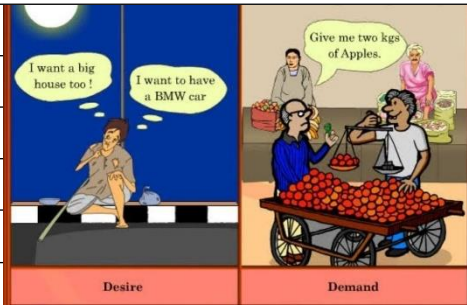
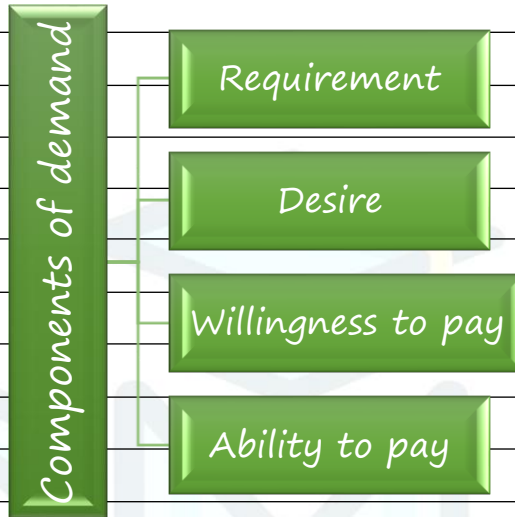


CH-2 Demand forecasting

MEANING OF DEMAND FORECASTING

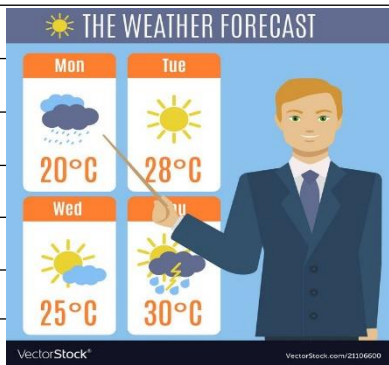


Meaning of Demand :- Demand refers to the quantity of a product or service that consumers are willing and able to purchase at a given price over a specific period of time. It encompasses both the desire for a product and the financial capacity to pay for it



Components of demand:-

- **Requirement :-** The need or want for a product or service
- **Desire :-** The onclination or preference of consumers for a product or service
- **Willingness to pay :-** The readiness of consumers to spend money on the product or service.
- **Ability to pay :-** The financial capacity of consumers to afford the product or service

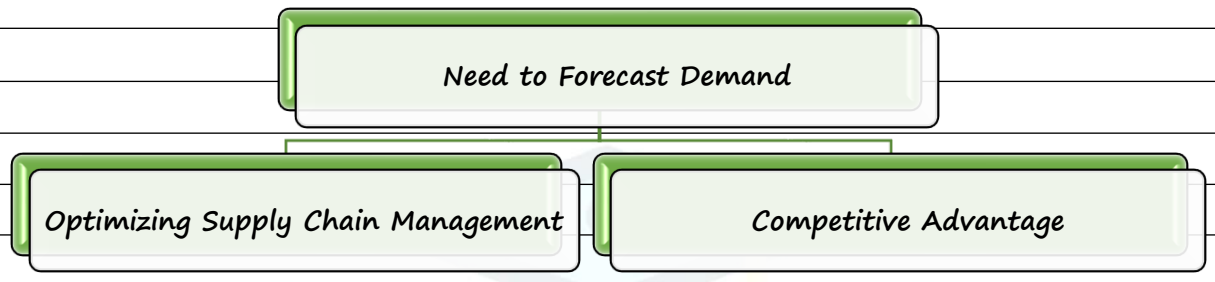


Meaning of Forecasting :- Foscasting is the process of making educated guesses about future events or requirements based on analyzing current and historical data. It involves predicting future demand, trends, or conditions.

Examples of Forecasting:

- ❖ **Product Requirements:** Predicting how many units of a product will be needed in the future.
- ❖ **Weather Forecasting:** Predicting weather conditions for a specific period.
- ❖ **Fashion Trends:** Anticipating future trends in clothing and accessories

WHY DO WE NEED TO FORECAST DEMAND



❖ **Optimizing Supply Chain Management:**

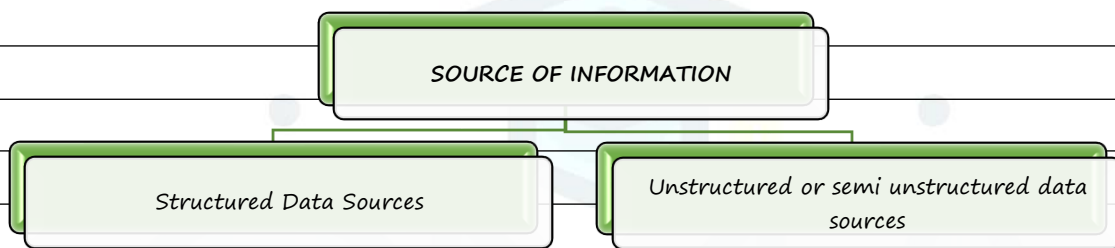
- **Production/Service Planning:-** Accurate demand forecasting helps organizations plan how much of a product to manufacture or how many services to offer, minimizing the risk of overproduction or underproduction.
- **Inventory Decisions:-** It ensures that the right amount of inventory is maintained to meet customer demand without excess stock that ties up capital or results in waste.
- **Facility Selection and Process Design:-** Helps in determining the capacity and layout of production facilities and processes to efficiently handle expected demand.
- **Fund Requirement Planning:** Assists in financial planning by predicting the funding required for production, inventory, and other operational costs.
- **Manpower Planning:-** Determines staffing needs to match the anticipated demand, ensuring that there are enough employees to handle production or service delivery.

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❖ Competitive Advantage:

- **Effectiveness and Efficiency:** Precise forecasting allows companies to be more effective and efficient, providing a competitive edge. Companies can respond more quickly to market changes and customer needs, giving them an advantage over competitors.
- **Customer Satisfaction:** Meeting customer demand accurately enhances satisfaction and loyalty, which is crucial for maintaining and growing market share.

