

PAPER – 5: ADVANCED MANAGEMENT ACCOUNTING

QUESTIONS

Implementation of Kaizen Costing System

1. M. India Ltd. (MIL) is an automobile manufacturer in India and a subsidiary of Japanese automobile and motorcycle manufacturer Leon. It manufactures and sells a complete range of cars from the entry level to the hatchback to sedans and has a present market share of 22% of the Indian passenger car markets. MIL uses a system of standard costing to set its budgets. Budgets are set semi-annually by the Finance department after the approval of the Board of Directors at MIL. The Finance department prepares variance reports each month for review in the Board of Directors meeting, where actual performance is compared with the budgeted figures. Mr. Suzuki, group CEO of the Leon is of the opinion that Kaizen costing method should be implemented as a system of planning and control in the MIL.

Required:

RECOMMEND key changes vital to MIL's planning and control system to support the adoption of KAIZEN COSTING CONCEPTS.

Kaizen Costing– Basic Concepts

2. ABC Ltd. is planning to introduce Kaizen Costing approach in its manufacturing plant. State whether and why the following are VALID OR NOT in respect of Kaizen Costing.
 - (i) VP (Finance) is of the view that company has to make a huge initial investment to bring a large scale modification in production process.
 - (ii) Head (Personnel) has made a point that introduction of Kaizen Costing does not eliminate the training requirement of employees.
 - (iii) General Manager (Manufacturing) firmly believes that only shop floor employees and workers' involvement is prerequisite of Kaizen Costing approach.
 - (iv) Manager (Operations) has concerns about creation of confusion among employees and workers regarding their roles and degradation in quality of production.

Life Cycle Costing – Optimal Plant Capacity

3. Y-Connections, China based firm, has just developed ultra-thintablet S-5 with few features like the ability to open two apps at the same time. This tablet cost ₹ 5,00,000 to develop; it has undergone extensive research and is ready for production. Currently, the firm is deciding on plant capacity, which could cost either ₹ 35,00,000 or ₹ 52,00,000. The additional outlay would allow the plant to increase capacity from 500 units to 750 units. The relevant data for the life cycle of the tablet at different capacity level are as under:

Expected Sales	500 units	750 units
Sale Price	₹79,600 per unit	₹69,600 per unit

Variable Selling Costs	10% of Selling Price	10% of Selling Price
Salvage Value - Plant	₹ 6,25,000	₹ 9,00,000
Profit Volume Ratio	40%	

Required:

ADVISE Y-Connections, regarding the OPTIMAL PLANT CAPACITY to install. The tablet's life cycle is two years.

Note: Ignore the time value of money.

Value Chain Analysis– Basic Concepts

4. EXAMINE the VALIDITY of following statements along with the reasons:
 - (i) The concepts, tools and techniques of value chain analysis apply only to all those organizations which produce and sell a product.
 - (ii) Procurement activities are included in the Primary activities as classified by Porter under value chain analysis concept.
 - (iii) Value chain analysis in the strategic framework consists of single cost driver concept.

Labour Related Decision – Strike

5. MFG Ltd. is producing a component called 'KDK'. Estimated costs are:

	Fixed Cost per year (₹ '000)	Variable Cost per 'KDK' (₹)
Production	32,000	3,600
Distribution	2,000	200

Direct labour costs are 40% of the variable production costs. In the production department machining and assembling of 'KDK', 90 men work 8 hours per day for 300 days in a year. Each worker can machine and assemble 1 'KDK' per uninterrupted 180 minutes time frame. In each 8 hours working day, 20 minutes are allowed for coffee-break, 30 minutes on an average for training and 22 minutes for supervisory instructions. Besides 10% of each day is booked as idle time to cover checking in and checking out changing operations, getting materials and other miscellaneous matters.

MFG Ltd. has been facing industrial relations problem as the workers of company have a very strong union. Company is faced with the possibility of a strike by direct production workers engaged on the assembly of 'KDK'. The trade union is demanding an increase of 15%, back-dated from the beginning of financial year, but the company expects that if a strike does take place, it will last 25 Days after which the union will settle for an increase of 10% similarly back-dated. The only product of the company is being sold at ₹6,000.

If the strike takes place, Sales of 1,300 'KDK' would be lost. The balance that would ordinarily have been produced during the strike period could, however be sold, but these

'KDK' would have to be made up in overtime working which would be at an efficiency rate of 90% of normal. This would entail additional fixed cost of ₹1,00,000 and wage payments at time and one-half.

Required:

Give necessary ADVICE to the management to allow the strike to go ahead or to accept the union's demand.

Pricing Strategy – Growth Stage (Antivirus Software)

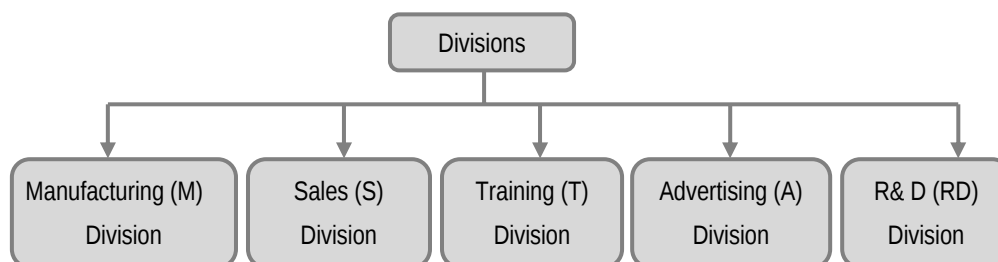
6. Rapid Heal Tech Ltd. (RHTL) is a leading IT security solutions and ISO 9001 certified company. The solutions are well integrated systems that simplify IT security management across the length and depth of devices and on multiple platforms. RHTL has recently developed an Antivirus Software and company expects to have life cycle of less than one year. It was decided that it would be appropriate to adopt a market skimming pricing policy for the launch of the product. This Software is currently in the Introduction stage of its life cycle and is generating significant unit profits.

EXPLAIN, with reasons, the changes, if any, to the unit selling price that could occur when the Software moves from the Introduction stage to Growth stage of its life cycle.

Also SUGGEST necessary STRATEGIES at this stage.

Zero Based Budgeting (Public Company – Telecommunications Sector)

7. Metro Communication Limited is a state-owned large public company in the telecommunications sector. One of its main planning and control tools is the preparation and use of traditional annual budgets. Its divisional structure is as under:



Division T, A and RD incur substantial amount on discretionary expenses.

