2412083503-management_accounting

1. (a) Management accounting is an extension of managerial aspects of cost accounting. Explain the statement and clearly distinguish between cost accounting and management accounting.

Explanation of the statement: The statement "Management accounting is an extension of managerial aspects of cost accounting" implies that management accounting builds upon the foundation of cost accounting to provide information specifically tailored for internal management decision-making . Cost accounting primarily focuses on the ascertainment and control of costs, generating data that is then utilized and analyzed by management accounting for planning, controlling, and decision-making purposes . In essence, cost accounting provides the raw material (cost data), and management accounting processes and refines this material into actionable insights for managers .

Distinction between Cost Accounting and Management Accounting:

Feature	Cost Accounting	Management Accounting
Primary Objective	Ascertainment and control of costs.	Providing information for internal decision-making, planning, and control.
Scope	Narrower, mainly concerned with cost data.	Broader, encompasses financial accounting, cost accounting, statistics, economics, etc.
Users	Internal management for cost control and product costing.	Internal management at various levels for strategic and operational decisions.
Reporting	Focuses on cost reports like cost sheets, variance reports.	Generates various reports like budgets, forecasts, performance reports, CVP analysis.
Legal Compliance	May have some statutory requirements (e.g., Cost Audit).	Largely voluntary and tailored to specific management needs.
Nature of Data	Deals with historical and predetermined cost data.	Uses both historical and future-oriented data (forecasts,

		budgets).
Time Horizon	Generally short-term.	Both short-term and long-term.

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1. (b) Define and explain responsibility accounting. What are the pre-requisites for introducing responsibility accounting in a company?

Definition and Explanation of Responsibility Accounting:
Responsibility accounting is a system of accounting that collects and reports revenues and costs by areas of responsibility, called responsibility centers. It focuses on identifying who is accountable for specific financial outcomes within an organization. The core idea is to hold managers responsible only for those costs and revenues over which they have direct control. This helps in performance evaluation, cost control, and effective delegation of authority.

Pre-requisites for introducing Responsibility Accounting in a company:

1. **Clear Organizational Structure:** A well-defined organizational chart that clearly outlines lines of authority and responsibility is crucial. This ensures that each manager knows what they are accountable for and to whom they report.
2. **Delegation of Authority:** Managers must be given sufficient authority to make decisions regarding the costs and revenues they are responsible for. Without adequate authority, holding them accountable is unfair.
3. **Establishment of Responsibility Centers:** The organization needs to be divided into distinct responsibility centers (e.g., cost centers, revenue centers, profit centers, investment centers). Each center should have a manager responsible for its performance.
4. **Defined Performance Measures:** Clear and objective performance measures or benchmarks should be established for each responsibility center. These measures should align with the center's objectives and the overall organizational goals.
5. **Effective Reporting System:** A robust information system is required to collect, process, and report financial data relevant to each responsibility center promptly and accurately. Reports should highlight controllable costs and revenues.
6. **Participative Budgeting:** Involvement of responsibility center managers in the budgeting process can foster a sense of ownership and commitment to achieving budgetary goals.

7. **Training and Communication:** Managers and employees need to be educated about the principles of responsibility accounting, their roles, and how their performance will be evaluated.

Or

1. (a) "Management accounting is nothing else but financial and cost accounting tailored to the requirements of management." Critically examine the statement.

Critical Examination of the statement: The statement suggests that management accounting is merely a customized version of financial and cost accounting data for management use . While it's true that management accounting extensively draws information from both financial and cost accounting, reducing it to "nothing else" is an oversimplification.

- **Reliance on Financial and Cost Accounting:** Management accounting undeniably relies on the historical data and cost classifications provided by financial and cost accounting . Financial accounting provides overall financial performance, while cost accounting offers detailed cost breakdowns for products, processes, and departments. Management accounting uses this data as a starting point for analysis, forecasting, and decision-making.
- **Beyond Just Tailoring:** Management accounting goes significantly beyond simply tailoring existing data:
    - **Forward-Looking Focus:** Unlike financial accounting which is historical, management accounting is highly forward-looking, involving budgeting, forecasting, and strategic planning . This requires estimating future costs, revenues, and market conditions, which is not a mere re-presentation of past data.
    - **Decision-Oriented:** Management accounting actively provides tools and techniques for specific decisions such as pricing, product mix, make-or-buy, capital budgeting, and performance evaluation. These tools (e.g., CVP analysis, marginal costing, capital budgeting techniques) are distinct from the primary functions of financial or cost accounting.
    - **Flexibility and Customization:** Management accounting is not bound by GAAP or statutory requirements, allowing it to be highly flexible and customized to the specific needs of

management, which is a significant departure from the rigid structure of financial accounting.
    - **Behavioral Aspects:** Management accounting also considers behavioral aspects, such as motivation and performance incentives, which are not directly addressed by financial or cost accounting.
    - **Integration of Diverse Data:** It integrates qualitative information and non-financial data alongside financial figures to provide a holistic view for decision-making.

In conclusion, while management accounting certainly leverages and represents data from financial and cost accounting, it is far more than just a "tailored" version. It is a distinct discipline that adds value by transforming raw accounting data into strategic insights, focusing on future-oriented decisions, and employing a broader range of analytical tools and techniques.

1. (b) Explain the concept of responsibility accounting. Discuss creation of various types of responsibility centres for its effective implementation.

Concept of Responsibility Accounting: (Refer to the explanation provided in 1.(b) above. It is the same concept.)

Creation of various types of responsibility centres for its effective implementation: For effective implementation of responsibility accounting, organizations are typically divided into different types of responsibility centers, each with distinct objectives and performance measures:

1. **Cost Centers:**
    - **Definition:** A cost center is a segment of an organization in which the manager is accountable for controllable costs only.
    - **Examples:** Production departments, maintenance departments, human resources department.
    - **Performance Measure:** Performance is evaluated by comparing actual costs incurred against budgeted or standard costs. The focus is on cost efficiency and minimizing costs while maintaining quality.
2. **Revenue Centers:**
    - **Definition:** A revenue center is a segment of an organization in which the manager is primarily accountable for generating revenues. They typically have little or no control over costs of goods sold or expenses.

    - **Examples:** Sales departments, marketing departments, regional sales offices.
    - **Performance Measure:** Performance is evaluated based on actual sales achieved against budgeted sales targets, market share, and sales growth.
3. **Profit Centers:**
    - **Definition:** A profit center is a segment of an organization in which the manager is responsible for both revenues and costs, and thus, for the profit generated by that segment.
    - **Examples:** A specific product line, a division of a multi-product company, a branch office.
    - **Performance Measure:** Performance is evaluated based on the profit achieved (revenues minus controllable costs). Managers are incentivized to increase sales and control costs.
4. **Investment Centers:**
    - **Definition:** An investment center is a segment of an organization in which the manager is responsible for revenues, costs, and the investments in assets used by the center.
    - **Examples:** Large divisions of a diversified company, subsidiaries.
    - **Performance Measure:** Performance is evaluated using metrics like Return on Investment (ROI), Residual Income (RI), or Economic Value Added (EVA). Managers are expected to make decisions that maximize returns on the assets under their control.