SOURCE OF INFORMATION



❖ Structured Data Sources:

- **Market Reports:** Provide insights into market trends, consumer preferences, and economic conditions, helping forecast demand.
- **Sales Force Opinion:** Input from sales teams who interact directly with customers and have firsthand knowledge of market conditions and customer needs.
- **Experts' Views:** Opinions from industry experts who offer valuable insights based on their experience and knowledge
- **Point of Sales (POS) Data:** Data collected from sales transactions at retail points, offering real-time insights into sales patterns and inventory levels.
- **Structured Customer Surveys:** Collect direct feedback from customers regarding their purchasing intentions and preferences

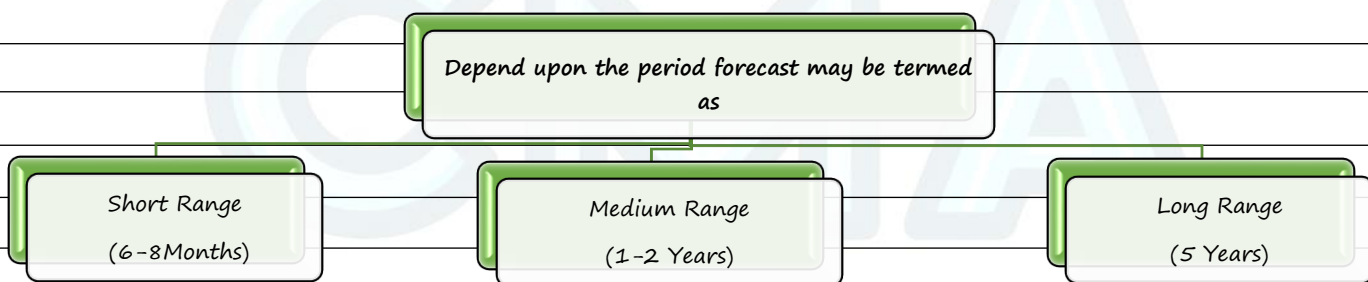
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❖ Unstructured or semi unstructured data sources:

- **Social Media Posts:** Insights from platforms like Twitter, Facebook, and Instagram, where consumers discuss products, express opinions, and share trends.
- **Video, Audio, and Multimedia Messages:** Rich media content that can provide qualitative insights into customer sentiments and trends.
- **Images:** Visual data from various sources that can help in understanding product appeal and market trends.

RANGE OF FORECASTING

The period of forecasting is the time range selected for forecasting depends on the purpose for which the forecast is made. The period may vary from 1 week to some years.



❖ Short-Range Forecasting:

- ❖ **Period:** From a few weeks to 3-6 months.
- ❖ **Examples:** Innovative products with shorter life cycles, such as smartphones (6-8 months).

❖ Objectives:

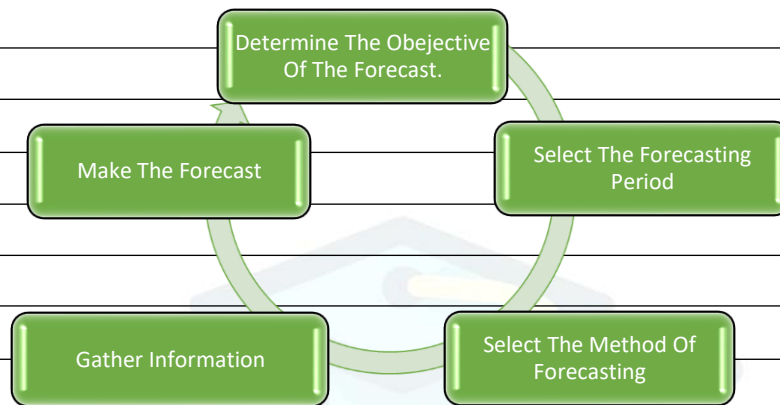
- ❖ **Inventory Requirements:** Estimate the quantity of inventory needed.
- ❖ **Transport Facilities:** Arrange logistics for dispatching finished goods.
- ❖ **Workload Management:** Determine the workload for labor and machinery.

- ❖ *Working Capital: Calculate the capital required for production.*
- ❖ *Production Setup: Plan production runs based on demand.*
- ❖ *Sales Quotas: Set targets for sales performance.*
- ❖ *Overtime Planning: Determine the amount of overtime needed to meet delivery deadlines.*
- ❖ **Medium-Range Forecasting:**
- ❖ *Period: Typically 3 months to 2 years.*
- ❖ *Examples: Consumer durable goods, medicines.*
- ❖ **Objectives:**
- ❖ *Budgetary Control: Monitor and control expenses within budget.*
- ❖ *Dividend Policy: Develop policies for distributing profits to shareholders.*
- ❖ *Maintenance Costs: Estimate and manage maintenance expenses.*
- ❖ *Operational Scheduling: Plan and schedule operations effectively.*
- ❖ *Capacity Planning: Adjust production capacity according to demand.*
- ❖ **Long-Range Forecasting:**
- ❖ *Period: Generally 1 year to 10-15 years.*
- ❖ *Examples: Daily household products like flour (Aata).*
- ❖ **Objectives:**
- ❖ *Capital Expenditure: Plan for future investments in facilities or developments.*
- ❖ *Cash Flow: Project future cash flow from sales.*
- ❖ *Manpower Requirements: Forecast future staffing needs.*
- ❖ *Material Requirements: Plan for the procurement of materials over the long term.*

❖ **Research and Development:** Strategize for long-term growth and innovation.

PROCESS OF FORECASTING

The process of forecasting involves several key steps to ensure accurate and useful predictions
Here a breakdown of these steps:



❖ **Determine the Objective of the Forecast:-**

❖ The first step in forecasting is to clearly define the purpose of the forecast. This involves understanding what you need to predict and why.

- Try to answer the questions
- What for you are making forecast ?
- Is it for predicting the demand?
- Is it to know the consumer's preferences?
- Is it to study the trend?
- You have to spell out clearly the use of forecast.

❖ **Select the Forecasting Period:-**

❖ Next, determine the time frame for the forecast. The period can be short-term (a few weeks to months), medium-term (3 to 6 months), or long-term (more than a year). The choice of period depends on the nature of the forecast and the type of decisions that will be influenced by the forecast.

