

## Extra questions for Chapter 3 Cost assignment

### 3.1 Intermediate: Job cost calculation

A printing and publishing company has been asked to provide an estimate for the production of 100 000 catalogues, of 64 pages (32 sheets of paper) each, for a potential customer.

Four operations are involved in the production process: photography, set-up, printing and binding.

Each page of the catalogue requires a separate photographic session. Each session costs £150.

Set-up would require a plate to be made for each page of the catalogue. Each plate requires 4 hours of labour at £7 per hour and £35 of materials. Overheads are absorbed on the basis of labour hours at an hourly rate of £9.50.

In printing, paper costs £12 per thousand sheets. Material losses are expected to be 2% of input. Other printing materials will cost £7 per 500 catalogues. 1000 catalogues are printed per hour of machine time. Labour and overhead costs incurred in printing are absorbed at a rate of £62 per machine hour.

Binding costs are recovered at a rate per machine hour. The rate is £43 per hour and 2500 catalogues are bound per hour of machine time.

A profit margin of 10% of selling price is required.

You are required to:

- determine the total amount that should be quoted for the catalogue job by the printing and publishing company. (11 marks)
- calculate the additional costs that would be charged to the job if the labour efficiency ratio achieved versus estimate in set-up is 90%. (4 marks)

(Total 15 marks)

*ACCA Foundation Stage Paper 3*

### 3.2 Intermediate: Reapportionment of service department overheads and a calculation of under/over-recovery of overheads

An organization has budgeted for the following production overheads for its production and service cost centres for the coming year:

Cost centre	£
Machining	180 000
Assembly	160 000
Paint shop	130 000
Engineering shop	84 000
Stores	52 000
Canteen	75 000

The product passes through the machining, assembly and paint shop cost centres and the following data relates to the cost centres:

	M/c	Ass	Paint shop	Eng shop	Stores
No. of employees	81	51	39	30	24
Eng Shop-service	18 000	12 000	10 000		
Stores (orders)	180	135	90	45	

The following budgeted data relates to the production cost centres:

	<b>M/c</b>	<b>Assembly</b>	<b>Paint shop</b>
M/c hours	9 200	8 100	6 600
Lab hours	8 300	11 250	9 000
Lab cost	£40 000	£88 000	£45 000

Required:

(a) Apportion the production overhead costs of the service cost centres to the production cost centres and determine predetermined overhead absorption rates for the 3 production cost centres on the following basis:

Machining - Machine hours.

Assembly - Labour hours.

Paint shop - Labour costs.

(11 marks)

(b) Actual results for the production cost centres were:

	<b>M/c</b>	<b>Assembly</b>	<b>Paint shop</b>
M/c hours	10 000	8 200	6 600
Lab hours	4 500	7 800	6 900
Lab cost	£25 000	£42 000	£35 000
Actual O/h	£290 000	£167 000	£155 000

Prepare a statement showing the under/over absorption per cost centre for the period under review.

(7 marks)

(c) Explain why overheads need to be absorbed upon pre-determined bases such as the above. Consider whether these bases for absorption are appropriate in the light of changing technology, suggesting any alternative basis that you consider appropriate.

(7 marks)

(Total 25 marks)

*AAT Cost Accounting and Budgeting*

### 3.3 Advanced: Comparison of methods of reapportioning service department costs

Puerile Plastics Ltd consists of six departments: personnel and administration, maintenance, stores, moulding, extrusion and finishing. The accountant has collected data for the 12 months to 30 September relating to the six departments, which is given below.

The accountant wishes to use the data to derive the selling prices of the firm's products, based on their full costs. The selling price of each product will be equal to 250% of the product's full cost. The market for the products is supplied by five large companies, of which Puerile Plastics Ltd is one, and ten small companies. Puerile Plastics Ltd has approximately a 20% market share. The standard production quantities can be converted into standard equivalent units of output for each of the three production departments. The accountant is considering different ways of allocating the costs of the three service departments in order to obtain the full cost per standard equivalent unit, and hence the sales price of each product.

Required:

- Calculate the total cost for each of the three production departments using the direct method of allocation of the service departments' costs. (4 marks)
- Calculate the total cost of each of the three production departments using the step-down (sometimes called step or sequential) method of allocation of the service departments' costs. State any assumptions which you make. (5 marks)
- Formulate* the equations which will provide the total cost of each of the three production departments using the reciprocal or cross-allocation method of allocation of costs. (4 marks)
- Compare and contrast the three methods of service cost allocation, using the results obtained in (a) and (b) above as examples. (7 marks)
- Comment on the approach the accountant is considering for the derivation of the selling price of the products. (5 marks)

(Total 25 marks)

*ICAEW P2 Management Accounting*

### Data relating to Question 3.3

	Personnel and						
	Administration	Maintenance	Stores	Moulding	Extrusion	Finishing	Total
Employees (number)	20	4	3	25	16	10	78
Proportion of total maintenance hours worked in each department (%)	5	10	15	20	40	10	100
Production of store's floorspace taken up by each department's materials (%)	—	10	—	20	30	40	100
Output levels (per thousand standard equivalent units)	—	—	—	187	149	336	
Direct costs (£000):							
Material	36	23	—	330	170	20	
Labour	155	25	18.72	168.75	115.2	81	
Variable overheads	—	—	—	71.25	151.8	30	
Fixed overheads	15	15	17.28	449.3	371.7	67	

### *Extra questions for Chapter 4 Accounting entries for a job costing system*

#### 4.1 Intermediate: Integrated cost accounting

NB Limited operates an integrated accounting system. At the beginning of October, the following balances appeared in the trial balance:

	(£000)	(£000)	(£000)
Freehold buildings		800	
Plant and equipment, at cost		480	
Provision for depreciation on plant and equipment			100
Stocks:			
Raw materials		400	
Work in Process 1:			
direct materials	71		
direct wages	50		
production overhead	125	246	
Work in Process 2:			

direct materials	127		
direct wages	70		
production overhead	<u>105</u>	302	
Finished goods		60	
Debtors		1120	
Capital			2200
Profit retained			220
Creditors			300
Bank			464
Sales			1200
Cost of sales		888	
Abnormal loss		9	
Production overhead under/over absorbed			21
Administration overhead	120		
Selling and distribution overhead	<u>80</u>		
	<u>4505</u>	<u>4505</u>	

