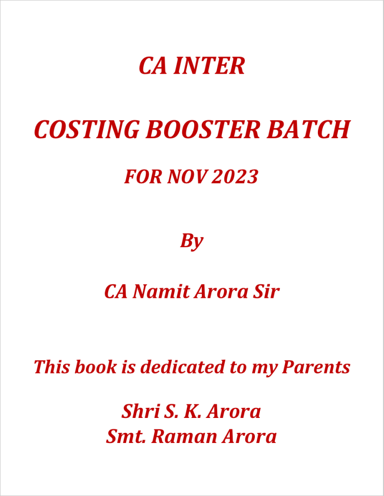
LECTURE 1



CA INTER

COSTING BOOSTER BATCH

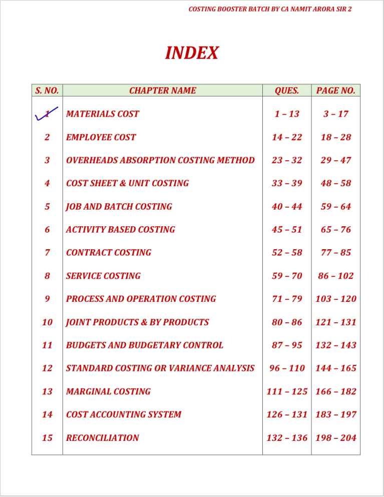
FOR NOV 2023

By

CA Namit Arora Sir

This book is dedicated to my Parents

Shri S. K. Arora
Smt. Raman Arora



INDEX

S. NO.	CHAPTER NAME	QUES.	PAGE NO.
✓ 1	MATERIALS COST	1 – 13	3 – 17
2	EMPLOYEE COST	14 – 22	18 – 28
3	OVERHEADS ABSORPTION COSTING METHOD	23 – 32	29 – 47
4	COST SHEET & UNIT COSTING	33 – 39	48 – 58
5	JOB AND BATCH COSTING	40 – 44	59 – 64
6	ACTIVITY BASED COSTING	45 – 51	65 – 76
7	CONTRACT COSTING	52 – 58	77 – 85
8	SERVICE COSTING	59 – 70	86 – 102
9	PROCESS AND OPERATION COSTING	71 – 79	103 – 120
10	JOINT PRODUCTS & BY PRODUCTS	80 – 86	121 – 131
11	BUDGETS AND BUDGETARY CONTROL	87 – 95	132 – 143
12	STANDARD COSTING OR VARIANCE ANALYSIS	96 – 110	144 – 165
13	MARGINAL COSTING	111 – 125	166 – 182
14	COST ACCOUNTING SYSTEM	126 – 131	183 – 197
15	RECONCILIATION	132 – 136	198 – 204

CHAPTER 1 - MATERIAL COST

1. **Re-order quantity (ROQ):** Order size repeated by any business organization.

2. **Ordering cost:** Cost associated with placement of orders (handling, freight etc.).

Annual Ordering Cost = $\boxed{\frac{A}{ROQ} \times O}$ $\frac{A}{ROQ}$

$(\frac{1}{2} \times 5{,}000 \times C) + \overset{\frac{1}{2}}{(1{,}000 \times C)}$ ↑

Here,
A = Annual requirement of raw material to be purchased in quantity
O = Cost per order

Note: Number or orders should not be in decimals. Positive Round off

3. **Carrying cost:** Cost associated with holding of average raw material stock (storage, interest, obsolescence etc).

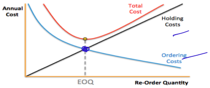
Annual Carrying Cost:

Alternative 1: When there is no Safety Stock = $\boxed{\frac{1}{2} \times ROQ \times C}$

Alternative 2: When there is Safety Stock = $\boxed{(\frac{1}{2} \times ROQ \times C)} + \boxed{\text{Safety Stock units} \times C}$

Here,
C = Carrying cost per unit per annum

4. **Economic order quantity (EOQ):** Order size (Unique ROQ) at which total of ordering and carrying cost will be lowest. Order size (Unique ROQ) at which total annual ordering cost equal to annual carrying cost.



Economic order quantity (EOQ) = $\sqrt{\frac{2AO}{C}}$

Here,
A = Annual requirement of raw material to be purchased in quantity
O = Cost per order
C = Carrying cost per unit per annum

5. **Re-order Level/ Ordering Level/ Re-order Point:**

Alternative 1 = Maximum usage × Maximum re-order period

Alternative 2 = Average usage × Average re-order period + Minimum stock/Safety stock

6. **Minimum Stock Level** = ROL – (Average usage × Average re-order period)

7. **Maximum Stock Level** = ROL + ROQ – (Minimum usage × Minimum re-order period)

8. **Average Stock level:**

Alternative 1 = ½ (Minimum stock level + Maximum stock level)

Alternative 2 = ½ of ROQ + Minimum stock level

9. **Danger Stock Level:**

Alternative 1 = Average usage × Emergency re-order period **(preferred)**

Alternative 2 = Minimum usage × Emergency re-order period

10. **ABC analysis:**

	% Value	% Quantity	Control
A ✓	→ 70% High	10% Low	High
B	20% Medium	20% Med.	Medium
C ✓	10% low	70% High	Low