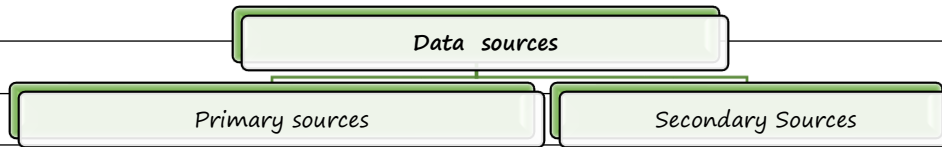
❖ **Select the method you want to use for making the forecast.**

❖ This method depends on the period selected for the forecast and the information or data available on hand. It also depends on what you expect from the information you get from the forecast. Select appropriate method for making forecast.

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❖ **Gather Information:-**

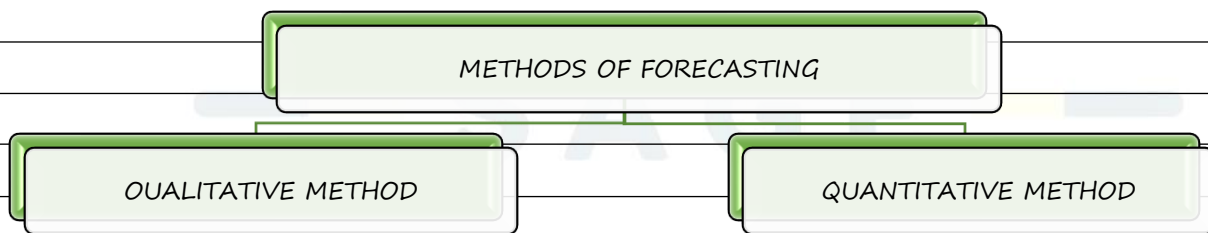
❖ Collect the data necessary for making the forecast. This data can come from two main sources.



- **Primary Sources:** Data collected directly from the firm's own records and operations, such as sales records or customer surveys
- **Secondary Sources:** Data obtained from external sources, including published reports, industry magazines, or educational institutions. Secondary data helps in supplementing primary data and providing broader context.

❖ **Make the forecast:** Using the data collected in the selected method of forecasting, the forecast is made.

METHODS OF FORECASTING



(1) **QUALITATIVE METHOD:-**

Qualitative forecasting methods rely on subjective judgement, intuition and experience rather than numerical data. These methods are especially useful in situations where historical data is not available or when forecasting of new products or market condition.

- Here is a breakdown of each method with example:-

CH-2 Demand forecasting

❖ Survey of buyer's intention or the user's expectation method:-

This method involves directly asking customers about their future purchase intention. The sales forecast is based on their responses

❖ Collective opinion or sales force composite method:-

This method gathers forecast from individual who are close to the market such as sales representative and managers. Their individual estimates combines to form a comprehensive forecast

❖ Group executive judgement or executive judgement method:-

This method involves combining the opinions of top executive from various departments . (Example:- Marketing, Finance,Production)to create a forecast

❖ Expert opinion

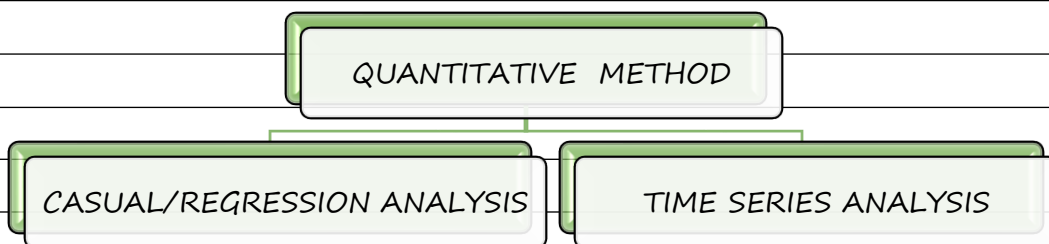
This method involves obtaining forecast from industry experts, consultants or analysts who have specialized knowledge about the market or product category.

❖ Market test method:-

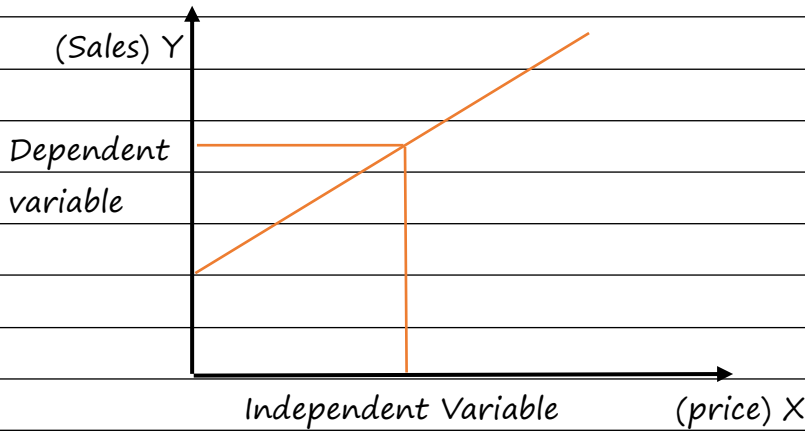
This method involves introducing the product to a limited segment of the market to gauge its performance before a full scale launch

(2) QUANTITATIVE METHOD:-

This approach takes into account historical data and uses statistical models to forecast the demand