The transactions during the month of October were:

	(£000)
Raw materials purchased on credit	<u>210</u>
Raw materials returned to suppliers	<u>10</u>
Raw materials issued to:	
Process 1	136
Process 2	44
Direct wages incurred:	
Process 1	84
Process 2	130
Direct wages paid	200
Production salaries paid	170
Production expenses paid	250
Received from debtors	1140
Paid to creditors	330
Administration overhead paid	108
Selling and distribution overhead paid	84
Sales, on credit	1100
Cost of goods sold	844

	<b>Direct materials</b> <b>(£000)</b>	<b>Direct wages</b> <b>(£000)</b>
Abnormal loss in:		
Process 1	6	4
Process 2	18	6
Transfer from Process 1 to Process 2	154	94
Transfer from Process 2 to finished goods	558	140

Plant and equipment is depreciated at the rate of 20% per annum, using the straight-line basis. Production overhead is absorbed on the basis of direct wages cost.

You are required

- (a) to ascertain and state the production overhead absorption rates used for Process 1 and for Process 2; (2 marks)
- (b) to write up the ledger accounts; (25 marks)
- (c) to explain the nature of abnormal losses and two possible reasons for their occurrence. (3 marks)
- (Total 30 marks)

*CIMA Stage 2 Cost Accounting*

#### 4.2 Intermediate: Preparation of cost accounts from reconciliation statement

(a) The cost accountant and the financial accountant of C Limited had each completed their final accounts for the year. Shown below are the manufacturing, trading and profit and loss accounts, together with a statement reconciling the cost and financial profits. You are required to show the following accounts in the cost ledger.

- (i) raw materials;
- (ii) work in progress;
- (iii) finished goods;
- (iv) profit and loss.

#### Manufacturing, Trading and Profit and Loss Account for the year ended 31 December

	£000	£000		£000	£000
Raw material			Trading account,		
Opening stock	110		cost of goods		
Purchases	<u>640</u>		manufactured		1000
	750				
Less: Returns	<u>20</u>				
	730				
Closing stock	<u>130</u>	600			
Direct wages					
Paid	220				
Accrued	<u>20</u>	<u>240</u>			
Prime cost		840			
Production expenses		162			
Work in progress:					
Opening stock	25				
Closing stock	<u>27</u>	(2)			
		<u>1000</u>			
Finished goods:			Sales	1530	<u>1000</u>
Opening stock	82		Less: Returns	<u>30</u>	
Manufactured	<u>1000</u>				1500
	1082				
Closing stock	<u>72</u>	<u>1010</u>			

Gross profit		<u>490</u>		
		<u>1500</u>		<u>1500</u>
Administration expenses	200		Gross Profit	<u>490</u>
Sales expenses	70		Discount received	10
Discount allowed	20			
Debenture interest	10			
Net profit	<u>200</u>			
	<u>500</u>			<u>500</u>

[Reconciliation Statement]

	(£000)	(£000)	(£000)
Profit shown in the financial accounts			200
Items not shown in the cost accounts:			
Discount allowed		20	
Debenture interest		10	
Sales expenses		70	
Discount received		<u>(10)</u>	<u>90</u>
			290
Difference in stock valuation:			
Opening stock, raw materials	7		
Opening stock, finished goods	9		
Closing stock, raw materials	<u>15</u>		
		31	
Closing stock, work in progress	(5)		
Opening stock, work in progress	(3)		
Closing stock, finished goods	(4)		
		(12)	
Profit shown in the cost accounts			<u>19</u>
			<u>309</u>

Notes:

Production overhead is absorbed at a rate of  $66\frac{2}{3}\%$  of wages.

Administration overhead is written off in the period in which it incurred.

(b) Discuss briefly the reasons for including in a cost accounting system notional interest capital locked up in stock and its treatment in preparing a reconciliation of cost and financial profits.

(25 marks)

CIMA Cost Accounting 2

## *Extra questions for Chapter 5 Process costing*

### **5.1 Intermediate: Cost control**

PC Manufacturing Company operates a process costing system and the following information relates to process A for the month of March:

Opening work in process of 1000 units 40% complete, consisting of £17 400 for direct materials and £10 000 for conversion costs.

Production completed for March was 8200 units with materials added for the month of £162 600 and conversion costs in the month of £173 920.

Closing work in process was 800 units which was 20% complete.

There are no losses in process. All materials are introduced at the start of the process and conversion costs are incurred uniformly throughout the process. Process A is the initial process and the completed production is then transferred to process B.

You are required:

- To prepare a schedule of equivalent production and cost per unit and the process account for the month of March.
- Assuming that the company operates a standard cost system using the following standards per finished unit:

Direct materials	£20
Conversion cost	£23

Prepare a performance report for the month of March showing the total variances only for current performance.

## *Extra questions for Chapter 6 Joint and by-product costing*

### **6.1 Intermediate: Preparation of process accounts and apportionment of joint costs**

A company manufactures two types of industrial sealant by passing materials through two consecutive processes. The results of operating the two processes during the previous month are shown below:

#### **Process 1**

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Costs incurred (£):

Materials 7000 kg at £0.50 per kg	3 500
Labour and overheads	4 340

Output (kg):

Transferred to Process 2	6430
Defective production	570

#### **Process 2**

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Cost incurred (£):

Labour and overheads	12 129
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Output (kg):

Type E sealant	2000
Type F sealant	4000
By-product	430

It is considered normal for 10% of the total output from process 1 to be defective and all defective output is sold as scrap at £0.40/kg. Losses are not expected in process 2. There was no work in process at the beginning or end of the month and no opening stocks of sealants.

Sales of the month's output from Process 2 were:

Type E sealant	1100 kg
Type F sealant	3200 kg
By-product	430 kg

The remainder of her output from process 2 was in stock at the end of the month.