11. **Valuation of Material:**

Statement Showing Cost Per Unit

Particulars	₹
Purchase price/Invoice price/Listed Price	XXX
Less: Trade or Quantity discount (× Cash discount)	(XXX)
Less: Subsidy/grant/incentives from government	(XXX)
Add: Road tax/toll tax	XXX
Add: IGST/CGST/SGST (when ITC is not available)	XXX
Add: Custom duty	XXX
Add: Insurance	XXX
Add: Commission/Brokerage on purchase	XXX
Add: Freight inward	XXX
Add: Net cost of Containers/Drums or packing material (when not returnable or returnable at low value)	XXX
Total cost	XXX
÷ Number of Effective units (Total units – Normal shortage – Provision for further Shortage)	÷ XXX
Cost per unit	XXX

Note:

- Cash discount, Indirect tax if ITC is available and demurrage, detention charges, penalty etc. do not form part of cost.
- GST is payable on Net purchase price (Listed price less Trade or Quantity discount)
- Freight is distributed on the basis of weight among various materials.
- GST, Custom Duty and Insurance are distributed on the basis of value among various materials.

12. **Normal Loss/Standard Loss/Unavoidable Loss:**

   - Average/ standard loss of concern industry,

- *Customer will suffer this loss due to increase in cost.*

Particulars	Quantity	Rate	Value
Purchase	100	10.00	1,000
Less : Normal Loss	(10)	-	NiL
Total Cost	**90**	**11.11**	**1,000**

13. Abnormal loss:

- *Loss over and above normal loss*
- *Businessmen will suffer this loss by debiting it in Costing P/L and profit will decrese*
- *No impact on cost per unit*

Particulars	Quantity	Rate	Value
Purchase	100	10.00	1,000
Less : Abnormal Loss P/L	(10)	10.00	(100)
Total Cost	**90**	**10.00**	**900**

14. Inventory Turnover Ratio (ITR) = *Raw Materials Consumed ÷ Average Inventory*

15. Inventory Holding Period (in days) = *365 ÷ ITR* $\frac{365}{ITR}$

16. Stores ledger:

Date	Receipts			Issues			Balance		
	Quantity	Rate	Value	Quantity	Rate	Value	Quantity	Rate	Value
				Return to supplier					
	Return to stores								
				Shortage					

Note:

- ***Transferred between two job or departments:*** *No treatment in stores ledger*
- ***Return to supplier:*** *Issue side at the rate it received from supplier or latest purchase rate*
- ***Return to stores:*** *Receipt side at the rate of issue or recent issue rate when rate of issue is unknown*
- ***Abnormal shortage:*** *Issue side as per the method (transfer to Costing P/L)*
- ***Normal shortage:*** *Issue side only in quantity column*
- ***Material consumed:*** *Total value of issued material - Material return to stores – Abnormal shortage – Return to supplier*
- ***Replacement:*** *It is treated as fresh supply*

PRACTICAL PROBLEMS

BPQ 1

Fh → 624,000 units p.a. of Fh

PQR Limited produces a product which has a monthly demand of 52,000 units. The product requires a component X which is purchased at ₹15 per unit. For every finished product, 2 units of component X are required. The Ordering cost is ₹350 per order and the Carrying cost is 12% p.a.

RM

'O'

$C = 12\% \text{ of } 15 = 1.80$

RM

624,000 × 2 units = 12,48,000 'A'

Required:

1. Calculate the economic order quantity for Component X.
2. If the minimum lot size to be supplied is 52,000 units, what is the extra cost, the company has to incur?
3. What is the minimum carrying cost, the Company has to incur?

Answer

1. EOQ $= \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 12{,}48{,}000 \times 350}{15 \times 12\%}} =$ **22,030 units**

Annual consumption = 52,000 units of FG × 2 units of X for 1 unit of FG × 12 month
= **12,48,000 units**

2. Statement Showing Extra Cost

Particulars	At EOQ 22,030 units	At ROQ 52,000 units
1. Ordering cost:	12,48,000 ÷ 22,030 =	12,48,000 ÷ 52,000 =
Number of orders	56.65 or 57	24
Ordering cost (number of orders × ₹350)	19,950	8,400
2. Carrying cost (½ × ROQ × C) (C = 12% of ₹15)	19,827	46,800
Total cost (1+2)	**39,777**	**55,200**
Extra cost	**-**	**15,423**

3. Minimum Carrying Cost:
Carrying cost depends upon the size of the order. It will be minimum on the least order size. (In this part of the question the two order sizes are 22,030 units and 52,000 units. Here 22,030 units is the least of the two order sizes. At this order size carrying cost will be minimum.) The minimum carrying cost in this case can be computed as under:

Minimum carrying cost = ½ × 22,030 units × 12% of ₹15 = **₹19,827**

BPQ 2

RM

A Company manufactures a special product which requires a component 'Alpha'. The following particulars are collected for the year 2022:

Annual demand of Alpha	'A'	8,000 units
Cost of placing an order	'O'	₹200 per order
Cost per unit of Alpha		₹400
Carrying cost p.a.		20%

C = 80 P.U.

