Divisional performance Measure [10 - 15 Marks]

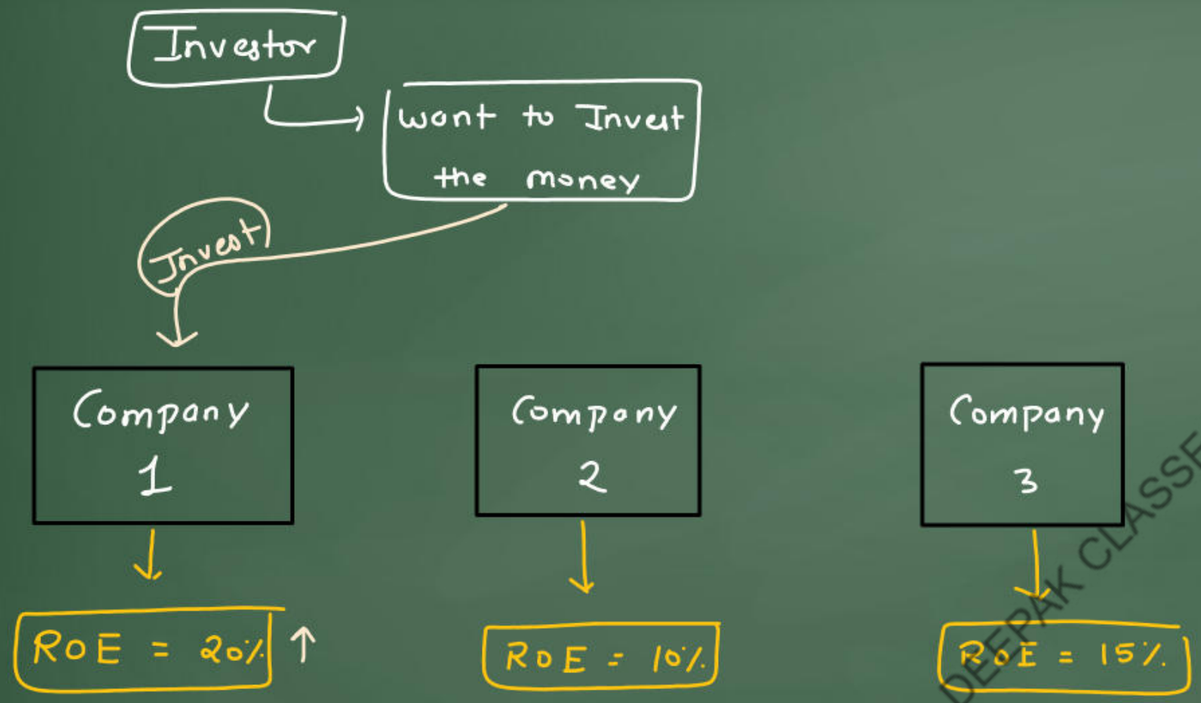
Chapter to be Cover in this Module

1. Organisations with multible divisions (Theory)
2. Dupont Analysis (Practical)
3. Divisional performance Measurement tools (Practical)
4. Economic Value Added (Practical)
5. Introducing to Learning Curve (Practical)
6. Balance score Card for Variable pay management. (Theory)

Chapter = DuPont Analysis

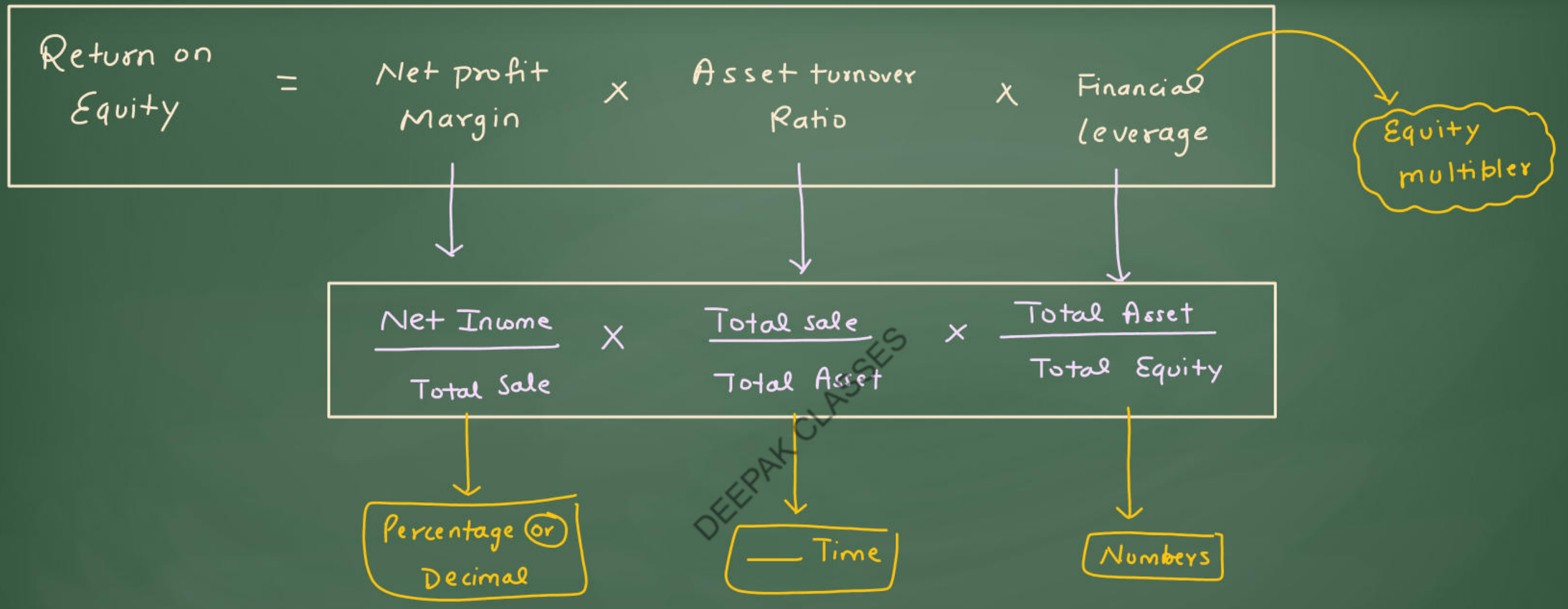
1. The DuPont Analysis also known as DuPont identification (or) DuPont Model.
2. This is a model popularized by the **DuPont Corporation** for analyzing Fundamental Result.
3. In **1920**, The DuPont Corporation started the Dupont analysis as a mean to measure **Asset at their gross Book Value rather than net book value.** thereby producing a **Higher** Return on Equity [R E O]
4. DuPoint Analysis is a Useful Technique to **Break down the different Return on Equity** [R E O] generators.
5. This Model analysis is Considered useful to **avoid misleading Conclusion** when it comes to Corporate profit analysis.
6. In simple words, it Break down the Return on Equity to analyze How Corporate Can **increase** the ROE for their shareholders.

Example



ROE = Return on Equity

= Company Equity par kitna Return deti hai Investor ko.


Return on Equity = Net profit Margin × Asset turnover Ratio × Financial leverage
Equity multibler
Net Income / Total Sale × Total sale / Total Asset × Total Asset / Total Equity
Percentage or Decimal
Time
Numbers
DEEPAK CLASSES

According to DuPont, Three main Financial parameter that drive Return on Equity (RoE)

Operating performance

Yhe ek profitability Ratio hai jiska purpose Net profit margin Nikalna. ki Company ne Total Revenue ka kitne percent profit generate kia hai usko Nikalne ka tarika

$$\text{Net profit Margin} = \frac{\text{Net Income}}{\text{Total Sale}}$$

Asset usage performance

Yhe ek Asset turnove Ratio hai Isko Nikalne ka purpose Yhe janana hai ki Company Apni Assets ka kitni efficency se use kar rhi hai. Isko Nikalne ka tarika

$$\text{Asset turnover Ratio} = \frac{\text{Total Sale}}{\text{Total Asset}}$$

Financial leverage

Company apne "debt" the Use Asset ko Finance krne ke lie kr rhi hai. ya Project ko Fund krne ke lie kr rhi hai. Isko Nikalne ka tarika

$$\text{Financial leverage} = \frac{\text{Total Asset}}{\text{Total Equity}}$$

operating performance mai Company apne Net profit margin ko maitain Rakhti hai. aur sath mai profit ko grow krna Bhi dekhti hai. Profit ko grow krne ke lie

→ Cost ko Reduce krna hoga

(Ya)

→ Price ko Increase krna hoga.

Asset turnover Ratio Two same Industry ko Compare krne par Bhi Kaam aati hai

(and)

Agar Asset turnover Ratio Increase hota hai toh iska positive Impact jata hai Return on Equity

→ ATR ↑ = ROE ↑

→ ATR ↓ = ROE ↓

Debt ka paisa Company ko grow krne ke lie ya operate Karne ke lie lagna chaiye

(and)

High Financial leverge	=	High ROE
low Financial leverage	=	low ROE

Significant of DuPont Analysis

The Company Can Increase its Return on Equity if it;

a) Generate High Net Profit Margin.

b) Effectvely use of Asset as to generate More Sale

c) has a high Financial leverge.