The selling prices of the products are: Type E sealant £7 per kg and Type F sealant £2.50 per kg. No additional costs are incurred on either of the two main products after the second process. The by-product is sold for £1.80 per kg after being sterilized, at a cost of £0.30 per kg, in a subsequent process. The operating costs of process 2 are reduced by the net income receivable from sales of the by-product.

Required:

- (a) Calculate, for the previous month, the cost of the output transferred from process 1 into process 2 and the net cost or saving arising from any abnormal losses or gains in process 1. (6 marks)
- (b) Calculate the value of the closing stock of each sealant and the profit earned by each sealant during the previous month using the following methods of apportioning costs to joint products:
  - (i) according to weight of output,
  - (ii) according to market value of output. (12 marks)
- (c) Consider whether apportioning process costs to joint products is useful. Briefly illustrate with examples from your answer to (b) above. (4 marks)

(Total 22 marks)

*ACCA Level 1 Costing*

## 6.2 Intermediate: Joint cost apportionment and decision on further processing

BK Chemicals produces three joint products in one common process but each product is capable of being further processed separately after the split-off point. The estimated data given below relate to June:

	Product B	Product K	Product C
Selling price at split-off point (per litre)	£6	£8	£9
Selling price after further processing (per litre)	£10	£20	£30
Post-separation point costs	£20 000	£10 000	£22 500
Output in litres	3 500	2 500	2 000

Pre-separation point joint costs are estimated to be £40 000 and it is current practice to apportion these to the three products according to litres produced.

You are required:

- (i) to prepare a statement of estimated profit or loss for each product and in total for June if all three products are processed further, and
- (ii) to advise how profits could be maximized if one or more products are sold at the split-off point. Your advice should be supported by a profit statement. (11 marks)

*CIMA Stage 2 Cost Accounting*

### ***Extra questions for Chapter 7 Income effects of alternative cost accumulation systems***

#### **7.1 Intermediate: Under/over-recovery of fixed overheads and preparation and reconciliation of absorption and variable costing profit statements**

- (a) Discuss the arguments put forward for the use of absorption and marginal costing systems respectively (8 marks)
- (b) The following information is available for a firm producing and selling a single product:

	(£000)
<hr/>	
<i>Budgeted costs</i> (at normal activity)	
Direct materials and labour	264
Variable production overhead	48
Fixed production overhead	144
Variable selling and administration overhead	24
Fixed selling and administration overhead	96

The overhead absorption rates are based upon normal activity of 240 000 units per period.

During the period just ended 260 000 units of product were produced, and 230 000 units were sold at £3 per unit.

At the beginning of the period 40 000 units were in stock. These were valued at the budgeted costs shown above.

Actual costs incurred were as per budget.

Required:

- (i) Calculate the fixed production overhead absorbed during the period, and the extent of any under/over absorption. For both of these calculations you should use absorption costing.
- (ii) Calculate profits for the period using absorption costing and marginal costing respectively.
- (iii) Reconcile the profit figures which you calculated in (ii) above.
- (iv) State the situations in which the profit figures calculated under both absorption costing and marginal costing would be the same.

(17 marks)

(Total 25 marks)

*ACCA Level 1 Costing*

## 7.2 Intermediate: Equivalent production and preparation of variable and absorption costing profit statements

A new subsidiary of a group of companies was established for the manufacture and sale of Product X. During the first year of operations 90 000 units were sold at £20 per unit. At the end of the year, the closing stocks were 8000 units in finished goods store and 4000 units in work-in-progress which were complete as regards material content but only half complete in respect of labour and overheads. You are to assume that there were no opening stocks. The work-in-progress account had been debited during the year with the following costs:

	(£)
Direct materials	714 000
Direct labour	400 000
Variable overhead	100 000
Fixed overhead	350 000

Selling and administration costs for the year were:

	Variable cost per unit sold (£)	Fixed cost (£)
Selling	1.50	200 000
Administration	0.10	50 000

The accountant of the subsidiary company had prepared a profit statement on the absorption costing principle which showed a profit of £11 000.

The financial controller of the group, however, had prepared a profit statement on a marginal costing basis which showed a loss. Faced with these two profit statements, the director responsible for this particular subsidiary company is confused.

You are required to

- prepare a statement showing the equivalent units produced and the production cost of *one* unit of Product X by element of cost and in total; (5 marks)
- prepare a profit statement on the absorption costing principle which agrees with the company accountant's statement; (9 marks)
- prepare a profit statement on the marginal costing basis; (6 marks)
- explain the differences between the two statements given for (b) and (c) above to the director in such a way as to eliminate his confusion and state why both statements may be acceptable. (5 marks)

(Total 25 marks)

*CIMA Stage 2 Cost Accounting*

## *Extra questions for Chapter 8 Cost-volume-profit analysis*

### 8.1 Intermediate: Separation of fixed and variable costs and construction of a break-even graph

A building company constructs a standard unit which sells for £30 000. The company's costs can be readily identifiable between fixed and variable costs.

Budgeted data for the coming six months includes the following:

	<b>Sales (in units)</b>	<b>Profit £</b>
January	18	70 000
February	20	100 000
March	30	250 000
April	22	130 000
May	24	160 000
June	16	40 000

You are told that the fixed costs for the six months have been spread evenly over the period under review to arrive at the monthly profit projections.

Required:

- (a) Prepare a graph for total sales, costs and output for the six months under review that shows:
- (i) The break-even point in units and revenue. (ii) Total fixed costs.
  - (iii) The variable cost line.
  - (iv) The margin of safety for the total budgeted sales.

(14 marks)

- (b) The company is worried about the low level of sales. The sales director says that if the selling price of the unit was reduced by £5000 the company would be able to sell 10% more units. All other costs would remain the same you are told.