Required:

IDENTIFY the possibilities of introducing a ZERO BASED BUDGETING system for Division T, A and RD.

Standard Costing – Missing Figures

8. A company produces a product X, using raw materials A and B. The standard mix of A and B is 1: 1 and the standard loss is 10% of input. You are required to COMPUTE the MISSING INFORMATION indicated by "?" based on the data given below:

	A	B	Total
Standard price of raw material (₹ / kg.)	24	30	
Actual input (kg.)	?	70	
Actual output (kg.)			?
Actual price ₹ / kg.	30	?	
Standard input quantity (kg.)	?	?	
Yield variance (sub usage)			270(A)
Mix variance			?
Usage variance	?	?	?
Price variance	?	?	?
Cost variance	0	?	1,300(A)

Decision Making (Public Transport – Bus Service)

9. Expert Roadways Services Pvt. Ltd. is planning to run a fleet of 15 buses in Birpur City on a fixed route. Company has estimated a total of 2,51,85,000 passenger kilometers per annum. It is estimated buses to have 100% load factor. Buses are purchased at a price of ₹ 44,00,000 per unit whose scrap value at the end of 5 years life is ₹ 5,50,000. Seating capacity of a bus excluding a Driver's seat is 42. Each bus can give a mileage of 5 kmpl. Average cost of fuel is ₹ 66 per liter. Cost of Lubricants & Sundries per 1,000 km would be ₹ 3,300. Company will pay ₹ 27,500 per month to Driver and two attendants for each bus.

Other annual charges per bus: Insurance ₹ 55,000, Garage Charges ₹ 33,000, Repairs & Maintenance ₹ 55,000. Route Permit Charges upto 20,000 km is ₹ 5,500 and ₹ 2,200 for every additional 5,000 km or part thereof.

Required:

- CALCULATE a suggested fare per passenger/km taking into account markup on cost @20% to cover general overheads and sufficient profit.
- The Transport Sector of Birpur is highly regulated. The Government has fixed the fare @ ₹ 1.35 for next 2 years. COMMENT on the two year's profitability taking into consideration the inflation rate of 8%.

Note: Route permit charges is not subject to Inflation.

Multinational Transfer Pricing

10. Standard Corporation Inc. (SCI) is a US based multinational company engaged in manufacturing and marketing of Printers and Scanners. It has subsidiaries spreading across the world which either manufactures or sales Printers and Scanners using the brand name of SCI.

The Indian subsidiary of the SCI buys an important component for the Printers and Scanners from the Chinese subsidiary of the same MNC group. The Indian subsidiary buys 1,50,000 units of components per annum from the Chinese subsidiary at CNY (¥) 30 per unit and pays a total custom duty of 29.5% of value of the components purchased.

A Japanese MNC which manufactures the same component which is used in the Printer and Scanners of SCI, has a manufacturing unit in India and is ready to supply the same component to the Indian subsidiary of SCI at ₹ 320 per unit.

The SCI is examining the proposal of the Japanese manufacturer and asked its Chinese subsidiary to present its views on this issue. The Chinese subsidiary of the SCI has informed that it will be able to sell 1,20,000 units of the components to the local Chinese manufacturers at the same price i.e. ¥ 30 per unit but it will incur an excise duty @ 10% on sales value. Variable cost per unit of manufacturing the component is ¥ 20 per unit. The Fixed Costs of the subsidiaries will remain unchanged.

The Corporation tax rates and currency exchange rates are as follows:

Corporation Tax rates		Currency Exchange Rates
China	25%	1 US Dollar (\$) = ₹61.50
India	34%	1 US Dollar (\$) = ¥ 6.25
USA	40%	1 CNY (¥) = ₹ 9.80

Required:

- PREPARE a financial appraisal for the impact of the proposal by the Japanese manufacturer to supply components for Printers and Scanners to Indian subsidiary of SCI. [Present your solution in Indian Currency and its equivalent.]
- IDENTIFY other issues that would be considered by the SCI in relation to this proposal.

(Note: While doing this problem use the only information provided in the question itself and ignore the actual taxation rules or treaties prevail in the above mentioned countries)

Balance Score Card (Telecom Company)

- Standard Telecom Ltd. is a leading cellular service provider having a global presence. It aims to be the most innovative and trusted telecom company in the world. To achieve this aim, it is constantly working on its overall functioning. It is trying to adopt best management practices in the world. Following are some information related to the company's performance for a particular period:

Particulars	Current Year	Base Year	Target
Operating Ratio	60%	54%	Reduce it to 50%
Average Revenue per user	₹ 225	₹ 210	Increase it to ₹250

Unresolved Consumer Complaints	27,500	25,000	Reduce it by 20%
Customer Relationship Centres	280	200	Take the total to 250
Employee Coverage under Training Programme	10%	8%	At least 15%

EVALUATE the performance of the company using BALANCE SCORECARD approach.

Profitability Analysis (Manufacturing Company)

12. Aditya Decors Ltd. (ADL) is a leading manufacturer of luxury sanitary products and has divided its whole business into different product segments. At the Last year the management of ADL has decided to make some changes in its one of product-line 'AADee', the improved version was made available for sale from 1st of April 2014.

At the end of the financial year 2014-15, the finance and accounts department has extracted some relevant data for the product line 'AADee' to analyse the decision taken last year. The data related with AADee for the financial year 2013-14 and 2014-15 are as follows:

	2013-14	2014-15
No. of Units Sold	4,00,000	4,30,000
Selling Price <i>per unit</i>	₹4,175	₹ 4,325
Direct Materials Consumed	24,00,000 kg.	25,10,000 kg.
Cost <i>per kg.</i> of Direct Materials	₹470	₹485
Direct LabourUsed	32,00,000 hrs.	34,80,000 hrs.
Rate <i>per labour hour</i>	₹30	₹ 31
Fixed Costs	₹1,60,00,000	₹ 1,76,00,000

ADL has the capacity to produce 5,00,000 units of AADee a year.

Required:

- (i) ANALYSE the changes in the operating income from financial year 2013-14 to 2014-15 with respect to the following components:
 - (a) Growth, (b) Price- Recovery and (c) Productivity Components
- (ii) RECONCILIATION of Operating Profit from 2013-14 to 2014-15.