The effective implementation of responsibility accounting relies on selecting the appropriate type of responsibility center based on the manager's level of control and the nature of the activities performed within that segment.

Page 2-3: Question 2

2. (a) Write a brief note on Budgeting Key Factor.

Budgeting Key Factor (or Limiting Factor): A budgeting key factor, also known as a limiting factor or principal budget factor, is a factor that restricts the output or sales of an organization. It is the factor whose scarcity or availability limits the ability of the organization to achieve its desired level of activity (e.g., production, sales, profit). Identifying the key

factor is crucial in budgeting because it determines the overall level of activity that can be achieved and thus, dictates the preparation of other functional budgets.

Examples of Key Factors:

- **Sales Demand:** If the market demand for a product is limited, then sales demand becomes the key factor.
- **Raw Material Availability:** If a specific raw material is scarce, it will limit production.
- **Skilled Labor Availability:** A shortage of skilled labor can restrict output.
- **Machine Capacity:** Limited machine hours or production capacity can be a bottleneck.
- **Cash Availability:** Insufficient working capital or funding can limit operations.

Significance in Budgeting: The budget related to the key factor is typically prepared first, and then all other budgets are built around it. For instance, if sales demand is the key factor, the sales budget is prepared first, and the production budget and subsequent budgets are derived from it. If raw material availability is the key factor, the production budget would be constrained by the available raw material, and then the sales budget would be adjusted accordingly. Proper identification of the key factor ensures that resources are optimally allocated and that the overall budget is realistic and achievable.

2. (b) PS Limited produces and sells a single product. Sales budget for calendar year 2025 as per quarters is as under:

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

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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.

You are required to prepare quarterly as well as whole yearly statement showing opening stock, production and closing stock of the product.

Working Notes:

1. **Sales for next quarter for Q4 production calculation:** Since production for Q4 depends on 30% of the following quarter's demand, and the sales budget is only for 2025, we need to estimate the sales for Q1 of 2026. This information is not provided. However, the problem specifies a closing inventory for the *year* of 8,000 units. We will work backward from the total yearly production and use the given opening and closing stock for the year to balance the overall production. For quarterly production, we will assume that the production for Q4 also considers the closing stock requirement for the year-end.

Let's calculate the production for each quarter:

Production Budget for the Year 2025 (PS Limited)

Particulars	**Quarter I (Units)**	**Quarter II (Units)**	**Quarter III (Units)**	**Quarter IV (Units)**	**Total (Units)**
Sales (as per budget)	18,000	22,000	25,000	27,000	92,000
Add: Desired Closing Stock					
Q1 Closing Stock	(30% of Q2 Sales) = 0.30 * 22,000 = 6,600				
Q2 Closing Stock		(30% of Q3 Sales) = 0.30 * 25,000 = 7,500			
Q3 Closing Stock			(30% of Q4 Sales) = 0.30 * 27,000 = 8,100		
Q4 Closing Stock				(Year-end closing stock) = 8,000	

Total Requirements	24,600	29,500	33,100	35,000	
Less: Opening Stock					
Q1 Opening Stock	(Year-opening stock) = 6,000				
Q2 Opening Stock	(Q1 Closing Stock) = 6,600				
Q3 Opening Stock		(Q2 Closing Stock) = 7,500			
Q4 Opening Stock			(Q3 Closing Stock) = 8,100		
Production required	18,600	22,900	25,600	26,900	94,000

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Calculation of Production based on custom scheduling:

- **Quarter I Production:**
  - 70% of Q1 Sales = 0.70 * 18,000 = 12,600 units
  - 30% of Q2 Sales = 0.30 * 22,000 = 6,600 units
  - Total Production Q1 = 12,600 + 6,600 = **19,200 units**
- **Quarter II Production:**
  - 70% of Q2 Sales = 0.70 * 22,000 = 15,400 units
  - 30% of Q3 Sales = 0.30 * 25,000 = 7,500 units
  - Total Production Q2 = 15,400 + 7,500 = **22,900 units**
- **Quarter III Production:**
  - 70% of Q3 Sales = 0.70 * 25,000 = 17,500 units
  - 30% of Q4 Sales = 0.30 * 27,000 = 8,100 units
  - Total Production Q3 = 17,500 + 8,100 = **25,600 units**
- **Quarter IV Production:**
  - 70% of Q4 Sales = 0.70 * 27,000 = 18,900 units

- 30% of Q1 (next year's) Sales = This is tricky. If we directly use the formula, we need Q1 2026 sales. However, the problem gives a specific year-end closing inventory.
- Let's ensure the total production calculated based on the 70/30 rule aligns with the overall opening and closing stock requirements.

Let's recalculate the production required to meet sales and desired closing stock for each quarter and for the whole year, then confirm with the 70/30 rule.

Quarterly and Yearly Statement Showing Opening Stock, Production, and Closing Stock

Particulars	Quarter I (Units)	Quarter II (Units)	Quarter III (Units)	Quarter IV (Units)	Total for Year (Units)
Sales	18,000	22,000	25,000	27,000	92,000
Add: Desired Closing Stock					
- Calculated as 30% of next quarter's sales as per rule	6,600 (30% of Q2 sales)	7,500 (30% of Q3 sales)	8,100 (30% of Q4 sales)	8,000 (Given year-end closing stock)	8,000
Total Available (if produced)	24,600	29,500	33,100	35,000 (Sales + Year-end CS)	100,000 (92,000 + 8,000)
Less: Opening Stock					
- Given Opening Stock	6,000	6,600	7,500	8,100	6,000
Production Required	**18,600**	**22,900**	**25,600**	**26,900**	**94,000**

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Verification with Production Scheduling Rule (70% current, 30% next):

- **Q1 Production:** (0.70 * 18,000) + (0.30 * 22,000) = 12,600 + 6,600 = 19,200 units.

- *Discrepancy:* Our "Production Required" for Q1 is 18,600, while the rule gives 19,200. This implies that the specific production rule might lead to a different year-end stock than the 8,000 units stated, or there's an implicit adjustment for the final quarter.

Let's reconcile. The problem states "Production is customarily scheduled to provide for 70% of the current quarter's sales demand plus 30% of the following quarter demand." and also states that the year is expected to "close with inventory of 8,000 units". The total production from the sum of the quarterly calculations based on the 70/30 rule should ideally match the total production required to meet sales and the final closing stock.

Let's calculate the total production based on the sum of quarterly productions calculated using the 70/30 rule. We need Q1 2026 sales for Q4 2025 production. If Q1 2026 sales are not given, it implies that the 8,000 units closing stock for the year is the binding constraint for the final quarter.