Determine whether the company should reduce the selling price to attract new sales in order to maximize profit. Clearly show any workings. (5 marks)

- (c) Evaluate whether the assumption that costs are readily identifiable as either fixed or variable throughout a range of production is realistic. Give examples of any alternative classification. (6 marks)

(Total 25 marks)

*AAT Cost Accounting and Budgeting*

## 8.2 Intermediate: Separation of fixed and variable costs and construction of a break-even chart

Z plc operates a single retail outlet selling direct to the public. Profit statements for August and September are as follows:

	<b>August</b>	<b>September</b>
Sales	80 000	90 000
Cost of sales	50 000	55 000
Gross profit	30 000	35 000
<i>Less:</i>		
Selling and distribution	8 000	9 000
Administration	15 000	15 000
Net profit	7 000	11 000

Required:

- (a) Use the high- and low-points technique to identify the behaviour of:
- (i) cost of sales;
  - (ii) selling and distribution costs;
  - (iii) administration costs. (4 marks)
- (b) Using the graph paper provided, draw a contribution break-even chart and identify the monthly break-even sales value area of contribution. (10 marks)
- (c) Assuming a margin of safety equal to 30% of the break-even value, calculate Z plc's annual profit. (2 marks)
- (d) Z plc is now considering opening another retail outlet selling the same products. Z plc plans to use the same profit margins in both outlets and has estimated that the specific fixed costs of the second outlet will be £100 000 per annum. Z plc also expects that 10% of its annual sales from its existing outlet would transfer to this second outlet if it were to be opened. Calculate the annual value of sales required from the new outlet in order to achieve the same annual profit as previously obtained from the single outlet. (5 marks)
- (e) Briefly describe the cost accounting requirements of organizations of this type (4 marks)
- (Total 25 marks)

*Chartered Institute of Management Accountants Operational Cost Accounting Stage 2*

### **8.3 Intermediate: Non-graphical CVP analysis**

A retailer with a chain of stores is planning product promotions for a future period. The following information relates to a product which is being considered for a four week promotion:

Normal weekly sales (i.e. without promotion), 2400 units at £2.80 per unit.

Normal contribution margin, 45% of normal selling price.

Promotional discount, 20% (i.e. normal selling price reduced by 20% during the promotion).

Expected promotion sales multiplier, 2.5 (i.e. weekly sales units expected during the promotion is  $2.5 \times 2400 = 6000$  units).

Additional fixed costs incurred to run the promotion (i.e. unaffected by the level of promotional sales) are forecast to be £5400. Unit variable costs would be expected to remain at the same level as normal.

Required:

- (a) Calculate the expected incremental profit/(loss) from the promotion. (8 marks)
- (b) Calculate the sales units multiplier that would be required during the promotion to break even compared with a no-promotion situation. (6 marks)
- (c) Describe other factors that should be considered before making a decision regarding the promotion. (6 marks)
- (Total 20 marks)

*ACCA Level 1 - Cost and Management Accounting 1*

### **8.4 Intermediate: Non-graphical CVP analysis and calculation of margin of safety**

Z Ltd manufactures and sells three products with the following selling prices and variable costs:

	<b>Product A</b> <b>(£/unit)</b>	<b>Product B</b> <b>(£/unit)</b>	<b>Product C</b> <b>(£/unit)</b>
Selling price	3.00	2.45	4.00
Variable cost	1.20	1.67	2.60

The company is considering expenditure on advertising and promotion of Product A. It is hoped that such expenditure, together with a reduction in the selling price of the product, would increase sales. Existing annual sales volume of the three products is:

Product A	460 000 units
Product B	1 000 000 units
Product C	380 000 units

If £60 000 per annum was to be invested in advertising and sales promotion, sales of Product A at reduced selling prices would be expected to be:

590 000 units at £2.75 per unit  
or 650 000 units at £2.55 per unit

Annual fixed costs are currently £1 710 000 per annum.

Required:

- (a) Calculate the current break-even sales revenue of the business. (8 marks)
- (b) Advise the management of Z Ltd as to whether the expenditure on advertising and promotion, together with selling price reduction, should be introduced on Product A. (6 marks)
- (c) Calculate the required unit sales of Product A, at a selling price of £2.75 per unit, in order to justify the expenditure on advertising and promotion. (5 marks)
- (d) Explain the term 'margin of safety', with particular reference to the circumstances of Z Ltd. (6 marks)

(Total 25 marks)

*ACCA Level 1 Costing*

### 8.5 Intermediate: Changes in sales mix

XYZ Ltd produces two products and the following budget applies for 2001:

	<b>Product X</b> <b>(£)</b>	<b>Product Y</b> <b>(£)</b>
Selling price	6	12
Variable costs	2	4
Contribution margin	4	8
Fixed costs apportioned	£100 000	£200 000
Units sold	70 000	30 000

You are required to calculate the break-even points for each product and the company as a whole and comment on your findings.

### 8.6 Intermediate: Analysis of change in profit arising from changes in volume and production methods plus sales revenue required to achieve a desired profit

A company has the following summary performance over two accounting periods:

	<b>Period 1</b> <b>(£000)</b>	<b>Period 2</b> <b>(£000)</b>
Sales	902.0	1108.1
Variable costs	<u>360.8</u>	<u>398.9</u>
Contribution	541.2	709.2
Fixed costs	<u>490.5</u>	<u>549.0</u>
Net profit	<u><u>50.7</u></u>	<u><u>160.2</u></u>

In period 2 selling prices were 5% higher than in period 1 and cost inflation (affecting both variable and fixed costs) was also 5%.

At the start of period 2 production methods were reorganized. This was the only other factor affecting costs between the two periods (apart from inflation and volume).

Required:

- (a) Calculate the percentage increase in sales volume in period 2 compared with period 1. (2 marks)
- (b) Calculate the increase in net profit in period 2 compared with period 1, due to:
  - (i) volume
  - (ii) reorganization of production methods. (Calculations should be done at year 1 prices.) (6 marks)
- (c) Calculate the sales (to the nearest £000) that were required in period 2 in order to achieve the same net profit as period 1. (3 marks)
- (d) State, and explain, the formula for the calculation of the break-even sales revenue for a period (figures are not required). (3 marks)

(Total 14 marks)

*ACCA Foundation Paper 3*

### **8.7 Advanced: CVP analysis and decision-making based on number of holidays to be sold by a hotel**

A hotel budget for the forthcoming year shows the following room occupancy:

	<b>Average %</b>
January - March	45
April - June	60
July - September	90
October - December	55

Revenue for the year is estimated to be £3 million and arises from three profit centres:

Accommodation\* 45%: Restaurant 35%: Bar 20%:

Total 100%

\*The accommodation revenue is earned from several different categories of guest, each of which pays a different rate per room.