Linear Programming and Transportation

13. IDENTIFY three SIMILARITIES and three DIFFERENCES between Linear Programming Model and Transportation Model.

Assignment and Transportation

14. EXPLAIN following statement-

"Assignment problem is special case of transportation problem; it can also be solved by transportation methods"

Program Evaluation and Review Technique

15. The Chennai Construction Company is bidding on a contract to install a line of microwave towers. It has identified, the expected duration of the critical path is 18 weeks and the sum of the variances of the activities on the critical path is 9 weeks.

Required:

CALCULATE the PROBABILITY that the project may be completed not earlier than 15 weeks and not later than 21 weeks.

Simulation- Perishable Stock

16. A cake vendor buys pieces of cake every morning at ₹4.50 each by placing his order one day in advance (**at the time of receiving his previous order**) and sale them at ₹ 7.00 each. Unsold cake can be sold next day at ₹2.00 per piece and there after it should be treated as no value. The pattern for demand of cake is given below:

Fresh Cake:

Daily Sale	100	101	102	103	104	105	106	107	108	109	110
Probability	.01	.03	.04	.07	.09	.11	.15	.21	.18	.09	.02

One day old cake:

Daily Sale	0	1	2	3
Probability	.70	.20	.08	.02

Use the following set of random numbers:

Fresh Cake	37	73	14	17	24	35	29	37	33	68
One day old cake	17	28	69	38	50	57	82	44	89	60

The vendor adopts the following rule.

If there is no stock of cake with him at the end of previous day, he orders for 110pieces otherwise he orders 100 or 105 pieces whichever is nearest actual fresh cake sale on the previous day. Starting with zero stock and a pending order of 105 pieces, simulate for 10 days and CALCULATE vendor's profit.

Learning Curve – Sensitivity Analysis

17. B-Parts Inc., USA based firm, has just invented a new part 'B-20'. New part has a budgeted total profit of ₹75,000 from the first 256parts. The time taken to produce the first part was 112.50 hours. The labour rate is ₹20 per hour. A 90% learning curve is expected to apply indefinitely.

Required:

CALCULATE the SENSITIVITY of the budgeted total profit from the first 256 parts to changes in the learning rate.

SUGGESTED ANSWERS/HINTS

1. **Kaizen Costing** emphasizes on *small but continuous improvement*. Targets once set at the beginning of the year or activities are *updated continuously* to reflect the improvement that has already been achieved and that are yet to be achieved.

The suggestive changes which are required to be adopted Kaizen Costing concepts in MIL are as follows:

Standard Cost Control System to Cost Reduction System: Traditionally Standard Costing system assumes stability in the current manufacturing process and standards are set keeping the normal manufacturing process into account thus the whole effort is on to meet performance cost standard. On the other hand Kaizen Costing believes in continuous improvements in manufacturing processes and hence, the goal is to achieve cost reduction target. The first change required is the standard setting methodology i.e. from earlier Cost Control System to Cost Reduction System.

Reduction in the periodicity of setting Standards and Variance Analysis: Under the existing planning and control system followed by the MIL, standards are set semi-annually and based on these standards monthly variance reports are generated for analysis. But under Kaizen Costing system cost reduction targets are set for small periods say for a week or a month. So the period covered under a standard should be reduced from semi-annually to monthly and the current practice of generating variance reports may be continued or may be reduced to a week.

Participation of Executives or Workers in standard setting: Under the Kaizen Costing system participation of workers or executives who are actually involved in the manufacturing process are highly appreciated while setting standards. So the current system of setting budgets and standards by the Finance department with the mere consent of Board of Directors required to be changed.

2. (i) **Invalid:** Kaizen Costing is the system of cost reduction procedures which involves making small and continuous improvements to the production processes rather than innovations or large-scale investment.
- (ii) **Valid:** The training of employees is very much a long-term and ongoing process in the Kaizen costing approach. Training enhances the abilities of employees.
- (iii) **Invalid:** Kaizen costing approach involves everyone from top management level to the shop floor employees. Every employee's active participation is a must requirement.
- (iv) **Invalid:** Though the aim of Kaizen Costing is to reduce the cost but at the same time it also aims to maintain the quality. Kaizen costing also aims to bring the clarity in roles and responsibilities for all employees.

3. Workings

Statement Showing Variable Manufacturing Cost per unit

Particulars of Costs	₹ / unit
Sales	79,600
Less: Contribution (40%)	31,840
Variable Cost	47,760
Less: Variable Selling Costs ($₹79,600 \times 0.1$)	7,960
Variable Manufacturing Cost	39,800

Statement Showing Expected Profit

Particulars of Costs	('000) ₹ / unit	
	500 units	750 units
Sales	39,800 ($₹79,600 \times 500$)	52,200 ($₹69,600 \times 750$)
Less: Variable Mfg. Cost	19,900 ($₹39,800 \times 500$)	29,850 ($₹39,800 \times 750$)
Less: Variable Selling Cost	3,980 ($₹39,800 \times 0.1$)	5,220 ($₹52,200 \times 0.1$)
Add: Salvage Value	625	900
Less: Cost of Plant	3,500	5,200
Net Profit	13,045	12,830

Development cost is sunk and is not relevant.

Advice---

Based on the above 'Expected Profit' statement which is purely based on *financial considerations* firm may go for high price – low volume i.e. 500 units level. However, *non-financial considerations* are also given due importance as they account for actions that may not contribute directly to profits in the short run but may contribute significantly to profits in long run. Here, it is important to note that life cycle of product is two years and there is no significant difference between the profits at both levels. In this scenario firm may opt the plant having high capacity not only to increase its market share but also to establish a long term brand image.

4. (i) **Invalid:** The concepts, tools and techniques of value chain analysis apply to organizations which produce and sell a product and also to organizations which provide a service.
- (ii) **Invalid:** Procurement activities are included in the support activities rather than primary activities.
- (iii) **Invalid:** Value chain analysis in the strategic framework consists of multiple cost drivers concept. In value chain analysis, a set of unique cost drivers is identified for each value activity instead of single cost driver application at the overall firm level. Multiple cost drivers may be classified into Structural drivers and Executional drivers.