Total Asset = Equity + Debt

Total Asset − Equity = Debt

Formula's

Total Asset = Fixed Asset + Current Asset

↓

other C.A + T.R + Inventory + C& C Equ.

$$\text{Asset turnover} = \frac{\text{operating Income}}{\text{Total Asset}}$$

$$\text{Return on Investment} = \text{Asset turnover} \times \text{Profit margin}$$

↓

$$\frac{\text{EBIT}}{\text{operating profit}}$$

EBIT : operating Income
+
Non operating Income
−
operating Expense

ROI [Return on Investment] = Asset turnover × profit margin

① Asset turnover = $\frac{\text{operating Income}}{\text{Total Assets}}$ → F.A + CA

② Profit margin = $\frac{EBIT}{\text{operating Income}}$ → EBIT = Operating Income + Non operating Income − Operating Expense

Company Ne Jo Investment ki hai Assets usme Company ne kitna Return generate kia hai usko hi ROI

$$ROE = \frac{\text{Net Income}}{\text{Total Revenue/Sale}} \times \frac{\text{Total Revenue/Sale}}{\text{Total Asset}} \times \frac{\text{Total Asset}}{\text{Total Equity}}$$

$$ROE = \frac{\text{Net Income}}{\text{Total Shareholder Equity}}$$

$$= \frac{\text{Net Income (EAT)}}{\text{Pre-tax Income}} \times \frac{\text{Pre-tax Income}}{\text{Operating Income}} \times \frac{\text{Operating Income (EBIT)}}{\text{Sale}} \times \frac{\text{Sale}}{\text{Asset}} \times \frac{\text{Asset}}{\text{Equity}}$$

Tax Burden × Interest Burden × Operating Margin × Asset turnover × Financial leverage

Sale	=	xxx
(-) Variable Cost	=	(xxx)
Contribution		xxxx
(-) Fixed Cost		(xxx)
Operating profit / EBIT		xxxx
(-) Interest on - Deb - loan - OD etc		(xxx)
EBT		xxxx
(-) Tax		(xxx)
EAT		xxxx
(-) Dividend paid to preference share		(xxx)
Earning for Equity share holder		xxxx
(÷) Number of Equity shareholders		÷ xxx
EPS (Earning per share)		xxxxx

EBIT = Earning Before Interest & Tax

EBT = Earning Before tax

EAT = Earning After tax

Solved Case 3

EBIT (operating Income)	=	2570
(-) Interest	=	(20)
EBT (Pre-tax Income)	=	2550
(-) Tax	=	(900)
EAT (Net Income)	=	1650

$$ROE = \frac{\text{Net Income}}{\text{Pre-tax Income}} \times \frac{\text{Pre-tax Income}}{\text{operating Income}} \times \frac{\text{operating Income}}{\text{Sale}} \times \frac{\text{Sale}}{\text{Asset}} \times \frac{\text{Asset}}{\text{Equity}}$$

$$= \frac{1650}{2550} \times \frac{2550}{2570} \times \frac{2570}{7100} \times \frac{7100}{7250} \times \frac{7250}{4100}$$

$$= 0.64705 \times 0.99221 \times 0.36197 \times 0.97931 \times 1.76829$$

$$= 0.4024 \text{ (or) } 40.24\%$$

Divisional performance Measurement tools – RoI, Residual Income

objective of Business organisation

1. PROFIT
2. SURVIVAL
3. GROWTH.

Performance measurement tools

1. Retun on Investment (RoI)
2. Residual Income (R.I)

] In this chapter

3. Economic Value Addition [EVA]] Next chapter

Return on Investment (RoI)

Ex

Bank FD = 500,000

Reton on FD = 8%.

Income = 500,000 × 8% p.a

= 40,000

Income = Investment × Retun on Investment

Return on Investment = $\frac{\text{Income}}{\text{Investment}} \times 100$

Ex

Investment in Business = 10,00,000

Income = 200,000

Return of Investment = $\frac{\text{Income}}{\text{Investment}} \times 100$

= $\frac{200,000}{10,00,000} \times 100$

= 20%

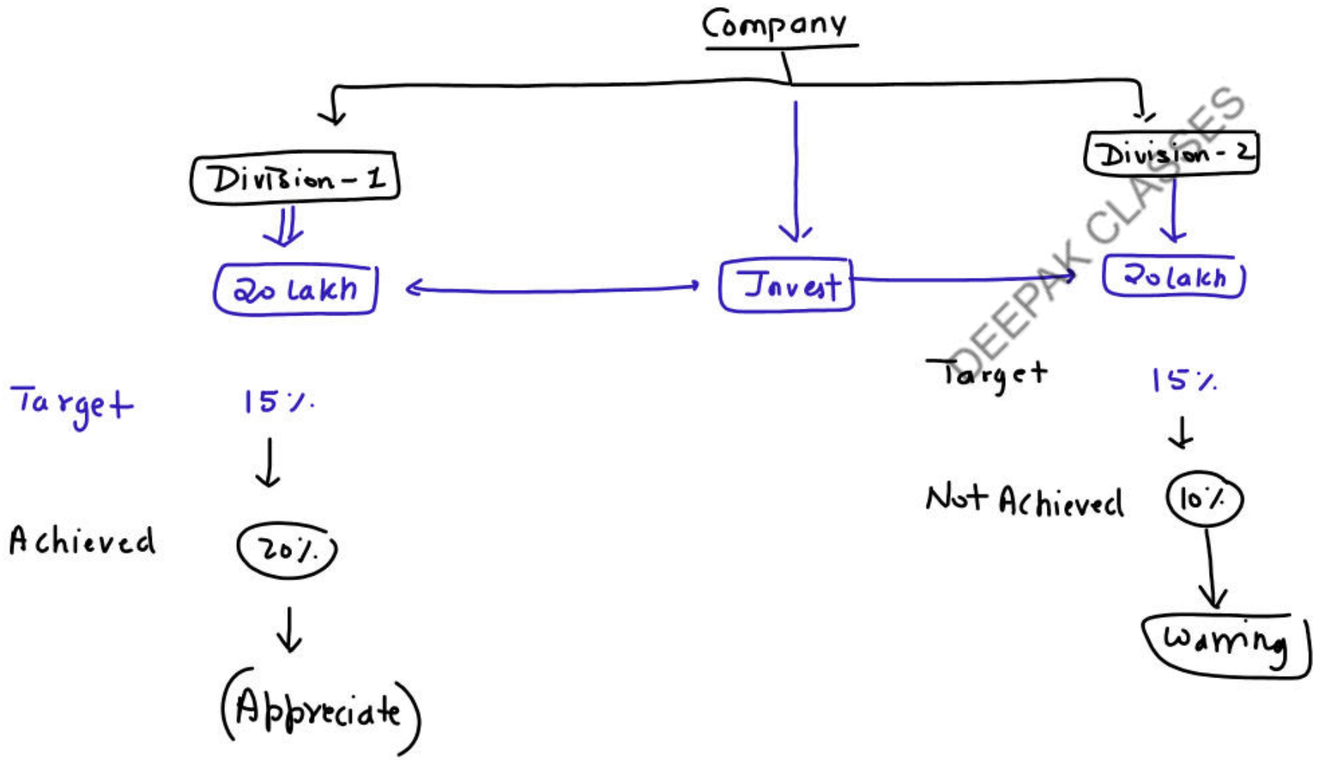
Formulas as per Module

Retun on Investment = $\frac{\text{Profit before Int \& Tax}}{\text{Capital employed}} \times 100$ (OR) $\frac{\text{Operating Income / profit}}{\text{Capital employed}} \times 100$

How RoI can be used to measure performance of manager/employee ?

Divisional manager are given **Target to Acheive** (Ex. 15%) for their Division.

If this target is achieved then those manager will Appreciate. & If not achieved then will give worring will not get Incentive.