The three profit centres have the following percentage gross margins:

	Accommodation (%)	Restaurant (%)	Bar (%)
Revenue	100	100	100
Wages	20	30	15
Cost of sales	-	40	50
Direct costs	<u>10</u>	<u>10</u>	<u>5</u>
	<u>30</u>	<u>80</u>	<u>70</u>
Gross margin	<u>70</u>	<u>20</u>	<u>30</u>

Fixed costs for the year are estimated to be £565 000.

Capital employed is £7 million.

As a means of improving the return on capital employed, two suggestions have been made:

- (i) to offer special two-night holidays at a reduced price of £25 per night. It is expected that those accepting the offer would spend an amount equal to 40% of the accommodation charge in the restaurant, and 20% in the bar.
- (ii) to increase prices. Management is confident that there will be no drop in volume of sales if restaurant prices are increased by 10% and bar prices by 5%. Accommodation prices would also need to be increased.

You are required

- (a) to calculate the budgeted return on capital employed before tax; (5 marks)
- (b) to calculate
  - (i) how many two-night holidays would need to be sold each week in the three off-peak quarters to improve the return on capital employed (ROCE) by a further 4% above the percentage calculated in (a) above; (5 marks)
  - (ii) by what percentage the prices of accommodation would need to be increased to achieve the desired increase in ROCE shown in (b) (i) above; (5 marks)
- (c) to explain briefly the major problems likely to be encountered with each of the two suggestions and recommend which should be adopted, assuming that they are mutually exclusive. (10 marks)

(Total 25 marks)

*CIMA Stage 4 Management Accounting - Decision Making*

### *Extra questions for Chapter 9 Measuring relevant costs and revenues for decision-making*

#### **9.1 Intermediate: Deleting a segment**

A company manufactures and sells a wide range of products. The products are manufactured in various locations and sold in a number of quite separate markets. The company's operations are organised into five divisions which may supply each other as well as selling on the open market.

The following financial information is available concerning the company for the year just ended:

	(£000)
Sales	8600
Production cost of sales	<u>5332</u>
Gross profit	3268
Other expenses	<u>2532</u>
Net profit	<u>736</u>

An offer to purchase Division 5, which has been performing poorly, has been received by the company.

The gross profit percentage of sales, earned by Division 5 in the year, was half that earned by the company as whole. Division 5 sales were 10% of total company sales. Of the production expenses incurred by Division 5, fixed costs were £316 000. Other expenses (i.e. other than production expenses) incurred by the division totalled £156 000, all of which can be regarded as fixed. These include £38 000 apportionment of general company expenses which would not be affected by the decision concerning the possible sale of Division 5.

In the year ahead, if Division 5 is not sold, fixed costs of the division would be expected to increase by 5% and variable costs to remain at the same percentage of sales. Sales would be expected to increase by 10%.

If the division is sold, it is expected that some sales of other divisions would be lost.

These would provide a contribution to profits of £20 000 in the year ahead. Also, if the division is sold, the capital sum received could be invested so as to yield a return of £75 000 in the year ahead.

Required:

- Calculate whether it would be in the best interests of the company, based upon the expected situation in the year ahead, to sell Division 5. (13 marks)
- Discuss other factors that you feel should influence the decision. (7 marks)
- Calculate the percentage increase in Division 5 sales required in the year ahead (compared with the current year) for the financial viability of the two alternatives to be the same. (You are to assume that all other factors in the above situation will remain as forecast for the year ahead.) (5 marks)

(Total 25 marks)

*ACCA Level 1 Costing*

## 9.2 Intermediate: Contribution analysis and an outsourcing decision

AZ Transport Group plc comprises three divisions - AZ Buses; AZ Taxis; and Maintenance.

AZ Buses operates a fleet of eight vehicles on four different routes in Ceetown. Each vehicle has a capacity of 30 passengers. There are two vehicles assigned to each route, and each vehicle completes five return journeys per day, for six days each week, for 52 weeks per year.

AZ Buses is considering its plans for year ending 31 December. Data in respect of each route is as follows:

	Route W	Route X	Route Y	Route Z
Return travel distance (km)	42	36	44	38
Average number of passengers:				
Adults	15	10	25	20
Children	10	8	5	10
Return journey fares:				
Adults	£3.00	£6.00	£4.50	£2.20
Children	£1.50	£3.00	£2.25	£1.10

The following cost estimates have been made:

Fuel and repairs per kilometre	£0.1875
Drivers' wages per vehicle per work-day	£120
Vehicle fixed cost per annum	£2000
General fixed cost per annum	£300 000

Requirements:

- (a) Prepare a statement showing the planned contribution of each route and the total contribution of each route and the total contribution and profit of the AZ Buses division for the year ending 31 December. (6 marks)
- (b) (i) Calculate the effect on the contribution of route W of increasing the adult fare to £3.75 per return journey if this reduces the number of adult passengers using this route by 20%, and assuming that the ratio of adult to child passengers remains the same. (Assume no change in the child fare.)  
(ii) Recommend whether or not AZ Buses should amend the adult fare on route W. (4 marks)

(c) The Maintenance division comprises two fitters who are each paid an annual salary of £15 808, and a transport supervisor who is paid an annual salary of £24,000.

The work of the Maintenance division is to repair and service the buses of the AZ Buses division and the taxis of the AZ Taxis division. In total there are eight buses and six taxis which need to be maintained. Each vehicle requires routine servicing on a regular basis on completion of 4000 kilometres: every two months each vehicle is fully tested for safety. The Maintenance division is also responsible for carrying out any breakdown work, though the amount of regular servicing is only 10% of the Maintenance division's work.