5. Alternative-1 with No Strike: (Refer W.N.-2, 3) ---

Cost of Settlement is 15% Increase i.e. ₹216 per unit

Annual Cost of Settlement

$$= 54,000 \text{ units} \times ₹ 216$$

$$= ₹ 1,16,64,000$$

Alternative 2 i.e. if Strike Goes Ahead: (Refer W.N.-1, 2, 3) ---

Extra Cost	(₹)
Annual Incremental Labour Cost (Ex. Strike Days Production) [54,000 units – (25 Days × 180 units per Day)] × ₹144.00]	71,28,000
Loss of Contribution <i>due to loss of sales</i> [1,300 units × ₹ 2,200]	28,60,000
Incremental Labour Cost for Balance 3,200 units [(25 Days × 180 units per Day) – 1,300 units] × ₹144.00]	4,60,800
Overtime Premium [3,200 units × 1,584 × 0.5]	25,34,400
Payment for Efficiency [3,200 units × 1/9 × 1,584 × 1.5]	8,44,800
Additional Fixed Cost	1,00,000
	1,39,28,000

If there is no strike, it will yield a financial benefit of ₹ 22,64,000 (₹1,39,28,000 – ₹ 1,16,64,000). Management should accept union's demand.

Working Note**(1) Statement Showing Contribution per unit of 'KDK' ----**

	(₹)
Selling Price	6,000
Less: Variable Costs:	
Labour Cost	1,440
Production Ex. Wages (₹3,600 – ₹1,440)	2,160
Distribution	200
Contribution	2,200

(2) Calculation of Labour Cost----

$$\text{Direct Labour (40\% of production costs of ₹3,600)} = ₹1,440 \text{ per unit}$$

$$\text{With 15\% Increase, Revised Labour Cost (₹1,440 + ₹216)} = ₹1,656$$

$$\text{With 10\% Increase, Revised Labour Cost (₹1,440 + ₹144)} = ₹1,584$$

(3) Statement Showing Budgeted Production----

Total Time in a Day: (8hrs. × 60 minutes)	= 480 minutes
Less: Idle Time	= 48 minutes
Coffee Break	= 20 minutes
Instructions	= 22 minutes
Training	= <u>30 minutes</u>
Productive Time <i>per day</i>	= 360 minutes

Therefore, 'KDK' to be produced per man per day: $(360/180 \times 1) = 2$ units

Since 'KDK' are produced at the rate of 2 'KDK' per man day, so total yearly production will be 54,000 units (2 units × 90 men × 300 days) of 'KDK'



This question has been solved by comparing 'Existing Situation' with both 'Alternatives (Strike or Non-Strike)' *independently*. However this question can also be solved by comparing 'Alternatives (Strike or Non-Strike)' *only* and final answer would be the same.

Students may also solve this question by taking 'Total Approach' instead of 'Incremental Approach'.

6. Following acceptance by early innovators, conventional consumers start following their lead. New competitors are likely to now enter the market attracted by the opportunities for large scale production and profit. RHTL may wish to discourage competitors from entering the market by lowering the price and thereby lowering the unit profitability. The price needs to be lowered so that the product becomes attractive to different market segments thus increasing demand to achieve the growth in sales volume. Strategies at this stage may include the following
 - (i) Improving quality and adding new features such as Data Theft Protection, Parental Control, Web Protection, Improved Scan Engine, Anti Spyware, Anti Malware etc.
 - (ii) Sourcing new market segments/ distribution channels.
 - (iii) Changing marketing strategy to increase demand.
 - (iv) Lowering price to attract price-sensitive buyers.
7. Discretionary costs are those that are incurred, typically each year, in an amount that is approved as part of the normal budget process. However, there is no clear relationship between the volume of services and the amount of cost that must be incurred. Manager must decide and justify the level that is deemed to be appropriate. This justification is to be made a fresh without making reference to previous level of spending in his/her department. Zero based budgeting is undoubtedly most effective in terms of discretionary costs. The bottom line of a zero based budgeting is that it is important to understand what types of objectives are being accomplished by discretionary cost centers and what resources being devoted to accomplishing various objectives. This will allows a prioritization, so

that organization can evaluate the likely impact of substantial increase or decrease in the resources allocated to the discretionary center.

Accordingly, ZBB has extensive potential application to the division T, A and RD.

8. Working for Finding – Missing Figures

$$\begin{aligned}\text{Cost Variance}_A &= 0 \\ \text{Cost Variance}_{(A+B)} &= ₹ 1,300 (A) \\ \text{Yield Variance}_{(A+B)} &= ₹ 270 (A)\end{aligned}$$

Standard Cost and Actual Cost (Incomplete Information)

Raw Material	Standard Data			Actual Data		
	Qty. (Kg.) [SQ]	Price (₹) [SP]	Amount (₹) [SQ x SP]	Qty. (Kg.) [AQ]	Price (₹) [AP]	Amount (₹) [AQ x AP]
A	???	24	???	???	30	???
B	???	30	???	70	???	???
Total	???		???	???		???

$$\begin{aligned}\text{Material Cost Variance}_A &= \text{Standard Cost} - \text{Actual Cost} \\ \Rightarrow 0 &= (SQ_A \times ₹ 24 - AQ_A \times ₹ 30) \\ \Rightarrow SQ_A &= 1.25 AQ_A \\ \text{Material Yield Variance}_{(A+B)} &= \text{Average Standard Price per unit of Standard Mix} \times [\text{Total Standard Quantity (units)} - \text{Total Actual Quantity (units)}] \\ \Rightarrow ₹ 270 (A) &= \left(\frac{₹ 24 \times SQ_A + ₹ 30 \times SQ_B}{SQ_A + SQ_B} \right) \times [(SQ_A + SQ_B) - (AQ_A + 70)]\end{aligned}$$

$SQ_A = SQ_B$ as Standard Mix is in ratio 1:1

$$\begin{aligned}\Rightarrow ₹ 270 (A) &= \left(\frac{₹ 24 \times SQ_A + ₹ 30 \times SQ_A}{SQ_A + SQ_A} \right) \times [(SQ_A + SQ_A) - (AQ_A + 70)] \\ \Rightarrow ₹ 270 (A) &= 27 \times [2 \times SQ_A - (AQ_A + 70)] \\ \Rightarrow ₹ 270 (A) &= 27 \times [2 \times 1.25 AQ_A - (AQ_A + 70)] \\ \Rightarrow AQ_A &= 40 \text{ Kg.} \\ \text{As } SQ_A &= 1.25 AQ_A \\ &= 1.25 \times 40 \text{ Kg.} \\ &= 50 \text{ Kg.} \\ \text{As } SQ_B &= SQ_A \\ &= 50 \text{ Kg.}\end{aligned}$$

$$\begin{aligned}
 \text{Cost Variance}_{(A+B)} &= \text{Standard Cost} - \text{Actual Cost} \\
 \Rightarrow 1,300 \text{ (A)} &= (50 \text{ Kg.} \times ₹ 24 + 50 \text{ Kg.} \times ₹ 30) - (40 \text{ Kg.} \times ₹ 30 + 70 \text{ Kg.} \times AP_B) \\
 \Rightarrow AP_B &= ₹ 40
 \end{aligned}$$