Revised approach considering the year-end closing stock as fixed:

The 70/30 rule determines the *interim* closing stocks (Q1, Q2, Q3). The *final* closing stock for Q4 is given as 8,000 units. This means the Q4 production must ensure that after meeting Q4 sales, 8,000 units are left.

Let's use the standard formula for production budget: **Production = Sales + Desired Closing Stock - Opening Stock**

Particulars	**Quarter I (Units)**	**Quarter II (Units)**	**Quarter III (Units)**	**Quarter IV (Units)**	**Total for Year (Units)**
Sales	18,000	22,000	25,000	27,000	92,000
Add: Desired Closing Stock					
Q1 Desired Closing Stock (30% of Q2 sales)	6,600				
Q2 Desired Closing Stock (30% of Q3 sales)		7,500			
Q3 Desired			8,100		

Closing Stock (30% of Q4 sales)					
Q4 Desired Closing Stock (Given for year-end)				8,000	8,000
Total Stock Required	24,600	29,500	33,100	35,000	100,000
Less: Opening Stock					
Q1 Opening Stock (Given year-opening)	6,000				6,000
Q2 Opening Stock (Q1 Closing Stock)		6,600			
Q3 Opening Stock (Q2 Closing Stock)			7,500		
Q4 Opening Stock (Q3 Closing Stock)				8,100	
Production	**18,600**	**22,900**	**25,600**	**26,900**	**94,000**

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The sum of quarterly production is 18,600 + 22,900 + 25,600 + 26,900 = 94,000 units. This total production is consistent with the overall annual requirement: Total Sales (92,000) + Year-end Closing Stock (8,000) - Year-opening Stock (6,000) = 94,000 units.

Therefore, the quarterly production should be derived from the standard production formula to ensure the given year-end closing stock is achieved, rather than strictly adhering to the 70/30 rule for the *last* quarter. The 70/30 rule helps determine the *target* closing stock for the *intermediate* quarters.

Page 3-4: Question 2 (Or)

The Budget Manager of a company is preparing a flexible budget for the coming accounting year. The company produces a single

product. The following information is provided:

- Direct material costs Rs.28 per unit.
- Direct labour averages Rs.12.50 per hour and requires 1.60 hours to produce one unit of the product.
- Salesmen are paid a commission of Rs.5 per unit sold.
- Fixed selling and administration expenses amount to Rs.3,75,000 per year.
- Manufacturing overheads have been estimated in the following amounts under given conditions of volume :

Expertise	**For 1,20,000 units (Rs.)**	**For 1,50,000 units (Rs.)**
Indirect materials	2,64,000	3,30,000
Indirect labour	1,50,000	1,87,500
Inspection	90,000	1,12,500
Maintenance	84,000	1,02,000
Supervision	1,98,000	2,34,000
Depreciation-Plant & Equipment	90,000	90,000
Engineering services	94,000	94,000
Total Manufacturing Overheads	9,70,000	11,50,000

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Prepare a total production cost budget at a production level of 1,40,000 units stating clearly the cost behaviour of each cost to output.

Step 1: Determine Cost Behavior for each Manufacturing Overhead Item

To determine if a cost is variable, fixed, or semi-variable, we will analyze the change in cost with respect to the change in volume.

- **Change in Volume:** 1,50,000 units - 1,20,000 units = 30,000 units
- **Cost Change for each item:**

1. **Indirect Materials:**
    - Change in Cost = 3,30,000 - 2,64,000 = 66,000
    - Variable Rate = 66,000 / 30,000 units = Rs. 2.20 per unit
    - *Conclusion: Variable Cost*

2. **Indirect Labour:**
    - Change in Cost = 1,87,500 - 1,50,000 = 37,500
    - Variable Rate = 37,500 / 30,000 units = Rs. 1.25 per unit
    - *Conclusion: Variable Cost*
3. **Inspection:**
    - Change in Cost = 1,12,500 - 90,000 = 22,500
    - Variable Rate = 22,500 / 30,000 units = Rs. 0.75 per unit
    - *Conclusion: Variable Cost*
4. **Maintenance:**
    - Change in Cost = 1,02,000 - 84,000 = 18,000
    - Variable Rate = 18,000 / 30,000 units = Rs. 0.60 per unit
    - Now, calculate fixed component:
        - At 1,20,000 units: Total Cost = 84,000; Variable Component = 1,20,000 * 0.60 = 72,000
        - Fixed Component = 84,000 - 72,000 = 12,000
    - *Conclusion: Semi-Variable Cost* (Rs. 0.60 per unit variable + Rs. 12,000 fixed)
5. **Supervision:**
    - Change in Cost = 2,34,000 - 1,98,000 = 36,000
    - Variable Rate = 36,000 / 30,000 units = Rs. 1.20 per unit
    - Now, calculate fixed component:
        - At 1,20,000 units: Total Cost = 1,98,000; Variable Component = 1,20,000 * 1.20 = 1,44,000
        - Fixed Component = 1,98,000 - 1,44,000 = 54,000
    - *Conclusion: Semi-Variable Cost* (Rs. 1.20 per unit variable + Rs. 54,000 fixed)
6. **Depreciation-Plant & Equipment:**
    - Cost remains 90,000 at both volumes.
    - *Conclusion: Fixed Cost*
7. **Engineering Services:**
    - Cost remains 94,000 at both volumes.
    - *Conclusion: Fixed Cost*

Step 2: Calculate Total Variable Cost per unit for Manufacturing Overheads

- Indirect Materials (Variable) = Rs. 2.20 per unit
- Indirect Labour (Variable) = Rs. 1.25 per unit
- Inspection (Variable) = Rs. 0.75 per unit
- Maintenance (Variable) = Rs. 0.60 per unit
- Supervision (Variable) = Rs. 1.20 per unit
- **Total Variable Manufacturing Overheads per unit = 2.20 + 1.25 + 0.75 + 0.60 + 1.20 = Rs. 6.00 per unit**

Step 3: Calculate Total Fixed Manufacturing Overheads

- Maintenance (Fixed component) = Rs. 12,000
- Supervision (Fixed component) = Rs. 54,000
- Depreciation-Plant & Equipment = Rs. 90,000
- Engineering Services = Rs. 94,000
- **Total Fixed Manufacturing Overheads = 12,000 + 54,000 + 90,000 + 94,000 = Rs. 2,50,000**

Step 4: Prepare Total Production Cost Budget at 1,40,000 units

Production Level: 1,40,000 units

Cost Item	Cost Behavior	Calculation	Amount (Rs.)
Direct Material Costs	Variable	1,40,000 units * Rs. 28/unit	39,20,000
Direct Labour Costs	Variable	1,40,000 units * 1.60 hours/unit * Rs. 12.50/hour	28,00,000
Manufacturing Overheads:			
Indirect Materials	Variable	1,40,000 units * Rs. 2.20/unit	3,08,000
Indirect Labour	Variable	1,40,000 units * Rs. 1.25/unit	1,75,000
Inspection	Variable	1,40,000 units * Rs. 0.75/unit	1,05,000
Maintenance	Semi-Variable	(1,40,000 * 0.60) + 12,000	84,000 + 12,000 = 96,000
Supervision	Semi-Variable	(1,40,000 * 1.20) + 54,000	1,68,000 + 54,000 = 2,22,000
Depreciation-Plant & Equipment	Fixed	90,000	90,000
Engineering Services	Fixed	94,000	94,000
Total Manufacturing Cost			**78,20,000**

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Note: The problem asks for "total production cost budget". Selling and administration expenses (salesmen commission, fixed selling & administration) are typically not included in "production cost" but rather in "total cost of sales" or "total cost". Since the question specifically asks for "total production cost budget", we will exclude selling and administration expenses from this budget.

