at which profit is zero)} = \frac{\text{Total FC}}{\text{contribution p.u.}}$$

$$\text{BEP Sales (units)} = \frac{\text{Total FC}}{\text{Contribution p.u.}} \quad (\text{Formula 1})$$

On multiplying both sides by s.p.p.u.

$$\text{BEP sales} \times \text{s.p.p.u.} = \frac{\text{Total FC}}{\text{Contribution p.u.}} \times \text{s.p.p.u.}$$

$$\text{BEP sales (in ₹)} = \frac{\text{Total FC}}{\frac{\text{Contribution p.u.}}{\text{s.p.p.u.}}}$$

$$\text{BEP sales (in ₹)} = \frac{\text{Total FC}}{\text{P/V Ratio}} \quad (\text{Formula 2})$$

BLOCK NO 7 : Calculation of PV Ratio using BEP Sales (in ₹)

$$\text{P/V ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100$$

$$= \frac{\text{FC} + \text{Profit}}{\text{Sales}} \times 100$$

At BEP → profit will be zero.



$$\text{P/V Ratio} = \frac{\text{FC}}{\text{BEP Sales}} \times 100$$

BLOCK NO 8: calculation of P/V Ratio when Profit & sales

(₹) of 2 periods are given.

$$\text{P/V Ratio} = \frac{\text{Difference in profit}}{\text{Difference in Sales}} \times 100$$

Derivation:

	Period 1	Period 2
Sales(₹)	S1	S2
Profit(₹)	P1	P2
F. Cost(₹)	F	F
	Same	

We know that,

$$\text{Contribution} = \text{FC} + \text{Profit}$$

We also know that,

$$\text{P/V ratio} = \frac{\text{Contribution}}{\text{Sales}}$$

$$\therefore \text{Contribution} = \text{Sales} \times \text{p/v ratio}$$

$$\therefore \text{Sales} \times \text{P/V ratio} = \text{FC} + \text{Profit}$$

Period 1:

$$S1 \times P/V \text{ Ratio} = F + P1 \quad \dots\dots\dots(1)$$

Period 2:

$$S2 \times P/V \text{ ratio} = F + P2 \quad \dots\dots\dots(2)$$

On reducing equation (1) from equation (2):

$$S2 \times P/V \text{ Ratio} - S1 \times P/V \text{ Ratio} = (F + P2) - (F + P1)$$

$$P/V \text{ Ratio} = S2 - S1$$

$$P/V \text{ Ratio} = \frac{P2 - P1}{S2 - S1}$$

$$\therefore P/V \text{ Ratio} = \frac{\text{Difference in profit}}{\text{Difference in sales}} \times 100$$

BLOCK NO 9: Margin of safety sales.

MOS Sales means Sales which generates Profit.

$$\text{MOS Sales (₹)} = \text{Total Sales (₹)} - \text{Total BEP Sales (₹)}$$

Particulars	Amt(₹)
Sales	xxx
(-) Variable cost	(xx)
Contribution	xx
(-) Fixed cost	(xx)
Profit	0

All FC of full year is recovered in BEP sales. It means FC shall not be there in MOS sales.

Now, MOS Sales xxx

(-) Variable cost (xx)

Contribution xx

(-) Fixed cost 0

Profit xx

i.e Contribution is profit.

In MOS Sales,

$$\text{Contribution p.u.} = \text{Profit p.u.}$$

OR

$$\text{Total contribution} = \text{Total profit}$$

$$\text{MOS sales (Units)} = \frac{\text{Total profit}}{\text{Profit p.u.}} = \frac{\text{Total profit}}{\text{Contribution p.u.}} \quad (\text{Formula 1})$$

On multiplying both sides by selling price p.u.

$$\text{MOS sales (units)} \times \text{s.p.p.u.} = \frac{\text{Total profit}}{\text{contribution p.u.}} \times \text{s.p.p.u.}$$

$$\text{MOS sales (₹)} = \frac{\text{Total profit}}{\frac{\text{contribution p.u.}}{\text{s.p.p.u.}}} = \frac{\text{Total Profit}}{P/V \text{ Ratio}} \quad (\text{Formula 2})$$

BLOCK NO 10 : Bep Sales Ratio & MOS Sales Ratio

We know that;

$$\text{Total sales (₹)} = \text{BEP sales (₹)} + \text{MOS sales (₹)}$$

On dividing both the sides, by total sales and multiplying both the sides by

100,

$$\frac{\text{Total sales}}{\text{Total sales}} \times 100 = \frac{\text{BEP sales}}{\text{Total sales}} \times 100 + \frac{\text{MOS sales}}{\text{Total sales}} \times 100$$

$$100\% = \text{BEP sales ratio (\%)} + \text{MOS sales ratio (\%)}$$

BLOCK NO 11: Variable cost to sales.

$$\text{Variable cost to sales ratio} = \frac{\text{variable cost}}{\text{sales}} \times 100$$

Example: If variable cost to Sales Ratio is 65%. It means company shall

Incur variable cost of ₹65 on making sales of ₹100.

BLOCK NO 12: Relation between P/V ratio and variable cost to sales ratio.

We know that,

$$\text{Contribution} = \text{Sales} - \text{variable cost}$$

On dividing both sides by sales and multiplying by 100.

$$\frac{\text{contribution}}{\text{Sales}} \times 100 = \frac{\text{sales}}{\text{sales}} \times 100 - \frac{\text{variable cost}}{\text{sales}} \times 100$$

$$\text{P/V ratio} = 100\% - \text{Variable cost to sales ratio (\%)}$$

$$\text{P/V ratio} + \text{Variable cost to sales ratio (\%)} = 100\%$$

BLOCK NO 13: Calculations of sales level to earn desired profit.

$$\text{Desired level of sales (units)} = \text{BEP sales (units)} + \text{MOS sales in (units)}$$

$$= \frac{\text{FC}}{\text{contribution p.u.}} + \frac{\text{Total profit}}{\text{contribution p.u.}}$$

$$\therefore \text{Desired level of sales (units)} = \frac{\text{FC} + \text{profit}}{\text{contribution p.u.}}$$

$$\text{Desired level of sales (₹)} = \text{BEP sales (₹)} + \text{MOS sales (₹)}$$

$$= \frac{\text{FC}}{\text{P/V ratio}} + \frac{\text{Total profit}}{\text{contribution p.u.}}$$

$$\therefore \text{Desired level of sales (₹)} = \frac{\text{FC} + \text{profit}}{\text{P/V ratio}}$$

BLOCK NO 14: Cost Indifferent point (Cost BEP)

It is that level of production at which total production cost (fixed and

variable) under labour intensive method and capital intensive method is same.