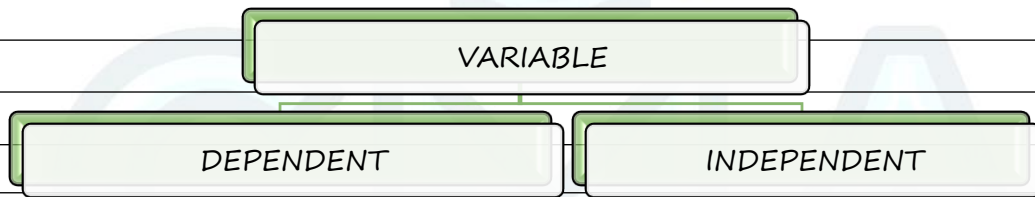


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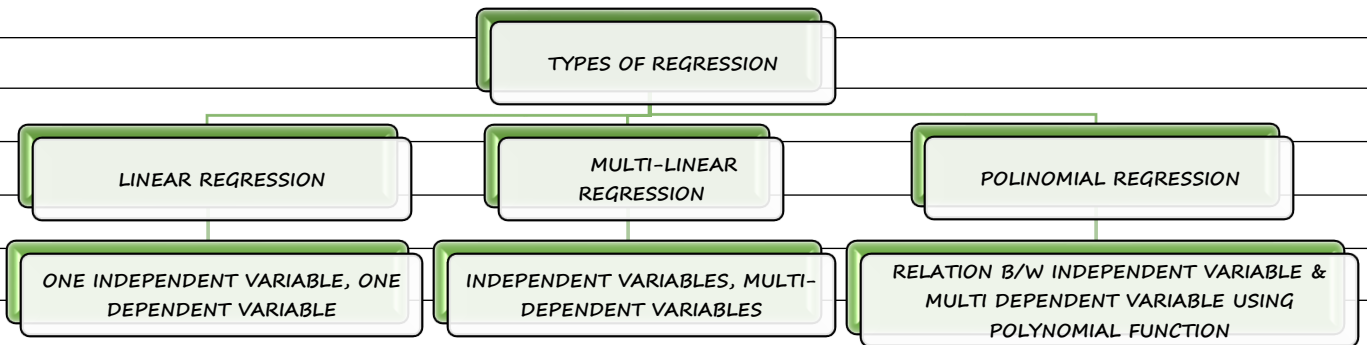
REGRESSION ANALYSIS:-

❖ Regression is a statistical method that helps us understand and predict the relationship between variables



❖ Example:- Predicting salary based on years of experience
 ▪ Predicting sales based on price

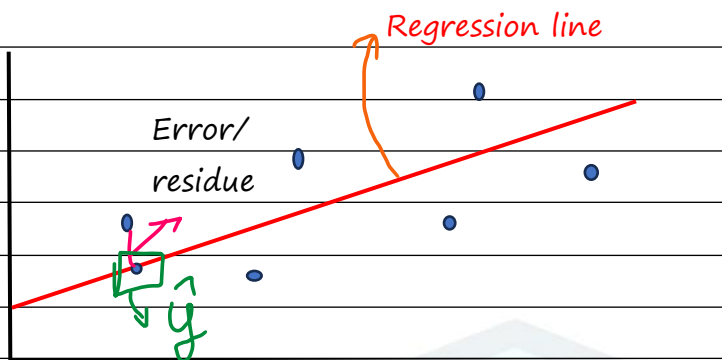
❖ This approach uses statistical models to forecast demand based on the relationship between demand & other influencing factors.



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REGRESSION LINE:-

The regression line is a fundamental concept in statistics used to describe the relationship between two variables. It is a straight line that best fits the data points in a scatter plot, providing a way to predict the value of one variable based on the value of another.



To find out the regression line the method called as *least square method* is used which means minimizing all square of errors. By doing so we get a linear relationship between x and y.

Why the name is least square method ?

The method is called the least squares method because it aims to minimize the sum of the squared errors between the observed values and the values predicted by the regression line. By squaring the errors, we eliminate any negative values and ensure that all deviations are treated as positive, which helps to find the best-fitting line through the data points. Thus, the method seeks to minimize the total of these squared deviations, which is why it is referred to as the "least squares" method.

Equation of regression:-

$$Y = A + BX$$

Y represents the dependent variable

X represents the independent variable

A = Slope of the line (how much Y changes for a unit change in x)

B = intercept (the value of Y when x is 0)

$$A = \bar{y} - B \bar{x}$$

B = covariance (x,y)

Variance of x

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$$\bar{Y} = \frac{\sum Y}{N}$$

$$\bar{X} = \frac{\sum X}{N}$$

N = number of observations

$$\text{Variance of } x = \frac{\sum (x - \bar{x})^2}{N} \quad \text{or} \quad \frac{\sum x^2 - (\bar{x})^2}{N}$$

$$\text{Covariance } (x,y) = - \frac{\sum (x - \bar{x})(y - \bar{y})}{N} \quad \text{or} \quad \frac{\sum xy - \bar{x}\bar{y}}{N}$$

Module illustration 3:-

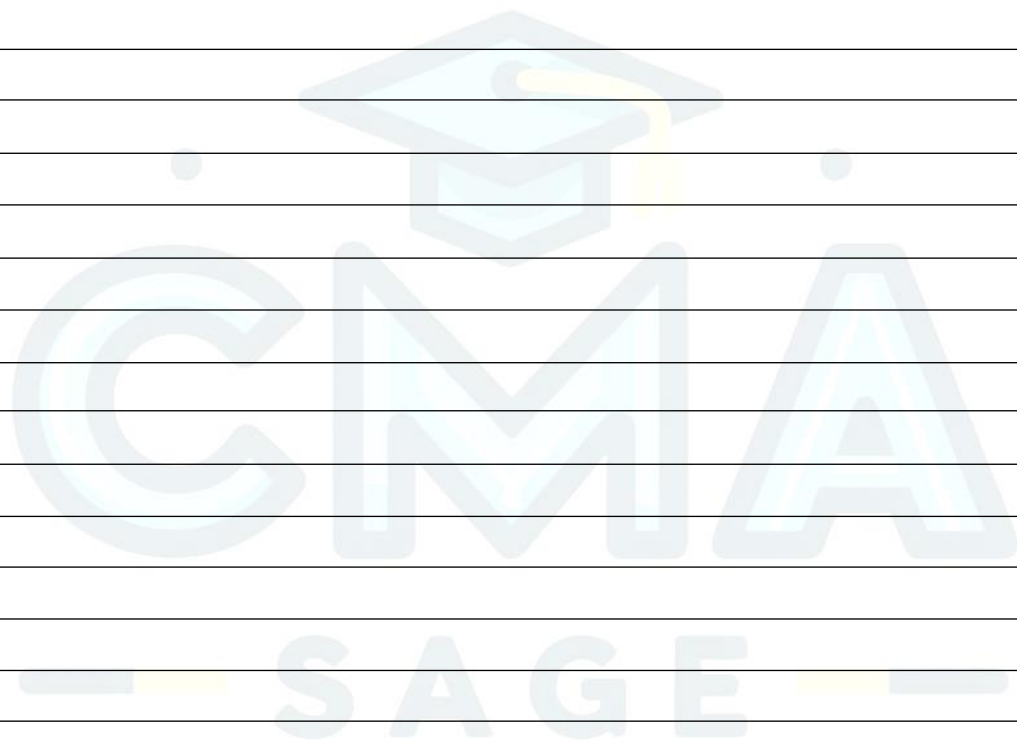
From the following time series data of sale project the sales for the next three years.

