



# **MANAGEMENT ACCOUNTING TECHNIQUES AS AID IN DECISION-MAKING**

## **ACN306Y**

# **PROGRAMME: GROUP DISCUSSION 2010**

**14:30 -15:30**

**COST VOLUME PROFIT,  
REGRESSION, LEARNING  
CURVES, OPTIMISATION  
(CHAPTERS 5, 6, 7, 8)**

**15:30 - 15:45**

**RELEVANT COST(CHAPTER 9)**

**15:45 – 16:00**

**BREAK**

**16:00 - 16:15**

**DECISION TREES(CHAPTER10)**

**16:15 - 16:30**

**NETWORKS (CHAPTER 11)**

**16:30 - 16:45**

**INVENTORY CONTROL  
(CHAPTER 12)**

**16:45 - 17:00**

**EXAMINATION TECHNIQUES**

**17:00 - 17:30**

**QUESTIONS AFTER CLASS**

# COST VOLUME PROFIT – CHAPTER 5

The following example will illustrate a very important concept, namely:

Sales consists of 2 components, namely

- Price
- Volume

When volume changes, all variable costs will change. When price change, variable cost will not change, unless the volume change.

The following example is of a business which has 1 product of which 100 units are sold

	Per unit (R)	Total (R)	Ratio		
Sales	10	1 000	1		
Variable cost	5	500	0.5		
Marginal Income	5	500	0.5		
Fixed cost		300	0.3		
Net profit		200	0.2		

$$\begin{aligned} \text{Break even sales in units} &= \text{Fixed costs} / \text{Marginal income per unit} \\ &= 300 / 5 = 60 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{Break even sales in Rands} &= \text{Fixed costs} / \text{Marginal income ratio} \\ &= 300 / 0.5 = \text{R } 600 \end{aligned}$$

$$\begin{aligned} \text{Safety margin} &= (\text{Sales} - \text{Breakeven sales}) / \text{Sales} \\ &= (1\,000 / 600) / 1\,000 = 0.4 \end{aligned}$$

$$\begin{aligned} \text{Net profit margin} &= \text{Safety margin} \times \text{Marginal income ratio} \\ &= 0.4 \times 0.5 = 0.2 \end{aligned}$$

# Change Over Point

- The possible level of sales will determine how much is spent on fixed overheads. The higher the fixed cost the higher is the breakeven point.
- The change over point is calculated as follows:  $(F2 - F1) / (V1 - V2)$  where
- $F2 =$  High fixed cost,  $F1 =$  Low fixed cost
- $V1 =$  Variable cost at  $F1$ ,  $V2 =$  Variable cost at  $F2$ .

## **EXAMPLE:**

Please refer to your study guide:

Question 3 p15 (d)

Mr Benito requires an after-tax net income of R160 000.  
Calculate the number of hamburgers that should be sold in order to obtain the desired income.

**compare with**

## Question 4 p18(d)

Calculate what the contract price per packet of biltong should be if Mr Meatman wants to earn a net profit of 25% on contract sales.

- Question 3 p16(d)

Number of hamburgers to be sold

After-tax net income required = R 160 000

Before-tax net income = R 160 000 / 0,65  
= R 246 154

Let number of hamburgers = x

- Sales = Variable cost + Fixed cost + Profit

Thus:  $8x = 3x + 275\,920 + 246\,154$

Thus:  $5x = 522\,074$

Thus:  $x = 104\,414,8 = 104\,415$



## Question 4 p20(d)

### **Selling price per packet to earn 25% net profit on sales**

Let the selling price per packet =  $x$

Sales = Variable cost + Fixed cost + Profit

$$400x = 6\,681 + 200 + 0,25(400x)$$

$$400x - 100x = 6\,881$$

$$x = 6\,881 \div 300$$

$$x = 22,94$$

Therefore the selling price per packet should be R22,94. (5)

# Splitting of overheads into fixed and variable cost

- You will often get a figure for total overheads, which has to be split into its fixed and variable elements
- There are various ways of doing this calculation, depending on the information given.

# Example 2

Refer study guide pages 45 - 49

Point 3 of the information says:

- The flexible budget, at capacity levels of 90% and 100%, indicates that total overheads will amount to R7 984 000 and R8 200 000 for 24 300 and 27 000 machine hours respectively.

## Variable overhead

Capacity	Hours	R
100%	27 000	8 200 000
90%	24 300	7 984 000
	2 700	216 000

$$\text{Variable overhead per hour} = \frac{\text{R216 000}}{2 700}$$

$$= \text{R80}$$

## Variable overhead per unit

$$\text{- Speedy} = \frac{15}{60} \times \text{R}80$$

$$= \text{R}20$$

$$\text{- Bumpy} = \frac{22,5}{60} \times \text{R}80$$

$$= \text{R}30$$

Students often ask us why we divide by 60.

- Variable overheads are calculated per hour, while machine time is given per minute. You have to convert the minutes into hours and therefore divide by 60, as there are 60 minutes in an hour.

# Example 3

- Refer study guide pages 49 - 52
- Information given pg 49:

The following is an extract from the budget for the financial year, based on 95% of the available machine hours:

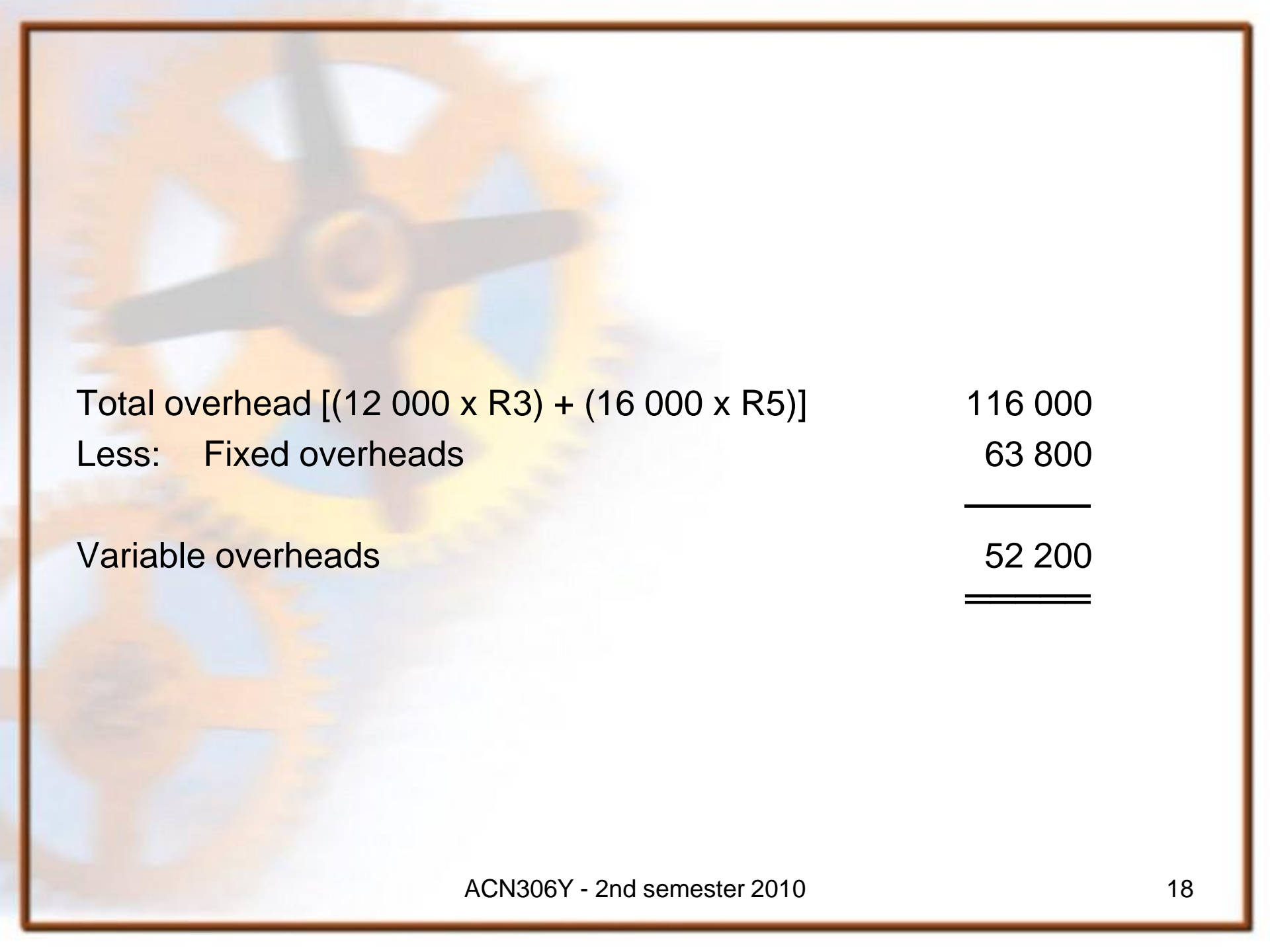
	<b>Abbo</b>	<b>Babbo</b>
Sales volume(units)	12 000	16 000
Sales volume (rand)	R348 000	R512 000