→ The company has been offered a quantity discount of 4% on the purchase of 'Alpha' provided the order size is 4,000 components at a time.

Required:

1. Compute the economic order quantity
2. Advise whether the quantity discount offer can be accepted.

Answer

1. EOQ $= \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 8{,}000 \times 200}{20\% \times 400}} =$ **200 units**

2. Evaluation of 4% discount offer

Particulars	At EOQ (order size 200 units)	At order size 4,000 units
Purchase cost 8,000 units @ ₹400/₹384 per unit	32,00,000	30,72,000
Ordering cost ($^A/_{ROQ}$ × ₹200)	8,000	400
Carrying cost (½ × ROQ × C) (C = 20% of ₹400/₹384)	8,000	1,53,600
Total cost	**32,16,000**	**32,26,000**

Advise: The total cost of inventory is lower if EOQ is adopted. Hence, the company is advised not to accept the quantity discount.

BBQ 3

A company manufactures a product from a raw material, which is purchased at ₹80 per kg. The company incurs a handling cost of ₹370 plus freight of ₹380 per order. The incremental carrying cost of inventory of raw material is ₹0.25 per kg per month. In addition, the cost of working capital finance on the investment in inventory of raw material is ₹12 per kg per annum. The annual production of the product is 1,00,000 units and 2.5 units are obtained from one kg of raw material.

60

C = 15 per kg

%

Required:

- *(a)* Calculate the economic order quantity of raw materials.
- *(b)* Advice, how frequently should order for procurement be placed.
- *(c)* If the company proposes to rationalize placement of orders on quarterly basis, what percentage of discount in the price of raw materials should be negotiated?

$\frac{48,000}{40,000 \text{ kg}}$

= 1.2 kg

% of Dis. = $\frac{1.20}{80} \times 100$

= 1.5% Discount

Answer

(a) ***EOQ*** = $\sqrt{\frac{2AO}{C}}$ = $\sqrt{\frac{2\times 40,000\times 750}{15}}$ = ***2,000 kgs***

Where,

A = Annual usage of raw Material
= 1 unit of raw material gives 2.5 units of Finished Goods
Therefore, for 1,00,000 units of finished goods, material required
= $\frac{1,00,000}{2.5}$ = ***40,000 Kgs***

O = Ordering cost per order = handling cost per order + freight per order
= ₹370 + ₹380 = ***₹750***

C = Carrying cost and holding cost of inventory per unit p.a.
= Carrying cost per unit p.a. + Interest cost of investment in inventory per unit p.a.
= (₹0.25 per kg per month × 12 months) + ₹12 per kg p.a.
= ₹3 + ₹12 = ***₹15 per kg p.a.***

(b) ***Frequency of placing order/time interval between order:*** Order schedule

= $\frac{365 \text{ days}}{20 \text{ orders}}$ = ***18 days (approx.)***

Working Notes:

*No. of orders = $\frac{\text{Annual requirement}}{\text{EOQ}}$ = $\frac{40,000 \text{ kgs}}{2,000 \text{ kgs}}$ = ***20 Orders***

(c) ***Statement of % of Discount to be Negotiated for Placing Quarterly Orders***

Particulars	At EOQ (order size 2,000 kgs)	At order size 10,000 kgs
Ordering cost ($^A/_{ROQ}$ × O)	15,000	3,000
Carrying cost (½ × ROQ × C)	15,000	75,000
Total cost	30,000	~~78,000~~
Extra Cost or Discount to be negotiated	-	***48,000***
% of Discount {(48,000 ÷ 40,000 × 80) × 100}	-	***1.5%***

$\frac{48,000}{320000} \times 100 = 1.5\%$

$\frac{1.2}{80} \times 100$

= 1.5%

40,000 kg × 80 = 32L
Purchase Cost

BBQ 4

"VV Imp."

M/s Tanishka Materials Private Limited produces a product which names "ESS". The consumption of raw material for the production of "ESS" is 210 Kgs to 350 Kgs per week. Other information is as follows:

Procurement Time : 5 to 9 Days
Purchase price of Raw Materials : ₹100 per kg
Ordering Cost per Order : ₹200
Storage Cost : 1% per month plus ₹2 per unit per annum
Consider 365 days a year.

100
↓
12% + 2
= 12 + 2 = 14
C

40 × 365
= 14600 kg
'A'

You are required to Calculate:

- *(a)* Economic Order Quantity
- *(b)* Re-Order Level (ROL)
- *(c)* Maximum Stock Level
- *(d)* Minimum Stock Level
- *(e)* Average Stock Level
- *(f)* Number of Orders to be placed per year
- *(g)* Total Inventory Cost
- *(h)* If the supplier is willing to offer 1% discount on purchase of total annual quantity in two orders, whether offer is acceptable?
- *(i)* If the answer is no, what should be the counteroffer w.r.t. percentage of discount?