Example ABC Ltd want to Invest 20 lakh (Project)

	D-I	D-II
Present Return on Invest (RoI)/ Target RoI	13%	5%
Expected Return on Investment	10%	7%

RoI ↓ (D-I)

Accept (D-II)

Overall Cost of Capital = 8%

Company

Project deti hai Division 1

↓

Toh Company ko Benefit hai But divisional performance khurab hojayegi

↓

(Reject the Project by D-1)

Project deti hai Division-2

↓

Toh Company ko loss hojayega kyuki Uski khudki Cost of Capital 8% aur Division-2 7% ka hi RoI generate kr rha hai

↓

(Company not agree to give this project to Division 2)

Residual Income (R.I)

↓

Baehi hui Income ko Residual Income khete hai

Ex XYZ Ltd

Amount collected from issue of 10% Debenture = 20 lakh

Company Invest this 20 lakh and earn a profit of 250,000

Residual Income	=	Profit/ Income	−	[Investment	×	Cost of Capital (%)]

Cost of Capital = 20 lakh × 10%

= 200,000

Residual Income = Profit − Cost of Capital (₹)

= 250,000 − 200,000

= 50,000

Residual Income	=	Divisional profit	−	[Divisional investment	×	Percentage Capital Capital]

Residual Income	=	operating Profit	−	[Investment in Asset	×	minimum Rate of Return]

↓

$$\left[\frac{\text{Opening Invest in Asset} + \text{Closing Invest in Asset}}{2}\right]$$

Q2

$$\text{Avg operating Asset} = \frac{2,77,000 + 3,23,000}{2}$$

$$= \boxed{300,000}$$

$$\text{operating profit} = 48000$$

Minimum Rate of Return = 12%

$$\text{Residual Income} = \text{operating profit} - \left[\text{Avg operating Asset} \times \text{minimum Rate of Return}\right]$$

$$= 48000 - [300,000 \times 12\%]$$

$$= 48000 - 36000$$

$$= \boxed{12000}$$

Q3

① $$\text{ROI} = \frac{\text{operating Income}}{\text{Invest. in Asset}} \times 100$$

$$= \frac{55000}{225000} \times 100$$

$$= \boxed{24.44\%}$$

② $$\text{Residual Income} = 55000 - [2,25,000 \times 12\%]$$

$$= 55000 - 27000$$

$$= \boxed{28000}$$

Q4

(a) Division A is more successful because it earn 20 Rubee for every Investment of ₹100 as Compare Division B earn 18 Rubees for every Investment of ₹100

(b) Division A

$$RI = 10L - [50L \times 16\%]$$

$$= 10L - 8L$$

$$= \boxed{200,000}$$

Division B

$$RI = 2250,000 - [1,25,00,000 \times 16\%]$$

$$= 2250,000 - 70,00,000$$

$$= \boxed{250,000}$$

[Division B is more Successful in terms of RI]

Q5

$$\text{Operating profit} = 1200,000 \times 10\%$$

$$= \boxed{120,000}$$

(1) $$ROI = \frac{\text{operating profit}}{\text{operating Assets}} \times 100$$

$$25\% = \frac{120,000}{OA}$$

$$\text{Operating Asset} = \frac{120,000}{25\%} = \boxed{480,000}$$

(2) $$RI = 120,000 - [480,000 \times 18\%]$$

$$= 120,000 - 86400$$

$$= \boxed{33600}$$

Q6 Division X

a) Asset turnover = $\frac{\text{Sale}}{\text{Asset}}$

$= \frac{500{,}000}{100{,}000} = 5$ Time

b) Margin = $\frac{\text{Profit}}{\text{Sale}} \times 100$

$= \frac{25000}{500{,}000} \times 100$

$= 5\%$

c) RoI = $\frac{\text{operating Profit}}{\text{operating Asset}} \times 100$

$= \frac{25000}{100{,}000} \times 100$

$= 25\%$

Division Y

d) Margin = $\frac{\text{Profit}}{\text{sale}} \times 100$

$0.4\% = \frac{30{,}000}{\text{sale}}$

$\text{Sale} = \frac{30{,}000}{0.4\%}$

Sale = 75,00,000

e) RoI = $\frac{\text{operating Profit}}{\text{operating Asset}} \times 100$

$2\% = \frac{30{,}000}{\text{op. Asset}}$

$\text{op. Asset} = \frac{30{,}000}{2\%}$

$= 1500{,}000$

(f)

Asset turnover = $\frac{\text{sale}}{\text{Asset}}$

$= \frac{7500{,}000}{1500{,}000}$

$= 5$ Time

Division Z

(g) Asset turnover = $\frac{\text{Sale}}{\text{Asset}}$

$0.4 = \frac{\text{Sale}}{250{,}000}$

$\text{Sale} = 250{,}000 \times 0.4$

$= 100{,}000$

h) Margin = $\frac{\text{Op. Income}}{\text{Sale}} \times 100$

$5\% = \frac{\text{op. Income}}{100,000}$

Operating Income = 5000

i) ROI = $\frac{\text{op. Income}}{\text{Op. Asset}} \times 100$

$= \frac{5000}{250,000} \times 100$

$= 2\%$

(b) (1) Division X performed Best as Compare to Division Y & Z

(2) Division X & Y has same Asset turnover but margin & ROI of Division Y has much lower as Compare to Division X. So It Clear that Division Y must improve in their Margin & ROI

(3) Division X & Z has some profit margin but Asset turnover & ROI of Division Z is much lower as Compare to division X. So It Clear that Division Z must improve in their Asset turnover & ROI

Q9

RI = Profit before Int & tax − [Investment in Net Asset × Notional Cost of Capital]

= 160,000 − [800,000 × 12%]

= 160,000 − 96000

= 64000

Pending Question

~~Q7~~, ~~Q8~~, ~~Q10~~, ~~Q11~~ = Illustration

~~Q6~~, ~~Q7~~ → Comprehensive

$$ROI = \frac{\text{operating profit}}{\text{Capital employed}} \times 100$$

$$\text{Capital employed} = \text{Total Asset} - \text{Current Liability}$$

(or)

$$\text{Non Current Asset} + \text{Current Asset} - \text{Current liab.}$$

Balance sheet

I Liability

1. Shareholder Fund
2. Non Current liab

Capital Employed

3. Current liab

Total liab

1. Non Current Asset
2. Current Asset

Total Asset

xxx

equal

.xxx

Q7

$$ROI = \frac{\text{Profit}}{\text{Capital employed}} \times 100$$

$$= \frac{28000}{142000} \times 100$$

$$= \boxed{19.72\%}$$

However, Suppose that the Investment Center "manager" has no responsibility for Collection of Debtor & B/R (Trade Receiveable). Then it impact on ROI. So the New ROI will be

$$ROI = \frac{28000}{(142000 - 30{,}000)} \times 100 = \boxed{25\%}$$

Q8

(a)

	Division A	Division B
Old ROI	30%	10%
New ROI (Operating Profit / Capital employed)	$\left(\frac{90K + 20K}{3L + 1L} \times 100\right)$	$\left(\frac{10K + 12K}{1L + 1L}\right) \times 100$
	27.5%	11%
will management Accept the proposal?	NO	YES

(b) As the whole Company Point of view 11% is Bad as before because cost of Cost of Capital is 15%.

Q10

(a) ROI

	Without Investment	With Investment
$ROI = \left(\frac{Profit}{Investment} \times 100\right)$	$\frac{160,000}{800,000} \times 100$	$\frac{175000}{900,000} \times 100$
ROI	20%	19.44%

As per the ROI performance mangement clo not want to Invest in project because the will Reduce after Investment.

(b) RI

	Without Investment	With Investment
Residual Income		
Operating profit	160,000	175000
(-) minimum Return [Investment x Cost of capital]	(96000) (8L x 12%)	(108,000) [900000 x 12%]
R.I	64000	67000

As per the RI performance management want to Investment in the Project so that Company get Extra RI of ₹ 3000 as before.

Q11.

Opening Net Book value of Asset = 200,00,000 − 50,00,000

= 150,00,000

Closing Net Book Value of Asset = 150,00,00 − 10,00,000

= 140,00,000

Avg NBV of Asset = $\frac{1,50,00,000 + 1,40,00,000}{2}$

= $\frac{2,90,00,000}{2}$

= 1,45,00,000

ROI = $\frac{\text{Operating profit}}{\text{Avg NBV of Asset}} \times 100$

= $\frac{95,000}{145,00,000} \times 100$

= 6.55%

Q6

Cost of Computer = 160,000

Life = 5 year

$$\text{Depreciation} = \frac{160{,}000 - 0}{5} = \boxed{32000 \text{ year}}$$

Net Income = Saving − Depreciation

= 70,000 − 32000 = **38000**

	1st year Beg	2nd yr Beg	3rd Beg	4th Beg	5th Beg
Net Book of Asset [Cost Asset − Deb]	160,000	128000	96000	64000	32000
Net Income	38000	38000	38000	38000	38000
$ROI = \frac{NI}{NBV \text{ of Asset}} \times 100$	23.75%	29.69%	39.58%	59.375%	118.75%
$EVA = NI - (C \times WACC)$	38000 − 40,000 (2000)	38000 − 32000 = 6000	38000 − 24000 14000	38000 − 16000 22000	38000 − 8000 30,000

Q7 (a) RoI on acquition Cost Basis

	Division 1	Division 2
$RoI = \frac{Profit}{Asset} \times 100$	$= \frac{8L}{40L} \times 100$	$\frac{12L}{75L} \times 100$
	$= 20\%$	16%

Comment

RoI on the Basis acquition cost is Better Performe as Compare to Replacement Cost

(b) RoI on the Basis of Current Replacement Cost

	Division 1	Division 2
$RoI = \frac{Profit}{Asset} \times 100$	$= \frac{8L}{60L} \times 100$	$\frac{12L}{80L} \times 100$
	$= 13.33\%$	15%

EVA = Economic Value added ⇒ [Management Accounting]

Topic to be Cover

1. Meaning of EVA (Done)
2. Formula of EVA (Done)
3. Meaning of NOPAT (Done)
4. Concept of Cost of Debt (Done)
5. Concept of Cost of Equity under CAPM (Done)
6. Concept of Capital employed (Done)
7. Concept of weighted Avg Cost of Capital (WACC) (Done)
8. Financial Leverage
9. illustration & Questions.