## Standards per unit:

	Abbo	Babbo
	R	R
Raw material – Zapo	12,00	7,50
Labour	4,50	3,00
Overheads	3,00	5,00

The budgeted fixed manufacturing overheads for the year amount to R63 800. Overheads are allocated to production at a rate of R4 per machine hour.



Total overhead [(12 000 x R3) + (16 000 x R5)]	116 000
Less: Fixed overheads	63 800
	<hr/>
Variable overheads	52 200
	<hr/> <hr/>

Total machine hours:  $R\ 116\ 000 / R\ 4$   
 $= 29\ 000$  machine hours

Variable overheads per hour:  $R\ 52\ 200 / 29\ 000$   
 $= R1,80$  per hour

Variable overheads per unit:

- Abbo  $3/4 \times R1,80 = R1,35$  per unit
- Babbo  $5/4 \times R1,80 = R2,25$  per unit

# QUESTIONS OFTEN ASKED:

- Please refer to your study guide
- P7 & 8 (a): Please read the first and the last paragraph of the question on p7 & 8.

## Required:

Determine the maximum number of games that can be played per annum.

## Number of games per annum

$$\begin{aligned} 100\% \text{ capacity} &= (15 \times 365 \times 2 \times 6) \text{ games} \\ &= 65\,700 \text{ games} \end{aligned}$$

Students often ask us why 15, 2 and 6

There are 15 hours of play, two games per hour and 6 courts

## **study guide: p19 calculation 2:**

Why do we multiply by 0,5?

Topside required for fixed contract

Because the contract is for 400 packets of  
500g (0,5kg)!

# Chapter 6

## REGRESSION ANALYSIS

- Correlation and regression analysis is a quantitative technique aimed at providing information which can be used in cost-volume-profit analysis.
- Correlation indicates the extent to which a relationship exists between two or more sets of data. NB: It is not always a causative relationship.

# Chapter 6

## REGRESSION ANALYSIS

- Once an acceptable correlation has been established, regression analysis can be used to formulate a forecasting model. This is done mathematically with the aid of statistical methods and formulae.
- Coefficient between  $-0.75$  and  $0.75$  is questionable.



# Chapter 6

## REGRESSION ANALYSIS

- This chapter focus on a linear (or almost linear) relationship between one dependent and one independent variable, that is simple linear correlation and regression analysis.
- You do not need to know all the formulae, but must know how to apply them.
- Know  $y = a + bx$

NB: Most formulae for this chapter will be given, but you must know how to apply them.

Know:  $y = a + bx$

$y$  = dependent variable

$x$  = independent variable

$a$  = fixed cost, and intercept on  $y$  axis

$b$  = variable cost, slope of the line

$r$  = coefficient of correlation

It measures the degree of relationship between two sets of data.

When  $r = 1$  or  $-1$ , a perfect correlation exists, forecasts can be made with 100% accuracy.

$r^2$  = coefficient of determination

$r^2$  indicates the extent to which a change in the dependent variable can be explained by the independent variable.

If  $r^2 = 0,81$ , it means that 81% of the change in the dependent variable can be explained by the independent variable, and that 19% of the change in the dependent variable is caused by other factors. Not always causal.

# CHAPTER 7

## LEARNING CURVE THEORY

- When a new product or process is developed, “learning” takes place. As the output increases, the time required to produce each unit decreases. A learning curve is a graphical expression of the decrease in the average time required to produce each unit as cumulative output increases.

# LEARNING CURVE THEORY

## Formula:

$$\frac{\text{Cumulative average time per unit}}{\text{Previous cumulative average time per unit}} \times \frac{100}{1}$$

## Example 1:

Time taken to manufacture the 1<sup>st</sup> unit 1 000 hours

Time taken to manufacture the 2<sup>nd</sup> unit 700 hours

$$= \frac{(1\ 000 + 700)/2}{1000} \times \frac{100}{1}$$

$$= \frac{850}{1\ 000} \times \frac{100}{1}$$

$$= 85\%$$

## Example 2:

It took 100 hours to manufacture the first 4 units and 190 hours to manufacture the first 8 units. To date, 8 units have been manufactured and sold. The company has been approached for a quote on the manufacturing of 8 units. It is expected that the learning curve will be maintained for the manufacture of the first **16** units.



$$\frac{\text{Cumulative average time per unit}}{\text{Previous cumulative average time per unit}} \times \frac{100}{1}$$

$$= \frac{190/8}{100/4} \times \frac{100}{1}$$

$$= 95\%$$

Units (Cum)	Units made	Cum average time/u	Total time
1	1	27,70	27,70
2	1	26,32	52,64
4	2	25,00	100,00
8	4	23,75	190,00
16	8	22,56	360,96

$$100/4 = 25$$

$$190/8 = 23,75$$

$$25/0,95 = 26,32$$

$$26,32/0,95 = 27,70 = 25/(0,95)^2$$

Total time taken for the additional 8 units:

Total time for units 1 – 16 ( $22,56 \times 16$ )      360,96

Total time for units 9 - 16 ( $360,96 - 190$ )      170,96

Remember, you can rearrange the formula with the information you have, to calculate the unknown element.

### Example 3:

Time taken to manufacture 2<sup>nd</sup> unit    16 000 hours  
Learning curve                                    90%

Calculate time taken to manufacture the 1<sup>st</sup> unit.

$$90\% = \frac{(X + 16\,000) \div 2}{X}$$

$$0,90X = \frac{(X + 16\,000)}{2}$$

$$1,80X = X + 16\,000$$

$$0,80X = 16\,000$$

$$X = 20\,000$$

# Study guide questions:

**Q1 p31: How should we know this contract is for the manufacturing of units 9 - 16 and not units 1 - 8.**

- Read carefully. The last two sentences of paragraph two, are the key. “As a first step, a contract for the manufacturing of eight concrete mixers was obtained. These machines have been delivered recently.”

# CALCULATION OF PROFIT

- Refer to p32: They have consequently decided to base their quotation on the recovery of direct manufacturing costs only, with a mark up of 25%, **based on the quotation price.**
- Make sure of the basis of the mark up. If profit is based on cost, the calculation is simple.
- Total cost x profit % = profit.

If profit is based on sales or quotation price,  
the quotation price is your basis.