Page 4: Question 3

3. ABC Limited., a manufacturing concern which has adopted standard costing furnishes the following information for the month ending March 31, 2024:

The standard mix to produce 10 units of product Z is as under:

- Material A: 300 kg. @ Rs.30 per kg
- Material B: 400 kg. @ Rs.50 per kg
- Material C: 500 kg. @ Rs.40 per kg
- **Total standard input for 10 units = 300 + 400 + 500 = 1,200 kg**
- **Standard output for 1,200 kg input = 10 units**

During the month of March, 2024, 100 units of product Z were actually produced and consumption was as under-

- Material A: 3,200 kg. @ Rs.35 per kg
- Material B: 4,750 kg. @ Rs.55 per kg
- Material C: 4,350 kg. @ Rs.36 per kg
- **Total actual input for 100 units = 3,200 + 4,750 + 4,350 = 12,300 kg**
- **Actual output = 100 units**

Required: Calculate the following material variances: (i) Material Cost Variance (ii) Material Price Variance (iii) Material Usage Variance (iv) Material Mix Variance. (v) Material Yield Variance

Standard Data for Actual Output (100 units):

Since 10 units of product Z require 1,200 kg of input, 100 units will require: Standard Input for Actual Output (SIFAO) = (1,200 kg / 10 units) * 100 units = 12,000 kg

Material	Standard Qty for 10 units (kg)	Standard Rate (Rs./kg)	Standard Cost for 10 units (Rs.)	Standard Qty for 100 units (kg) (SIFAO)	Standard Cost for 100 units (Rs.) (SC)
A	300	30	9,000	(300/10)*100 = 3,000	3,000 * 30 = 90,000
B	400	50	20,000	(400/10)*100 = 4,000	4,000 * 50 = 2,00,000
C	500	40	20,000	(500/10)*100 = 5,000	5,000 * 40 = 2,00,000
Total	**1,200**		**49,000**	**12,000**	**4,90,000**

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Actual Data for Actual Output (100 units):

Material	Actual Qty (kg) (AQ)	Actual Rate (Rs./kg) (AR)	Actual Cost (Rs.) (AC)
A	3,200	35	1,12,000
B	4,750	55	2,61,250
C	4,350	36	1,56,600
Total	**12,300**		**5,29,850**

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Revising Actual Quantity (RAQ) for Mix Variance (Proportionate Standard Quantity for Actual Input): Total Actual Input = 12,300 kg
RAQ for each material = (Actual Total Input / Standard Total Input for 100 units) * Standard Qty for 100 units for that material Or, RAQ for each material = (Proportion of that material in standard mix) * Total Actual Input

- Standard proportions: A = 300/1200 = 1/4; B = 400/1200 = 1/3; C = 500/1200 = 5/12
- RAQ A = (300/1200) * 12,300 = 3,075 kg
- RAQ B = (400/1200) * 12,300 = 4,100 kg
- RAQ C = (500/1200) * 12,300 = 5,125 kg
- **Total RAQ = 3,075 + 4,100 + 5,125 = 12,300 kg** (This matches Total Actual Input, which is correct)

Variance Calculations:

1. Material Cost Variance (MCV): MCV = Standard Cost (SC) - Actual Cost (AC) MCV = (SIFAO * SR) - (AQ * AR) MCV = 4,90,000 - 5,29,850 = **(39,850) A** (Adverse)

2. Material Price Variance (MPV): MPV = (Standard Rate - Actual Rate) * Actual Quantity MPV = (SR - AR) * AQ

- Material A: (30 - 35) * 3,200 = -5 * 3,200 = (16,000) A
- Material B: (50 - 55) * 4,750 = -5 * 4,750 = (23,750) A
- Material C: (40 - 36) * 4,350 = 4 * 4,350 = 17,400 F
- **Total MPV = (16,000) A + (23,750) A + 17,400 F = (22,350) A**

3. Material Usage Variance (MUV): MUV = (Standard Quantity for Actual Output - Actual Quantity) * Standard Rate MUV = (SIFAO - AQ) * SR

- Material A: (3,000 - 3,200) * 30 = -200 * 30 = (6,000) A
- Material B: (4,000 - 4,750) * 50 = -750 * 50 = (37,500) A
- Material C: (5,000 - 4,350) * 40 = 650 * 40 = 26,000 F
- **Total MUV = (6,000) A + (37,500) A + 26,000 F = (17,500) A**

Verification: MCV = MPV + MUV (39,850) A = (22,350) A + (17,500) A (39,850) A = (39,850) A. (Verified)

4. Material Mix Variance (MMV): MMV = (Revised Actual Quantity - Actual Quantity) * Standard Rate MMV = (RAQ - AQ) * SR

- Material A: (3,075 - 3,200) * 30 = -125 * 30 = (3,750) A
- Material B: (4,100 - 4,750) * 50 = -650 * 50 = (32,500) A
- Material C: (5,125 - 4,350) * 40 = 775 * 40 = 31,000 F
- **Total MMV = (3,750) A + (32,500) A + 31,000 F = (5,250) A**

5. Material Yield Variance (MYV): MYV = (Actual Output - Standard Output from Actual Input) * Standard Cost per Unit of Output OR MYV = (Standard Input for Actual Output - Actual Input) * Standard Cost per Unit of Input

Let's use the second formula: Standard Cost per unit of input = Total Standard Cost / Total Standard Input for 10 units = 49,000 / 1,200 kg = Rs. 40.8333 per kg

Let's use the first method for conceptual clarity. Standard Yield from Standard Input (1200 kg) = 10 units Standard Yield from Actual Input (12300 kg) = (10/1200) * 12300 = 102.5 units

Standard Cost per unit of Output (for 1 unit) = 49,000 / 10 = Rs. 4,900

MYV = (Actual Output - Standard Output from Actual Input) * Standard Cost per unit of Output MYV = (100 units - 102.5 units) * Rs. 4,900 MYV = -2.5 units * 4,900 = **(12,250) A**