Meaning of EVA

① EVA is a Value Based Financial performance measure, an investment decision tools.

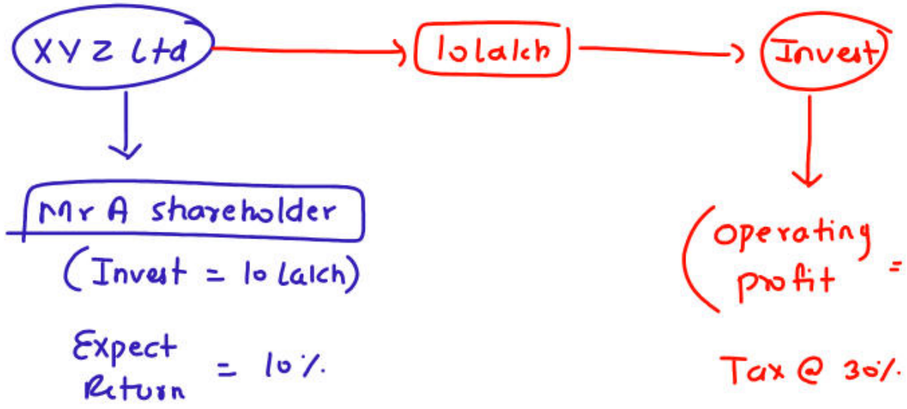
② It is Computed as a product of "EXCESS RETURN" made on the Investment and investments

③ EVA measure the Firm ability to earn more than the ture Cost of Capital
EVA measure Economic profit that Exceed the Investor Expectation

④ If EVA is positive, that Indicate the Company Surpassed the Expectation of its shareholder & vice versa.
If EVA is zero, this should to be treated as sufficient acheivements because the shareholder have earned a return that Compensate the Risk.

$$EVA = NOPAT - (\text{Capital employed} \times WACC\%)$$

Ex



Note :- It is assume that there is No Debetur & Loan.

Net operating profit after tax (NOPAT) = Operating profit − Tax

= 2 lakh − 30%

= 140,000

EVA = NOPAT − (C·EX WACC%)

= 140,000 − (10 lakh X 10%)

= 140,000 − 100,000 = 40,000

Statement of profit

	Sale	xxx
(−)	variable cost	(xx)
	Contribution	xxx
(−)	Fixed cost	(xx)
	EBIT	xxxx
(−)	Interest → Deb → loan	(xxx)
	EAI & BT	xxxx
(−)	Tax	(xx)
	EAT	xxx
(−)	pref. dividend	(xxx)
	Earning for Equity share	xxx

→ (distribute to E.S)

→ (Retain Earning)

Net operating profit After Tax (NOPAT)

EBIT	=	xxx
less :- Interest	=	(xxx)
EBT		xxx
less :- Tax @		(xxx)
EAT		xxxx

NOPAT ≠ EAT

NOPAT → Yhe Vo profit jisme shirf tax is minus hua hai Is profit mai Interest minus Nhi hua.

Formula's

NOPAT = EAT + Interest (1 − Tax Rate)

Ex

EBIT = 500,000

Interest = 120,000

Tax @ 30%

Find NOPAT

EBIT =	500,000
(–) Interest =	(120,000)
EBT	3,80,000
(–) Tax @ 30%	(1,14,000)
EAT	266,000

NOPAT = EAT + Interest (1 – Tax Rate — 1st Preference

= 266,000 + 120,000 (1 – 0.30)

= 266,000 + 84000

= **350,000**

If Interest is Not given in Question

NOPAT = EBIT [1 – Tax] — 2nd preference

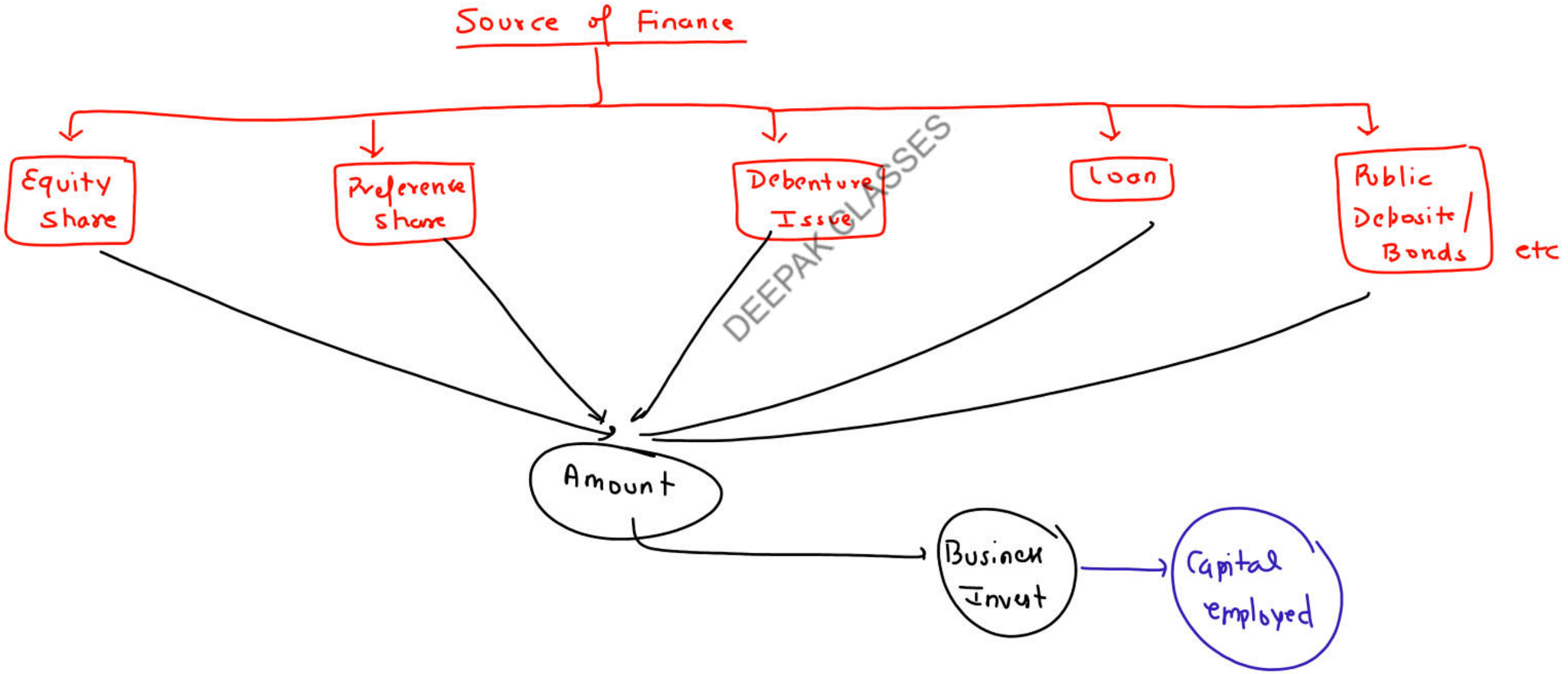
= 500,000 [1 – 30%]

= 500,000 × 0.70

= **350,000**

Capital employed

Capital employed Vo Amount of Capital jo Business mai Invest ho Rakhi hai jis paiso se Business ko operate kia jaa rha hai.



Q12

$$EVA = NOPAT - [\text{Capital employed} \times WACC\%]$$

$$= 28000 - [200{,}000 \times 10\%]$$

$$= 28000 - 20{,}000$$

$$= \boxed{8000}$$

Cost of Debt [Kd]

Ex ABC Ltd
↳ Debeture Issue @12% = ₹10 lakh → [Debt]

Cost of Debt (Kd) = 10L x 12% = 120,000

Impact of Taxation in kd

(1)

Company → Bank | Deb holder → Income tax @10%

Company → EBIT = 1L

Bank | Deb holder → EBT = 100000

Income tax → Tax-10% → EAT = 90,000

Tax-10% → Tax 10,000

(2)

Company → Bank | Deb holder → IT @10%

Company → 100,000 → EBIT

Bank | Deb holder → Int = 10k → Bal = 90,000 → EBT

IT → Tax = 9000

Bal = 81000

Summary

	If there is No Int Payment	If ther is payment of Int also
Tax	10,000	9000

Tax Saving = 1000

Ex 12% Debenture = 10 lakh

No Tax payment

Cost of Debt = ?