14600 ÷ 2
= 7300 kg

99
↓
12% + 2

Answer

(a) ***EOQ*** = $\sqrt{\frac{2AO}{C}}$ = $\sqrt{\frac{2\times {}^{*}14,600\times 200}{12\%\times 100+2}}$ = ***646 kg***

*Annual consumption of raw material = [{(210+350) ÷ 2} ÷ 7 days] × 365 = ***14,600 kg***

(b) ***Re-order Level*** = Maximum consumption per day × Maximum lead time
= (350 ÷ 7) × 9 days = ***450 kg***

(c) ***Maximum Stock Level*** = ROL + ROQ - (Minimum consumption per day × Minimum lead time)
= 450 kg + 646 kg – (210 ÷ 7) × 5 days]
= ***946 kg***

(d) ***Minimum Stock Level*** = ROL - (Average consumption per day × Average lead time)
= 450 kg – [{(210+350) ÷ 2} ÷ 7 days] × (5 + 9) ÷ 2}
= ***170 kg***

(e) ***Average Stock Level*** = ½ × (Minimum Stock Level + Maximum Stock Level)
= ½ × (946 kg + 170 kg) = ***558 kg***

Or

= ½ × ROQ + Minimum Stock Level
= ½ × 646 kg + 170 kg = ***493 kg***

(f) ***Number of Orders*** = Annual consumption ÷ EOQ
= 14,600 kg ÷ 646 kg = ***22.6 or 23***

(g) ***Total Inventory Cost*** = Purchase cost + Ordering cost + Carrying cost

= (Purchase Quantity × Price) + $\left(\frac{A}{ROQ} \times O\right)$ + (½ × ROQ × C)
= (14,600 × ₹100) + (23 × ₹200) + (½ × 646 × ₹14)
= $\boxed{₹14,69,122}$

(h) Evaluation of 1% discount offer in two orders:

Inventory Cost at Offer Price = Purchase cost + Ordering cost + Carrying cost
= (14,600 × ₹99) + (2 × ₹200) + (½ × 7,300) × (12% of ₹99 + ₹2)
= **₹14,96,462**

Advice: As total inventory cost at offer price is ₹27,340 (14,96,462 – 14,69,122) higher, offer should not be accepted.

(i) Counter offer:

Let discount rate (%) = D
Counter offer Price = ₹100 – D = ₹100 – D
Revised Carrying Cost = [(₹100 – D) × 12%] + ₹2 = ₹12 - 0.12D + ₹2
= ₹14 – 0.12D

Total Inventory Cost at Counter offer Price:

= Purchase cost + Ordering cost + Carrying cost
= {14,600 × (₹100 – D)} + (2 × ₹200) + (½ × 7,300) × (₹14 - 0.12D)
= ₹14,60,000 – 14,600D + ₹400 + ₹51,100 – 438D
= $\boxed{₹15,11,500 – 15,038D}$

Now,

$\boxed{₹14,69,122}$ = ₹15,11,500 – 15,038D
₹42,378 = 15,038D
D = **2.82**

Therefore, discount should be at least 2.82% in offer price.

BPQ 5

A Company uses three raw materials A, B, and C for a particular product for which the following data apply:

RM	Usage for one unit of product	ROQ (in kg)	Price per kg	Delivery period (in weeks)			ROL (in kg)	Mini. level
				Mini.	Average	Max.		
A	10 kg	10,000	0.10	1	2	3	8,000	-
B	4 kg	5,000	0.30	3	4	5	4,750	-
C	6 kg	10,000	0.15	2	3	4	-	2,000 kg

Weekly production varies from 175 to 225 units, averaging 200 units of the said product.

What would be the following quantities?

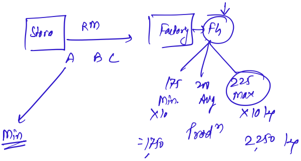
(i) Minimum stock of A *(ii)* Maximum stock of B *(iii)* Re-order level of C *(iv)* Average stock level of A

Answer

(i) Minimum stock of A = ROL – (Average usage × Average lead time)
= 8,000 kg – [(200 units × 10 kg) × 2 weeks] = **4,000 kg**

(ii) Maximum stock of B = ROL – (Minimum usage × Minimum lead time) + ROQ
= 4,750 – [(175 units × 4 kg) × 3 weeks] + 5,000
= 9,750 – 2,100 = **7,650 kg**

(iii) Re-order Level of C = Maximum re-order period × Maximum usage



= 4 weeks × 1,350 (225 units × 6 kg) = **5,400 kg**

Or

= Minimum stock of C + (Average usage × Average lead time)
= 2,000 + [(200 units × 6 kg) × 3 weeks] = **5,600 kg**

(iv) Average level of A = Minimum stock level + ½ ROQ
= 4,000 + ½ × 10,000
= 4,000 + 5,000 = **9,000 kg**

Or

= $\frac{\text{Minimum stock} + \text{Maximum stock}}{2}$

= $\frac{4,000 + 16,250}{2}$ = **10,125 kg**

Working Notes:

Max. Stock of A = ROL (Minimum usage × Minimum re-order period) + ROQ
= 8,000 kg – [(175 units × 10 kg) × 1 week] + 10,000 = **16,250 kg**

BPQ 6

Shri Ram Enterprises manufactures a special product ZED. The following particulars were collected for the year:

(a)	Monthly demand of ZED 1,000 units	*(e)*	Minimum usage 25 units per week
(b)	Cost of placing an order ₹100	*(f)*	Maximum usage 75 unit per week
(c)	Inventory Carrying cost 15% per annum	*(g)*	Cost of material ₹100 per unit
(d)	Re-order period 4 to 6 weeks. 5	*(h)*	Normal usage 50 units per week

Calculate from the above:

1. Re-order-quantity. If the supplier is willing to supply 1,500 units at a discount of 5%, is it worth accepting.
2. Re-order level **3.** Minimum Level **4.** Maximum Level **5.** Average Stock Level.