Standard Cost and Actual Cost (Complete Information)

Raw Material	Standard Data			Actual Data			Std. Cost of Actual Qty. (₹) [AQ × SP]
	Qty. (Kg.) [SQ]	Price (₹) [SP]	Amount (₹) [SQ × SP]	Qty. (Kg.) [AQ]	Price (₹) [AP]	Amount (₹) [AQ × AP]	
A	50	24	1,200	40	30	1,200	960
B	50	30	1,500	70	40	2,800	2,100
Total	100		2,700	110		4,000	3,060

Computation of Variances

Material Cost Variance = Standard Cost – Actual Cost

$$= SQ \times SP - AQ \times AP$$

$$(A) = ₹1,200 - ₹1,200$$

$$= ₹0$$

$$(B) = ₹1,500 - ₹2,800$$

$$= ₹1,300 \text{ (A)}$$

$$\text{Total} = ₹0 + ₹1,300 \text{ (A)}$$

$$= ₹1,300 \text{ (A)}$$

Material Price Variance = Standard Cost of Actual Quantity – Actual Cost

$$= AQ \times SP - AQ \times AP$$

Or

$$= AQ \times (SP - AP)$$

$$(A) = 40 \text{ Kg.} \times (₹24.00 - ₹30.00)$$

$$= ₹240 \text{ (A)}$$

$$(B) = 70 \text{ Kg.} \times (₹30.00 - ₹40.00)$$

$$= ₹700 \text{ (A)}$$

$$\text{Total} = ₹240 \text{ (A)} + ₹700 \text{ (A)}$$

$$= ₹940 \text{ (A)}$$

Material Usage Variance = Standard Cost of Standard Quantity for Actual Output – Standard Cost of Actual Quantity

	=	SQ × SP – AQ × SP
		Or
	=	SP × (SQ – AQ)
(A)	=	₹24 × (50 Kg. – 40 Kg.)
	=	₹240 (F)
(B)	=	₹30 × (50 Kg. – 70 Kg.)
	=	₹600 (A)
Total	=	₹240 (F) + ₹600 (A)
	=	₹360 (A)
Material Mix Variance	=	Total Actual Quantity (units) × (Average Standard Price Per unit of Standard Mix – Average Standard Price per unit of Actual Mix)
	=	110 Kg. × $\left(\frac{₹ 2,700}{100 \text{ Kg.}} - \frac{₹ 3,060}{110 \text{ Kg.}} \right)$
	=	₹90 (A)
Material Yield Variance	=	Average Standard Price per unit of Standard Mix × [Total Standard Quantity (units) – Total Actual Quantity (units)]
	=	$\left(\frac{₹ 2,700}{100 \text{ Kg.}} \right) \times (100 \text{ Kg.} - 110 \text{ Kg.})$
	=	₹ 270 (A) (Given)
Standard Output	=	Standard Input – Standard Loss
	=	100 Kg. – 10 Kg.
	=	90Kg.
Actual Output	=	90 Kg.

(Actual Output and Standard Output are always equal numerically in any Material Variance Analysis)

9. (i) **Statement Suggesting Fare per passenger – km (Each Bus)**

Particulars	Cost per annum (₹)
Fixed Expenses:	
Insurance	55,000.00

Garage Charges	33,000.00
Depreciation	7,70,000.00
Running Expenses:	
Repair and Maintenance	55,000.00
Cost of Lubricants and Sundries	1,38,517.50
Fuel Cost	5,54,070.00
Salary of Driver and Two Attendants	3,30,000.00
Route Permit Charges	16,500.00
Total Cost <i>per annum</i>	19,52,087.50
Add: Markup @ 20% of Total Cost or 16.67% of Total Revenue	3,90,417.50
Total Revenue	23,42,505.00

Rate *per passenger-km* equals to ₹1.395

Workings

Total Passenger Kms	= 2,51,85,000
Total Buses	= 15
Passenger Kms <i>per bus</i>	= 16,79,000 (2,51,85,000 Kms / 15)
Total Passenger Capacity <i>per bus</i>	= 42 – 2
	= 40
Annual Distance Covered <i>by a bus</i>	= 41,975 Kms. (16,79,000 Kms / 40)

(ii) Regulated Fare *per passenger km* is ₹1.35

Profitability Statement for Each Bus

Particulars	Year 1 (₹)	Year 2 (₹)
Fixed Expenses:		
Insurance	59,400.00	64,152.00
Garage Charges	35,640.00	38,491.20
Depreciation	7,70,000.00	7,70,000.00
Running Expenses:		
Repair and Maintenance	59,400.00	64,152.00
Cost of Lubricants and Sundries	1,49,598.90	1,61,566.81
Fuel Cost	5,98,395.60	6,46,267.25
Salary of Driver and Two Attendants	3,56,400.00	3,84,912.00

Route Permit Charges		16,500.00	16,500.00
Total Cost [A]		20,45,334.50	21,46,041.26
Total Revenue (Regulated) [B]		22,66,650.00	22,66,650.00
Profit [B] – [A]		2,21,315.50	1,20,608.74
Profit to Total Revenue		9.76%	5.32%

The gross margin is showing a downward trend because the cost components have taken into the effect of inflation hence increasing year by year but the total revenue has remained stagnant due to Government regulations which resulted in reduction in gross margin per bus.

The company's gross margin to total revenue ratio has come out to be 9.76% and 5.32% in first and second year respectively but initially the company's desired gross margin to total revenue ratio is 16.67% to cover general overheads and sufficient profit. Though the amount of general overheads is not given but we can safely assume that they may also subject to inflation i.e. increase year by year then in such case the company needs to maintain or increase its gross margin per bus to maintain its net profit after general overheads which is not possible in regulated environment. The information about regulated fare in the given case is regarding first two years only but if this regulated fare scenario persists for further years then the project may not be viable for the company.

10. (i) Impact of the Proposal by the Japanese Manufacturer to Supply Components for Printers and Scanners to the Indian Subsidiary of the SCI.