Total cost under 1st method = Total cost under 2nd method

$FC1 + VC1 \times \text{units produced} = FC2 + VC2 \times \text{units produced}$

$VC1 \times \text{units produced} - VC2 \times \text{units produced} = FC2 - FC1$

$\text{Units produced} \times (VC1 - VC2) = FC2 - FC1$

$\text{Units produced} = \frac{FC2 - FC1}{VC1 - VC2}$

BB-14

$\therefore \text{cost (BEP) (units)} = \frac{\text{Difference in total fixed cost}}{\text{Difference in variable cost p.u.}}$

Note 1: Under labor intensive method

Low total fixed cost since machines are less more VC p.u.

Note 2: Under capital intensive method

High total fixed cost and low variable cost p.u.

Decision about Selection of Production Method:

1. If Actual Production (units) / units to be Produced is equal to cost BEP units then any method can be selected.

2. If units to be produced is more than cost BEP units then method having low V.C. p.u. is to be selected (i.e capital Intensive method).

OR

low variable cost to Sales Ratio shall be selected.

3. If units to be produced is less than cost BEP then method having more variable cost p.u. shall be selected (i.e labour intensive method) Or more variable cost to Sale Ratio Shall be selected.

Note:

Actual Production will be low if demand in low and vice versa

BLOCK NO 15: Merger of two departments or two companies.

If Management of 2 companies decides to Merge both companies then merged Company desires to know following things:

Eg: A ltd + B ltd = AB ltd.

1. P/v Ratio

2. BEP sales (in ₹)

3. Desired Sales (in ₹)

4. Capacity utilization at BEP Sales (₹)

Step 1: Make Marginal cost Equation of both companies at 100% Capacity Level.

Step 2: Add all figures to calculate sales, Variable cost, FC and

BB-15



contribution of Merged company.

$$P/V \text{ ratio of Merged company} = \frac{\text{Total contribution of both Co.}}{\text{Total sales of both Co.}} \times 100$$

$$\text{BEP sales (₹) of merged company} = \frac{\text{Total fixed cost of both Co.}}{P/V \text{ ratio of merged Co.}}$$

$$\begin{aligned} \text{Desired sales of merged co. to earn desired profit} &= \\ &= \frac{\text{Total FC of both Co.} + \text{Desired profit}}{P/V \text{ ratio of merged company}} \end{aligned}$$

Capacity utilization of merged co. to achieve BEP sales =

$$= \frac{\text{Total BEP of both Co.}}{\text{Total sales of both Co.}} \times 100$$

Capacity utilization of merged co. to achieve desired sales =

$$= \frac{\text{Total desired sales}}{\text{Total sales of both Co.}} \times 100$$

BLOCK NO 16 : Cash BEP Sales

$$\text{BEP sales (units)} = \frac{FC}{\text{contribution p.u.}}$$

$$\text{BEP sales (₹)} = \frac{FC}{P/V \text{ Ratio}}$$

BB-16



Example of TFC : 1. Rent of factory = ₹20,00,000

2. Dep. of machine = ₹10,00,000

₹30,00,000

While calculating cash BEP sales we will consider only cash FC i.e we shall ignore non cash FC.

$$\text{Cash BEP (units)} = \frac{\text{Cash FC}}{\text{Contribution p.u.}}$$

$$\text{Cash BEP (₹)} = \frac{\text{Cash FC}}{P/V \text{ ratio}}$$

BLOCK NO 17: Cash of BEP sales when one co.

is selling multiple products.

A company normally sells more than one product and contribution of each product and is different but FC is common for all the products. Then co. is required to calculate BEP Sales (units) separately for each product.

Sometime company also desires to calculate BEP Sales (units) together for all the Product.

BB-17



BLOCK NO 18 : Shut Down Point.

If a company is earning loss in one or more product then company has to take decision whether to produce that product or not. To Take this decision We divide FC into two categories.

BB-18

1. Avoidable FC:

FC which will not incur if Product is not manufactured.

eg: Salary of manager.

2. Un Avoidable FC:

It is that FC which will continue to incur even if Product is not Manufactured.

Eg:

Factory	
Department 1 ↓ Product X	Department 2 ↓ Product Y

BB-18

Rent - ₹ 7,00,000 (Un avoidable fixed cost)

Manager - ₹ 18,000 p.m. (Avoidable fixed cost)

$$\text{SDP Sales (units)} = \frac{\text{Avoidable FC}}{\text{Contribution p.u.}}$$



$$\text{SDP Sales (in ₹)} = \frac{\text{Avoidable FC}}{\text{P/V ratio}}$$

Note 1: Avoidable FC = Total FC - Unavoidable FC

Rules to take decision:

1. If Actual sales of Product is equal to or more than SDP sales then it is better to continue Production.
2. If Actual sales of product is less than SDP sales then it is better to shutdown (stop) the production.

BLOCK NO 19 : Calculation of BEP sales in case co.

Is having range type FC.

Eg: If FC is ₹ 2000 in producing every next 50 units then it shall be called as range - type FC.

BB-19

Particulars	FC(₹)
i.e. 1 - 100 units	4000
101 - 200 units	8000
201 - 300 units	12000

In case we have Range type FC we will calculate BEP Sales for each Range.

If calculated BEP Sales (units) falls within its Range then it shall be valid





BEP Sales (units) otherwise it shall be invalid BEP sales (units).

BLOCK NO 20 : Cost sheet based question.

We will use cost sheet to calculation answer in same question.

BB-20

BLOCK NO 21 : Calculation of income under absorption costing and marginal costing.

Absorption costing technique is used to calculate cost per unit of item

Manufactured.

While Marginal costing Technique is used to take future decision.

Eg: launching of new Products,

Calculation of future BEP sales (₹), etc.

In absorption costing technique, cost of stock is calculated based on variable manufactured cost and fixed Production cost.

while under Marginal costing Technique, cost of stock is calculated based on variable manufacture cost only.

BB-21



Note 1 : Variable manuf. cost = DMC + DLC + D Exp. + Variable Prod. OH

Due to difference in calculation of cost of stocks under absorption costing and Marginal costing, income calculated using both methods is different.

Note 2 : Under absorption OH and over absorbed OH will arise only in absorption costing technique.