The annual distance travelled by taxi fleet is 128 000 kilometres.

The projected material costs associated with each service and safety check are £100 and £75 respectively, and the directors of AZ Transport Group plc are concerned over the efficiency and cost of its own Maintenance division. The company invited its local garage to tender for the maintenance contract for its fleet and the quotation received was for £90 000 per annum including parts and labour.

If the maintenance contract is awarded to the local garage then the Maintenance division will be closed down, and the two fitters made redundant with a redundancy payment being made of 6 months' salary to each fitter. The transport supervisor will be retained at the same salary and will be redeployed elsewhere in the Group instead of recruiting a new employee at an annual salary cost of £20 000.

Requirements:

- (i) Calculate the cost of existing maintenance function. (6 marks)
- (ii) Advise the directors of AZ Transport Group plc whether to award the maintenance contract to the local garage on financial grounds. (4 marks)
- (iii) State clearly the other factors which need to be considered before making such a decision, commenting on any other solutions which you consider to be appropriate. (5 marks)

(Total 25 marks)

*CIMA Stage 2 Operational Cost Accounting*

### 9.3 Intermediate: Limiting factor analysis

Triproduct Limited makes and sells three types of electronic security systems for which the following information is available.

*Standard cost and selling prices per unit*

<b>Product</b>	<b>Day scan (£)</b>	<b>Night scan (£)</b>	<b>Omni scan (£)</b>
Materials	70	110	155
Manufacturing labour	40	55	70
Installation labour	24	32	44
Variable overheads	16	20	28
Selling price	250	320	460

Fixed costs for the period are £450 000 and the installation labour, which is highly skilled, is available for 25 000 hours only in a period and is paid £8 per hour.

Both manufacturing and installation labour are variable costs.

The maximum demand for the product is:

<b>Day scan</b>	<b>Night scan</b>	<b>Omni scan</b>
2000 units	3000 units	1800 units

Requirements:

- Calculate the shortfall (if any) in hours of installation labour. (2 marks)
- Determine the best production plan, assuming that Triproduct Limited wishes to maximise profit. (5 marks)
- Calculate the maximum profit that could be achieved from the plan in part (b) above. (3 marks)
- Having carried out an investigation of the availability of installation labour, the firm thinks that by offering £12 per hour, additional labour would become available and thus overcome the labour shortage.

Requirement:

Based on the results obtained above, advise the firm whether or not to implement the proposal.

(5 marks)

(Total 15 marks)

*CIMA Stage 1 Cost Accounting*

### 9.4 Intermediate: Key/limiting factor decision-making

BVX Limited manufactures three garden furniture products - chairs, benches and tables.

The budgeted unit cost and resource requirements of each of these items is detailed below:

	Chair (£)	Bench (£)	Table (£)
Timber cost	5.00	15.00	10.00
Direct labour cost	4.00	10.00	8.00
Variable overhead cost	3.00	7.50	6.00
Fixed overhead cost	<u>4.50</u>	<u>11.25</u>	<u>9.00</u>
	<u>16.50</u>	<u>43.75</u>	<u>33.00</u>
Budgeted volumes per annum	4000	2000	1500

These volumes are believed to equal the market demand for these products.

The fixed overhead costs are attributed to the three products on the basis of direct labour hours.

The labour rate is £4.00 per hour.

The cost of timber is £2.00 per square metre

The products are made from a specialist timber.

A memo from the purchasing manager advises you that because of a problem with the supplier it is to be assumed that this specialist timber is limited in supply to 20 000 square metres per annum.

The sales director has already accepted an order for 500 chairs, 100 benches and 150 tables, which if not supplied would incur a financial penalty of £2000. These quantities are included in the market demand estimates above.

The selling prices of the three products are

Chair	£20.00
Bench	£50.00
Table	£40.00

Required:

(a) Determine the optimum production plan *and* state the net profit that this should yield per annum. (10 marks)

(b) Calculate *and* explain the maximum prices which should be paid per sq. metre in order to obtain extra supplies of the timber. (5 marks)

(c) The management team has accused the accountant of using too much jargon. Prepare a statement which explains the following terms in a way that a multidisciplinary team of managers would understand.

The accountant will use this statement as a briefing paper at the next management meeting. The terms to be explained are:

(i) variable costs;

(ii) relevant costs;

(iii) avoidable costs;

(iv) incremental costs;

(v) opportunity costs.

(10 marks)

(Total 25 marks)

*CIMA Operations Cost Accounting Stage 2*

### 9.5 Intermediate: Allocation of scarce capacity

EX Limited is an established supplier of precision parts to a major aircraft manufacturer. It has been offered the choice of making either Part A or Part B for the next period, but

not both.

Both parts use the same metal, a titanium alloy, of which 13 000 kilos only are available, at £12.50 per kilo. The parts are made by passing each one through two fully-automatic computer-controlled machine lines - S and T - whose capacities are limited. Target prices have been set and the following data are available for the period:

*Part details*

	<b>Part A</b>	<b>Part B</b>
Maximum call-off (units)	7000	9000
Target price	£145	£115
	per unit	per unit
Alloy usage	1.6 kilos	1.6 kilos
Machine times		
Line S	0.6 hours	0.25 hours
Line T	0.5 hours	0.55 hours

*Machine details*

	<b>Line S</b>	<b>Line T</b>
Hours available	4000	4500
Variable overhead	£80	£100
per machine hour		

You are required:

(a) to calculate which part should be made during the next period to maximise contribution; (9 marks)

(b) to calculate the contribution which EX Limited will earn and whether the company will be able to meet the maximum call-off. (3 marks)

As an alternative to the target price shown above, the aircraft manufacturer has offered the following alternative arrangement:

Target prices less 10% plus £60 per hour for each unused machine hour.