On Indian Subsidiary of SCI

Particulars	Amount (₹)
Cost of Purchase from the Chinese Manufacturer :	
Invoiced Amount $\{(1,50,000 \text{ units} \times \text{¥ } 30) \times \text{₹ } 9.80\}$	4,41,00,000
Add: Total Custom Duty $(\text{₹ } 4,41,00,000 \times 29.5\%)$	1,30,09,500
Total Cost of Purchase from the Chinese Manufacturer (A)	5,71,09,500
Cost of Purchase from Japanese Manufacturer in India:	
Invoice Amount $(1,50,000 \text{ units} \times \text{₹ } 320)$	4,80,00,000
Total Cost of Purchase from Japanese Manufacturer in India (B)	4,80,00,000
Savings on Purchase Cost Before Corporate Taxes (A) – (B)	91,09,500
Less: Corporate Tax @34%	30,97,230
Savings after Corporate Taxes	60,12,270

On Chinese Subsidiary of SCI

Particulars	Amount (₹)
Loss of Contribution [[$(1,50,000 - 1,20,000 \text{ units}) \times ₹ (30 - 20)$] $\times ₹ 9.80$]	29,40,000
Add: Excise Duty on Local Sale - Chinese Manufacturer [[$(1,20,000 \text{ units} \times ₹ 30) \times 10\%$] $\times ₹ 9.80$]	35,28,000
Total Loss Before Corporate Taxes	64,68,000
Less: Tax Savings on the Losses ($₹ 64,68,000 \times 25\%$)	16,17,000
Net Loss after Corporate taxes	48,51,000

On SCI Group

Particulars	Amount (₹)
Saving from Indian Subsidiary	60,12,270
Loss from Chinese Subsidiary	48,17,000
Net Benefit to SCI Group	11,61,270

From the above analysis it can be seen that the proposal from the Japanese manufacturer in India is beneficial for the SCI as it give a net benefit of ₹ 11,61,270.

- (ii) The SCI need to consider various other issues before reaching at a final decision of accepting the proposal of the Japanese manufacturer in India. The few suggestive issues that should be considered are as follows:
- *The longevity of the proposal of the Japanese manufacturer:* Whether Japanese manufacturer will supply the components in the future also. For this purpose a long term agreement between the Indian Subsidiary of SCI and Japanese manufacturer in India needs to be entered.
 - *Certainty of the fiscal policy in India:* The Japanese manufacturer will not be able to supply the component at the present price if the fiscal policy of India will change in the future.
 - *Repatriation of Profit earned in India:* Though the Indian subsidiary is making profit but it depends on the Government policy on the repatriation of profit from India to USA.
 - *Operating Conditions in China:* The SCI has to make sure that the Chinese subsidiary is operating profitably and able to use the spare capacity in the future as well.
 - *The fiscal policy in China:* If the Government of China liberalize its fiscal policies in China in future then the manufacturing cost will be cheaper than the today's cost.

Apart from above suggestive points the foreign relations and other tax treaties and accords should also be kept in consideration.

11. The balanced scorecard is a method which displays organisation's performance into four dimensions namely financial, customer, internal and innovation. The four dimensions acknowledge the interest of shareholders, customers and employees taking into account of both long-term and short-term goals. The detailed analysis of performance of the company using Balance Scorecard approach as follows:

- (i) **Financial Perspective:** Operating ratio and average revenue will be covered in this prospective.

Company is unable to achieve its target of reducing operating ratio to 50% instead it has increased to 60%. Company is required to take appropriate steps to control and manage its operating expenses. Average revenue per user has increased from ₹ 210 to ₹ 225 but remains short of targeted ₹ 250. This is also one of the reasons of swelled operating ratio. Company can boost up its average revenue per user either by increasing the price of its services or by providing more paid value added services.

- (ii) **Customer Perspective:** Service complaints will be covered under this perspective. The company had set a target of reducing unresolved complaints by 20% instead unresolved complaints have risen by 10% $[(27,500-25,000)/(25,000) \times 100]$. It shows dissatisfaction is increasing among the consumers which would adversely impact the consumer's general perception about the company and company may lose its consumers in long run.

- (iii) **Internal Business Perspective:** Establishing customer relationship centres will be covered under this perspective. Company has established 80 relationship centres in the current period exceeding its target of 50 (250-200) to cater to the needs of existing consumers as well as soliciting new consumers. This shows the seriousness of the company towards the consumer satisfaction and would help them in the long run.

- (iv) **Learning and Growth Perspective:** Employee training programmes are covered under this perspective.

Company had set a target to cover at least 15% employee under its training programmes but covered only 10%. This could hurt capabilities of the employees which are needed for long term growth of the organisation necessary to achieve the objectives set in the previous three perspectives. People or the human resource of the company is one of the three principle sources where organisational learning and growth comes.

12. Analysis of Changes in the Operating Income from Financial Year 2013-14 to 2014-15.**Growth Component**

Revenue Effect of Growth Component

$$\begin{aligned}
 &= \left(\frac{\text{Actual Units of Output Sold in 2014 - 15}}{\text{Actual Units of Output Sold in 2013 - 14}} - 1 \right) \times \text{Selling Price in 2013 - 14} \\
 &= (4,30,000 \text{ units} - 4,00,000 \text{ units}) \times ₹ 4,175 \\
 &= ₹ 12,52,50,000 \text{ (F)}
 \end{aligned}$$

Cost Effect of Growth Component (Variable Costs)*Direct Materials*

$$\begin{aligned}
 &= \left(\frac{\text{Direct Materials Required to Produce 4,30,000 Units in 2013 - 14}}{\text{Direct Materials Used to Produce 4,00,000 Units in 2013 - 14}} - 1 \right) \times \text{Cost per Kg. in 2013 - 14} \\
 &= \left(\frac{24,00,000 \text{ Kg.}}{4,00,000 \text{ units}} \times 4,30,000 \text{ units} - 24,00,000 \text{ Kg.} \right) \times ₹ 470 \\
 &= (25,80,000 \text{ Kg.} - 24,00,000 \text{ Kg.}) \times ₹ 470 \\
 &= ₹ 8,46,00,000 \text{ (A)}
 \end{aligned}$$