Income statement under absorption costing

BB-21

Particulars	Amount
DMC (var.)	xx
DLC (var.)	xx
D. Exp(var.)	xx
Variable factory OH (var.)	xx
Fixed factory OH (absorbed amt ₹) (units produced x Standard OAR)	xx
Total mfd. cost of quantity produced	xx
(+) Op. Stock of FG	xx
(-) Cl. Stock of FG	(xx)
Total Mfd. Cost of units sold	xx
Add: Var. admin OH	xx
Fix admin OH	xx
Var. S & D OH	xx

10



Profit under absorption costing.

DCP Approach :

Rule 1: We will always start with income as per marginal costing technique.

1. Debit item + Excess in cost = Plus

(op stock) + (Marginal cost) = Plus

2. Credit item + excess in cost = Minus

(Cl. stock) (Marginal cost)

3. Dr. Item(Op. stock)+ excess in absorption Cost = Minus

4. Cr. Item(Cl. stock)+ excess in absorption Cost = Plus



7. STANDARD COSTING

BB

Basic Things-

Full chapter contains discussion over 'should be' and 'Actual happened'

Variance means comparison of Actual and Standard And their Difference

Variance may be favorable (F) or Unfavorable / Adverse (A)

We will study 5 types of Variance

1. Material Variance
2. Labour Variance
3. Overhead variance
4. Sales Variance
5. Profit Variance

Actual cost if more than standard Cost then it is

AC . Cost > Std. Cost -Adverse

AC . Cost < Std. Cost - favorable

Actual Sales and Profit if more than Standard Sales and Profit

then favorable variance and vice versa

AC . Sales > Std. Sales - favorable

AC . Sales < Std. sales -Adverse

Khushi → favorable Variance

Dukh → Adverse Variance

Best example to understand terms to be used under this chapter.

BB

Eg. A student decides to study Accountancy subject





for 10 hours in a day.

[Budgeted Input =10 hours]

It is expected that one question of Accountancy can be completed in one hour.

[Budgeted Input for 1 unit of output = 1 hour]

During a particular day, the student actual studied for 12 hours.

[Actual Input = 12 hours]

And student completed 4 questions.

[Actual output = 4 questions]

Conclusion:

1. In 10 hours, the student must solve 10 questions.

[Budgeted Output =10 question or Budgeted output in budgeted input=10 questions]

Budgeted output in budgeted input =

$\frac{10 \text{ hours}}{1 \text{ hr for 1 question}} = \frac{\text{Budgeted I/P}}{\text{Bud I/P for 1 unit of O/P}}$

2. In 12 hours, the student must solve 12 question.

[Budgeted O/P in actual I/P =12 questions]

Budgeted O/P in actual I/P

$\frac{12 \text{ hours}}{1 \text{ hr for 1 question}} = \frac{\text{Total actual I/P}}{\text{Bud I/P for 1 unit of O/P}}$

3. The student solved 4 questions which should have been completed in 4 hours.

[Bud. I/P for Actual O/P =4 hours] or [Std. I/P for Actual O/P=4 hours]

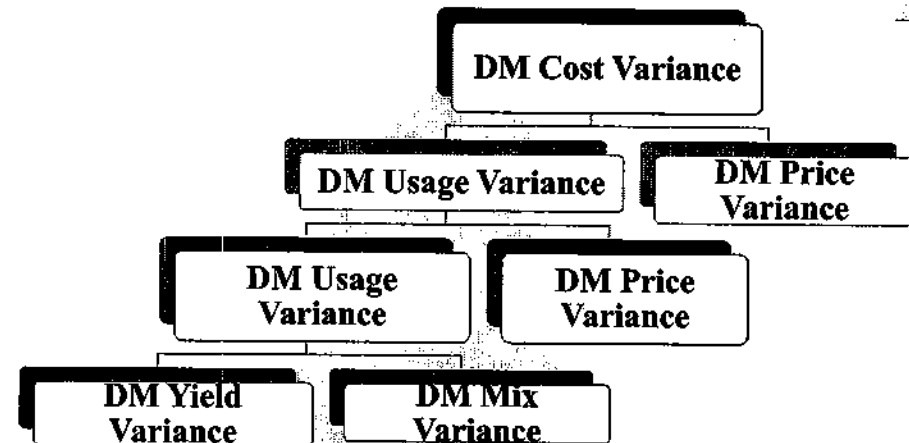
Bud. I/P for Actual O/P = 4 questions x 1 hour



for 1 question

=Actual O/P x Budgeted I/P for 1 unit of output

BLOCK NO 1: Direct Material Variance



Eg: Order (Actual Output)

→ Std DM = 20 kg x Rs. 3 = Rs. 60

→ Actual =22 kg x Rs. 4 =88

DM Cost Variance = 60-88 =28 (A)

1) DM Cost variance : It is difference between Std. DMC & actual DMC

Formula : DMVC = Std. DMC - Actual DMC

= Std. quantity for actual output x Std. Price of material

- Actual quantity x Actual Price of material

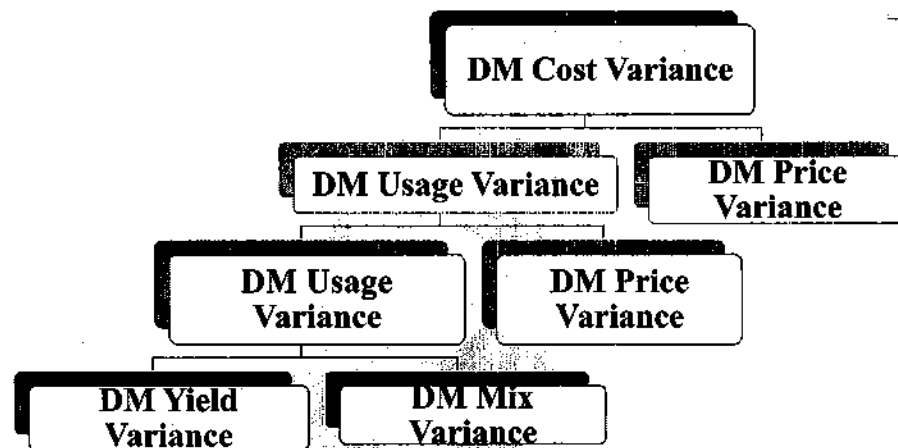
Eg: 12/P unit = 2kg Material

Actual Output (22 Units)

for 1 question

= Actual O/P x Budgeted I/P for 1 unit of output

BLOCK NO 1: Direct Material Variance



Eg: Order (Actual Output)

→ Std DM = 20 kg x Rs. 3 = Rs. 60

→ Actual = 22 kg x Rs. 4 = 88

DM Cost Variance = 60 - 88 = 28 (A)

1) DM Cost variance : It is difference between Std. DMC & actual DMC

Formula : DMVC = Std. DMC - Actual DMC

= Std. quantity for actual output x Std. Price of material

- Actual quantity x Actual Price of material

Eg: 12/P unit = 2kg Material

Actual Output (22 Units)

Std. I/P 22 unit x 2 kg = 44 kg
Std. Qnty for Actual Output = 44 kg

Actual I/P = 50
Actual O/P = 50 kg

Actual Qnty for

2. DM Usage Variance : It is a difference in Budgeted DMC & actual DMC

due to difference in budgeted material to be consumed & actual material

consumed. It is responsibility of Production Manager.