Total cost 117 574

Add: Mark-up

(R117 574 x 25/75) 39 191

Quotation price 156 765

Use the ratio:

Cost = 75

Profit = 25

Quotation = 100

# CHAPTER 8

## OPTIMISATION

When a company produces more than one product, management must decide how much of each output to produce. Owing to various constraints, such as material, labour and machine time, companies can only produce a limited amount of outputs. Optimisation is used to determine the optimal product mix.



# OPTIMISATION

This module does not require you to be able to solve problems graphically. You need to be able to solve problems with the application of marginal costing techniques, as well as problems requiring the application of linear programming in situations where two constraints, plus a sales constraint exist.

# OPTIMISATION

## Example 1

**Study guide p40 - 44**

## **QUESTION 1 (21 marks; 25 minutes)**

Super Sport Products Limited is a manufacturer of sport equipment. In order to compile the budget of the section that manufactures children's cricket bats for the next financial year, a decision must be taken regarding the optimal product mix.

Two models of children's cricket bats are being manufactured:

- the Hansie bat for older children, and
- the Johnty bat for younger children.

The standard per unit for each of the models are as follows:

	<b>Hansie bat</b>	<b>Johnty bat</b>
	<b>R</b>	<b>R</b>
Material	12,95	10,50
Direct labour (@ R6 per hour)	18,00	6,00
Manufacturing overheads (@ R3,50 per machine hour)	10,50	5,25
Selling price	45,00	25,00

*Additional information:*

1. Both bats are made from the same material, of which only 35 500 kilograms, at a total cost of R248 500, will be available during the next financial year.

2. The following is an extract of the budget for manufacturing overheads:

<b>Capacity utilisation</b>	<b>Number of machine hours</b>	<b>Total manufacturing overheads</b>
		<b>R</b>
100%	50 000	158 075
90%	45 000	151 575

3. It is estimated that 11 000 Hansie bats and 14 500 Johnty bats could be sold annually.
4. Selling and administrative expenses are fixed and amount to R15 000 per annum.



## **REQUIRED:**

Determine the product mix which will maximise the net profit of the section for the next financial year.

**SOLUTION:**  
**SUPER SPORT PRODUCTS LIMITED**

*Product mix to maximise net profit*

1. *Optimal product mix*

Maximise  $10,15 H + 6,55 J$

Where:  $H = \text{Hansie bats}$  and  $J = \text{Johnty bats}$

## 2. *Marginal income per unit*

	Hansie	Johnty
	R	R
Selling price	45,00	25,00
Less: Variable cost	34,85	18,45
Material	12,95	10,50
Labour	18,00	6,00
Overheads	3,90	1,95
Marginal income per unit	<u>10,15</u>	<u>6,55</u>



	Hours	R
Total cost	50 000	158 075
Total cost	45 000	151 575
	5 000	6 500

Variable manufacturing overhead cost per hour  
= R 6 500 / 5000  
= R 1,30 per hour

Variable manufacturing overhead cost per unit:

$$\begin{aligned} \text{Hansie} &= \text{R } 1,30 \times (\text{R } 10,50 / \text{R } 3,50) \\ &= \text{R } 3,90 \end{aligned}$$

$$\begin{aligned} \text{Johnty} &= \text{R } 1,30 \times (\text{R } 5,25 / \text{R } 3,50) \\ &= \text{R } 1,95 \end{aligned}$$

### 3. Constraints

Products	Units	Material		Machine hours	
		Per unit	Total R	Hours per unit	Total hours
Hansie	11 000	12,95	142 450	3,00=(10.5/3.5)	33 000
Johnty	14 500	10,50	152 250	1,50=(5,25/3,5)	21 750
			294 700		54 750
			248 500		50 000
			46 200		4 750

Material and machine hours are constraints.

(5)

**!! Remark:**

Only one constraint exists with regard to material. The material constraint could be calculated in terms of rand or kilogram. The solution in the study guide has included both options, it should be seen as two alternative ways of determining the material constraint.

#### 4. *Marginal income per constraint*

Product	Marginal income per unit	Material			Machine hours		
		Per unit R	Marginal income per R	Ranking	Hours per unit ③	Marginal income per hour	Ranking
Hansie	10,15	12,95	0,78 10.15/12.95	1	3,00	3,38	2
Johnty	6,55	10,50	0,62 6,55/10,50	2	1,50	4,37	1

- The ranking in terms of the constraints does not favour the same product, therefore linear programming will have to be applied to determine the optimal product mix.

## 5. Equations

Let Hansie bats = H and

Johnty bats = J

$$12,95 H + 10,50 J \leq 248\ 500 \quad (1)$$

$$3,00 H + 1,50 J \leq 50\ 000 \quad (2)$$

$$(2) \times 7: 21,00 H + 10,5 J \leq 350\ 000 \quad (3)$$

$$(1) \quad : 12,95 H + 10,5 J \leq 248\ 500 \quad (1)$$

$$(3) - (1) : 8,05 H \leq 101\ 500$$

Thus  $H \leq 12\ 608,70$

limited to the market demand of 11 000 Hansie bats

## Material available for Johnty bats:

	R
Available	248 500
Utilised for Hansie bats (11 000 x R12,95)	142 450
Available for Johnty	<hr/> 106 050 <hr/>
Production of Johnty (R106 050 /10,50)	= 10 100 bats

## Machine hours available for Johnty bats

Available	50 000
Utilised for Hansie bats (11 000 x 3)	33 000
Available for Johnty	<hr/> 17 000 <hr/>
Production of Johnty (17 000/1,5)	= 11 333 bats

The optimal product mix is 11 000 Hansie bats and 10 100 Johnty bats.!!

(7)

**!! Remark:**

There are sufficient machine hours to manufacture 11 333 Johnty bats. There are, however, material for only 10 100 Johnty bats. Only 10 100 Johnty bats can therefore be manufactured.



### ***Kilograms per unit:***

Cost per kg = R 248 500 / 35 500

= R 7,00

Hansie = R 12,95 / R 7,00

= 1,85 kg

Johnty = R 10,50 / R 7,00

= 1,50 kg

### ***Machine hours per unit:***

Hansie = R 10,50 / R 3,50

= 3,00 hours


Johnty = R 5,25 / R 3,50

= 1,50 hours

# Chapter 9

## Relevance approach to non-routine decisions

The management accountant's role in decision-making is to provide information relevant to a decision. Managers use this information in preparing a quantitative analysis of the problem under review. Qualitative factors should also be considered before a final decision is taken.



The various decisions are

- outsourcing versus manufacturing
- deletion of a market segment
- expansion of a product range
- acceptance of once-off sales opportunities at discounted selling prices
- further processing of a product
- acceptance of special order using optimisation

# COST AND REVENUE CONCEPTS

- **COMMITTED FIXED COST**

Fixed cost which the enterprise is bound to pay in terms of a contract, for example rent, retrenchment expenses, bond expenses.

- **DISCRETIONARY FIXED COST**

Fixed cost in respect of which an enterprise can opt not to longer incur again with immediate effect, for example renting a car, salary of temporary staff, etc.

- **OPPORTUNITY COST**

Measures the monetary benefits sacrificed when the choice of one course of action requires that another course of action has to be forfeited.

- **INCREMENTAL COST/REVENUE**

Relates to additional cost/revenue that has to be incurred/ which can be earned in a particular situation.

- **SUNK COST**

Cost which has been incurred in terms of past decisions and which cannot be changed with a future decision.

- **DIRECT COST**

In terms of the relevance approach, it relates to cost directly relating to a specific situation, or cost which has to be incurred for a specific purpose. The cost can be either fixed or variable, in contrast to the use of the term within the context of direct and absorption costing approach, where it relates to variable cost only.

- **ARBITRARY ALLOCATED COST**

Those costs which are allocated to a certain product or division on an arbitrary basis.