Direct Labour

$$\begin{aligned}
 &= \left(\frac{\text{Labour Hours Required to Produce 4,30,000 Units in 2013 - 14}}{\text{Labour Hours Used to Produce 4,00,000 Units in 2013 - 14}} - 1 \right) \times \text{Rate per hr. in 2013 - 14} \\
 &= \left(\frac{32,00,000 \text{ hrs.}}{4,00,000 \text{ units}} \times 4,30,000 \text{ units} - 32,00,000 \text{ hrs.} \right) \times ₹ 30 \\
 &= (34,40,000 \text{ hrs.} - 32,00,000 \text{ hrs.}) \times ₹ 30 \\
 &= ₹ 72,00,000 \text{ (A)}
 \end{aligned}$$

Price-Recovery ComponentRevenue Effect of Price-Recovery Component

$$\begin{aligned}
 &= \left(\frac{\text{Selling Price in 2014 - 15}}{\text{Selling Price in 2013 - 14}} - 1 \right) \times \text{Actual Units of Output Sold in 2014 - 15} \\
 &= (₹ 4,325 - ₹ 4,175) \times 4,30,000 \text{ units} \\
 &= ₹ 6,45,00,000 \text{ (F)}
 \end{aligned}$$

Cost Effect of Price-Recovery Component (Variable Costs)*Direct Material*

$$\begin{aligned}
 &= \left(\begin{array}{cc} \text{Direct Material} & \text{Direct Material} \\ \text{Price in} & - \text{Price in} \\ 2014 - 15 & 2013 - 14 \end{array} \right) \times \left(\begin{array}{c} \text{Direct Material Required to} \\ \text{Produce 4,30,000 Units in} \\ 2013 - 14 \end{array} \right) \\
 &= (\text{₹}485 - \text{₹}470) \times 25,80,000 \text{ kg.} \\
 &= \text{₹}3,87,00,000 \text{ (A)}
 \end{aligned}$$

Direct Labour

$$\begin{aligned}
 &= \left(\begin{array}{cc} \text{Labour Hour Rate in} & \text{Labour Hour Rate in} \\ 2014 - 15 & 2013 - 14 \end{array} \right) \times \begin{array}{c} \text{Labour Hours Required to Produce} \\ 4,30,000 \text{ units in } 2013 - 14 \end{array} \\
 &= (\text{₹} 31 - \text{₹} 30) \times 34,40,000 \text{ hrs.} \\
 &= \text{₹}34,40,000 \text{ (A)}
 \end{aligned}$$

Cost effect of Price-Recovery Component (Fixed Costs)

$$\begin{aligned}
 &= \left(\begin{array}{cc} \text{Rate per Unit} & \text{Rate per Unit} \\ \text{in } 2014 - 15 & \text{in } 2013 - 14 \end{array} \right) \times \begin{array}{c} \text{Actual Units of Capacity in Last Year,} \\ \text{if Adequate to Produce Current Year's Output in Last Year} \end{array} \\
 &= \left(\frac{\text{₹}1,76,00,000}{5,00,000 \text{ units}} - \frac{\text{₹}1,60,00,000}{5,00,000 \text{ units}} \right) \times 5,00,000 \text{ units} \\
 &= (\text{₹}35.2 - \text{₹}32) \times 5,00,000 \text{ units} \\
 &= \text{₹}16,00,000 \text{ (A)}
 \end{aligned}$$

Productivity ComponentProductivity Component (for Variable Costs)*Direct Material*

$$\begin{aligned}
 &= \left(\begin{array}{cc} \text{Direct Materials Used} & \text{Direct Materials Required} \\ \text{to Produce 4,30,000} & \text{to Produce 4,30,000} \\ \text{units in } 2014 - 15 & \text{units in } 2013 - 14 \end{array} \right) \times \text{Cost per Kg. in } 2014 - 15 \\
 &= (25,10,000 \text{ kg.} - 25,80,000 \text{ kg.}) \times \text{₹} 485 \\
 &= \text{₹}3,39,50,000 \text{ (F)}
 \end{aligned}$$

Direct Labour

$$= \left(\begin{array}{cc} \text{Labour Hours Used} & \text{Labour Hours Required} \\ \text{to Produce 4,30,000 Units} & \text{to Produce 4,30,000 Units} \\ \text{in } 2014 - 15 & \text{in } 2013 - 14 \end{array} \right) \times \text{Rate per Hour in } 2014 - 15$$

$$= (34,80,000 \text{ hours} - 34,40,000 \text{ hours}) \times ₹ 31$$

$$= ₹12,40,000 \text{ (A)}$$

Reconciliation of Operating Profit from 2013-14 to 2014-15

	Amount (₹)	Amount (₹)
Operating Profit in 2013-14 (Refer to Working Note)		43,00,00,000
Add: Revenue effect of Growth Component	12,52,50,000	
Revenue effect of Price-Recovery	6,45,00,000	
Productivity Component (Direct Material)	3,39,50,000	22,37,00,000
Less: Cost effect of Growth Component (Direct Material)	8,46,00,000	
Cost effect of Growth Component (Direct Labour)	72,00,000	
Cost effect of Price-Recovery (Direct Material)	3,87,00,000	
Cost effect of Price-Recovery (Direct Labour)	34,40,000	
Cost effect of Price-Recovery (Fixed Cost)	16,00,000	
Productivity Component (Direct Labour)	12,40,000	13,67,80,000
		51,69,20,000

Working Note

Calculation of Operating Profit in 2013-14 and 2014-15

	2013-14 (₹)	2014-15 (₹)
Sales (₹ 4,175 × 4,00,000 units; ₹ 4,325 × 4,30,000)	167,00,00,000	185,97,50,000
Less: Costs		
Direct Materials (₹470 × 24,00,000 Kg.; ₹485 × 25,10,000 Kg.)	112,80,00,000	121,73,50,000
Direct Labour (₹ 30 × 32,00,000 hrs.; ₹31 × 34,80,000 hrs.)	9,60,00,000	10,78,80,000
Fixed Cost	1,60,00,000	1,76,00,000
Operating Profit	43,00,00,000	51,69,20,000
Increase/ (Decrease) in Operating Profit	8,69,20,000	

13. Similarities

- (i) Both the models have an objective function.
- (ii) Both models' objective functions are linear.
- (iii) Both the models require non-negativity constraints.