For eg: SQAO=12kg AQAO=15kg SP=4 AP=6

Formula:

[Std. Qnty for actual output - Actual quantity for actual output]

X Std. Price of Material

= (12 kg - 15 kg) x Rs. 2 = Rs. 6 (A)

3) DM Price Variance : It is difference between Std. direct material cost &

actual DMC due to diff between Std. price of material & actual price of

material. Purchase manager is responsible for DMPV.

Formula : (Std Price of material - Actual Price of Material) x Actual Qnty

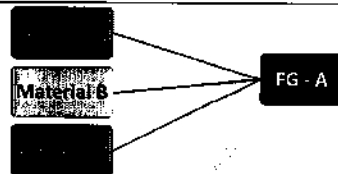
= (4 - 6) x 12 kg = Rs. 24

Verification Point :

1) DMCV = DMUV + DMPV

$$2) \text{ DMUV} = \text{DMYV} + \text{DMMV}$$

4) Direct Material Yield Variance & Direct Material Mix Variance:



Std. Material Mix Ratio

1 Plastic Body + 1 Refill = 1 Pen (Blue)

1 Plastic body + 1 Refill = 1 Pen (Red)

1:1

But (1:2)

1 Plastic body + 2 refill = 1 Pen (Blue & Red)

DMYV and DMMV shall arise when:

Condition 1: When material is of 2 types or more

AND

Condition 2: Std. Mat. Mix Ratio is not followed.

$$\text{DMUV} = \text{DMYV} + \text{DMMV}$$

It means Production manager is responsible for DMYV and DMMV.

DMMV shall arise when there is difference between Revised Std. Qnty and Actual Qnty.

Eg: RM A&B (1:1) Total RM
used A 10 kg B 20 kg

Actual Quantity 30 kg

Revised Std Qty - 15 kg
10 kg 5kg

But Actual A

15 kg

B 20 kg -5kg

30kg

Box No. 1: Calculation of Material Variance

Some Terms :

SP=Std. Price of Material

AP= Actual Price of material

AQ=Actual Quantity (RM) for Actual output

RSQ=Revised Std. Quantity

SQAO=Std. Quantity for Actual output

Particulars	SP x SQAO	SP x RSQ	SP x AQ	AP x AQ
Mat A	Xx	xx	xx	Xx
Mat B	Xx	xx	xx	Xx
Total	Xxx	xxx	xxx	xxx
	M1	M2	M3	M4

D.M.

D.M.

D.M.



Yield var.
price var.

mix var.

D.M. Usage var.

D.M. Cost Var.

$$D M \text{ Cost Variance} = M_1 - M_4$$

$$D M \text{ Usage Variance} = M_1 - M_3$$

$$D M \text{ Price Variance} = M_3 - M_4$$

$$D M \text{ Yield Variance} = M_1 - M_2$$

$$D M \text{ Mix Variance} = M_2 - M_3$$

RSQ = We will divide total actual quantity in
Std. material Mix Ratio.

SQAO = Std. Qty for Actual Output

= Actual O/P x Budgeted I/P for one
unit of O/P

$$= \text{Actual O/P} \times \frac{\text{Total bud. material (kg)}}{\text{Total bud. output}}$$

Block No - 2 Calculation of DMPV at the time of Purchase.

DMPV is calculated for AQ consumed.

If AQ consumed is replaced by AQ purchased then
result is known as

Direct Material Price Variance at the time of
Purchase.

$$\therefore DMPV = M_3 - M_4$$

$$= SP \times AQ - AP \times AQ$$

$$= (SP - AP) \times AQ$$

i.e (SP-AP) x Actual Quantity Purchased

Block no. 3: Alternative Method to Calculate DMV

DMV : Yield is difference between actual output
& Std. O/P in actual I/P

It is multiplied with p.u Std Cost of O/P

Formula = [Actual O/P - Std. O/P in actual I/P] x Std.
Material Cost p.u of "output"

$$= \left[\text{Actual O/P} - \frac{\text{Actual I/P}}{\text{Budgeted I/P for 1 unit of O/P}} \right] \times \frac{\text{Total Std. mat. cost}}{\text{Total actual output}}$$

$$= \left[\text{Actual O/P} - \frac{\text{Actual I/P}}{\text{Budgeted I/P for 1 unit of O/P}} \right] \times \frac{M_1}{\text{Total actual output}}$$

Block No. 4 Direct Labour Variances

Direct Labour Variances are calculated in 2
cases



Direct Labour Variances are calculated in 2 cases

Case 1: When workers do not sit idle

i.e without "abnormal" idle time

Case 2: When workers have to sit idle

i.e. with "abnormal" idle time

Case 1: Calculation of Direct Labour Variances (without abnormal idle time)

Actual hours paid (AHP) = Actual hours worked (AHW)

For Material Price Variance:

Price
Quantity

SP AP
AQ RSQ SQAQ

For Labour Variance:

Price
Hours

SR AR
AH RSH SHAO

SR = Std. Rate of Wages
AR = Actual Rate of Wages
AH = Actual Hours
RSH = Revised Std. hours
SHAO = Std. hrs for Actual Output

BB-4

Direct Labour Cost Variance

Direct Labour Efficiency Variance

Direct Labour Rate Variance

Direct Labour Yield Variance

Direct Labour Mix Variance

Direct Labour Mix Variance

Verification :

1. DLCV = DLEV + DLRV
2. DLEV = DLYV + DLMV

BB-4

1. DLCV: It is diff between Std. DLC and actual DLC for actual O/P

Formula : Std. DLC for actual O/P - Actual DLC for actual O/P

= SHAO x SR - Actual hours X Actual rate

2. DLEV : It is difference between budgeted DLC (std. DLC) and actual DLC

due to difference between budgeted Lab. Hours and actual labour hours.