Verification: MUV = MMV + MYV (17,500) A = (5,250) A + (12,250) A (17,500) A = (17,500) A. (Verified)

Page 4-5: Question 3 (Or)

3. (a) Calculate: (i) Efficiency Ratio; (ii) Activity Ratio; (iii) Capacity Ratio, from the following information:

Particulars	Amount
Budgeted Production	750 units
Budgeted Hours per unit	5
Actual Production	780 units
Actual Hours taken	4,000

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Calculations:

First, let's calculate some necessary components:

- **Standard Hours for Actual Production (SHAP):**
  - Actual Production * Budgeted Hours per unit
  - SHAP = 780 units * 5 hours/unit = **3,900 hours**
- **Budgeted Hours (BH):**
  - Budgeted Production * Budgeted Hours per unit
  - BH = 750 units * 5 hours/unit = **3,750 hours**
- **Actual Hours (AH):**
  - Given = **4,000 hours**

(i) Efficiency Ratio: Measures the efficiency of the workforce. Efficiency Ratio = (Standard Hours for Actual Production / Actual Hours) * 100 Efficiency Ratio = (3,900 hours / 4,000 hours) * 100 Efficiency Ratio = 0.975 * 100 = **97.5%**

(ii) Activity Ratio: Measures the level of activity achieved compared to the budgeted activity. Activity Ratio = (Standard Hours for Actual

Production / Budgeted Hours) * 100 Activity Ratio = (3,900 hours / 3,750 hours) * 100 Activity Ratio = 1.04 * 100 = **104%**

(iii) Capacity Ratio: Measures the extent to which the available capacity has been utilized. Capacity Ratio = (Actual Hours / Budgeted Hours) * 100 Capacity Ratio = (4,000 hours / 3,750 hours) * 100 Capacity Ratio = 1.0667 * 100 = **106.67%**

Verification: Activity Ratio = Efficiency Ratio * Capacity Ratio 104% = 97.5% * 106.67% (approximately) 104 = 0.975 * 1.0667 * 100 104 = 104 (Verified)

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

Product/Quantity/Price	Units	Budgeted Price (Rs.)	Units	Actual Price (Rs.)
A	4,000	25	4,800	30
B	3,000	50	2,800	45
C	2,000	75	2,400	70
D	1,000	100	800	105

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Step 1: Calculate Budgeted Sales Revenue and Actual Sales Revenue

Product	Budgeted Quantity (BQ)	Budgeted Price (BP)	Budgeted Sales Revenue (Rs.) (BQ * BP)	Actual Quantity (AQ)	Actual Price (AP)	Actual Sales Revenue (Rs.) (AQ * AP)
A	4,000	25	1,00,000	4,800	30	1,44,000
B	3,000	50	1,50,000	2,800	45	1,26,000
C	2,000	75	1,50,000	2,400	70	1,68,000
D	1,000	100	1,00,000	800	105	84,000
Total	**10,000**		**5,00,000**	**10,800**		**5,22,000**

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Step 2: Calculate Sales Variances

(i) Total Sales Value Variance (or Total Sales Variance): Total Sales Value Variance = Actual Sales Revenue - Budgeted Sales Revenue Total Sales Value Variance = 5,22,000 - 5,00,000 = **Rs. 22,000 F** (Favorable)

(ii) Sales Price Variance: Sales Price Variance = (Actual Price - Budgeted Price) * Actual Quantity Sales Price Variance = (AP - BP) * AQ

- Product A: (30 - 25) * 4,800 = 5 * 4,800 = 24,000 F
- Product B: (45 - 50) * 2,800 = -5 * 2,800 = (14,000) A
- Product C: (70 - 75) * 2,400 = -5 * 2,400 = (12,000) A
- Product D: (105 - 100) * 800 = 5 * 800 = 4,000 F
- **Total Sales Price Variance = 24,000 F + (14,000) A + (12,000) A + 4,000 F = Rs. 2,000 F**

(iii) Sales Volume Variance: Sales Volume Variance = (Actual Quantity - Budgeted Quantity) * Budgeted Price Sales Volume Variance = (AQ - BQ) * BP

- Product A: (4,800 - 4,000) * 25 = 800 * 25 = 20,000 F
- Product B: (2,800 - 3,000) * 50 = -200 * 50 = (10,000) A
- Product C: (2,400 - 2,000) * 75 = 400 * 75 = 30,000 F
- Product D: (800 - 1,000) * 100 = -200 * 100 = (20,000) A
- **Total Sales Volume Variance = 20,000 F + (10,000) A + 30,000 F + (20,000) A = Rs. 20,000 F**

Verification: Total Sales Value Variance = Sales Price Variance + Sales Volume Variance 22,000 F = 2,000 F + 20,000 F 22,000 F = 22,000 F. (Verified)

Page 5-6: Question 4

4. (a) MFN Limited started its operation in 2022-23 with the total production capacity of 2,00,000 units. The following data for two years is made available to you:

Particulars	2022-23	2023-24
Sales units	80,000	1,20,000
Total cost (Rs.)	34,40,000	45,60,000

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There has been no change in the cost structure and selling price and it is

expected to continue in 2024-25 as well . Selling price is Rs.40 per unit.

You are required to calculate: (i) Break-Even Point (in units) (ii) Profit at 75% of the total capacity

Step 1: Calculate Variable Cost per unit and Fixed Cost We will use the High-Low Method for calculating variable cost per unit and fixed cost.

- **Change in Total Cost =** Rs. 45,60,000 (at 1,20,000 units) - Rs. 34,40,000 (at 80,000 units) = Rs. 11,20,000
- **Change in Units =** 1,20,000 units - 80,000 units = 40,000 units
- **Variable Cost per unit (VC) =** Change in Total Cost / Change in Units
  - VC = 11,20,000 / 40,000 = **Rs. 28 per unit**
- **Calculate Fixed Cost (FC):** Using data for 2022-23: Total Cost = (Variable Cost per unit * Sales Units) + Fixed Cost 34,40,000 = (28 * 80,000) + FC 34,40,000 = 22,40,000 + FC FC = 34,40,000 - 22,40,000 = **Rs. 12,00,000**

  Verification using data for 2023-24: 45,60,000 = (28 * 1,20,000) + FC 45,60,000 = 33,60,000 + FC FC = 45,60,000 - 33,60,000 = **Rs. 12,00,000** (Fixed cost is consistent)

Selling Price (SP) = Rs. 40 per unit

(i) Break-Even Point (in units): Break-Even Point (in units) = Fixed Cost / (Selling Price per unit - Variable Cost per unit) Break-Even Point (in units) = FC / (SP - VC) Break-Even Point (in units) = 12,00,000 / (40 - 28) Break-Even Point (in units) = 12,00,000 / 12 = **1,00,000 units**

(ii) Profit at 75% of the total capacity:

- **Total Production Capacity =** 2,00,000 units
- **Units at 75% Capacity =** 2,00,000 units * 75% = **1,50,000 units**
- **Sales Revenue at 75% Capacity =** 1,50,000 units * Rs. 40/unit = Rs. 60,00,000
- **Variable Cost at 75% Capacity =** 1,50,000 units * Rs. 28/unit = Rs. 42,00,000
- **Contribution at 75% Capacity =** Sales Revenue - Variable Cost = 60,00,000 - 42,00,000 = Rs. 18,00,000
- **Profit at 75% Capacity =** Contribution - Fixed Cost
  - Profit = 18,00,000 - 12,00,000 = **Rs. 6,00,000**

4. (b) The following data relates to a manufacturing company: Plant Capacity = 4,00,000 units per annum. Present Utilization = 40% Actual for the year 2023-24 were: Selling price = Rs.50 per unit, Material cost = Rs.20 per unit, Variable Manufacturing costs Rs.15 per unit and Fixed cost - Rs. 27,00,000 .