Answer

1. Re-order quantity = $\sqrt{\frac{2 \times {}^{*}2,600 \times 100}{15}}$ = **186 units**

***Annual Requirement** = 52 weeks × Normal usage of input units per week
= 52 weeks × 50 units per week = **2,600 units**

Evaluation of 5% discount offer

Particulars	At EOQ 186 units	At ROQ 1,500 units
1. Purchase cost 2,600 units @ ₹100/₹95 p.u.	2,60,000	2,47,000
2. Ordering cost:		
Number of orders	2,600 ÷ 186 = 13.97 or 14	2,600 ÷ 1,500 = 1.73 or 2
Ordering cost (number of orders × ₹100)	1,400	200
3. Carrying cost (½ × ROQ × C) (C = 15% of ₹100/₹95)	1,395	10,688
Total cost (1+2+3)	**2,62,795**	**2,57,888**

Discount

Advise: The total cost of inventory is lower if discount is adopted. Hence, it is worth accepting.

2. Re-order Level = Maximum Re-order period × Maximum Usage
= 6 weeks × 75 units = **450 units**

3. Minimum Level = ROL - (Normal usage × Average re-order period)
= 450 units - (50 units × 5 weeks)
= 450 units - 250 units = **200 units**

4. Maximum Level = ROL - (Minimum usage × Minimum re-order period) + ROQ
= 450 units - (25 units × 4 weeks) + 186 units = **536 units**

5. Average Stock Level = ½ × (Minimum Stock Level + Maximum Stock Level)
= ½ × (200 units + 536 units) = **368 units**

Or

= ½ × ROQ + Minimum Stock Level
= ½ × 186 + 200 units = **293 units**

BBQ 7

Aditya Ltd. produces a product 'Exe' using a raw material Dee. To produce one unit of Exe, 2 kg of Dee is required. As per the sales forecast conducted by the company, it will able to sale 10,000 units of Exe in the coming year. The following is the information regarding the raw material Dee:

1. The Re-order quantity is 200 kg. less than the Economic Order Quantity (EOQ).
2. Maximum consumption per day is 20 kg. more than the average consumption per day.
3. There is an opening stock of 1,000 kg.
4. Time required to get the raw materials from the suppliers is 4 to 8 days.
5. The purchase price is ₹125 per kg.

There is an opening stock of 900 units of the finished product Exe. The rate of interest charged by bank on Cash Credit facility is 13.76%. To place an order company has to incur ₹720 on paper and documentation work.

From the above information find out the followings in relation to raw material Dee:

(a) Re-order Quantity
(b) Re-order level
(c) Maximum Stock level
(d) Minimum Stock level
(e) Average Stock level
(f) Calculate the impact on the profitability of the company by not ordering the EOQ.
[Take 364 days for a year]

10,000 FG
- 900 Op. stock FG
9,100 units
×2 kg
→ 18,200 kg RM consumed
- 1,000 RM Op. Stock
17,200 kg Purchase

Avg Cons.
$\frac{18,200}{364} = 50$ kg

A = 17,200 kg

$50 = \frac{\overset{70\,kg}{Max} + Min}{2}$

100 = 70 + Min

Min = 30 kg

EOQ = 1,200 kg

Answer

(a) Re-order quantity = EOQ – 200 kg

$= \sqrt{\frac{2 \times 17,200 \times 720}{125 \times 13.76\%}}$ - 200 kg = $\boxed{\textbf{1,000 kg}}$

(b) Re-order Level = Maximum consumption per day × Maximum lead time
= 70 kg × 8 days = **560 kg**

(c) Maximum Level = ROL + ROQ - (Minimum consumption per day × Minimum lead time)
= 560 kg + 1,000 kg - (30 kg × 4 days) = **1,440 kg**

(d) Minimum Level = ROL - (Average consumption per day × Average lead time)
= 560 kg - (50 kg × 6 days) = **260 kg**

(e) Average Stock Level = ½ × (Minimum Stock Level + Maximum Stock Level)
= ½ × (1,440 kg + 260 kg) = **850 kg**

Or

= ½ × ROQ + Minimum Stock Level
= ½ × 1,000 kg + 260 kg = **760 kg**

Extra Cost
440

(f) Impact on Profitability

Particulars	At ROQ (1,000 kg)	At EOQ (1,200 kg)
Number of orders	$\frac{17,200}{1,000}$ = 17.20 or 18	$\frac{17,200}{1,200}$ = 14.33 or 15
Ordering cost	18 × 720 = 12,960	15 × 720 = 10,800
Carrying cost (½× ROQ × C)	8,600 (½ × 1,000 × 125 × 13.76%)	10,320 (½ × 1,200 × 125 × 13.76%)
Total ordering and carrying cost	***21,560***	***21,120***
Impact on profit	-	***440***