[SHAO-AH] x SR

3. DLRV: It is difference between the budgeted DLC and actual DLC due to difference std. rate of wages and actual rate of wages.

[SR-AH] x AH

4. DLYV and DLMV : These variance are part of



DLEV. These variance shall arise when:

- Condition 1: There are 2 or more type of Labour ,
And
Condition 2: Std. Lab. Mix Ratio is not followed

BB-4

Box No. 2: Calculation of DIRECT LABOUR Variance .

(with out abnormal time)

Particulars				
Skilled	XX	XX	XX	XX
Semi skilled	XX	XX	XX	XX
Unskilled	XX	XX	XX	XX
Total	XXX	XXX	XXX	XXX
	L1	L2	L3	L4

D.L. D.L.

Yield var. Rate var. mix var.

D.M. Efficiency var.

D.L. Cost Var.

$$D L \text{ Cost Variance} = L_1 - L_4$$

$$D L \text{ Efficiency Variance} = L_1 - L_3$$

$$D L \text{ Rate Variance} = L_3 - L_4$$

$$D L \text{ Yield Variance} = L_1 - L_2$$

$$D L \text{ Mix Variance} = L_2 - L_3$$



RSH = Revised Std. Hours

RSH shall be calculated when there are 2 or more types of labour and Std. Lab

Ratio is not followed. To calculate RSH, we will divide actual hours Paid in Std. lab. Mix Ratio

SHAO = Std. Hours for actual O/P

$$= \text{Actual O/P} \times \text{Bud. I/P for 1 unit}$$

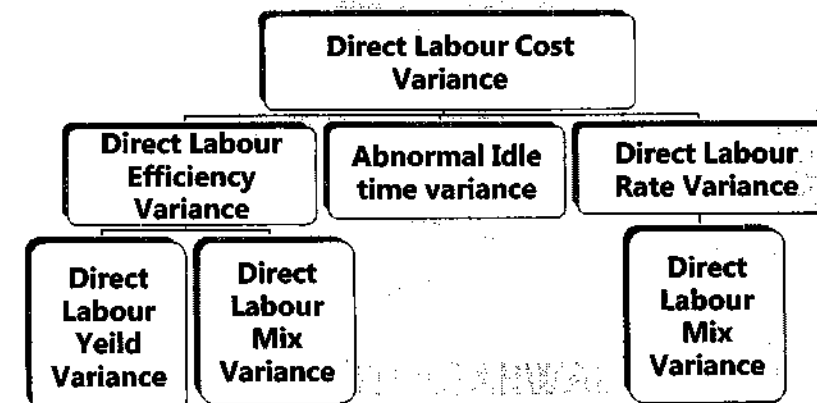
O/P

$$= \text{Actual O/P} \times \frac{\text{Total Bud. lab hours}}{\text{Total Bud. O/P}}$$

BB-4

Case 2: With Abnormal idle time when workers has to sit idle.

$$\text{Abnormal idle time} = \text{AHP} - \text{AHW}$$



Verification Points:

1. DLCV = DLEV + Abnormal Idle time variance + DLRV
2. DLEV = DLYV + DLMV



→ Abnormal Idle Time Variance:

This variance shall arise when AHW is less than AHP due to abnormal reasons.

This variance shall always be adverse.

Formula: $(AHW - AHP) \times SR$

Box No. 3: Calculation of DIRECT LABOUR Variance .

(Ab. Idle Time)

Particular	SR x SHAO	SR x RSH	SR x AHW	SR x AH	AR x AHP
Skilled	xx	xx	XX	xx	XX
Semi-skilled	xx	xx	XX	xx	XX
Unskilled	xx	xx	XX	xx	XX
Total	xxx	xxx	Xxx	xxx	Xxx
	L ₁	L ₂	L ₃	L ₄	L ₅

D.L.
D.L.

var.
Rate var.

mix

Yield
var.

Efficiency var.

Ab. Idle

D.M.

Time var.

D.L. Cost Var.

D L Cost Variance = $L_1 - L_5$

D L Efficiency Variance = $L_1 - L_3$

D L Ab. Idle time Variance = $L_3 - L_4$
(Always Adv)

BB-4



D L Rate Variance = $L_4 - L_5$

D L Yield Variance = $L_1 - L_2$

D L Mix Variance = $L_2 - L_3$

Block No. 5: Labour Efficiency Ratio

Lab. Efficiency Ratio = $\frac{\text{Std. hours for actual O/P}}{\text{Actual hours}} \times 100$

Std. lab cost = $\frac{\text{Total Std. lab cost}}{\text{Total unit Produced}}$

Actual lab cost per unit = $\frac{\text{Total actual lab. cost}}{\text{Total units produced}}$

Block No.6 : Overhead Variance

For the purpose of calculating OH variance OH are divided into 2 Category:

- 1) Variable OH: Power on Machine
- 2) Fixed OH : Factory Rent

Example : Following data is provided for a month

Particular	Budget	Actual
Hours		26
Output		33000 hrs
Overhead		

Conclusion :

1. Budgeted Days = 25days , Actual Days = 26
2. Budgeted hours=30000 , Actual hours = 33000

BB-5

BB-6





3. Budgeted O/P = 24000 hrs , Actual O/P = 32500 hrs

4. Budgeted OH = 45000 , Actual OH = 50000

5. Budgeted OH p.u =

$$\frac{\text{Bud. OH}}{\text{Bud. O/P}} = \frac{\text{Rs. 45000}}{24000 \text{ units}} = \text{Rs. 1.875 p.unit}$$

$$\text{Actual OH p.u} = \frac{\text{Actual OH}}{\text{Actual O/P}} = \frac{50000}{32500} = \text{Rs. 1.53846 p.u}$$

6. Bud. OH per hour

$$= \frac{\text{Bud OH}}{\text{Bud hours}} = \frac{45000}{30000} = \text{Rs. 1.50 per hour}$$

$$\text{Actual OH per hour} = \frac{\text{Actual OH}}{\text{Actual Hr.}} = \frac{50000}{33000} = \text{Rs. 1.515151}$$