- **RELEVANT COST/REVENUE**

Relates to cost/revenue relevant in a particular situation.



# How to approach a relevant cost question

- Make sure you understand what the decision is all about. (Make or buy, a special order, outsourcing vs. manufacturing, etc.)
- Unless otherwise stated, you have to look at the long-term, as well as the short- to medium term.

- In the long-term, you should take into account all the **relevant** costs. All costs which will have an influence on the decision, will be relevant, because you can change it over the long term.
- Consider all cost/revenue items mentioned in the question. If a cost item is not relevant, indicate the fact and explain why it is excluded.

- In the short- to medium-term, the committed portion of the fixed cost is added back from the result arrived at in the long-term calculation. The entity is bound to pay these costs, regardless of the decision, and it is therefore irrelevant in the short- to medium term.

# CHAPTER 10

## DECISION TREES

- A decision-making model includes the following steps:
- Identify objectives.
- Search for possible courses of action.
- Identify events.
- List possible alternatives.
- Measure payoffs.
- Select a course of action.

- The diagram of the decision-making process and the hypothetical possible outcomes of each event is called a “decision tree” .
- A decision tree is useful for analysing alternatives, especially where there are many possible outcomes for various alternatives, and where some outcomes depend on previous outcomes.

Two types of nodes are used in the construction of a decision tree:

- A decision node



- An event node



- A decision node implies that the decision-maker is in control of a situation, i.e. whatever is decided upon, will occur with certainty.
- An event node indicates the presence of an uncertainty about the possible outcome, and is not controllable. Event nodes will have probabilities attached to each possible outcome.

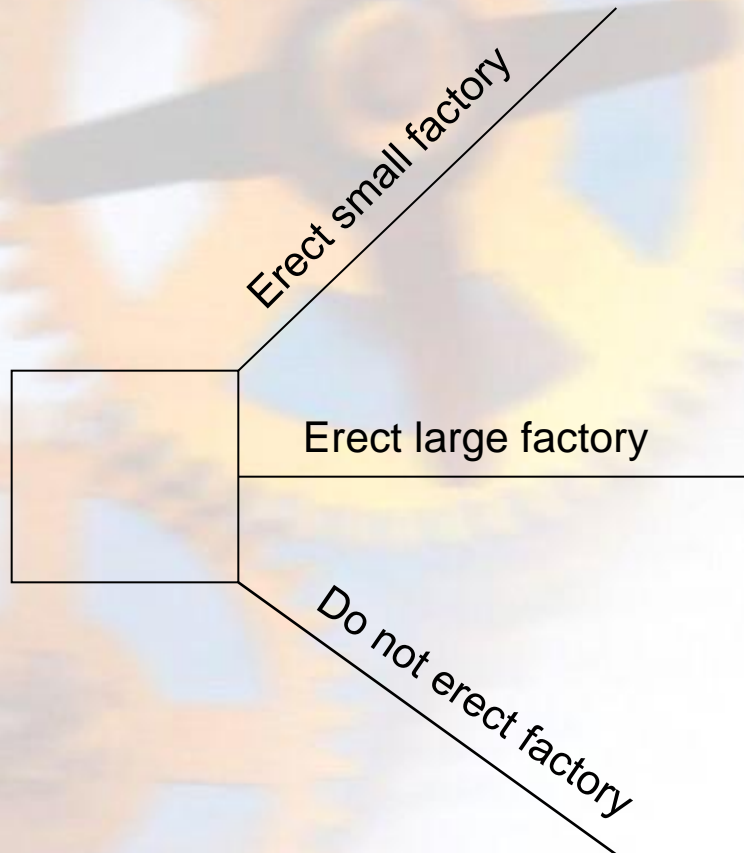
# EXAMPLES



Present the information in each of the following situations in a decision tree format using the correct nodes:

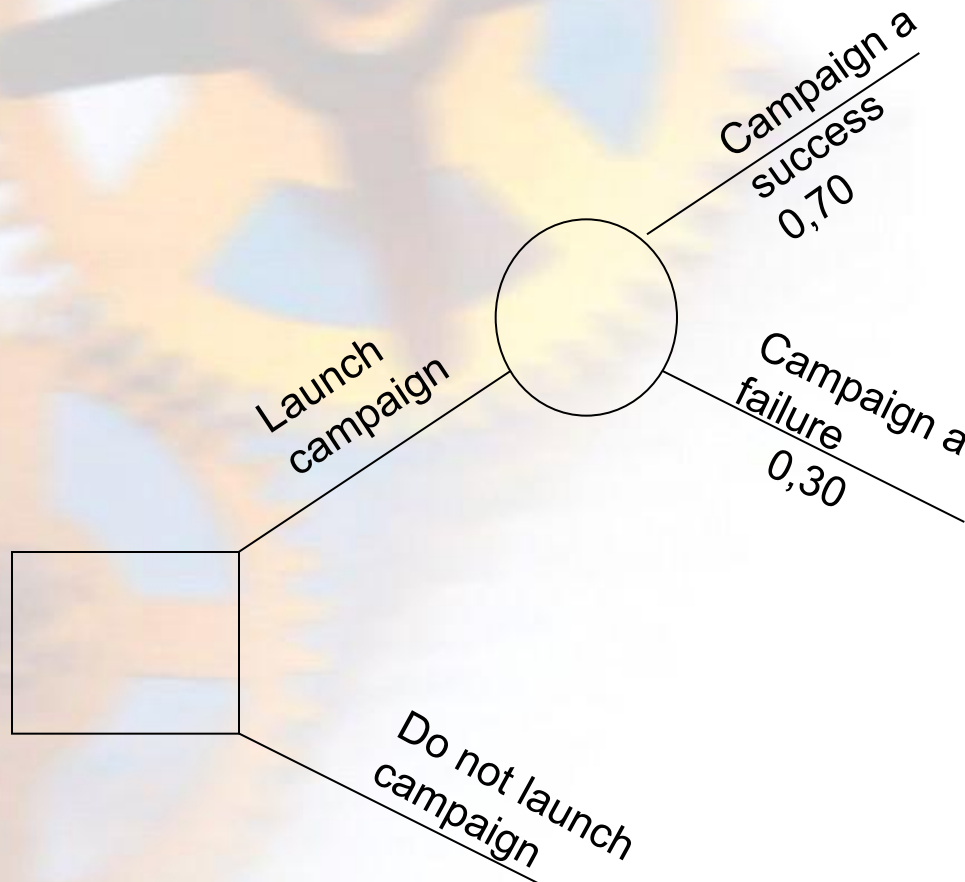


1. Decide whether to erect a large or a small factory.

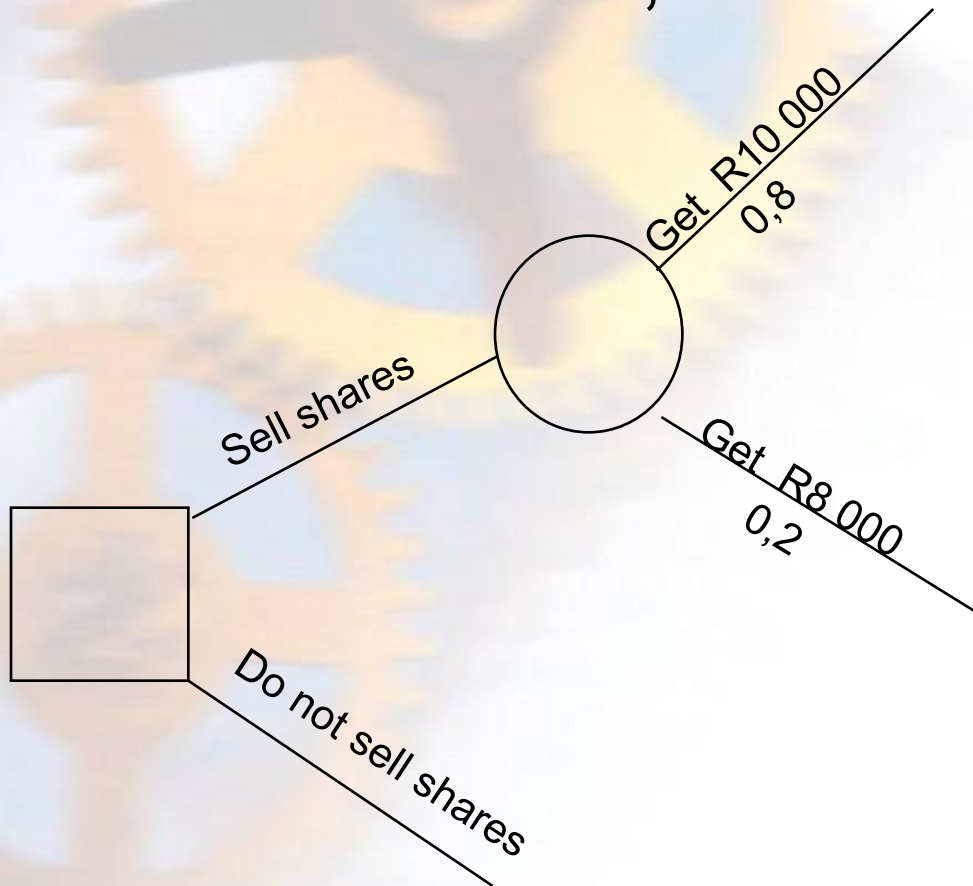


(Not to do anything is an implied option)

2. Decide whether to launch an advertising campaign. If launched, the campaign will have a 70% chance on success.

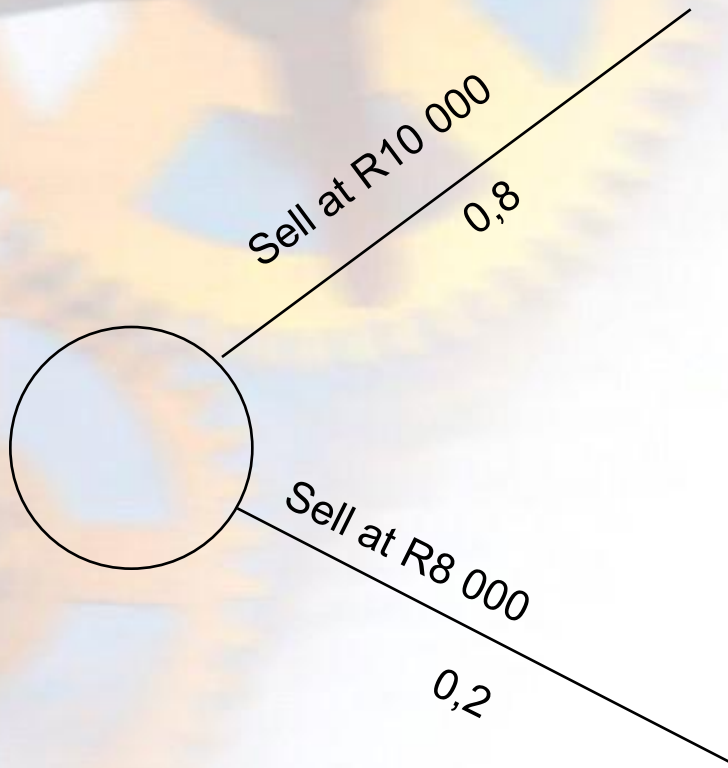


4. James is considering selling his shares.  
There is an 80% chance of getting R10 000 for his shares, otherwise he will get R8 000.

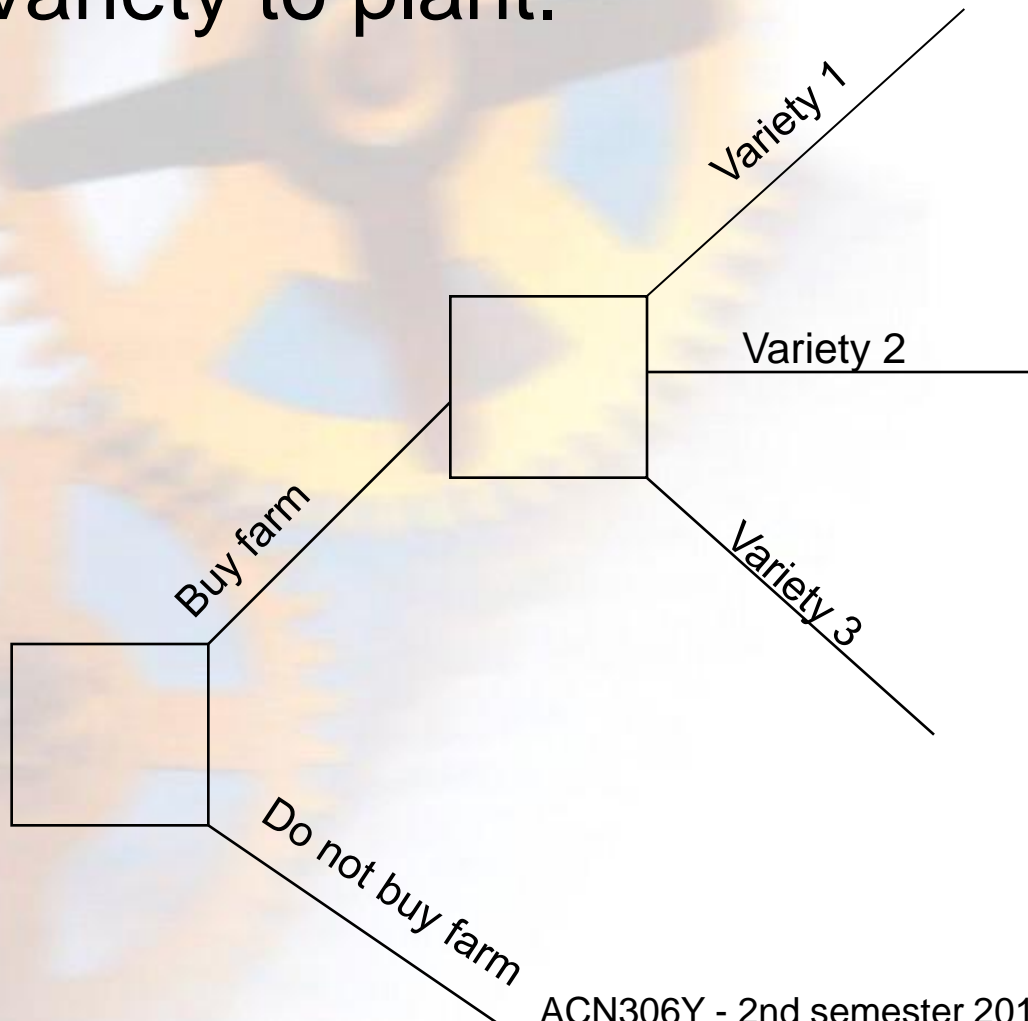


The word "considering" implies that the decision has not yet been taken. <sup>75</sup>

5. James has decided to sell his shares.  
There is an 80% chance of getting R10 000,  
otherwise he will get R8 000.



8. Johan is considering buying a mango farm. If he does, he also has to decide which variety to plant.



# Chapter 11

## Network analysis

- As the result of rapid technological development projects are becoming larger and more complex. Project costs and time control is becoming more and more necessary and at the same time more difficult.
- Network analysis is an extension of budgetary control methods and overcomes some of the above weaknesses. It provides a method of controlling both costs and physical progress.