Working notes:

1. Calculation of annual consumption and purchase of raw materials 'Dee':

Sales forecast of the product 'Exe'	10,000 units
Less: Opening stock of 'Exe'	(900 units)
Fresh units of 'Exe' to be produced	9,100 units
Raw material required to produce 9,100 units of 'Exe' (9,100 units × 2 kg.)	***18,200 kg.***
Less: Opening Stock of 'Dee'	1,000 kg.
Annual purchase for raw material 'Dee'	***17,200 kg.***

2. Minimum consumption per day of raw material 'Dee':

Average consumption per day = 18,200 kg ÷ 364 days = 50 kg
Hence, Maximum consumption per day = 50 kg + 20 kg = 70 kg
So minimum consumption per day = Average × 2 – Max. = 50 × 2 – 70
= 30 kg

BBQ 8

The purchase department of your organisation has received an offer of quantity discounts on its orders of materials as under:

Price per tone	Sample Random ROQ	Range	*Tonnes number* (level) "Qty"
₹1,200	400	1-499	Less than 500
₹1,180	500	500-999	500 and less than 1000
₹1,160	1,000	1,000-1999	1000 and less than 2000
₹1,140	2,000	2,000-2999	2000 and less than 3000
₹1,120	3,000	3,000 Above	3000 and above

The annual requirement for the materials is 5,000 tonnes. The delivery cost per order is ₹1,200 and the stock holding cost is estimated at 20% of material cost per annum.
'A' 'O'

You are required to calculate the most economical purchase level.

Answer

Statement of Most Economical Purchase Level

Order Size (ROQ)	Total Ordering Cost (A/ROQ × 1,200)	Total Carrying Cost (½ × ROQ × 20% of Price)	Purchase Cost (5,000 × Price)	Total Cost
400	{(5,000/400) 12.5 or 13 × 1,200} = 15,600	48,000 (½ × 400 × 20% × 1,200)	60,00,000 (5,000 × 1,200)	60,63,600
500	{(5,000/500) 10 × 1,200} = 12,000	59,000 (½ × 500 × 20% × 1,180)	59,00,000 (5,000 × 1,180)	59,71,000
1,000	{(5,000/1,000) 5 × 1,200} = 6,000	1,16,000 (½ × 1,000 × 20% × 1,160)	58,00,000 (5,000 × 1,160)	59,22,000
2,000	{(5,000/2,000) 2.5 or 3 × 1,200} = 3,600	2,28,000 (½ × 2,000 × 20% × 1,140)	57,00,000 (5,000 × 1,140)	59,31,600
3,000	{(5,000/3,000) 1.6 or 2 × 1,200} = 2,400	3,36,000 (½ × 3,000 × 20% × 1,120)	56,00,000 (5,000 × 1,120)	59,38,400

Optimum order quantity is 1,000 units having minimum total cost of inventory and purchase cost of ₹59,22,000.

BBQ 9

IPL Limited uses a small casting in one of its finished products. The castings are purchased from a foundry. IPL Limited purchases 54,000 castings per year at a cost of ₹800 per casting.
'A'

$\frac{54,000}{360}$ = 150 units daily

The castings are used evenly throughout the year in the production process on a 360-day-per-year basis. The company estimates that it costs ₹9,000 to place a single purchase order and about ₹300 to carry one casting in inventory for a year.

'O'

C =

~~The high carrying costs result from the need to keep the castings in carefully controlled temperature and humidity conditions, and from the high cost of insurance.~~ Delivery from the foundry generally takes 6 days, but it can take as much as 10 days.

Avg lead time

The days of delivery time and percentage of their occurrence are shown in the following tabulation:

Delivery time (days)	:	6	7	8	9	10
Percentage of occurrence	:	75	10	5	5	5

	Avg	1	2	3	4
Delivery time	6	7	8	9	10
% →	75	10	5	5	5
Safety	75%	85%	90%	95%	100%
Risk	25%	15%	10%	5%	0%

Required

1. Compute the economic order quantity (EOQ).
2. Assume the company is willing to assume a 15% risk of being out of stock. What would be the safety stock? The re-order point?
3. Assume the company is willing to assume a 5% risk of being out of stock. What would be the safety stock? The re-order point?
4. Assume 5% stock-out risk. What would be the total cost of ordering and carrying inventory for one year?
5. Refer to the original data. Assume that using process re-engineering the company reduces its cost of placing a purchase order to only ₹600. In addition, company estimates that when the waste and inefficiency caused by inventories are considered, the true cost of carrying a unit in stock is ₹720 per year.
   - (a) Compute the new EOQ. 'O' C
   - (b) How frequently would the company be placing an order, as compared to the old purchasing policy?