Population of the town(in lakhs)	X	5	7	8	11	14
No. of tv sets demanded(in thousands)	Y	9	13	11	15	19

Fit a linear regression of Y on X and estimate the demand for CTV sets for two towns with a population of 10 lakhs and 20 lakhs.



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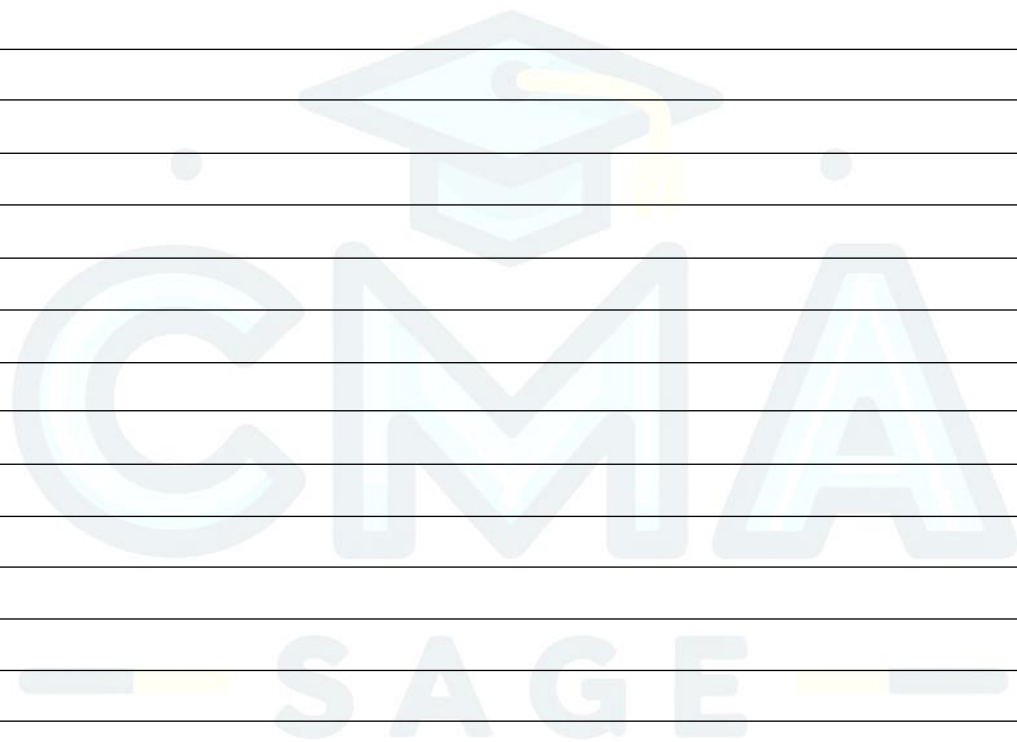


CH-2 Demand forecasting

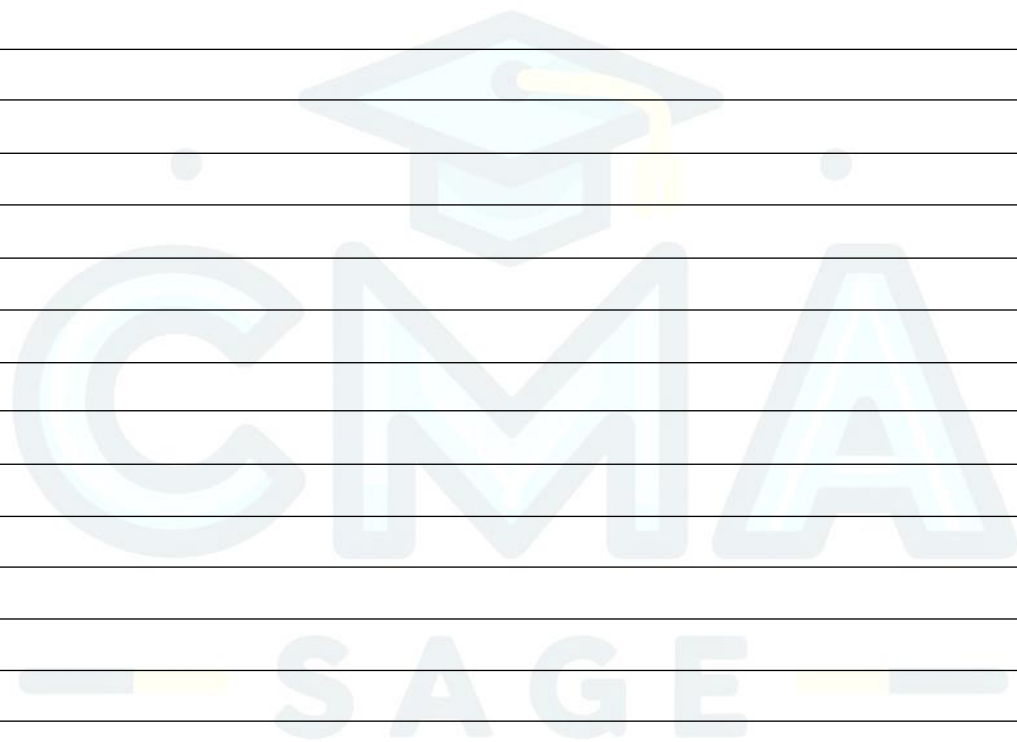
Module illustration 2:-

With the help of following data project the trend of sales for the next five years:

Years	2015	2016	2017	2018	2019	2020	2021
Sales(in lakhs)	80	90	92	83	94	99	92

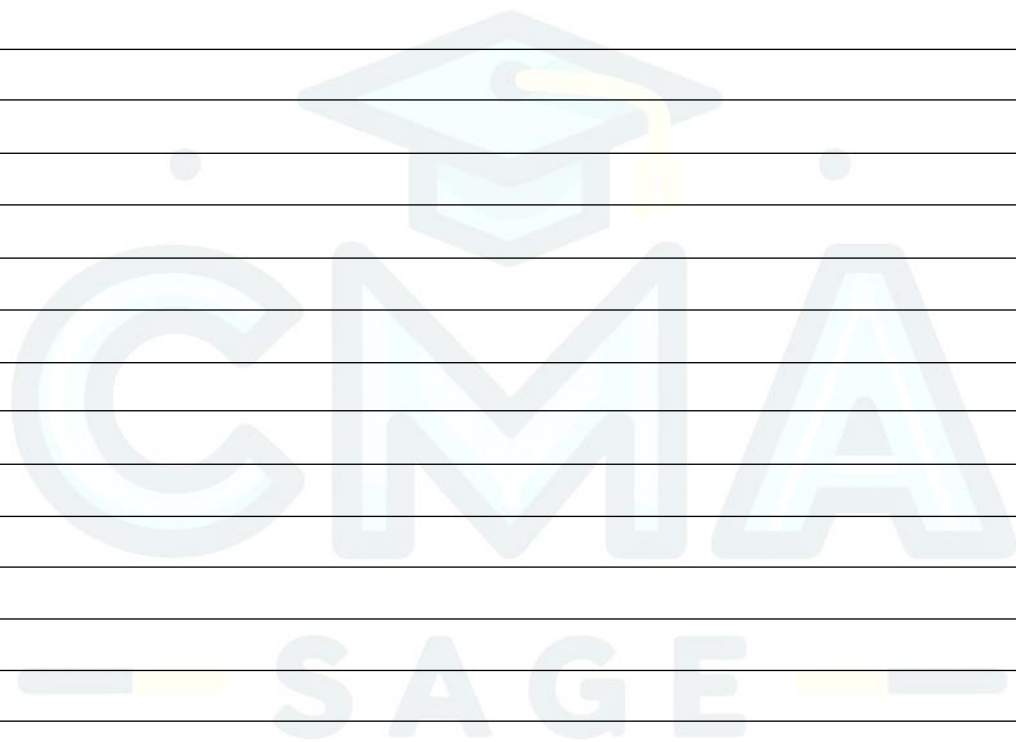


CH-2 Demand forecasting



Module illustration 2:-

Years	2016	2017	2018	2019	2020	2021
Sales (in lakhs)	100	110	115	120	135	140



PYQ(December 2022):-

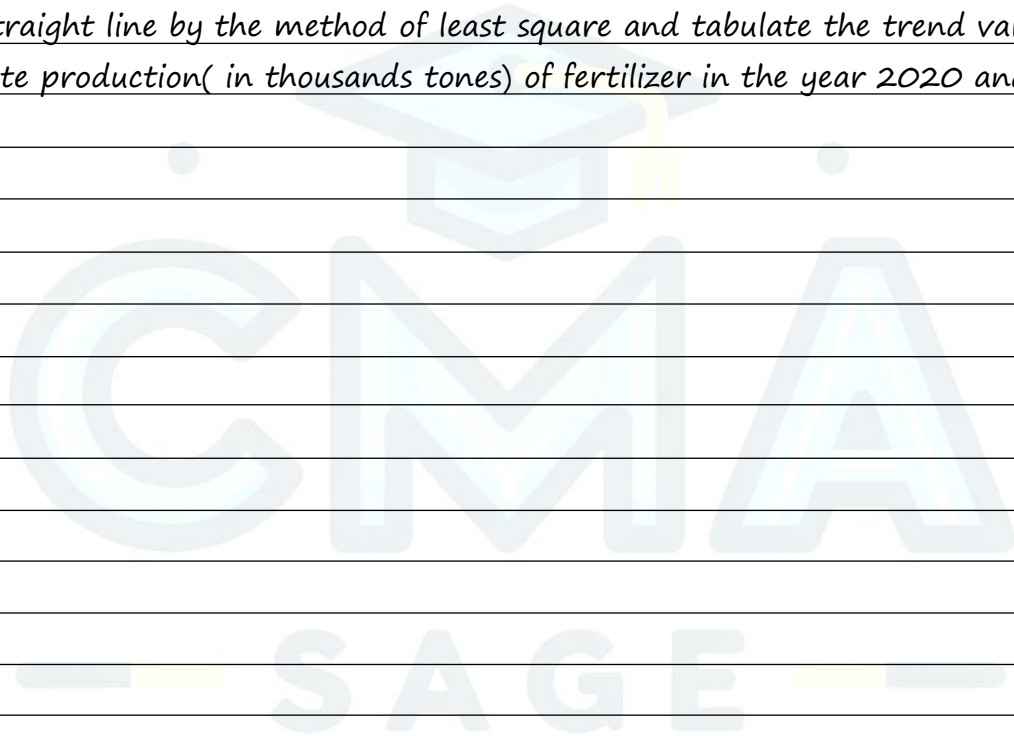
The production (in thousand tones) of a fertilizer factory of ROMY Ltd. For the year 2013 through 2022 are given below:

Year	2013	2015	2016	2017	2018	2019	2022
Production (in thousands)	70	75	90	98	85	91	100

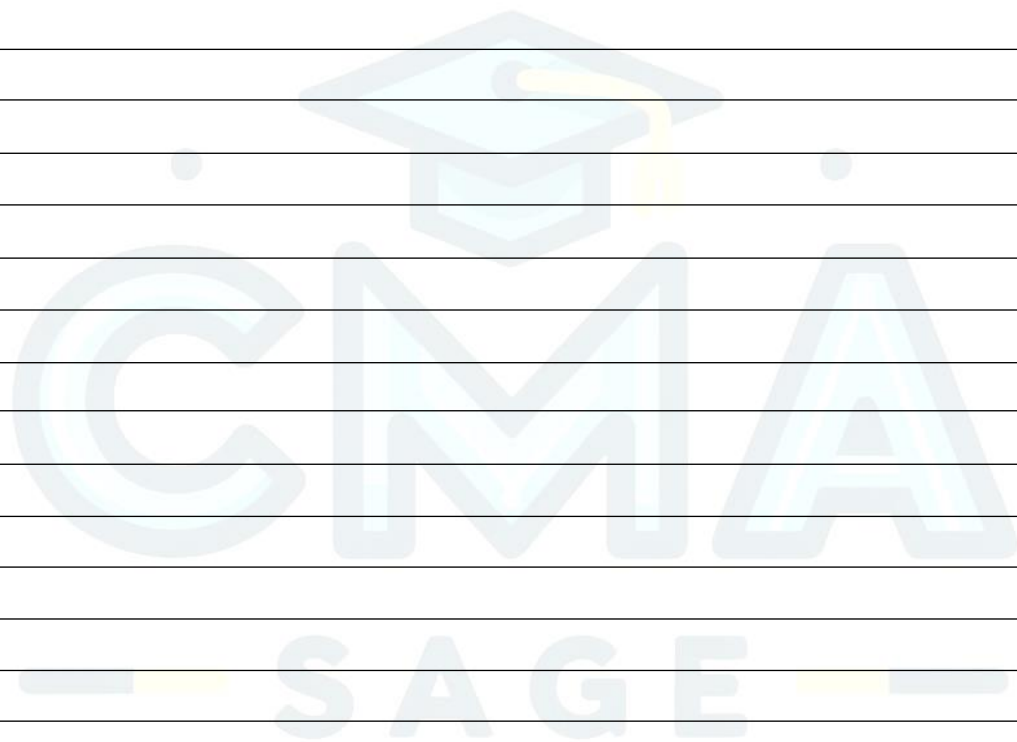
(Present calculation upto three decimal points)