(c) You are required to decide whether your recommendation in (a) above will be altered and, if so, to calculate the new contribution. (10 marks)

(Total 22 marks)

*CIMA Stage 3 Management Accounting Techniques*

**9.6 Advanced: Identification of limiting factors and allocation of scarce capacity where several production constraints exist**

Timbcon Ltd has two fully automated machine groups X and Y through which lengths of timber are passed in order to produce decorative lampstand centres. There are production capacity constraints and Timbcon Ltd has decided to produce only one of the two lampstand models, 'Traditional' or 'Modern', in the year to 31 March.

The following forecast information is available for the year to 31 March:

	<b>'Traditional'</b>	<b>'Modern'</b>
(i) Maximum sales potential (units)	7400	10 000
(ii) Lampstand unit data:		
Selling price	£45	£40
Machine time:		
group X (hours)	0.25	0.15
group Y (hours)	0.20	0.225

- (iii) Machine groups X and Y have maximum operating hours of 1700 and 1920 hours respectively. Lampstand production is the sole use available for production capacity.
- (iv) The maximum quantity of timber available is 17 000 metres. Each lampstand requires a two metre length of timber. Timber may be purchased in lengths as required at £2.50 per metre.
- (v) Variable machine overhead for machine groups X and Y is estimated at £25 and £30 per machine hour respectively.
- (vi) All units are sold in the year in which they are produced.

Required:

- (a) Use the above information to determine which of the lampstand centres, 'Traditional' or 'Modern', should be produced and sold in the year to 31 March in order to maximise profit. Your answer should state the number of units to be produced and sold and the resulting contribution. (8 marks)
  - (b) Timbcon Ltd wish to consider additional sales outlets which would earn contribution at the rate of £20 and £30 per machine hour for machine groups X and Y respectively. Such additional sales outlets would be taken up only to utilise any surplus hours not required for lampstand production.  
Prepare figures which show whether 'Traditional' or 'Modern' lampstands should now be produced in order to maximise total contribution in the year to 31 March and state what the contribution would be. (7 marks)
  - (c) A linear programming model which incorporates the data given in parts (a) and (b) of the question has shown that where Timbcon Ltd is willing to produce and sell both 'Traditional' and 'Modern' lampstands and use any spare capacity for the additional sales outlets detailed in (b) above, the profit maximising mix is the production and sale of 4250 units of each type of lampstand in the year to 31 March. Prepare a budget analysis showing the total machine hours and timber (metres) required for each lampstand type and in total for the above production/sales mix, the budgeted contribution for each type of lampstand and the total budgeted contribution for Timbcon Ltd in the year to 31 March. (7 marks)
  - (d) Suggest ways in which Timbcon Ltd may overcome the capacity constraints which limit the opportunities available to it in the year to 31 March, and indicate the types of costs which may be incurred in overcoming each constraint. (8 marks)
- (Total 30 marks)

### 9.7 Advanced: Allocation of scarce resources

A processing company, EF, is extremely busy. It has increased its output and sales from 12 900 kg in quarter 1 to 17 300 kg in quarter 2 but, though demand is still rising, it cannot increase its output more than another 5% from its existing labour force which is now at its maximum.

Data in quarter 2 for its four products were:

	Product P	Product Q	Product R	Product S
Output (kg)	4560	6960	3480	2300
Selling price (£ per kg)	16.20	11.64	9.92	13.68
Costs (£ per kg):				
Direct labour (at £6 per hour)	1.96	1.30	0.99	1.70
Direct materials	6.52	4.90	4.10	5.42
Direct packaging	0.84	0.74	0.56	0.70
Fixed overhead (absorbed on basis of labour cost)	3.92	2.60	1.98	3.40
Total	13.24	9.54	7.63	11.22

The XY Company has offered to supply 2000 kg of product Q at a delivered price of 90% of EF's selling price. The company will then be able to produce extra product P in its place up to the plant's total capacity.

You are required to state, with supporting calculations:

- (a) whether EF should accept the XY Company's offer; (10 marks)
- (b) which would be the most profitable combination of subcontracting 2000 kg of one product at a price of 90% of its selling price and producing extra quantities of another product up to the plant's total capacity. Assume that the market can absorb the extra output and that XY's quality and delivery are acceptable. (15 marks)

*CIMA P3 Management Accounting*

### *Extra questions for Chapter 11 Pricing decisions and profitability analysis*

#### **11.1 Advanced: Calculation of cost-plus price and minimum short-run price plus a discussion of cost-plus and relevant cost pricing**

Wright is a builder. His business will have spare capacity over the coming six months and he has been investigating two projects.

##### *Project A*

Wright is tendering for a school extension contract. Normally he prices a contract by adding 100% to direct costs, to cover overheads and profit. He calculates direct costs as the actual cost of materials valued on a first-in-first-out basis, plus the estimated wages of direct labour. But for this contract he has prepared more detailed information.

Four types of material will be needed:

Material	Quantity (units):		Price per unit:		
	Needed for contract	Already in stock	Purchase price of units in stock (£)	Current purchase price (£)	Current resale price (£)
Z	1100	100	7.00	10.00	8.00
Y	150	200	40.00	44.00	38.00
X	600	300	35.00	33.00	25.00
W	200	400	20.00	21.00	10.00

Z and Y are in regular use. Neither X nor W is currently used; X has no foreseeable use in the business, but W could be used on other jobs in place of material currently costing £16 per unit.

The contract will last for six months and requires two craftsmen, whose basic annual wage cost is £16,000 each. To complete the contract in time it will also be necessary to pay them a bonus of £700 each. Without the contract they would be retained at their normal pay rates, doing work which will otherwise be done by temporary workers engaged for the contract period at a total cost of £11 800.

Three casual labourers would also be employed specifically for the contract at a cost of £4000 each.

The contract will require two types of equipment: general-purpose equipment already owned by Wright, which will be retained at the end of the contract, and specialized equipment to be purchased second-hand, which will be sold at the end of the contract. The general-purpose equipment cost £21 000 two years ago and is being depreciated on a straight-line basis over a seven-year life (with assumed zero scrap value). Equivalent new equipment can be purchased currently for £49 000. Second-hand prices for comparable general-purpose equipment, and those for the relevant specialized equipment, are shown below.