In order to improve capacity utilization, the following proposal is considered: Reduce Selling price by 10% and spend additionally Rs.3,00,000 in Sales Promotion.

How many units should be produced and sold in order to increase profit by Rs. 8,00,000 per year?

Step 1: Calculate Current Profit

- **Current Production/Sales Units =** Plant Capacity * Present Utilization
  - Current Units = 4,00,000 units * 40% = 1,60,000 units
- **Current Selling Price (SP) =** Rs. 50 per unit
- **Current Variable Cost per unit (VC) =** Material Cost + Variable Manufacturing Costs
  - VC = 20 + 15 = Rs. 35 per unit
- **Current Contribution per unit (CP) =** SP - VC = 50 - 35 = Rs. 15 per unit
- **Current Total Contribution =** 1,60,000 units * Rs. 15/unit = Rs. 24,00,000
- **Current Fixed Cost (FC) =** Rs. 27,00,000
- **Current Profit =** Total Contribution - Fixed Cost
  - Current Profit = 24,00,000 - 27,00,000 = **(Rs. 3,00,000) (Loss)**

Step 2: Analyze the Proposal

- **New Selling Price (New SP) =** Current SP - 10% reduction
  - New SP = 50 - (0.10 * 50) = 50 - 5 = Rs. 45 per unit
- **New Variable Cost per unit (New VC) =** Remains the same = Rs. 35 per unit
- **New Contribution per unit (New CP) =** New SP - New VC = 45 - 35 = Rs. 10 per unit
- **New Fixed Cost (New FC) =** Current Fixed Cost + Additional Sales Promotion
  - New FC = 27,00,000 + 3,00,000 = Rs. 30,00,000

Step 3: Calculate Target Profit and Required Units

- **Desired Increase in Profit =** Rs. 8,00,000
- **Target Profit =** Current Profit + Desired Increase (Since current profit is a loss, we want to reach a positive profit of 8,00,000)
    - Target Profit = (-3,00,000) + 8,00,000 = Rs. 5,00,000

  Correction: "increase profit by Rs. 8,00,000" usually means the *new* profit should be Current Profit + Desired Increase. If current is a loss of 3,00,000, an increase of 8,00,000 means a new profit of (-3,00,000 + 8,00,000) = 5,00,000. If the interpretation is to *achieve* a profit of 8,00,000 from the current loss position, the required increase would be 11,00,000. Assuming "increase profit by Rs. 8,00,000" means the *new* profit should be the original profit plus 8,00,000.

  Let's re-evaluate the target profit. If the current profit is -$300,000 (a loss), and we want to increase the profit *by* $800,000, the new target profit would be -$300,000 + $800,000 = $500,000. This is the more standard interpretation in such problems.

  However, if the question meant "achieve a profit of Rs. 8,00,000", then the target profit would be Rs. 8,00,000. Given the phrasing "increase profit by Rs. 8,00,000", the target profit is Rs. 5,00,000.

  Let's use the formula: **Sales Units for Target Profit = (Fixed Cost + Target Profit) / Contribution per unit** Sales Units = (30,00,000 + 5,00,000) / 10 Sales Units = 35,00,000 / 10 = **3,50,000 units**

Therefore, **3,50,000 units** should be produced and sold to increase profit by Rs. 8,00,000 per year.

Page 6: Question 4 (Or)

4. (a) What do you mean by P/V ratio? Discuss its significance in decision-making. How it can be improved?

P/V Ratio (Profit-Volume Ratio) Definition: The P/V ratio, also known as the Contribution Margin Ratio, expresses the relationship between contribution margin and sales revenue. It is calculated as: P/V Ratio = (Contribution Margin / Sales) * 100 OR P/V Ratio = (Sales - Variable Cost) / Sales * 100 OR P/V Ratio = (Contribution per unit / Selling Price per unit) * 100

It indicates the proportion of each sales rupee that is available to cover fixed costs and contribute to profit. A higher P/V ratio means that a larger portion of sales revenue contributes to covering fixed costs and generating profit, indicating better profitability.

Significance in Decision-Making: The P/V ratio is a vital tool for management in various decision-making scenarios:

1. **Break-Even Analysis:** It helps in calculating the break-even point. A higher P/V ratio results in a lower break-even point, meaning the company needs to sell fewer units or less revenue to cover its fixed costs.
2. **Profitability Analysis:** It provides a quick measure of the profitability of each product, sales territory, or division. Products with higher P/V ratios are generally more profitable.
3. **Pricing Decisions:** It assists in setting selling prices. Understanding the P/V ratio helps in determining the impact of price changes on profitability.
4. **Sales Mix Decisions:** In a multi-product company, it guides management in deciding the optimal sales mix to maximize overall profit. Products with higher P/V ratios should be prioritized.
5. **Cost Control:** It highlights the impact of variable costs on profitability. Efforts to reduce variable costs directly improve the P/V ratio.
6. **Make or Buy Decisions:** It can be used to compare the profitability of making a component in-house versus purchasing it from an external supplier.
7. **Performance Evaluation:** It serves as a key performance indicator to evaluate the efficiency of sales and production activities.
8. **Target Profit Planning:** It helps in determining the sales volume required to achieve a target profit.

How it can be improved:

1. **Increase Selling Price:** Raising the selling price per unit, assuming demand remains stable, will directly increase the contribution per unit and thus the P/V ratio.
2. **Decrease Variable Costs:** Reducing direct material costs, direct labor costs, or variable overheads per unit will increase the contribution per unit. This can be achieved through:
    - Negotiating better prices with suppliers.

    - Improving production efficiency to reduce material wastage or labor time.
    - Using cheaper but equally effective substitutes.
    - Automation to reduce variable labor costs.
3. **Improve Sales Mix (for multi-product companies):** Shifting the sales emphasis towards products that have a higher contribution margin per unit or a higher P/V ratio.
4. **Increase Productivity and Efficiency:** While this often reduces variable costs, it can also include measures that effectively increase the output per unit of variable input, thus improving the P/V ratio.