Required:

1. Fit a straight line by the method of least square and tabulate the trend values.
2. Estimate production(in thousands tones) of fertilizer in the year 2020 and years 2025.



CH-2 Demand forecasting



PYQ (June 2024):-

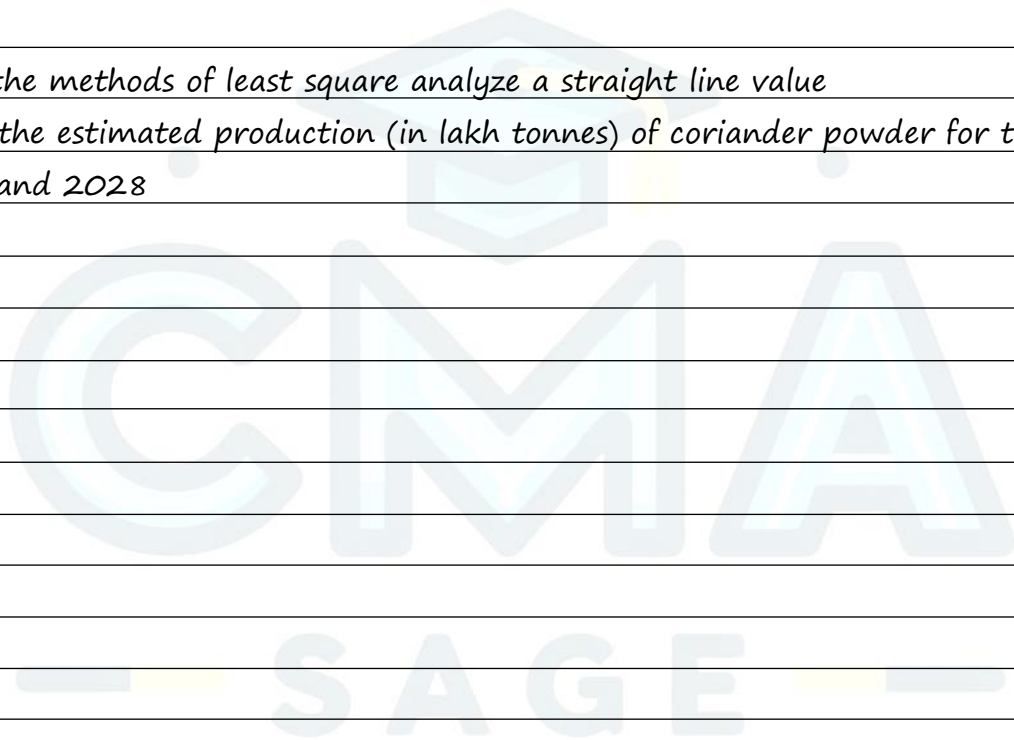
RONTEX Ltd. A medium size manufacturing company has provided productions analysis of coriander powder (in lakhs tonnes) for the years 2015 to 2023 as follows:-

Year	2015	2017	2019	2021	2023
Production of Coriander powder(in lakh tonnes)	54	63	69	81	48

(Present calculation up to two decimal points)

Required:-

1. Using the methods of least square analyze a straight line value
2. Assess the estimated production (in lakh tonnes) of coriander powder for the years 2014 and 2028



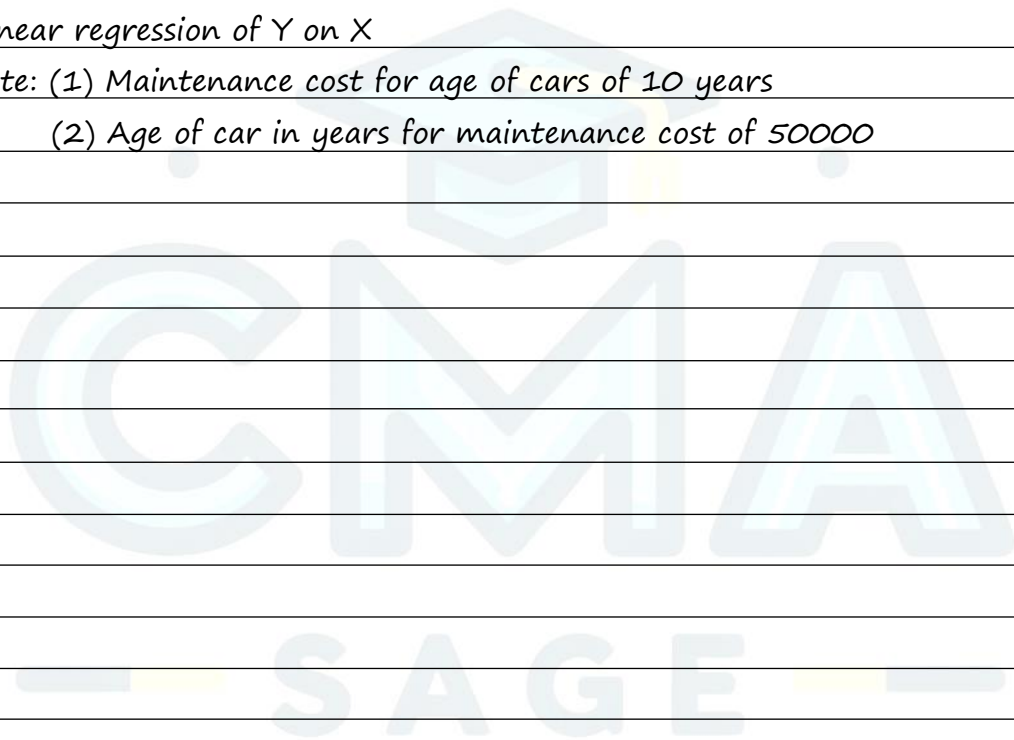
PYQ: (December 2023)

The following table gives the age of cars of SKODA make and its annual maintenance cost.