Answer

1. Computation of economic order quantity (EOQ):

$$\text{EOQ} = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 54{,}000 \times 9{,}000}{300}} = \boxed{1{,}800 \text{ castings}}$$

2. Assuming a 15% risk of being out of stock:

From the probability table given in the question, we can see that 85% certainty in delivery time is achieved when delivery period is 7 days i.e. at 15% risk level of being out of stock, the maximum delivery period should not exceed 7 days.

$$\text{Safety stock} = \frac{\text{Annual Demand}}{360} \times (\text{Maximum lead time} - \text{Average lead time})$$

$$= \frac{54{,}000}{360} \times (7 \text{ days} - 6 \text{ days}) = 150 \text{ castings}$$

$$\text{Re-order point} = \text{Safety stock} + \text{Average lead time consumption}$$

$$= 150 \text{ castings} + (6 \text{ days} \times 150 \text{ casting}) = \boxed{1{,}050 \text{ castings}}$$

ROL = (Avg con. × Avg lead time) + Safety Stock

= (150 × 6 days) + Safety Stock

= 900 units + 150 units

= 1,050

3. Assuming a 5% risk of being out of stock:

From the probability table given in the question, we can see that 95% certainty in delivery time is achieved when delivery period is 9 days i.e. at 5% risk level of being out of stock, the maximum delivery period should not exceed 9 days.

$$\text{Safety stock} = \frac{\text{Annual Demand}}{360} \times (\text{Maximum lead time} - \text{Average lead time})$$

$$= \frac{54{,}000}{360} \times (9 \text{ days} - 6 \text{ days}) = 450 \text{ castings}$$

$$\text{Re-order point} = \text{Safety stock} + \text{Average lead time consumption}$$

$$= 450 \text{ castings} + (6 \text{ days} \times 150 \text{ casting}) = 1{,}350 \text{ castings}$$

ROL = (150 × 6) + 150 × 3

= 900 + 450 = 1,350

4. At 5% stock-out risk the total cost of ordering and carrying cost is as follows:

$$\text{Total cost of ordering} = \frac{\text{Annual Demand}}{\text{EOQ}} \times \text{Cost per order}$$

$$\left(\frac{1}{2} \times \text{EOQ} \times C\right) + \text{Safety Stock} \times C$$

$$\frac{1}{2} \times 1800 \times 300 + 450 \times 300$$

$$= \frac{54{,}000}{1{,}800} \times ₹9{,}000 = ₹2{,}70{,}000$$

$$\text{Total cost of carrying} = (\text{Safety stock} + \tfrac{1}{2}\ \text{EOQ}) \times \text{Carrying cost per unit p.a.}$$

$$= (450 \text{ units} + \tfrac{1}{2} \times 1{,}800 \text{ units}) \times ₹300 = ₹4{,}05{,}000$$

5. (a) Computation of new EOQ $= \sqrt{\frac{2 \times 54000 \times 600}{720}} = 300$ ***castings***

(b) Total number of orders to be placed in a year $= \frac{54{,}000}{300} = 180$ ***orders***

Under new purchasing policy IPL Ltd. has to place order in every 2nd day (360 days ÷ 180 orders), however under the old purchasing policy it was every 12th day.

BBQ 10

M/s Tyrotubes trades in four wheeler tyres and tubes. It stocks sufficient quantity of tyres of almost every vehicle. In year end 2021-22, the report of sales manager revealed that M/s Tyrotubes experienced stock-out of tyres.

Stock-out of tyres	*No. of times*
100	2%
80	5%
50	10%
20	20%
10	30%
0	33%

50 × 150 = 7500 × 2%

= 150

30 × 150 = 4500 × 5%

= 225

M/s Tyrotubes losses ₹150 per unit due to stock-out and spends ₹50 per unit on carrying of inventory.

Determine optimum safety stock level.

50 × 50 = 2,500

Answer

Computation of Stock-out and Inventory Carrying Cost

Safety stock (1)	*Stock-out (units) (2)*	*Probability (3)*	*Stock-out cost (4) = (2) × ₹150*	*Expected stock-out cost (5) = (3) × (4)*	*Inventory carrying cost (6) = (1) × ₹50*	*Total cost (7) = (5) + (6)*
100	0	0	0	0	5,000	***5,000***
80	20	0.02	3,000	60	4,000	***4,060***
50	50	0.02	7,500	150		
	30	0.05	4,500	225		
			12,000	375	2,500	***2,875***
20	80	0.02	12,000	240		
	60	0.05	9,000	450		
	30	0.10	4,500	450		
			25,500	1,140	1,000	***2,140***
10	90	0.02	13,500	270		
	70	0.05	10,500	525		
	40	0.10	6,000	600		
	10	0.20	1,500	300		
			31,500	1,695	500	***2,195***
0	100	0.02	15,000	300		
	80	0.05	12,000	600		
	50	0.10	7,500	750		
	20	0.20	3,000	600		
	10	0.30	1,500	450		
			39,000	2,700	0	***2,700***

At safety stock level of 20 units, total cost is least i.e ₹2,140. Hence optimum safety stock is 20 units.

Working Notes:

Computation of Probability of Stock-out

Stock-out(units)	100	80	50	20	10	0	Total
No. of times	2	5	10	20	30	33	100
Probability	0.02	0.05	0.10	0.20	0.30	0.33	1.00

BBQ 11

From the following data for the year ended 31.12.22, Calculate the inventory turnover ratio for the two items and put forward your comments on them:

Particulars	Material A	Material B
Opening stock 01.01.2022	10,000	9,000
+ Purchases	52,000	27,000
− Closing stock 31.12.2022	6,000	11,000

÷2 8,000 ÷2 = 10,000

RMC

Answer

Fast Mov. Slow.