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4. (b) The Cost-Volume-Profit relationship of SR Ltd. is described by the equation: Y=Rs.2,40,000+0.6X, in which X represents sales revenue and Y is the total cost (FC+VC) at the sales revenue / Volume represented by X.

Required: (i) Identify the P/V Ratio. (ii) What sales volume must be obtained to break- even for the Company? (iii) Analyze Sales volume to be required to produce an income Rs.1,00,000.

Step 1: Understand the CVP Equation The standard CVP equation for total cost is: Y=FixedCosts(FC)+VariableCosts(VC) Also, we know that Variable Costs (VC) can be expressed as a percentage of Sales (X), i.e., VC=Variable Cost Ratio×X. So, Y=FC+(Variable Cost Ratio×X)

Comparing this with the given equation: Y=Rs.2,40,000+0.6X

- **Fixed Costs (FC) = Rs. 2,40,000**
- **Variable Cost Ratio = 0.6 or 60%** (This means for every rupee of sales, 60 paise goes towards variable costs).

(i) Identify the P/V Ratio: The P/V Ratio (Contribution Margin Ratio) is the percentage of sales revenue remaining after covering variable costs. P/V Ratio = 1 - Variable Cost Ratio P/V Ratio = 1 - 0.6 = **0.4 or 40%**

(ii) What sales volume must be obtained to break-even for the Company? Break-Even Point (in Sales Revenue) = Fixed Costs / P/V Ratio Break-Even Point = 2,40,000 / 0.4 Break-Even Point = **Rs. 6,00,000**

(iii) Analyze Sales volume to be required to produce an income

Rs.1,00,000. Sales Volume for Target Profit = (Fixed Costs + Target Profit) / P/V Ratio Sales Volume = (2,40,000 + 1,00,000) / 0.4 Sales Volume = 3,40,000 / 0.4 = **Rs. 8,50,000**

Page 7: Question 5

5. SR Ltd. gives you the following details of its existing operations

Particulars	Amount (Rs.)
Selling price (Rs.)	20
Variable Cost per unit (Rs.)	15
Fixed Cost (Rs.)	50,000
Actual Output and Sales (units)	25,000

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The management is considering a proposal for modernisation of its production operations. As per this proposal the cost structure is estimated to be as follows:

Particulars	Amount (Rs.)
Selling price (Rs.)	20
Variable Cost per unit (Rs.)	10
Fixed Cost (Rs.)	1,50,000

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As a management accountant of the company, you are asked to give the following calculations and advice for consideration by the management :

(i) The level of output under the proposed alternative where the company will earn the same amount of profit as being earned at existing level of sales operations.

Step 1: Calculate Profit under Existing Operations

- Selling Price (SP) = Rs. 20 per unit
- Variable Cost (VC) = Rs. 15 per unit
- Contribution per unit (CP) = SP - VC = 20 - 15 = Rs. 5 per unit
- Fixed Cost (FC) = Rs. 50,000
- Actual Sales Units = 25,000 units

- Total Contribution = 25,000 units * Rs. 5/unit = Rs. 1,25,000
- **Profit (Existing) =** Total Contribution - Fixed Cost = 1,25,000 - 50,000 = **Rs. 75,000**

Step 2: Calculate Required Output under Proposed Alternative for Same Profit

- **Proposed Selling Price (SP') =** Rs. 20 per unit
- **Proposed Variable Cost (VC') =** Rs. 10 per unit
- **Proposed Contribution per unit (CP') =** SP' - VC' = 20 - 10 = Rs. 10 per unit
- **Proposed Fixed Cost (FC') =** Rs. 1,50,000
- **Target Profit =** Rs. 75,000 (same as existing)
- **Required Output (Units) =** (Proposed Fixed Cost + Target Profit) / Proposed Contribution per unit
    - Required Output = (1,50,000 + 75,000) / 10
    - Required Output = 2,25,000 / 10 = **22,500 units**

(ii) Range of sales where existing operations and the proposed modernization will be more profitable. Whether, the company should consider the modernization of production facility at existing level of sales operations.

Finding the Indifference Point (Equating Profits): Let 'X' be the level of sales (in units) where profit under both alternatives is equal.

- **Profit (Existing) =** (Contribution per unit (Existing) * X) - Fixed Cost (Existing)
    - Profit (Existing) = (5 * X) - 50,000
- **Profit (Proposed) =** (Contribution per unit (Proposed) * X) - Fixed Cost (Proposed)
    - Profit (Proposed) = (10 * X) - 1,50,000

Set Profit (Existing) = Profit (Proposed): 5X - 50,000 = 10X - 1,50,000 1,50,000 - 50,000 = 10X - 5X 1,00,000 = 5X X = 1,00,000 / 5 = **20,000 units**

This is the indifference point.

- **Range of sales where existing operations will be more profitable:**
    - For sales **Below 20,000 units**, the existing operation will be more profitable because it has lower fixed costs, even though its variable cost per unit is higher.

- **Range of sales where proposed modernization will be more profitable:**
    - For sales **Above 20,000 units**, the proposed modernization will be more profitable because its higher fixed costs are offset by a significantly lower variable cost per unit (higher contribution per unit).

Consideration at existing level of sales operations (25,000 units):

Since the existing level of sales operations is 25,000 units, which is **above the indifference point of 20,000 units**, the **proposed modernization will be more profitable** at this level.

Let's verify the profits at 25,000 units:

- **Profit (Existing) at 25,000 units =** (5 * 25,000) - 50,000 = 1,25,000 - 50,000 = Rs. 75,000
- **Profit (Proposed) at 25,000 units =** (10 * 25,000) - 1,50,000 = 2,50,000 - 1,50,000 = Rs. 1,00,000

Advice: The company **should consider the modernization of the production facility** at the existing level of sales operations (25,000 units) because it will lead to a higher profit (Rs. 1,00,000 vs. Rs. 75,000).

(iii) Prepare a comparative statement of profit under the two alternatives if the company plans to produce and sell 30,000 units.

Comparative Statement of Profit at 30,000 units

Particulars	**Existing Operations (Rs.)**	**Proposed Modernization (Rs.)**
Sales Revenue (30,000 units * Rs. 20)	6,00,000	6,00,000
Less: Variable Costs		
(30,000 units * Rs. 15)	4,50,000	
(30,000 units * Rs. 10)		3,00,000
Contribution Margin	**1,50,000**	**3,00,000**
Less: Fixed Costs	50,000	1,50,000
Profit	**1,00,000**	**1,50,000**

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Conclusion: If the company plans to produce and sell 30,000 units, the

proposed modernization will be significantly more profitable, yielding a profit of Rs. 1,50,000 compared to Rs. 1,00,000 under existing operations. This further supports the decision for modernization if higher sales volumes are anticipated.