Cost of Debt (kd) = 10 lakh × 12%

= 120,000

(Interest)

Ex 12% Deb = 10L

Tax = 10%

Cost of Debt = ?

Cost of Debt = Interest × (1 − Tax Rate)

(1 − Tax Rate) → Decimal

= 120,000 × [100% − 10%]

= 120,000 × 90%

= 108,000

120,000 − 12,000

(Total Cost of Debt) − (Tax saving)

EBIT = 500,000

Tax Rate = 10%.

Interest Rate = 12%.

Debenture = 10 lakh

	Without Interest (No Debt)	With Interest (with Debt)
EBIT	500,000	500,000
(-) Interest (kd)	Nil	(120,000)
EBT	500,000	380,000
(-) Tax @ 10%.	(50,000)	(38000)
	450,000	342,000

Tax Saving = 12000

Cost of Equity (Ke) [under Capital Asset pricing model) [CAPP]

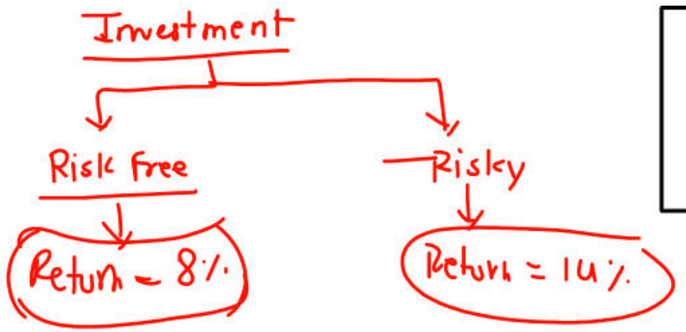
$$\text{Cost of Equity (Ke)} = \text{Risk free Return} + \text{Beta}\left[\text{Market Return} - \text{Risk free Return}\right]$$

Risk Free Return → Jab Hum Risk Free Investment krte hai like Fixed Deposite, Govt Security, Govt Bond etc (Risk ↓, Return ↓)
Fixed Deposite → 7%
Govt Security → 7-8%

Market Return → Jab Hum Risk Investment krte hai M stock Market then Hum jo Return milta hai Vo Market Return hota hai aur vo Return RFR se jayada hota hai

(Risk ↑, Return ↑)

Ex

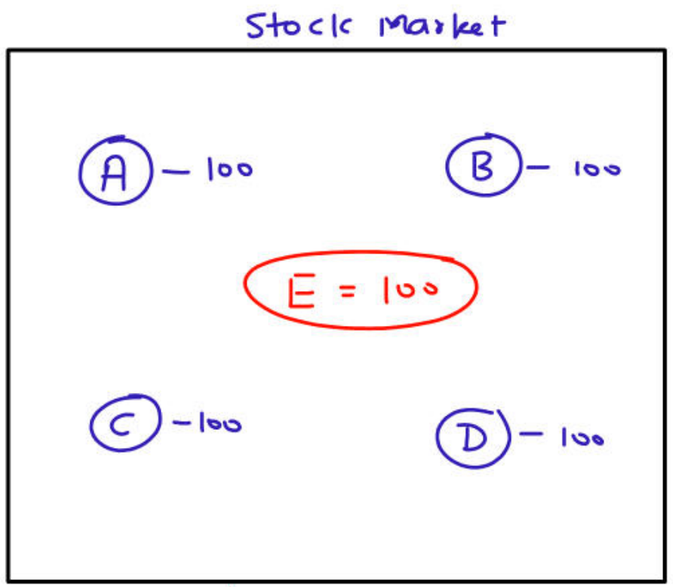


$$\text{Market Risk Premium} = \text{Market expected Return} - \text{Risk free Return}$$

= 14% − 8% ⇒ 6%

Beta Coefficient

Sensitivity of a particular Investment with regard to Market Risk



(Market gir gyi → Govt Policy) = (Systematic Risk)

A | B | C = 90 — Market↓ = 10%.

D = 70.

E = 95

$\beta = 1$ = Market Risk = Investment Risk — A/B/K

$\beta > 1$ = I.R > M.R — 10%.↓

$\beta < 1$ = M.R > I.R — 30↓

$\beta = 0$ → No Risk

Ex

Risk Free Return = 8%.

Market Return = 14%

$\beta = 1$

Now,

Cost of Equity (Ke) $= R_F + \beta (R_M - R_F)$

$= 8\% + 1 (14\% - 8\%)$

$= 8\% + 1 \times 6\%$

$= 14\%$

If β Coefficient is 1.5

$Ke = R_F + \beta (R_M - R_F)$

$= 8\% + 1.5 (14\% - 8\%)$

$= 8\% + 1.5 (6\%)$

$= 8\% + 9\%$

$= 17\%$

Weighted Avg Cost of Capital (WACC)

↓

Overall Cost of Capital

- Cost of debt = 12%
- Cost of Equity = 14%

[Jab Hum ek Single Rate Nikal lete hai Sabko Merge krke usko WACC kehte hai]

60% = Debt

40% Equity

$$WACC = (Kd \times \text{Debt Ratio}) + (Ke \times \text{Equity Ratio})$$

$$= (12\% \times 60\%) + (14\% \times 40\%)$$

$$= 7.2 + 5.6 = 12.8\%$$

Q13 / Q9

Cost of Debt (kd) = Interest x (1 − Tax Rate)

= 12% x (1 − 0.30)

= 12% x 0.70

= 8.4%

Cost of Equity (ke) = $R_F + B(R_M - R_F)$

= 9% + 1.05 (19% − 9%)

= 9% + 1.05 (10%)

= 9% + 10.5%

= 19.5%

Debt Equity Ratio (Given) 20% & 80%

WACC = (8.4% x 20%) + (19.5% x 80%)

= 1.68 + 15.6

= 17.28%

Capital employed = 2000 + 500 + 7500

= 10,000 Cr

EVA = NOPAT − (Capital emp. x WACC%)

= 2100 Cr − (10,000 Cr x 17.28%)

= 2100 Cr − 1728 Cr

= 372 Cr

Financial leverage

$$\text{Financial leverage} = \frac{EBIT}{EBT} \quad \text{or} \quad \frac{EBIT}{EBIT - \text{Interest}}$$

$$= \text{\_ \_ \_ \_ \_ Times}$$

Ex

EBIT = 500,000

Interest = 150,000

$$\text{Financial leverage} = \frac{EBIT}{EBIT - \text{Interest}}$$

$$= \frac{500{,}000}{500{,}000 - 150{,}000}$$

$$= \frac{500{,}000}{350{,}000} = 1.43 \text{ Time}$$

Q14

(a)

EBIT	40,00,000	(Bal. Fig)
(–) Interest	(1500,000)	
EBT	2500,000	(Let 100)
(–) Tax (40%)	(10,00,000)	→ 40
EAT	1500,000	→ 60

NOPAT = EAT + Interest (1 – Tax)

= 15L + 15L (1 – 0.40)

= 15L + 15L × 0.60

= 15L + 9L

= 24 lakh

(b)

EVA = NOPAT – [Capital employed × WACC %]

= 24 lakh – [1 Cr × 12.6%]

= 24 lakh – 12.60L

= 11,40,000

Steps to Calculate EVA

1. Cost of Debt (Kd) = Interest (1-Tax)

2. Cost of Equity (Ke) = $R_F + \beta (R_M - R_F)$

3. Capital employed = Debt + Shareholder Fund
   = Debt + [ESC + R&S]

4. Debt Ratio = $\frac{\text{Debt}}{\text{Capital employed}}$

5. Equity Ratio = $\frac{\text{Shareholder Fund}}{\text{Capital employed}}$

6. WACC = (Kd x Debt Ratio) + (Ke x Equity Ratio)

7. NOPAT = EAT + Interest (1-Tax)

8. Calculate EAT with the help of EBIT, Int & tax

9. If EBIT is not given then Calculate with the help of Financial leverage

10. EVA = NOPAT − (Capital employed x WACC%)

Q15

① Interest Rate on loan = $\frac{4.85\,Cr}{37\,Cr} \times 100$

= 13.11%

② Cost of debt = Int (1 − Tax)

= 13.11% (1 − 0.25)

= 13.11% × 0.75

= 9.8325%

As per module, Beta will be Consider for Calculating EVA is Highest of All the Beta.