Age of cars in years (x)	2	4	6	8
Maintenance cost (in thousands)(y)	10	20	25	30

Required:-

1. Fit a linear regression of Y on X
2. Estimate: (1) Maintenance cost for age of cars of 10 years
(2) Age of car in years for maintenance cost of 50000



CH-2 Demand forecasting

PYQ: (June 2023)

The sales of Ctv (in millions) of SONTON Ltd. For the five years are given below:

Year	2014	2016	2018	2020	2022
Sales of CTV	18	21	23	27	16

Required:-

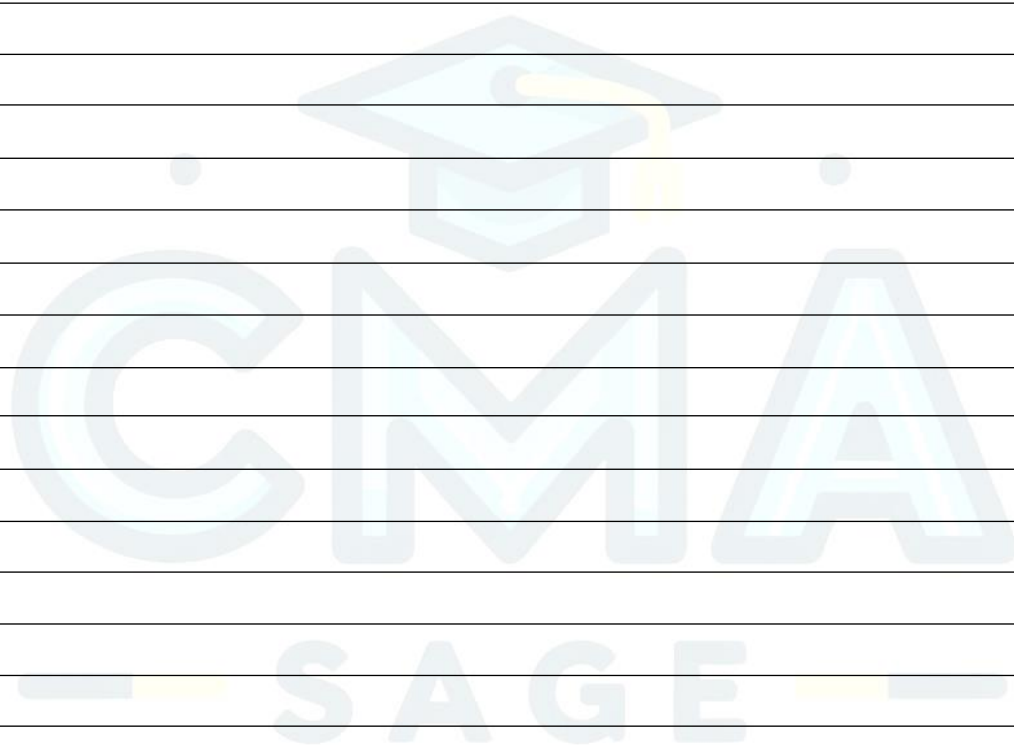
Estimate the trend values of sales of CTV for the years of 2021, 2024 and 2026



PYQ: (December 2021)

With help of following data, project the trend of sales for the next 7 years:

Years	2005	2006	2007	2008	2009	2010
Sales(in lakhs)	90	95	100	110	125	140

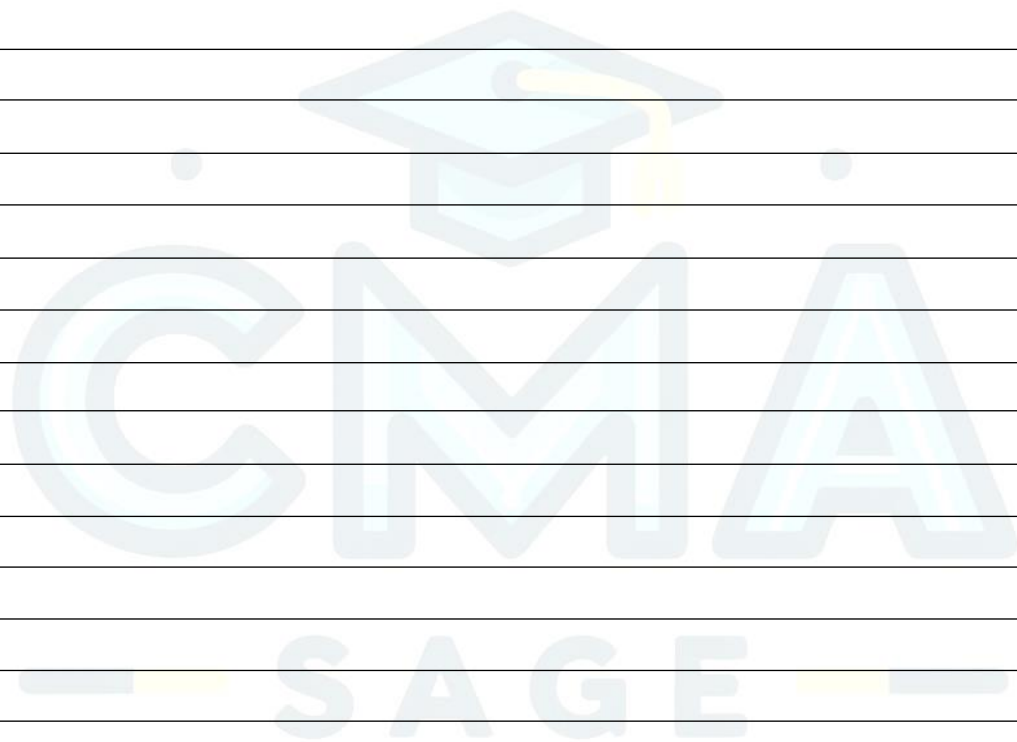


MODEL QUESTION PAPER

Question:1

With the help of following data, project the trend of sales for the next 5 years:

Years	2017	2018	2019	2020	2021	2022
Sales in lakhs	120	130	135	140	150	165



CH-2 Demand forecasting