7. Std. hrs for actual O/P

$$= \text{Actual O/P} \times \text{Bud. I/P for 1 unit of O/P}$$

$$= 32500 \text{ units} \times \frac{\text{Total Bud hrs}}{\text{Total Bud. Output}}$$

$$= 32500 \text{ units} \times \frac{30000}{24000} = 40625 \text{ hours}$$

8. Expected O/P in Actual hrs

$$= \frac{\text{Actual hours}}{\text{Bud. I/P for 1 unit of O/P}} = \frac{33000 \text{ hrs}}{\frac{30000 \text{ hrs}}{24000}} = \frac{33000 \times 24000}{30000} = 26400$$

9. Expected output in Actual Days (Possible Output)

$$= \frac{\text{Actual Days}}{\text{Bud I/P for 1 unit of O/P}} = \frac{26 \text{ days}}{\frac{25 \text{ days}}{24000}} = 24960 \text{ units}$$

BB-6



STANDARD COSTING

Co. Planning
Production

Hour based
planning
- Best

Days based planning
- Possible picture

10. Expected hours in Actual Days

$$= \text{Actual Days} \times \text{Std. hrs in 1 day}$$

$$= 26 \text{ days} \times \frac{\text{Total Bud. hrs}}{\text{Total Bud days}} = 26 \text{ days} \times \frac{30000 \text{ hrs}}{25 \text{ days}} = 31200 \text{ hour}$$

Statement showing 5 super values which will help in calculation of OH Variance.

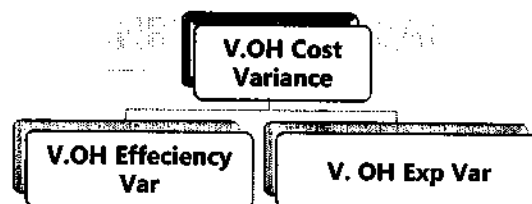
BB-6

Particulars	Formula	Value
1. Output absorbed OH	Actual O/P x Bud. OH p.u	Std. hrs for actual x Bud. OH p.u
(Recovered)	= 32000 units x 1.875 p.u	40625 hr x Rs. 1.5
	= ₹ 60937.5	= ₹ 60937.5
2. Input absorbed OH	Actual hr x Bud. OH per hr	Expected O/P in Actual hrs x Bud OH p.unit
(Recovered)	= 33000 hrs x Rs 1.5	= 26400 units x 1.875
	= ₹ 49500	= ₹ 49500
	= Possible OP x Bud	= Possible hrs x



Variable	OH p.u	Bud OH p.hr
	= 24960 x 1.875	= 31200 x 1.5
	= ₹ 46800	= ₹ 46800
Bud OH	= Bud o/p x Bud OH p.u.	= Bud hrs x bud OH per hr
Normally in (section)	= 24000 units x 1.875	= 30000 hr x 1.5
	= ₹ 45000	= ₹ 45000
Actual OH	Actual o/p x Actual OH p.u.	Actual Hrs x Actual OH per hr
Normally in (section)	= 32500 units x 1.5846	= 33000 hrs x 1.515151
	= ₹ 50000	= ₹ 50000

→ Variable overheads Variance



Verification-

$$\text{V.OH Cost Var.} = \text{V.OH Eff. Var.} + \text{V. OH Exp}$$



Var.

1) V. OH cost variance = It is the difference between V.OH is calculated

Based on output.

Formula- O/P absorbed V.OH - Actual V.OH

2) V. OH Exp var = It is Diff Between Recovered V.OH & Actual V. OH

Provided recovered V.OH is calculated based on Input.

Formula- I/P absorbed V.OH - Actual V.OH

3) V. OH Efficiency var =

Eg - ₹ 100000
100000

50000

(units) (exp)

(Hrs)

ORR = ₹ 1 P.U
ORR = 2 P.Hrs

= $\frac{1000000}{1000000}$
= $\frac{10,00,000}{5,00,000}$

(O/P based)
(I/P based ORR)

Actual
40000 units

100000 units





100000 units x ₹ 1

4000 Hrs x ₹ 2

= ₹ 100000

= ₹ 80000

It is difference Between Output absorbed V.OH & I/P absorbed V.OH

Formula- $\frac{\text{O/P absorbed V.OH}}{\text{absorbed V.OH}} - \text{I/P}$

BB-6

BOX NO. 4-

Particulars	O/P x Absorbed V.OH	I/P x Absorbed V.OH	Actual V.OH
F1 / F2	xx	xx	XX
Total	VO ₁	VO ₂	VO ₃



V.OH

V.OH

Eff. Var.

Exp. Var.

V.OH Cost Var.

1) V.OH Cost Var. = $Vo_1 - Vo_3$

2) V.OH Eff. Var. = $Vo_1 - Vo_2$

3) V.OH Exp. Var. = $Vo_2 - Vo_3$

Fixed OH Variance - are Divided into 2 category.

Case -1 : When Budgeted Days & Actual days are not given in Ques.

i.e. F.OH variance without calendar variance.

Case -2 : When Budgeted Days & Actual days are given in Ques.

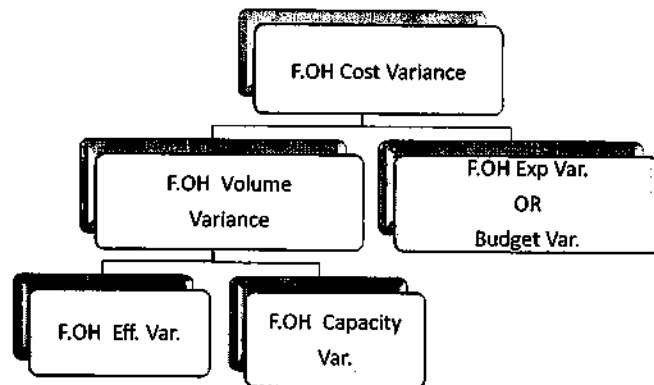
i.e. F.OH variance with calendar variance.

Case-1 → Calculation of F.OH Variance when budgeted Days & Actual

Days are not given in Ques.

BB-6





Verification Point-

1) F.OH Cost Variance = F.OH Volume Var. + F.OH Exp. Var.

2) F.OH Volume Variance = F.OH Eff. Var. + F.OH Capacity Var.

→

1. Fixed OH Cost Variance :- It is Diff. Between recovered F.OH & Actual

F.OH provided recovered F.OH is calculated based on Output.

2. F.OH Volume Variance :- It is Diff. Between recovered F.OH & Budgeted

F.OH provided recovered F.OH is calculated based on Output.