- Network analysis is a very effective tool in project management because it enables one to plan and control a project in a cost efficient manner.
- Know the formula for calculating the duration of an activity:

$$[(1 \times \text{most optimistic duration}) + (4 \times \text{most likely duration}) + (1 \times \text{most pessimistic duration})]/6$$

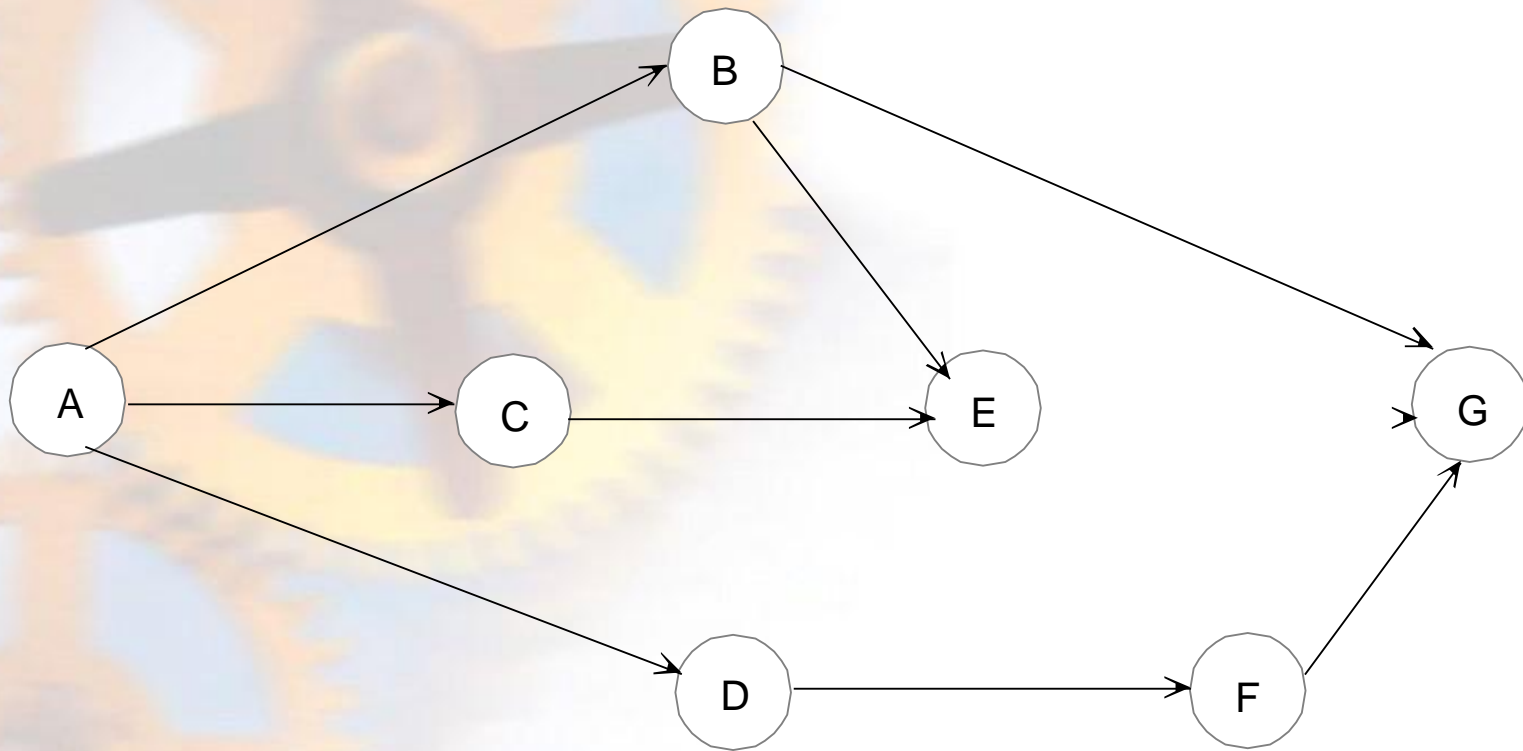
# Example

- Refer to Study guide p82 – 84

## **Question 2 (23 marks; 28 minutes)**

A contract for the erection of prefabricated classrooms has been awarded to Vinnigrig CC. You are the cost accountant of the firm and have identified the activities involved, and the sequence thereof, as follows:





Activity	Normal	Accelerated	Cost slope
A – B	10	9	1 800
A – C	10	9	2 800
A – D	8	7	1 200
B – E	7	4	4 700
B – G	9	8	4 000
C – E	8	6	800
D – F	4	3	1 500
E – G	5	2	1 200
F – G	8	6	1 700

The duration of the various activities and cost slopes are as above. The fixed costs amount to R 4 500 per day. They are not regarded as committed fixed costs.

## REQUIRED:

- (a) Determine the critical path. (4)
  - (b) Determine the programme to be followed in order to complete the project at the minimum cost and indicate the saving in normal costs. (19)
- [23]

- The following representation highlights the accelerations.
- Represent activities as follows:
  - - A-B-G with a ■
  - - A-B-E-G with a √
  - - A-C-E-G with a X
  - - A-D-F-G with a ▲

- Suggested Solution

(a) Critical path

$$A - B - G : 10 + 9 = 19 \text{ days}$$

$$A - B - E - G : 10 + 7 + 5 = 22 \text{ days}$$

$$A - C - E - G : 10 + 8 + 5 = 23 \text{ days}$$

$$A - D - F - G : 8 + 4 + 8 = 20 \text{ days}$$

Thus: 23 days is the critical path because it is the most time consuming.

Activity	Represent	Normal	Accelerated	Cost slope
A – B	■ √	10-1 =	9	1 800
A – C	X	10	9	2 800
A – D	▲	8-1 =	7	1 200
B – E	√	7	4	4 700
B – G	■	9	8	4 000
C – E	X	8-1-1 =	6	800
D – F	▲	4-1 =	3	1 500
E – G	√ X	5-2-1 =	2	1 200
F – G	▲	8	6	1 700

	Routes				Saving in fixed cost	Additional variable cost	Net saving
	■	√	X	▲			
	A→B →G	A→B →E→ G	A→C →E→ G	A→D →F→ G			
	Days	Days	Days	Days	R	R	R
Normal time: Accelerate: C → E by 1 day	19	22	23 (1)	20	4500	800	3700
E → G by 2 days	19	22 (2)	22 (2)	20	4500x2 =9000	1200x2= 2400	6600
E → G by 1 day A → D by 1 day	19	20 (1)	20 (1)	20 (1)	4500	1200	2100
A → B by 1 day C → E by 1 day D → F by 1 day	19 (1)	19 (1)	19 (1)	19 (1)	4500	1800 800	400
	18	18	18	18	22500	9700	12800