③ Cost of Equity (ke) = $R_F + \beta (R_m - R_F)$

= 12% + 1.10 (15.50 − 12)

= 12% + 1.10 (3.50%)

= 12% + 3.85%

= 15.85%

④ Capital employed = Debt + Shareholder Fund

= 37Cr + 740 Cr

= 777 Cr

⑤ Debt Ratio = $\frac{37\,Cr}{777\,Cr}$ = 0.0476

⑥ Equity Ratio = $\frac{740\,Cr}{777\,Cr}$ = 0.9524

⑦ WACC = (9.83% × 0.0476) + (15.85% × 0.9524)

= 0.4679 + 15.095

= 15.56%

⑧ NOPAT = EAT + Int (1 − Tax)

= 205.90 Cr + 4.85 Cr (1 − 0.25)

= 205.90 + 3.6375

= 209.54 Cr

$$EVA = NOPAT - (\text{Capital}_{emp} \times WACC\%)$$

$$= 209.54\,Cr - (777\,Cr \times 15.56\%)$$

$$= 209.54 - 120.90$$

$$= \boxed{88.64\,Cr}$$

Q15

① Interest Rate on loan = $\frac{40L}{400L} \times 100$

= 10%

② Cost of debt = Int (1 − Tax)

= 10% (1 − 0.30)

= 7%

③ Cost of Equity (ke) = $R_F + \beta (R_m - R_F)$

= 9% + 1.05 (16% − 9%)

= 9% + 1.05 (7%)

= 16.35%

④ Capital employed = Debt + Shareholder Fund

= 400 + 2000 + 4000

= 6400 lakh

⑤ Debt Ratio = $\frac{400L}{6400L}$ = 0.0625

⑥ Equity Ratio = $\frac{6000L}{6400L}$ = 0.9375

⑦ WACC = (7% × 0.0625) + (16.35% × 0.9375)

= 0.4375 + 15.33%

= 15.77%

⑧ NOPAT = EBIT (1 − Tax)

= 2000L (1 − 0.30)

= 1400L

Q8

	EBIT =	2000L
(-)	Int =	(40L)
	EBT	1960L
(-)	Tax @ 30%	(588L)
	EAT	1372L

NOPAT = EAT + Int (1 − Tax)

= 1372L + 40L (1 − 0.30)

= 1372L + 28L

= 1400L

EVA = NOPAT − [CE × WACC %]

= 1400L − [6400L × 15.77%]

= 1400L − 1009.28L

= 390.72L

Q8

① Cost of debt (Kd) = 10% (1 − 0.30)

= 10% × 0.70

= 7%

② Cost of Equity (ke) = 17.5%

③ Capital employed = 170 + 130 + 400

= ₹700L

④ Debt Ratio = $\frac{400L}{700L}$ = 0.5714

⑤ Equity Ratio = $\frac{300L}{700L}$ = 0.4286

⑥ WACC = (7% × 0.5714) + (17.5% × 0.4286)

= 4% + 7.5% = 11.5%

⑦ Financial leverage = $\frac{EBIT}{EBIT - Int.}$ [let EBIT = x]

$1.4 = \frac{x}{x - 40L}$

$1.4(x - 40L) = x$

$1.4x - 56L = x$

$1.4x - 1x = 56L$

$0.4x = 56L$

$x = \frac{56L}{0.4}$

x = 140 Lakh

EBIT = 140 Lakh

NOPAT = EBIT (1 − Tax)

= 140L (1 − 0.30)

= ₹98L

EVA = 98L − (700L × 11.5%)

= 98L − 80.5L

= 17.5 Lakh

Ill-16

① Cost of debt (Kd) = 12% (1 − 0.30)

= 12% × 0.70

= **8.4%**

② Cost of Equity (ke) = **15%**

③ Capital employed = 1582L + 155L + 154L + 109L + 500L

= **2500L**

④ Debt Ratio = $\frac{500L}{2500L}$ = 0.20

⑤ Equity Ratio = $\frac{2000L}{2500L}$ = 0.80

⑥ WACC = (8.4% × 0.20) + (15% × 0.80)

= 1.68 + 12 ⇒ **13.68%**

⑦ Financial leverage = $\frac{EBIT}{EBIT - Int.}$ [let EBIT = x]

$1.1 = \frac{x}{x - 60L}$

$1.1(x - 60L) = x$

$1.1x - 66L = x$

$1.1x - 1x = 66L$

$0.1x = 66L$

$x = \frac{66L}{0.1}$

EBIT (x) = 660L

NOPAT = EBIT (1 − Tax)

= 660L (1 − 0.30)

= **462L**

EVA =

= 462L − (2500L × 13.68%)

= 462L − 342L

= **120L**

(17)

Int. Rate on Long term Debt $= \frac{20L}{200L} \times 100$

$= \boxed{10\%}$

1) Cost of debt (Kd) $= 10\% (1 - 0.35875)$

$= 10\% (0.64125)$

$= \boxed{6.4125\%}$

2) Cost of Equity (Ke) $= 10\% + 1.4 (15\% - 10\%)$

$= 10\% + 1.4 (5\%)$

$= 10\% + 7\%$

$= \boxed{17\%}$

(3) Capital employed $= 200L + 1000L + 2000L$

$= \boxed{3200L}$

(4) Debt Ratio $= \frac{200L}{3200L} = 0.0625$

(5) Equity Ratio $= \frac{3000L}{3200L} = 0.9375$

(6) WACC $= (6.412\% \times 0.0625) + (17\% \times 0.9375)$

$= 0.4 + 15.94$

$= \boxed{16.34\%}$

(7) NOPAT $=$ EBIT $(1 - Tax)$

$= 1000 (1 - 0.35875)$

$= \boxed{641.25L}$

(8) EVA $= 641.25L - (3200L \times 16.34\%)$

$= 641.25L - 522.88L$

$= \boxed{118.37L}$

Ill-18

① Capital employed = Total Asset − Current liab

= 75L − 15L

= 60L

② WACC = 10%

③ NOPAT = 25L

④ EVA = NOPAT − (Capital emp × WACC%)

= 25L − (60L × 10%)

= 25L − 6L

= 19L — (Positive)

Q10 (R·A)

① NOPAT = 54580L − 15230L

= 39350L

② WACC = (5% × 0·30) + (11% × 0·70)

= 1·5 + 7·7

= 9·2%

③ Capital employed = 155,740 lakh

④ EVA = 39,350L − (155,740L × 9·2%)

= (39,350 − 14328·08) lakh

= 25,021·92 lakh

Learning Curve [V. Imbt]