Page 8: Question 5 (Or)

5. (a) Explain the concept of key factor in management decision making with examples? Also discuss the criteria used to measure the relative profitability when a key factor is in play.

Concept of Key Factor (or Limiting Factor) in Management Decision Making: A key factor, also known as a limiting factor or principal budget factor, is a factor that restricts or limits the overall level of activity (such as production or sales) of an organization. When a key factor is present, the company cannot produce or sell as much as it desires due to the scarcity of this particular resource or constraint. Therefore, decisions must be made to optimize the utilization of this scarce resource to maximize profitability. Identifying the key factor is crucial because it dictates the allocation of other resources and the overall operational plan.

Examples:

- **Limited Sales Demand:** The market can only absorb a certain quantity of the product. This is often the most common key factor.
- **Shortage of Raw Materials:** A critical raw material may be difficult to procure in sufficient quantities.
- **Limited Skilled Labour:** There might not be enough trained personnel to meet desired production levels.
- **Machine Capacity (Machine Hours):** A particular machine or production line may have limited operating hours, creating a bottleneck.
- **Working Capital:** Insufficient funds to finance production or sales activities.

Criteria Used to Measure Relative Profitability when a Key Factor is in Play:

When a key factor exists, the traditional measure of profitability (contribution per unit) is insufficient. Instead, the focus shifts to maximizing the contribution earned **per unit of the key factor**. This is

because the goal is to get the most "bang for the buck" from the limited resource.

The primary criterion used is:

Contribution per unit of Key Factor (or Contribution per limiting resource unit)

Calculation: Contribution per unit of Key Factor = (Contribution per Product Unit) / (Quantity of Key Factor required per Product Unit)

Explanation: Management should prioritize producing and selling those products that yield the highest contribution per unit of the limiting factor. This strategy ensures that the scarce resource is utilized in the most profitable way, leading to overall profit maximization for the company.

Example Scenario (Machine Hours as Key Factor): Suppose a company produces two products, Product X and Product Y.

- Product X: Selling Price Rs.100, Variable Cost Rs.60, Contribution Rs.40. Requires 2 machine hours.
- Product Y: Selling Price Rs.120, Variable Cost Rs.80, Contribution Rs.40. Requires 1 machine hour.

If machine hours are the key factor:

- Contribution per machine hour for Product X = Rs. 40 / 2 hours = Rs. 20 per machine hour
- Contribution per machine hour for Product Y = Rs. 40 / 1 hour = Rs. 40 per machine hour

In this case, even though both products have the same contribution per unit, Product Y should be prioritized because it generates twice as much contribution for each scarce machine hour utilized.

This approach ensures that decisions made under resource constraints lead to the optimal outcome for the business.

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5. (b) Isha Ltd., produces three products A, B and C and for each of them uses three different machines X, Y and Z. Relevant data for June, 2024 are given below:

Product	A	B	C
Selling Price per unit (Rs)	10,000	8,000	6,000
Variable cost per unit (Rs.)	7,000	5,600	4,000
Machine-wise hours required per unit:			
Machine X	20	12	4
Machine Y	20	18	6
Machine Z	20	6	2
Expected Demand (units)	200	200	200

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Machine Z is identified as the bottleneck and its capacity is limited to 5,400 hours.

Calculate the optimum product mix from above information and ascertain the total profit at the mix so determined if fixed cost amounts to Rs.7,80,000.

Step 1: Calculate Contribution per unit for each product

- **Product A:**
  - Contribution = Selling Price - Variable Cost
  - 10,000 - 7,000 = **Rs. 3,000 per unit**
- **Product B:**
  - Contribution = 8,000 - 5,600 = **Rs. 2,400 per unit**
- **Product C:**
  - Contribution = 6,000 - 4,000 = **Rs. 2,000 per unit**

Step 2: Identify the Key Factor and calculate Contribution per unit of Key Factor

Machine Z is the bottleneck (key factor) with a capacity of 5,400 hours. We need to calculate the contribution per hour of Machine Z for each product.

- **Machine Z Hours Required per unit:**
  - Product A: 20 hours
  - Product B: 6 hours
  - Product C: 2 hours
- **Contribution per Hour of Machine Z:**
  - **Product A:** Rs. 3,000 / 20 hours = **Rs. 150 per hour**
  - **Product B:** Rs. 2,400 / 6 hours = **Rs. 400 per hour**
  - **Product C:** Rs. 2,000 / 2 hours = **Rs. 1,000 per hour**

Step 3: Rank the Products based on Contribution per Hour of Machine Z

1. **Product C** (Rs. 1,000 per hour)
2. **Product B** (Rs. 400 per hour)
3. **Product A** (Rs. 150 per hour)

Step 4: Determine the Optimum Product Mix (Allocate Machine Z hours based on ranking)

- **Total Machine Z Capacity = 5,400 hours**
- **Expected Demand for each product = 200 units**

1. **Allocate to Product C (Highest Rank):**
    - Demand = 200 units
    - Machine Z hours required for Product C = 200 units * 2 hours/unit = 400 hours
    - Remaining Machine Z Capacity = 5,400 - 400 = 5,000 hours
    - Units of C to be produced = **200 units**
2. **Allocate to Product B (Second Rank):**
    - Demand = 200 units
    - Machine Z hours required for Product B = 200 units * 6 hours/unit = 1,200 hours
    - Remaining Machine Z Capacity = 5,000 - 1,200 = 3,800 hours
    - Units of B to be produced = **200 units**
3. **Allocate to Product A (Third Rank):**
    - Demand = 200 units
    - Machine Z hours required for Product A = 200 units * 20 hours/unit = 4,000 hours
    - Available Machine Z Capacity = 3,800 hours
    - Since demand (4,000 hours) exceeds available capacity (3,800 hours), Product A production will be limited by Machine Z capacity.
    - Units of A to be produced = Available Machine Z Capacity / Hours per unit for A
    - Units of A = 3,800 hours / 20 hours/unit = **190 units**

Optimum Product Mix:

- **Product A: 190 units**
- **Product B: 200 units**
- **Product C: 200 units**

Step 5: Ascertain Total Profit at the Optimum Mix

- **Total Contribution from Optimum Mix:**
  - Product A: 190 units * Rs. 3,000/unit = 5,70,000
  - Product B: 200 units * Rs. 2,400/unit = 4,80,000
  - Product C: 200 units * Rs. 2,000/unit = 4,00,000
  - **Total Contribution = 5,70,000 + 4,80,000 + 4,00,000 = Rs. 14,50,000**
- **Less: Fixed Cost = Rs. 7,80,000**
- **Total Profit =** Total Contribution - Fixed Cost
  - Total Profit = 14,50,000 - 7,80,000 = **Rs. 6,70,000**

Final Answer: The optimum product mix is:

- Product A: 190 units
- Product B: 200 units
- Product C: 200 units

The total profit at this determined mix is **Rs. 6,70,000**.