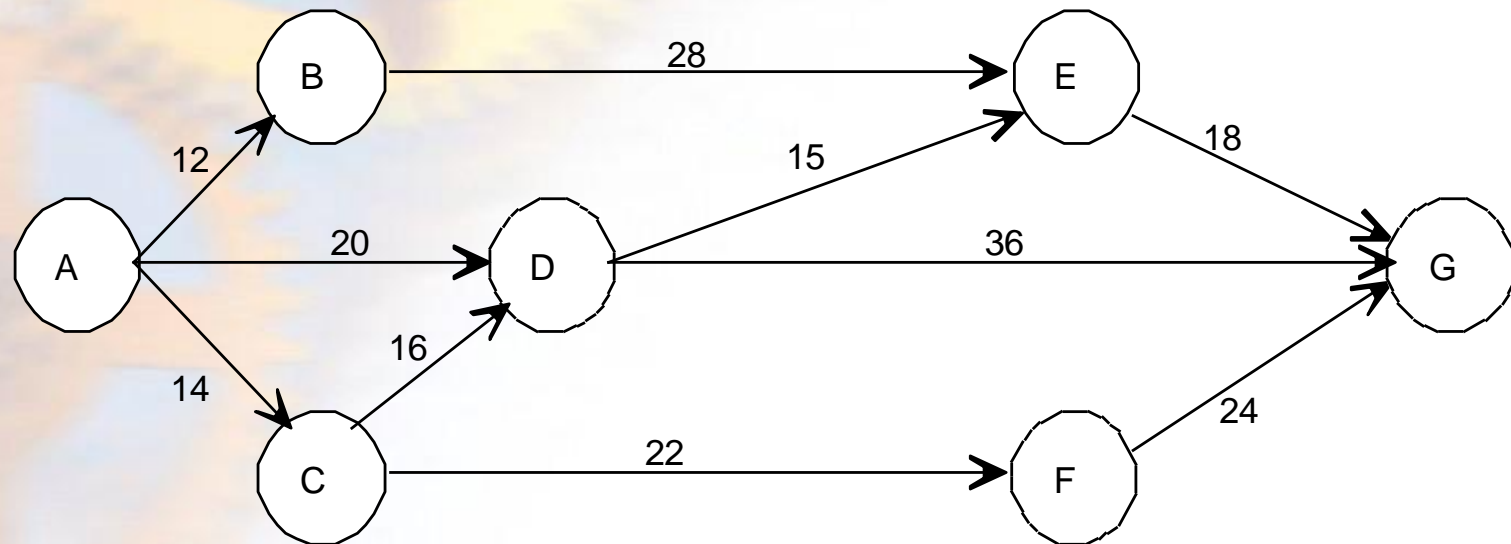
No further acceleration is cost effective, as a 1 day acceleration will cost R 13 200 (2 800 (X) + 4 700 (✓) + 4 000 (■) +1 700 (▲)), therefore exceeding the possible saving in fixed costs of R 4 500 per day. Therefore the project should be completed in 18 days, at a net saving of R 12 800.



# DETERMINATION OF THE LATEST STARTING AND COMPLETION TIMES OF ACTIVITIES

EXAMPLE: STUDY GUIDE p84 - 87

We are going to discuss these concepts briefly by making use of the following example:



- **Latest completion time (LCT) (Requirement or “deadline”)**

LCT = critical route – longest route from the **end** of the activity to the end of the project

- If you take activity A – C as an example, you will find that there are three routes leading from C, which is the end of the activity, to G, which is the end of the project, namely

$$C - D - E - G : 16 + 15 + 18 = 49$$

$$C - D - G : 16 + 36 = 52 \text{ (longest)}$$

$$C - F - G : 22 + 24 = 46$$

$$\text{LCT} = 66 \text{ (critical route)} - 52 = 14 \text{ days}$$

- **Latest starting time required (LST)** at Milestone A and activity A – C

LST = critical route – longest route from the **beginning** of the activity to the end of the project.

There are again three routes to take into account.

$$A - C - D - E - G : 14 + 16 + 15 + 18 = 63$$

$$A - C - D - G : 14 + 16 + 36 = 66 \text{ (longest)}$$

$$A - C - F - G : 14 + 22 + 24 = 60$$

$$\begin{aligned} \text{LST} &= 66 - 66 \\ &= 0 \end{aligned}$$

Alternatively, you can simply deduct the duration of the activity from the LCT of that activity ( $14 - 14 = 0$ ).

- **Earliest completion time possible (ECT)**  
ECT = longest route from the **beginning** of the **project** to the **end** of the **activity**.

The ECT for activity D – E will therefore be the longest of:

$$A - D - E \quad : 20 + 15 = 35$$

$$A - C - D - E \quad : 14 + 16 + 15 = 45 \text{ (longest)}$$

$$\text{ECT} = 45 \text{ days}$$

- **Earliest starting time possible (EST)**

EST = the longest route from the **beginning** of the **project** to the **beginning** of the **activity**.

- EST for D – E will therefore be the longest of:

$$A - D \quad : \quad = 20$$

$$A - C - D \quad : \quad 14 + 16 = 30 \text{ (longest)}$$

EST = 30 days.

Alternatively, you can deduct the duration of the activity from the ECT of that activity ( $45 - 15 = 30$ ).

# Slack

- Slack refers to the difference between the “deadline” and the fastest possible completion time at a specific milestone or at the end of an activity or at the beginning of an activity.
- It gives the time a project team can delay activities with because it is not on the critical path.

# LCT, LST, ECT and EST

- Differentiate between **activities** (for example **A – B**) and **milestones** (for example **B**)
- Latest is calculated from the last milestone backwards and it refers to a “deadline”.
- Earliest is calculated from the first milestone forward and it refers to a possibility.
- Completion Time refers to the second milestone of an activity.
- Starting Time refers to the first milestone of an activity.
- Slack is the difference between the LCT and ECT or the LST and EST, it refers thus to the difference between the latest and earliest times at a specific milestone.