Ex

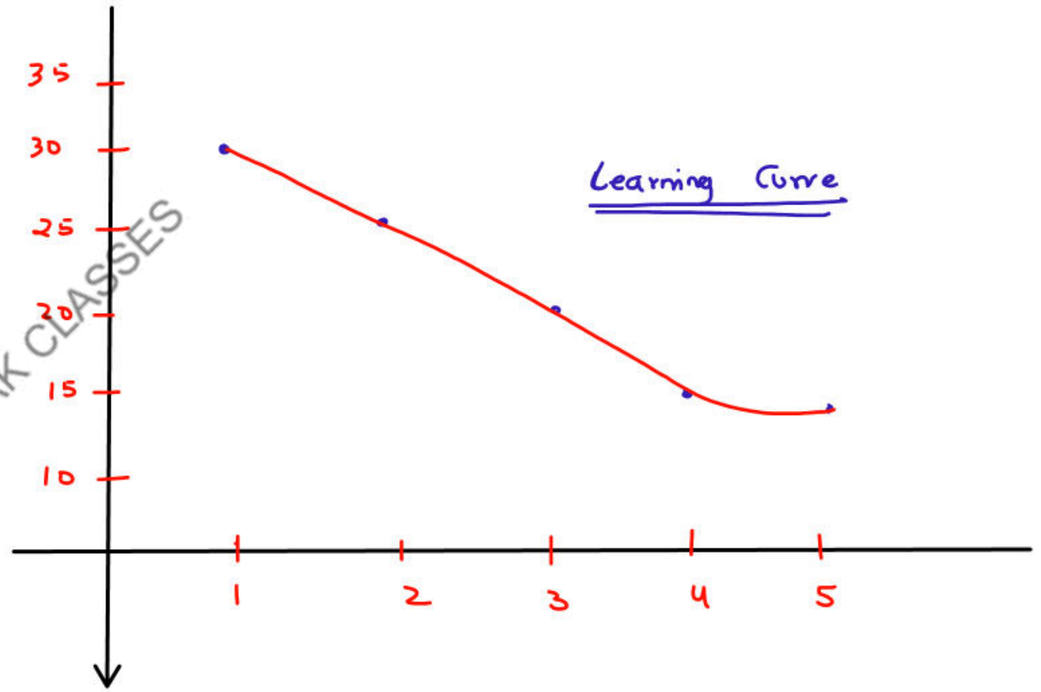
Teacher → Student

↓

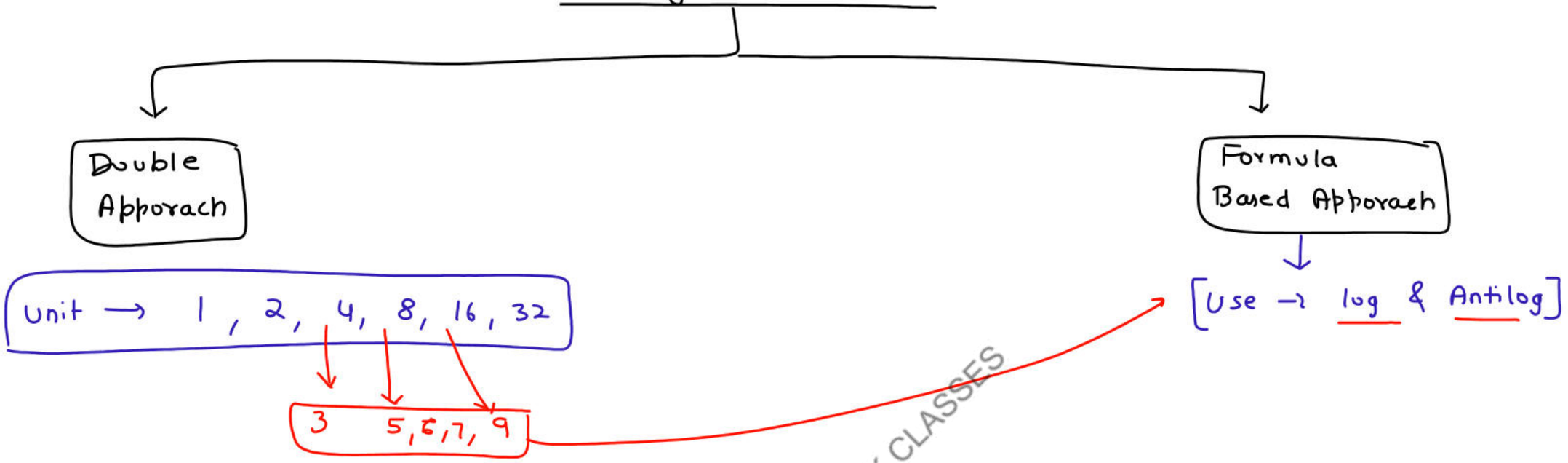
[H.W ⇒ Final Alc]

↓

1. [Time → 30 Min]
2. [Time → 25 min]
3. [Time → 20 min]
4. [Time → 15 min]
5. [Time → 15 min]



Learning Curve Approach



Ex

Double Approach

Incremental output (unit)	Total Cummulative unit	Cummulative Avg time (Hr)	Total Time (Hr)	Incremental Time (Hr)
	1 unit	50 Hr	50 Hour	
1unit	2 unit	40 Hr (80%)	80 Hour	30 Hour
2unit	4unit	32 Hr (80%)	128 Hour	48 Hour
4unit	8unit	25.6 Hr (80%)	204.8 Hour	76.8 Hour
8unit	16 unit	20.48 Hr (80%)	327.68 Hour	122.88 Hr

Q Statement showing Computation of Cost of Making 4 & 8 Machine

No. of Machine	Avg time	Direct labour Cost	Mat. Cost	Fixed Cost	Total Cost / Mach
1	1000 Hr	15000	150,000	60,000	2,25,000
2	900 Hr	13500	150,000	30,000	193500
4	810 Hr	12150	150,000	15000	177,150
8	729 Hr	10,935	150,000	7500.	168435

Learning Curve = 90%

Avg Cost of Making 4 Mach = 177,150 , → 4 Mach Total Cost = 708,600

Avg Cost of Making 8 Mach = 168,435 , → 8 Mach Total Cost = 13,47,480

Q statement showing Compution of Cost of Making 8 unit

No. of unit	Avg time	Total time	Labour Cost
1	10 Hr	10 Hr	₹ 120
2	8 Hr	16 Hr	₹ 192
4	6.4 Hr	25.6 Hr	₹ 307.2
8	5.12 Hr	40.96 Hr	₹496.52 (1)
16	4.096 Hr	65.536 Hr	₹786.432
32	3.2768 Hr	104.8576	₹ 1258.2912

Learning Curve = 80%

	₹
Cost of 32 unit =	1258.2912
Cost of 8 unit =	(496.52)
Cost of 24 unit	761.7712

Q21

Statement Showing Computation of Avg time, Total Time & Incremental time

No. of Yachts	Avg time per yachts	Total Time	Incremental time
1	800 Hr	800 Hr	-
2	640 Hr	1280 Hr	480 Hr
4	512 Hr	2048 Hr	768 Hr
8	409.6 Hr	3276.8 Hr	1228.8 Hr

① statement of profit for Second yacht

	£
Material	5000
Labour [480 Hr x 5]	2400
overhead [150% of labour]	3600
Total Cost	11000
(+) Profit (20% on cost)	2200
Sale	13,200

① statement of profit for 2 yacht

	£
Material [5000 x 2]	10,000
Labour [1280 Hr x 5]	6400
overhead (150%)	9600
Total Cost	26000
(+) Profit (20%)	5200
Sale	31200

① statement of profit for 3rd & 4th yacht

	£
Material [5000 x 2]	10,000
Labour [768 Hr x 5]	3840
overhead (150%)	5760
Total Cost	19600
(+) Profit (20%)	3920
Sale	23,520

① statement of profit for 4th yacht & 8th yacht

	4 yacht	8 yacht
Material [5000/yrt]	20,000	40,000
Labour [Hr x 5]	10,240	16384
overhead [150% of L.C]	15,360	24,576
Total Cost	45600	80,960
(+) Profit [20%]	9120	16,192
Sale	54,720	97,152
Price per yacht	÷ 4	÷ 8
	13,680	12,144

Q Statement showing Computation of Cost of Making 8 lot

No. of lots	Avg time	Direct labour Cost	Mat. Cost	Variable o/H	Total Cost / Mach
1	1000 Hr	20,000	150	25000	45,150
2	600 Hr	12000	150	15000	27,150
4	360 Hr	7200	150	9000	16,350
8	216 Hr	4320	150	5400	9870 → Avg Cost per unit

Learning Curve = 60%

Q2 At 80 % learning Curve

No. of Mach	Avg time per mach	Total time	Incremental time
1	600 Hr	600 Hr	
2	480 Hr	960 Hr	360 Hr

At 90 % learning Curve

No. of Mach	Avg time per mach	Total time	Incremental time
1	600 Hr	600 Hr	
2	540 Hr	1080 Hr	480 Hr

Q3

No of gift	Avg time per gift	Total time	Incremental time
1	20 Hr	20 Hr	—
2	18 Hr	36 Hr	16 Hr
4	16.2 Hr	64.8 Hr	28.8 Hr

① Calculating Total Cost of 4 gift

Direct labour [64.8 Hr × 50] = 3240

Variable o/H [4 × 2000] = 8000

Total Cost 11240

Cost of per product = $\frac{11,240}{4}$ = 2810

price to quote = Cost of per product + Cost per product

= 2810 + 1500

= 4310

(11)

		₹
Direct labour [20Hr × 4] × ₹50	=	4000
(+) Variable o/H [2000 × 4]	=	8000
Total cost		12000

per unit cost = $\frac{12000}{4}$ = 3000

Price quote = 3000 + 1500

= 4500

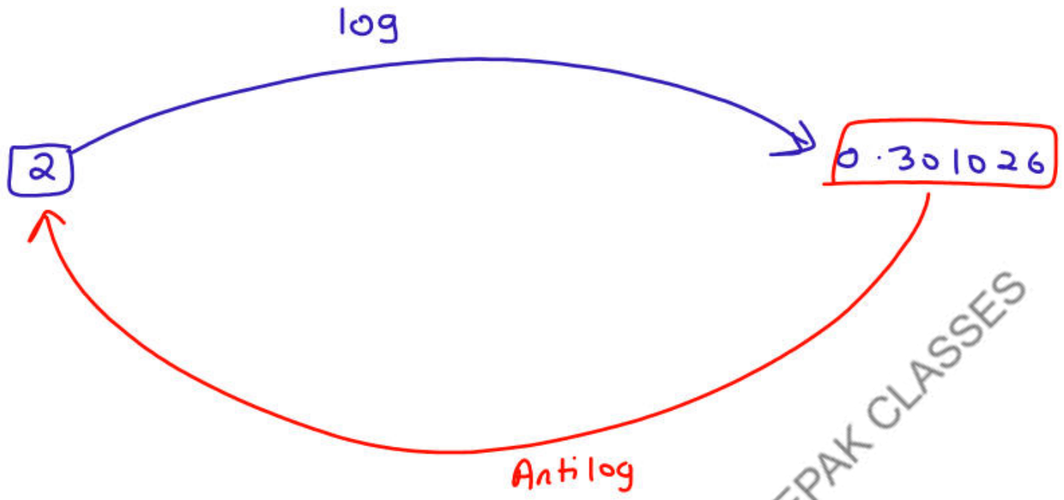
Lograthim & Anglog

Topic to be Cover

1. Meaning of log (Done)
2. property of log (Done)
3. How to Calculate log Value in Calculator (Done)
4. Meaning of Antilog (Done)
5. How to Calculate Anti-log Value in Calculator (Done)

Antilog

↳ It is a opposite of log.