It Happens Due to diff Between actual Output & budgeted Output.

3. F.OH Exp. Variance :- It is Diff. Between Budgeted F.OH & Actual F.OH.

4. F.OH Eff. Variance :- It is Diff. Between Output absorbed F.OH & I/P Absorbed F.OH.

5. F.OH Capacity Variance :- It is Diff. Between I/P absorbed F.OH & Budgeted F.OH.

Box No. 5: Calculation of F.OH variance when bud days & actual days

Are not given in Ques.

Particulars	O/p Absorbed F.OH	I/p Absorbed F.OH	Budgeted F.OH	Actual F.OH
F1 / F2	xx	xx	xx	xx
	FO ₁	FO ₂	FO ₃	FO ₄

F.OH
F.OH

F.OH

BB-6



Eff. var. Cap. var.
Exp. var.

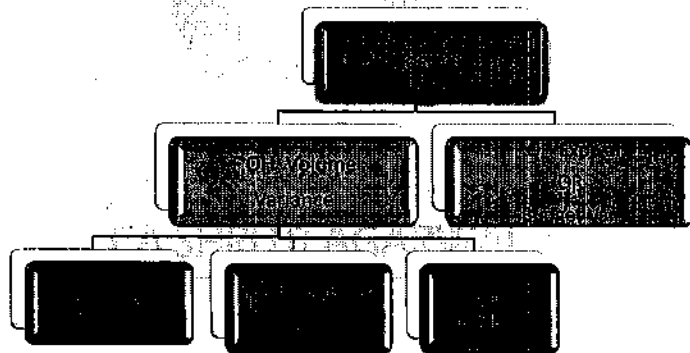
F.OH. Volume var.

F.OH Cost Var.

- 1) F.OH Cost Var. = FO 1 - FO 4
- 2) F.OH Vol. Var. = FO 1 - FO 3
- 3) F.OH Exp. Var. = FO 3 - FO 4
- 4) F.OH Eff. Var. = FO 1 - FO 2
- 5) F.OH Cap. Var. = FO 2 - FO 3

Case-1 → Calculation of F.OH Variance when budgeted Days & Actual

Days are given in Ques.



Verification Point-

- 1) F.OH Cost Variance = F.OH Volume Var. + F.OH Exp. Var.
- 2) F.OH Volume Variance = F.OH Eff. Var. + F.OH



Cap. Var. + F.OH Calendar Var.

↓ F.OH Calendar Var. :- It is diff. between possible F.OH & budgeted F.OH.

Box No.-6 :- F.OH Var. with calendar Var.

Particulars	O/p Absorbed F.OH	I/p Absorbed F.OH	Possible F.OH	Budgeted F.OH	Actual F.OH
F1 / F2	xx	xx	xx	xx	xx
	FO1	FO2	FO3	FO4	FO5

F.OH F.OH

Eff. var. Exp. var. Cap. var.

vol. var. F.OH

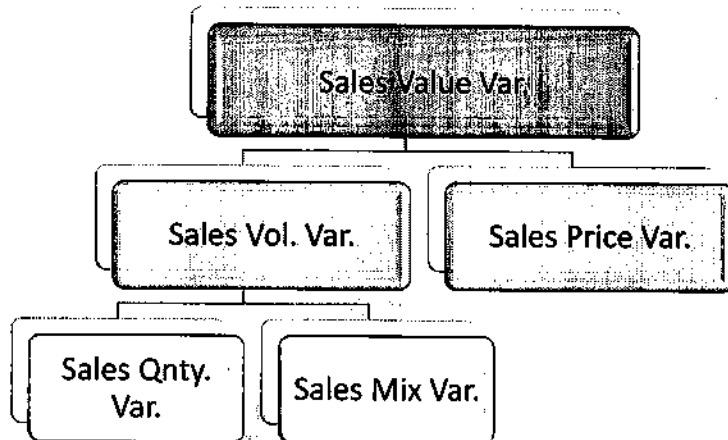
Calendar var. F.OH

Cost Var. F.OH

- 1) F.OH Cost Var. = FO 1 - FO 5
- 2) F.OH Vol. Var. = FO 1 - FO 4
- 3) F.OH Exp. Var. = FO 4 - FO 5
- 4) F.OH Eff. Var. = FO 1 - FO 2
- 5) F.OH Cap. Var. = FO 2 - FO 3
- 6) F.OH calendar Var. = FO 3 - FO 4

Block No.7 : Sales Variance.-





Verification :-

1) Sales Value Var. = Sales Vol. Var. + Sales Price Var.

2) Sales Vol. Var. = Sales Qnty. Var. + Sales Mix Var.

1. Sales Value Variance : It is diff between Budgeted Sales value & Actual Sales value.

2. Sales Volume Variance : It is diff between budgeted sales value & Actual sales Value.

Due To difference Between budgeted sales volume & Actual Volume

3. sales price Variance: It is diff between budgeted sales value & Actual sales Value.

Due To difference Between budgeted selling price

& Actual selling price p.u.

4. Sale Quantity & Mix Variance : These variance shall arise when sold product is of two types & more ,

And

Budgeted Sales unit ratio is not followed.

Box-7

Particulars	B.S.P p.u x Bud. Qty	B.S.P p.u x RSQ	B.S.P p.u x AQ sold	A.S.P p.u X AQ sold
Prod - A	xx	xx	xx	XX
Prod - B	xx	xx	xx	XX
Prod - C	xx	xx	xx	XX
Prod - D	xx	xx	xx	XX
Total	xxx S1	xxx S2	xxx S3	Xxx S4



Sales volume var.

Sales Value Var.



- 1) Sales Value Var. = $S_4 - S_1$
- 2) Sales price Var. = $S_4 - S_3$
- 3) Sales Vol. Var. = $S_3 - S_1$
- 4) Sales Mix Var. = $S_3 - S_2$
- 5) Sales Qty Var. = $S_2 - S_1$

Terms:

BSP = Budgeted selling price p.u

ASP = Actual selling price

RSQ = Revised Std Qty

We will divide total of AQ sold in Std Qty Ratio.