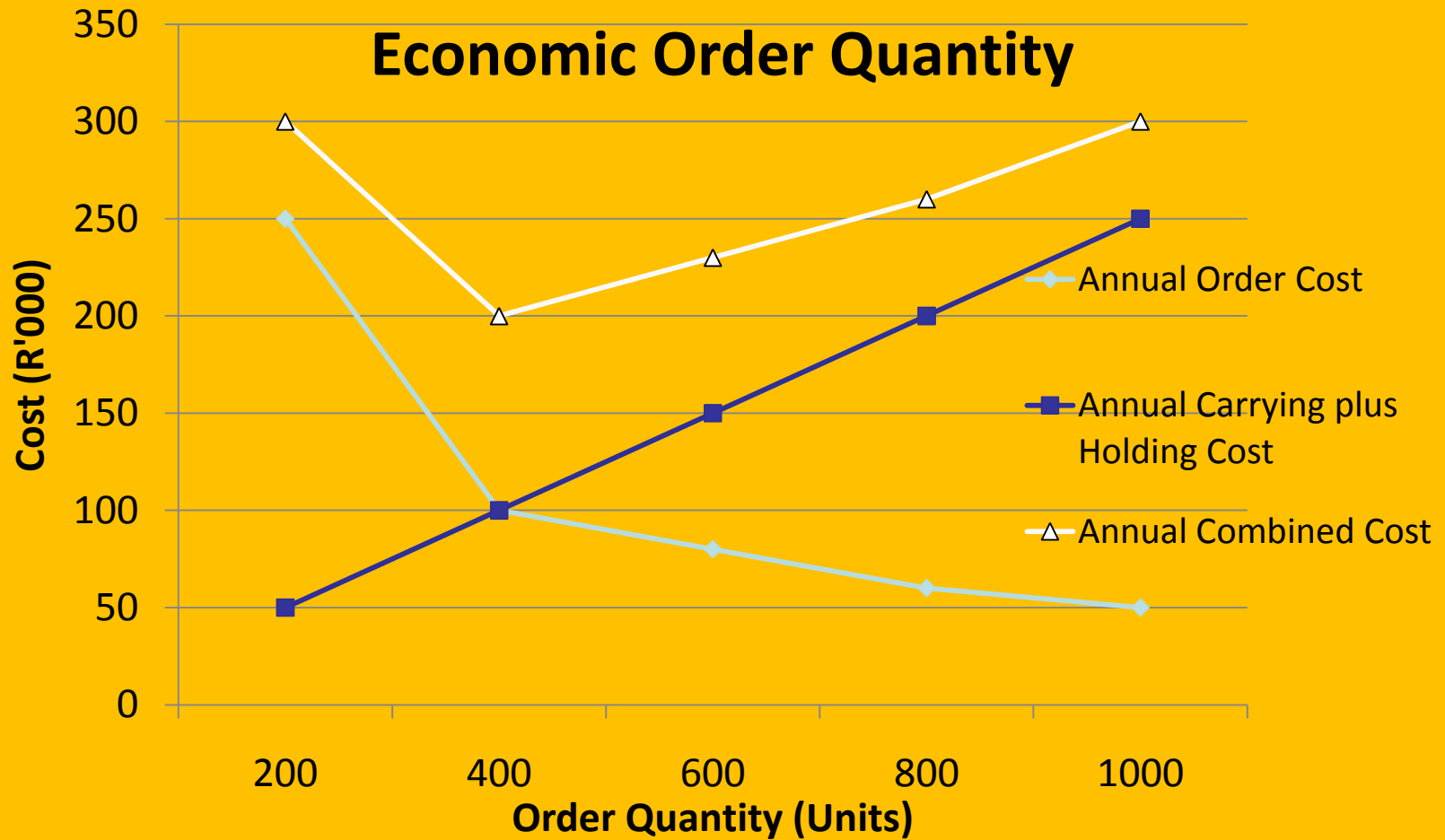
# Chapter 12

## Inventory and Production Models

- It is generally expensive to hold inventory. Traditionally, enterprises held large quantities of inventory. Nowadays a more holistic management approach is followed. The application of inventory and production models in inventory control, can assist management in providing relevant information to optimise profitability and cash flow.



# Origin of EOQ model



Minimum stock cost is where:  $\text{Ordering cost} = \text{Carrying plus Holding cost}$

Study guide p97 – 99

**QUESTION 5 (20 marks; 24 minutes)**

Sterny (Pty) Limited assembles electrical equipment. One of the company's main products requires an electric motor. These motors are purchased from an outside contractor. The company wants to formulate a purchasing policy that will ensure minimum costs.

You are provided with the following information:

Annual production requirement	:	17 000 motors
Purchase price	:	R50 per motor
Cost of placing an order	:	R60
Lead time	:	15 days

Stockholding costs consist of the following:

Direct costs : R10 per motor per annum

Cost of capital : 20% per annum after tax

- The current rate of inflation is 15% per annum. The company is operative for 340 days per annum.
- The supplier of the electric motors has requested the company not to place more than 20 orders per annum, in which case they are prepared to grant a discount of R0,25 per motor. The current rate of taxation is 30%.

## REQUIRED:

- (a) Determine the following without taking the request of the contractor into account:
- (i) the economic order quantity (5)
  - (ii) the re-order point. (3)
- (b) Determine whether the request to place 20 orders per annum should be met. (12)

Figures must be rounded off to the nearest rand. **[20]**

## SOLUTION

(i) *The economic order quantity*

EOQ

$$= \sqrt{\frac{2 \times \text{Annual demand} \times \text{Ordering cost per order}}{\text{Stockholding cost per unit per annum}}}$$

$$= \sqrt{\frac{2 \times 17\,000 \times \text{R}60}{(\text{R}50 \times \frac{20 - 15}{100}) + \text{R}10}}$$

$$= \sqrt{\frac{\text{R}2\,040\,000}{\text{R}12,50}}$$

$$= \sqrt{163\,000}$$

$$= 403,98 \text{ motors}$$

$$= 404 \text{ motors}$$

(ii) *Re-order point*

$$\begin{aligned} \text{Re-order point} &= \text{Consumption during lead time} \\ &= 17\,000 / 340 \times 15 \text{ days} \\ &= 750 \text{ motors} \end{aligned} \quad (3)$$

(b) *Evaluation of request*

Number of orders per annum if EOQ is accepted

$$\begin{aligned} &= 17\,000 / 404 \text{ orders} \\ &= 42,08 \text{ orders} \\ &\approx 43 \text{ orders} \quad (1\frac{1}{2}) \end{aligned}$$

Order size if 20 orders are placed

$$\begin{aligned} &= 17\,000 / 20 \text{ motors} \\ &= 850 \text{ motors} \end{aligned}$$

	Relevant cost (special request)	Relevant cost (EOQ model)
Average stock (850/2);(404/2)	425 motors R	202 motors R
Ordering cost (20 x R60); (43 x R60)	1 200	2 580
Discount not allowed (17 000 x R0,25)	-	4 250
Carrying cost 425 x [(5% x R49,75) +R10]	5 307	
202 x R12,50 [per (a)(i)]		2 525
Total relevant cost	6 507	9 355

Relevant cost when making a decision:

Ordering cost + stockholding cost

Do not forget to include any additional costs and opportunity income.

Ordering cost = Cost per order

Stockholding cost = Total stockholding cost per annum x average stock level ( Order quantity/2 + safety stock) + cost of capital to carry the stock.





# Examination Techniques

# Mark scoring techniques

## **REQUIRED**

- Knowing theory thoroughly makes a big difference
- Be able to write solutions self. It is different than understanding solutions

## **REVISION TECHNIQUES**

- needs plenty of practise (major problem in written answers)
- Repetition of practising
- must do under time pressure

# Mark scoring techniques

## PLAN ANSWER

- Neat layout. Use headings, columns and rows
- marks awarded (normally a half mark per figure or one mark per fact)
- timing (marks per minute - **DON'T RUN OVER THE TIME ALLOCATED** for the answer!)
- Go back to a question if time is available after you have finished.

# Mark scoring techniques

- Indicate different parts of workings/answers clearly
- use spaces; **DON'T CRAM**

# Mark scoring techniques

## Written answers

- Point form (unless otherwise indicated - sentences longer than two/three lines are generally getting 'waffly')
- one item of information under each point (let the marker decide whether each point earns a mark)

# Mark scoring techniques

- be specific in your answer
- list points generated if time unavailable to explain each one

# Mark scoring techniques

## Calculation answers

- cross reference all involved workings
- avoid getting bogged down: assume figures if necessary and carry on with your answer
- **show all your calculations!**



# **STRATEGIES FOR ANSWERING MULTIPLE-CHOICE QUESTIONS**



# MULTIPLE CHOICE QUESTIONS

## DIFFERENT TYPES OF QUESTIONS:

- Options that require prior knowledge
- Questions where no prior knowledge is required

# MULTIPLE CHOICE QUESTIONS

## GENERAL STRATEGIES FOR MULTIPLE-CHOICE QUESTIONS

- **Read the question carefully**, paying attention to the key-words of the question
- Watch for words like **always, never, except** (Be careful selecting answers that indicate extremes)
- Look for key words in questions or examples that might provide an answer, or other reference

# MULTIPLE CHOICE QUESTIONS

## Select the best answer

- There is no penalty for guessing; make your best guess; **do not leave a blank answer**
- Answer by calculation (numbers) or by elimination (words) normally.

# MULTIPLE CHOICE QUESTIONS

- **If a question has you stumped** or seems too difficult, skip it and come back to it later after you have finished the easier questions
- **If you can eliminate at least two answers**, and still are not sure, take a guess or come back to the question later. Then go with the answer that seems right to you.

# MULTIPLE CHOICE QUESTIONS

- **Go back to the most difficult question after you have answered all the others.** If you still can't eliminate any answers at this point, **GUESS. DO NOT LEAVE ANY BLANK ANSWERS!**

# MULTIPLE CHOICE QUESTIONS

- **PLEASE DO NOT USE THE MULTIPLE CHOICE QUESTIONS TO MAKE UP TIME FOR OTHER QUESTIONS. IT IS AS IMPORTANT AS ANY OTHER QUESTION!**
- **DON'T GO OVER THE TIME BECAUSE NO MARKS FOR CALCULATIONS AT MULTIPLE CHOICES**



**GOOD  
LUCK!!!**