#

$\log a = N$

$a = \text{Antilog } N$

$\log 2 = 0.301026$

$2 = \text{Antilog}(0.301026)$

Calculator Trick for Antilog

① Type a Number in Calculator

② ÷ 227695

③ + 1

④ ('x =') 19 time

Formula Approach

Learning Curve can also be Expressed as

$$y = ax^{b}$$

Where, y = is the **Avg time** per unit for x unit

a = the **time for First unit**

x = the Cummulative No. of unit

b = the learning Coefficient

$$b = \frac{\log [\text{learning curve}]}{\log 2}$$

Q23 (1) Given :-

$a = 10$

Learning Curve $= 0.80$

$x = 20$ unit

$y = ?$

$$b = \frac{\log [\text{learning curve}]}{\log 2}$$

$$= \frac{\log (0.80)}{\log 2} = \frac{-0.0969138}{0.30102645}$$

$$= \boxed{-0.322}$$

$$y = ax^b$$

$$y = 10 (20)^{-0.322}$$

Taking log both side

$$\log(y) = \log\left(10 \times 20^{-0.322}\right) \quad [\because \log(AB) = \log A + \log B]$$

$$\log y = \log 10 + \log (20)^{-0.322}$$

$$\log y = 1 + (-0.322) \log 20$$

$$\log y = 1 - 0.322 (\log 20)$$

$$\log y = 1 - [0.322 \times 1.301028]$$

$$\log y = 1 - 0.418931$$

$$\log y = 0.581068$$

$\log y = 0.581068$

$y = \text{Antilog}[0.581068]$

$\boxed{y = 3.8112}$

Avg time per unit $= 3.8112$

Total time $= 3.8112 \times 20$

$= \boxed{76.22 \text{ Hour}}$

(11) $y = ax^b$

$y = 10(30)^{-0.322}$

Taking log both side

$\log y = \log 10 + \log(30)^{-0.322}$

$\log y = 1 - 0.322 \log 30$

$\log y = 1 - 0.322 \times 1.4771$

$\log y = 1 - 0.47563$

$\log y = 0.5244$

$y = \text{Anti log}(0.5244)$

$\boxed{y = 3.3450 \text{ / unit}}$

Total time $= 3.3450 \times 30 \text{ unit}$

30 unit $= \boxed{100.35 \text{ Hr}}$

(iii) $y = ax^b$

$y = 10 \times (40)^{-0.322}$

Taking log both side

$\log y = \log \left[10 \times (40)^{-0.322} \right]$

$\log y = \log 10 + \log (40)^{-0.322}$

$\log y = 1 + -0.322 \log 40$

$\log y = 1 - 0.322 \times 1.6021$

$\log y = 1 - 0.5159$

$\boxed{\log y = 0.4841}$

$\log y = 0.4841$

$y = \text{Anti log } (0.4841)$

$\boxed{y = 3.0485}$

Total time for 40 unit $= 3.0485 \times 40$

$= \boxed{121.94 \text{ Hr}}$

Total time for 31 to 40 unit = Total time for 40 unit − Total time for 30 unit

$= 121.94 \text{ Hr} - 100.35 \text{ Hr}$

$= \boxed{21.60 \text{ Hour}}$

Q3

$a = 100$

$b = \frac{\log 0.80}{\log 2}$

$\boxed{b = -0.322}$

$x = 60$ unit

$y = ax^b$

$y = 100\,(60)^{-0.322}$

Taking log both side

$\log y = \log 100 - 0.322 \log 60$

$\log y = 2 - 0.322\,(1.77815)$

$\log y = 2 - 0.5726$

$\log y = 1.42743$

$y = \text{Antilog}(1.42743)$

$\boxed{y = 26.76 \text{ Hour}}$

Total time for 60 unit $= 26.76 \times 60$

$= \boxed{1605.37 \text{ Hr}}$

(ii) $\boxed{x = 40 \text{ unit}}$

$y = ax^b$

$y = 100\,(40)^{-0.322}$

$\log y = \log 100 - 0.322 \log 40$

$\log y = 2 - 0.322 \times 1.6021$

$\log y = 2 - 0.5159$

$\log y = 1.4841$

$y = \text{Antilog}(1.4841)$

$\boxed{y = 30.48 \text{ Hr}}$

Total time for 40 unit $= 30.48 \times 40$

$= \boxed{1219.42 \text{ Hr}}$

Total time for 41 to 60 unit $= 1605.37 - 1219.42$

$= \boxed{385.95 \text{ Hour}}$

Q5

Learning Curve = 80%.

$a = 40$

$b = \frac{\log 0.80}{\log 2} = -0.322$

$x = 30$ unit

$y = ax^b$

$y = 40 \times (30)^{-0.322}$

$\log y = \log 40 - 0.322 \log 30$

$\log y = 1.6020 - (0.322 \times 1.4771)$

$\log y = 1.6020 - 0.4756$

$\log y = 1.12637$

$y = \text{Antilog}(1.12637)$

$y = 13.38$ Hour

Total time = 13.38×30 unit

= 401.40 Hour

Calculating Cost per unit

		£
Direct Mat	(60 × 30)	= 1800
Direct lab	[401.40 × 6]	= 2408.4
Variable o/H	[401.40 × 1]	= 401.40
Fixed o/H*	[401.40 × 5]	= 2007
	Total Cost	6617

WN*

Effective Hour = 2000 Hr − 25% = 1500 Hr

Fixed Cost/Hour = $\frac{7500}{1500}$ = 5/Hour

Cost per unit = $\frac{6617}{30 \text{ unit}}$

= ₹220

(11)

$a = 40$

$x = 50$ unit

$b = -0.322$

$y = ax^b$

$y = 40 \times (50)^{-0.322}$

$\log y = \log 40 - 0.322 \log 50$

$\log y = 1.6020 - 0.322 \times 1.6989$

$\log y = 1.6020 - 0.5471$

$\log y = 1.0549$

$y = \text{Antilog}(1.0549)$

$y = 11.347$

Total time = 11.347×50

= 567.35 Hr

Total time for 20 unit = 567.35 Hr − 401.40

= 165.95 Hr

D. M	(20 × 60)	= 1200
D. L	[165.95 × 6]	= 995.7
V. O/H	[165.95 × 1]	= 165.95
F. O/H	[165.95 × 5]	= 829.75
	Total Cost	3191.4
(+)	Profit 25%	797.85
	Sale	3990

Sale per unit = $\frac{3990}{20}$ = 199.5 unit

June 2024

Learning Curve = 90%.

$a = 40$

$b = \frac{\log 0.90}{\log 2} = -0.152$

$x = 30$ unit

$y = ax^b$

$y = 40 \times (30)^{-0.152}$

$\log y = \log 40 - 0.152 \log 30$

$\log y = 1.6020 - (0.152 \times 1.4771)$

$\log y = 1.6020 - 0.2245$

$\log y = 1.3775$

$y = \text{Antilog}(1.3775)$

$y = 23.85$ Hour

Total time = 23.85 × 30 unit

= 715.51 Hour

Calculating Cost per unit

		₹
Direct Mat	(60 × 30)	= 1800
Direct lab	[715.51 × 6]	= 4293.06
Variable o/H	[715.51 × 2]	= 1431.02
Fixed o/H*	[715.51 × 5]	= 3577.55
	Total Cost	11,110

WN*

Effective Hour = 2000 Hr − 25% = 1500 Hr

Fixed Cost/Hour = $\frac{7500}{1500}$ = 5/Hour

Cost per unit = $\frac{11,110}{30 \text{ unit}}$

= **370 / unit**

(11)

$a = 40$

$x = 70$ unit (30unit + 40unit)

$b = -0.152$

$y = ax^b$

$y = 40 \times (70)^{-0.152}$

$\log y = \log 40 - 0.152 \log 70$

$\log y = 1.6020 - 0.152 \times 1.8451$

$\log y = 1.6020 - 0.2804$

$\log y = 1.3216$

$y = \text{Antlog}(1.3216)$

$y = 20.96$

Total time = 20.96×70

= 1467.89

Total time for 20 unit = 1467.89 − 715.51

= **752.38 Hr**

D. M	(40 × 60)	=	2400
D. L	[752.38 × 6]	=	4514.28
V. O/H	[752.38 × 2]	=	1504.76
F. O/H	[752.38 × 5]	=	3761.9
Total cost		12,180	80
(+) Profit	20%	3045	20
Sale		15,225	100 (let)

Sale per unit = $\frac{15,225}{40 \text{ unit}}$ = **380**