RSQ- It will be calculated when

Case -1 :- Sold product is of 2 Types or more
And

Case-2 :- Std Qty Ratio is not followed

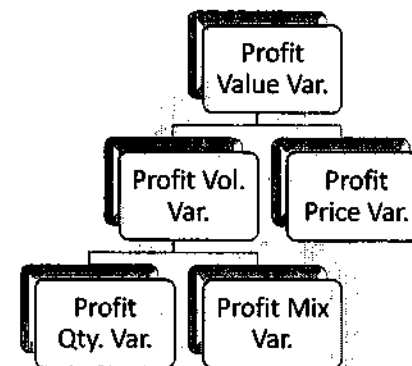
BB-7



Block No.8 : profit Variance -

$$\text{Profit p.u.} = \text{Margin p.u.} \\ = \text{Selling p.u.} - \text{Cost p.u.}$$

BB-8



Verification -

1) Profit value var. = Profit Vol. Var. + Profit Price Var.

2) Profit vol. var. = Profit Qty. var. + Profit Mix Var.

1. Profit vol. var. = It is Diff. between budgeted profit & actual profit.

2. Profit Price Var. = It is Diff. between budgeted profit & actual profit.

Due to diff between budgeted selling price & Actual selling price.

3. Profit Volume Var. = It is the diff between budgeted profit and

BB-9





Actual profit.

Due to diff between budgeted sales Qty & Actual sales Qty .

4. Profit Qty & Mix Var. = These var. shall arise when

Case-1 :- Sold Product is of 2 types or more

And

Case-2 :- Std Sales units Ratio is not Followed.

Box -8 Calculation for profit Variance

Particulars	B. Profit p.u x Bud. Qty	B. Profit p.u x RSQ	B. Profit p.u x AQ sold	A. Profit p.u x AQ sold
Prod - A	xx	xx	xx	xx
Prod - B	xx	xx	xx	xx
Total	xxx	xxx	xxx	xxx
	P1	P2	P3	P4

PROFIT
PROFIT

PROFIT

Qty. var.
price var.

mix var.

PROFIT volume var.

PROFIT Value Var.

1) Profit Value Var. = P 4 - P1

2) Profit price Var. = P4 - P3

3) Profit Vol. Var. = P3 - P1

4) Profit Mix Var. = P3 - P2

5) Profit Qty Var. = P2 - P1

Block No.9 : Production Volume Var -

It is that part of budgeted fixed OH which is related to Unutilised

Capacity of Factory.

Formula- Unutilised capacity x Bud. F.OH P.U

Unutilised Cap. = Actual Cap - budgeted Cap (units)

Block No.10 : Overheads Expenses Variance -

It is diff. between total budgeted OH cost (Fixed & variable) &

Actual OH cost (Fixed & variable)

Formula = Budgeted OH - Actual OH

Budgeted OH = Budgeted F.OH + Budgeted V.OH

Bud. OH = Bud. F.OH (For budgeted Prod. Capacity)

+ Bud. V.OH (For Actual Prod. Capacity)

Particular	Amt (₹)
Actual Cost	XXX
Cost -Adv. var.	(XXX)
Cost - Fav. Var.	XXX
Std Cost	XXX




BB-1

BB-2

BB-3

BLOCK NO 3: Sales Budget

This Budget shows sales target to be achieved by business organization.

It shows quantity and amount to be achieved during budgeted Period.

At the end of period, Budgeted sales are compared with actual sales to calculate variance.

In case of negative (Adverse) variance, Reasons are identified so that such negative variance do not repeat in future.

BLOCK NO 4: Production Budget

This Budget shows the production "units" which will be produced in Budgeted period.

This budget is prepared with the help of following equation :

$$\begin{array}{lcl} \text{Budgeted} & = & \text{Budgeted} + \text{Cl. Stock} - \text{Op. stock} \\ \text{Production} & \text{sales} & \text{of FG(Budgeted)} \quad \text{of FG} \end{array}$$

$$\text{Raw material consumed} = \text{Budgeted production} \times \text{Raw material reqd. p.u.}$$

$$\text{Labour hours to be utilized} = \text{Budgeted production} \times \text{Labour hours reqd. p.u.}$$

BLOCK NO 5: Production Cost Budget

This Budget shows the cost which should have been incurred to produce Budgeted output.

In future, we compose budgeted production cost with actual production cost to calculate Variance.

BLOCK NO 6: Cash Budget

This Budget shows estimated cash inflow and estimated cash outflows during budgeted Period.

Cash A/c is prepared for past cash inflows and out flows while cash Budget is made for future inflows and outflows.

This budget is prepared with the help of following equation:

$$\begin{array}{ccccccc} \text{Opening cash} & + & \text{Estimated cash} & - & \text{Estimated cash} & = & \text{Closing cash} \\ \text{Balance} & & \text{inflows} & & \text{outflows} & & \text{balance} \end{array}$$



BLOCK NO 7: Flexible Budget

When Budget is prepared at different activity level it is called flexible Budget.

For this we will divide all expense into 3 categories:

1. Variable Exp: If cost p.u. of an expense is same at different level or production then it is variable Expense.
2. Fixed Expense: If total cost of an expense is same at different of level of production, then it is fixed Expense.
3. Semi variable Expense: If an expense is neither variable nor fixed expense then it is semi-variable Expense.

Variable portion in SVC = $\frac{\text{Difference in total SVC}}{\text{Difference in units}}$

Fixed portion in SVC = Total SVC - Total variable portion of that SVC

Note 1: Any increase or decrease in variable cost shall be applied on variable cost per unit.

Note 2: Any increase or decrease in fixed cost shall be applied on total fixed cost.

AKASH AGARWAL CLASSES

CONT:800/1177042/043



"EMPOWERING FUTURE FINANCE LEADERS, AAC IS ALWAYS THERE WHEN IT COMES TO CMA!"

CMA INTERMEDIATE
June 23 Results [Meet Our Top Scorers]

AAC = CMA 8007777042 India's No.1 Coaching Institute For CMA!

CMA INTERMEDIATE
June 23 Results [GROUP 1 Top Scorers]

AAC = CMA 8007777042 India's No.1 Coaching Institute For CMA!

CMA INTERMEDIATE
June 23 Results [GROUP 1 Top Scorers]

& Many More... Still Counting ...
AAC = CMA 8007777042 India's No.1 Coaching Institute For CMA!

CMA INTERMEDIATE
June 23 Results [GROUP 1 Top Scorers]

& Many More... Still Counting ...
AAC = CMA 8007777042 India's No.1 Coaching Institute For CMA!

years of hard work, dedication, and countless success stories. The AAC is proud to share the glorious results, especially in the CMA Intermediate exams. Here's to many more years of excellence.

Next can be you!