Statement Showing Inventory Turnover Ratio

Particulars	Material A	Material B
Opening stock	10,000	9,000
Add: Purchases	52,000	27,000
	62,000	36,000
Less: Closing stock	(6,000)	(11,000)
Materials consumed	56,000	25,000
Average inventory (Opening stock + Closing stock) ÷ 2	8,000	10,000
Inventory turnover ratio (Materials consumed ÷ Average inventory)	***7 times***	***2.5 times***
Inventory turnover (365 ÷ IT Ratio)	***52 days***	***146 days***

The material turnover ratio of Material A is very high. Hence, A is the fast moving material.

BBQ 12

MM Ltd. has provided the following information about the items in its inventory. ABC

Item Code Number	Units	Unit Cost (₹)
101	25	× 50 = 1250
102	300	× 1 = 300
103	50	80
104	75	8
105	225	2
106	75	12

MM ltd. has adopted the policy of classifying the items constituting 15% or above of Total Inventory Cost as 'A' category, items constituting 6% or less of Total Inventory Cost as 'C' category and the remaining items as 'B' category.

You are required to:

(1) Rank the items on the basis of % of Total Inventory Cost.

(2) Classify the items into A, B, and C, categories as per ABC Analysis of Inventory Control adopted by MM Ltd.

Answer

(1) Statement Showing % of Total Inventory Cost and Rank

Item Code Number	Units	Unit Cost (₹)	Total Cost (₹)	% of Total Inventory Cost	Rank
101	25	50	1,250	16.67 A	2
102	300	1	300	4 'C'	6
103	50	80	4,000	53.33 A	1
104	75	8	600	8 B	4
105	225	2	450	6 'C'	5
106	75	12	900	12 B	3
-	***750***	-	***7,500***	***100***	-

(2) Classifying items as per ABC Analysis of Inventory Control

Basis for ABC Classification as % of Total Inventory Cost

15% & above	:	'A' items
7% to 14%	:	'B' items
6% and less	:	'C' items

Rank	Item Code Number	Total Cost (₹)	% of Total Inventory Cost	Category
1	103	4,000	53.33	
2	101	1,250	16.67	
Total	***2***	***5,250***	***70.00***	***A***
3	106	900	12	
4	104	600	8	
Total	***2***	***1,500***	***20.00***	***B***
5	105	450	6	
6	102	300	4	
Total	***2***	***750***	***10.00***	***C***
Grand Total	***6***	***7,500***	***100***	

BBQ 13

SKD Company Ltd., not registered under GST, purchased material P from a company which is registered under GST. The following information is available for the one lot of 1,000 units of material purchased:

Listed price of one lot	₹50,000
Trade discount	@ 10% on listed price
CGST and SGST (Credit Not available)	12% (6% CGST + 6% SGST)
X Cash discount (Will be given only if payment is made within 30 days.)	@10% X
Freight and Insurance	₹3,400 +
Toll Tax paid	₹1,000 +
Demurrage Penalty (Abnormal) X	₹1,000
Commission and brokerage on purchases	₹2,000 +
Amount deposited for returnable containers	₹6,000
Amount of refund on returning the container	₹4,000
Other Expenses	@ 2% of total cost

2,000

20% of material shortage is due to normal reasons. The payment to the supplier was made within 20 days of the purchases.

You are required to calculate cost per unit of material purchased to SKD Company Ltd.

Answer

Computation of Total cost of material purchased of SKD Manufacturing Company

Particulars	Units	₹
Listed Price of Materials	1,000	50,000
Less: Trade discount @ 10% on invoice price		(5,000)
		45,000
Add: CGST @ 6% of ₹ 45,000		2,700
Add: SGST @ 6% of ₹ 45,000		2,700

2% of T.C.

58,800 + Other Exp = Total Cost

58,800 = 98% of TC or T.C. = 60,000

			50,400 ✓
Add: Toll Tax			1,000 ✓
Freight and Insurance			3,400 ✓
Commission and Brokerage Paid			2,000 ✓
Add: Cost of returnable containers:			
Amount deposited	₹6,000		
Less: Amount refunded	(₹4,000)		2,000 ✓
			→ 58,800
Add: Other Expenses @ 2% of Total Cost (₹58,800 × 2/98)			1,200
Total Cost of Material		1,000	60,000 ✓
Less: Shortage due to Normal Loss @ 20%		(200)	-
Total cost of material of good units		800 ✓	60,000 ✓
Cost per unit (₹60,000/800 units)		***1***	***75***

Note:

1. GST is payable on net price i.e., listed price less discount.
2. Cash discount is treated as interest and finance charges; hence it is ignored.
3. Demurrage is penalty imposed by the transporter for delay in uploading or off-loading of materials. It is an abnormal cost and not included.
4. Shortage due to normal reasons should not be deducted from cost to ascertain total cost of good units.

$$\frac{60,000}{800} = \underline{75}$$