Differences

- (i) The general linear programming problem may be of *maximization* or *minimization* type, whereas, transportation problem predominately deals with *minimization* problem.
 - (ii) A general linear programming problem is solved by using *simplex algorithm*; whereas transportation problem is solved by using *transportation algorithm* (as simplex method is less appropriate to solve).
 - (iii) The resources, for which the structural constraints are built up is *homogeneous* in transportation model; whereas in Linear Programming model they are *heterogeneous*.
14. The assignment problem is special case of transportation problem; it can also be solved by transportation method. But the solution obtained by applying this method would be severely degenerate. This is because the optimality test in the transportation method requires that there must be $m+n-1$ allocations/assignments. But due to the special structure of assignment problem of order $n \times n$, any solution cannot have more than n assignments. Thus, the assignment problem is naturally degenerate. In order to remove degeneracy, $n-1$ number of dummy allocations will be required in order to proceed with the transportation method. Thus, the problem of degeneracy at each solution makes the transportation method computationally inefficient for solving an assignment problem.



$$(*) \quad m+n-1 - n \Rightarrow n+n-1 - n \Rightarrow 2n-1 - n \Rightarrow n-1$$

15. Probability of Completing the Project by Schedule Time T_s is given by

$$Z = \frac{T_s - T_e}{\sigma_e}$$

Probability if the Project is required to be completed in 15 weeks:

Probability if the Project is required to be completed in 15 weeks is given by

$$Z = \frac{15 - 18}{3}$$

$$Z = -1$$

$$\text{Probability } (Z = -1) = 0.1587$$

Probability if the Project is required to be completed in 21 weeks:

Probability if the Project is required to be completed in 21 weeks is given by

$$Z = \frac{21 - 18}{3}$$

$$Z = +1$$

$$\text{Probability } (Z = +1) = 0.8413$$

Probability that the Project may be completed not earlier than 15 weeks and not later than 21 weeks

$$= 0.8413 - 0.1587$$

$$= 0.6826$$

$$\text{Or} = 68.26\%$$

16. Random No- Coding for Fresh Cake

No. of Cakes	Probability	Cumulative Probability	Random Numbers
100	0.01	0.01	00 – 00
101	0.03	0.04	01 – 03
102	0.04	0.08	04 – 07
103	0.07	0.15	08 – 14
104	0.09	0.24	15 – 23
105	0.11	0.35	24 – 34
106	0.15	0.50	35 – 49
107	0.21	0.71	50 – 70
108	0.18	0.89	71 – 88
109	0.09	0.98	89 – 97
110	0.02	1.00	98 – 99

Random No. Coding for One Day Old Cake

No. of Cakes	Probability	Cumulative Probability	Random Numbers
0	0.70	0.70	00 – 69
1	0.20	0.90	70 – 89
2	0.08	0.98	90 – 97
3	0.02	1.00	98 – 99

Let us simulate the sale of fresh and one day old cakes for the next ten days using the given random numbers / information.

Simulation Sheet

Day	R. No. of Fresh Cake	Fresh Stock	Demand	Sales Pcs.	Cl. Stock	Order Initiated	One Day Old Stock	R.N. of Old Cake	Sale of Old Cake Pcs.	Loss Pcs.
1	37	105	106	105	0	110	0	17	0	0
2	73	110	108	108	2	110	0	28	0	0
3	14	110	103	103	7	105	2	69	0	2

4	17	105	104	104	1	105	7	38	0	7
5	24	105	105	105	0	105	1	50	0	1
6	35	105	106	105	0	110	0	57	0	0
7	29	110	105	105	5	110	0	82	0*	0
8	37	110	106	106	4	105	5	44	0	5
9	33	105	105	105	0	105	4	89	1	3
10	68	105	107	105	0	110	0	60	0	0
				1051					1	18

Calculation of Vendor's Profit

	Amount (₹)
Sales of Fresh Cakes (1,051 Pcs. × ₹7)	7,357.00
Sale of One Day Old Cake (1 Pcs. × ₹2)	2.00
Total Sales Revenue	7,359.00
Less: Cost of Cakes Sold [₹4.50 × (1,051 + 1) Pcs.]	4,734.00
Less: Cost of Spoilt Cakes [₹4.50 × 18 Pcs.]	81.00
Profit	2,544.00



Order for **Day 2's Sale** - Vendor will initiate order in day one's morning i.e. one day in advance **at the time of receiving previous order.**

Vendor follows - *If there is no stock of cake with him at the end of previous day, he orders for 110 pieces otherwise he orders 100 or 105 pieces whichever is nearest actual fresh cake sale on the previous day.*

Accordingly to initiate order in day one's morning vendor has to consider previous day's stock i.e. Day 0's stock. But, there is no stock at the end of Day 0 or beginning of Day 1 (given in the question). Accordingly Vendor will initiate order of 110 pieces in day 1's morning for day 2's sales.

(*)

On 7th Day Demand for 'One Day Old' cake is one piece (as per random no. 82). But there was nil stock at the end of the 6th Day. Accordingly, sale of one Day old cake is nil.

17. Cumulative Average Time for 256 parts = 48.43 hrs.*
 $[112.50 \times (0.90^8)]$
 Total Time for 256 parts = 12,398.08 hrs.
 $[48.43 \text{ hrs.} \times 256 \text{ parts}]$

Total Labour Cost of 256 parts	= ₹ 2,47,961.60
	[12,398.08 hrs. × ₹ 20]
Revised Labour Cost for zero profit	= ₹ 3,22,961.60
	[₹ 2,47,961.60 + ₹ 75,000]
Total Time for 256 parts (Revised)	= 16,148.08 hrs.
	[₹ 3,22,961.60/₹ 20]
Cumulative Average Time for 256 parts (Rev.)	= 63.08 hrs.
	[16,148.08/256]

The usual learning curve model is

$$y = ax^b$$

Where

y	= Cumulative Average Time per part for x parts
a	= Time required for first part
x	= Cumulative number of parts
b	= Learning coefficient (log r/log 2)

Accordingly

⇒	63.08	=	112.50 × (256) ^b
⇒	0.5607	=	2 ^{8b}
⇒	log 0.5607	=	log 2 ^{8b}
⇒	log 0.5607	=	8 × b × log 2
⇒	log 0.5607	=	8 × $\frac{\log r}{\log 2}$ × log 2
⇒	log 0.5607	=	8 log r
⇒	log 0.5607	=	log r ⁸
⇒	0.5607	=	r ⁸
⇒	r	=	$\sqrt[8]{0.5607}$
⇒	r	=	0.9645
	Learning Rate (r)	=	96.45%.

Therefore

Sensitivity	= 6.45/90
	= 7.17%



Students may also take 48.38 hrs. (112.50 × 0.43)