	General-purpose equipment		Specialized equipment	
	Purchase price	Resale price (£)	Purchase price (£)	Resale price (£)
Current	20 000	17 200	9000	7400
After 6 months:				
if used for 6 months	15 000	12 600	7000	5800
if not used	19 000	16 400	8000	6500

The contract will require the use of a yard on which Wright has a four-year lease at a fixed rental of £2000 a year. If Wright does not get the contract the yard will probably remain empty. The contract will also incur administrative expenses estimated at £5000.

#### *Project B*

If Wright does not get the contract he will buy a building plot for £20 000 and build a house. Building costs will depend on weather conditions:

Weather condition	A	B	C
Probability	0.4	0.4	0.2
Building costs (excluding land)	£60 000	£80 000	£95 000

Similarly the price obtained for the house will depend on market conditions:

Market condition	D	E
Probability	.7	.3
Sale price (net of selling expenses)	£100 000	£120 000

Wright does not have the resources to undertake both projects. The costs of his supervision time can be ignored.

Requirements

- (a) Ignoring the possibility of undertaking project B, calculate:
  - (i) the price at which Wright would tender for the school extension contract if he used his normal pricing method, and
  - (ii) the tender price at which you consider Wright would neither gain nor lose by taking the contract. (10 marks)
- (b) Explain, with supporting calculations, how the availability of project B should affect Wright's tender for the school extension contract. (5 marks)
- (c) Discuss the merits and limitations of the pricing methods used above, and identify the circumstances in which they might be appropriate. (10 marks)

(Total 25 marks)

*ICAEW P2 Management Accounting*

**11.2 Advanced: Calculation of cost-plus selling price and optimum selling price and their impact on profits**

Exejet Engineering Ltd manufactures a range of products for the aircraft industry including the Keroklene fuel filter for use in executive jets. A Keroklene fuel filter consists of a pump unit which contains a filter element. The pump unit has a life of five years, after which the entire fuel filter must be scrapped. The fuel filter element must be replaced at the end of each year.

The total market for this type of fuel filter is stable at a level of 2000 units a year, which Exejet shares with several competitors who supply equivalent units. However, customers must purchase replacement filter elements from the supplier of the original equipment as elements are not interchangeable. The supplier who has the largest share of the market has just set its prices for 2002; these include complete fuel filter units at £390 and replacement filter elements at £80 each.

Pump units are manufactured to Exejet's specification by a sub-contractor at a delivered price of £305 each, but the filter elements are made in house. The budgeted cost of manufacturing 1250 filter elements in 2002 has been estimated as follows:

	£
Direct labour: 1875 hours	18 750
Materials	43 750
Variable overhead	12 500
Fixed overhead	<u>5 000</u>
Total	<u>80 000</u>

Complete Keroklene fuel filters are sold as a pump unit and a filter element packed together, so no assembly operation is required. Fixed costs associated with the packaging and sale of complete units and replacement elements are budgeted at £7000 for 2002, and are recovered on the basis of the direct labour hours used in the manufacture of filter elements.

Sales of the Keroklene fuel filter in 2001 are expected to be 250 complete units, a figure which has remained stable for several years and which generates a demand for 1000 replacement filter elements each year. Management are confident that the same volume will be maintained in 2002 provided that their traditional pricing policy of full cost plus

5%, rounded up to the nearest pound, is maintained. They also believe that any greater profit margin would render their product uncompetitive in its limited market. However, the new management accountant feels that the 5% margin is too low and not necessarily appropriate for both complete units and replacement elements. He has therefore discussed pricing policy with Exejet's sales manager.

The sales manager's firm opinion is that, given the market leader's prices for 2002, Exejet could capture 40% of the total market for complete units if it priced them at £280, but would lose sales of 5 units for every £1 charged above £280. He also believes that sales for complete fuel filter units would be unaffected by the price charged for replacement filter elements provided this did not exceed the price charged by the market leader by more than 20%. However, if replacement elements were priced at more than 20% above the main competitor's prices then heavy sales losses for complete units would result.

Requirements:

- (a) Calculate the selling prices for complete units and replacement elements that would result from the traditional pricing policy. (3 marks)
  - (b) Assuming that the sales manager's views concerning the effects of price changes are correct, determine the optimum selling prices for both complete units and replacement elements. (7 marks)
  - (c) Calculate the change in profits that would result from using the new selling prices calculated in (b) above compared with the original prices calculated in (a) above, for each year in the period 2002 to 2004. (5 marks)
  - (d) Outline any problems you foresee for Exejet in implementing the prices you have calculated in (b) above and suggest how they might be overcome. (5 marks)
  - (e) Discuss the reasons why many companies appear to determine their selling prices on a 'cost-plus' basis and evaluate the appropriateness of such a practice. (5 marks)
- (Total 25 marks)

*ICAEW Management Accounting and Financial Management 2*

### *Extra questions for Chapter 12 Decision-making under conditions of risk and uncertainty*

#### **12.1 Advanced: Expected net present value and decision whether to abandon a project after one year**

A company is considering a project involving the outlay of £300 000 which it estimates will generate cash flows over its 2-year life at the probabilities shown in the following table:

<b>Cash flows for project Year 1</b>	
<b>Cash flow (£)</b>	<b>Probability</b>
100 000	0.25
200 000	0.50
300 000	<u>0.25</u>
	<u>1.00</u>

Year 2		
If cash flow in Year 1 is: (£)	there is a probability of:	that cash flow in Year 2 will be: (£)
100 000	0.25	Nil
	0.50	100 000
	<u>0.25</u>	200 000
	<u>1.00</u>	
200 000	0.25	100 000
	0.50	200 000
	<u>0.25</u>	300 000
	<u>1.00</u>	
300 000	0.25	200 000
	0.50	300 000
	<u>0.25</u>	350 000
	<u>1.00</u>	

*Note:* All cash flows should be treated as being received at the end of the year.

It has a choice of undertaking this project at either of two sites (A or B) whose costs are identical and are included in the above outlay. In terms of the technology of the project itself, the location will have no effect on the outcome.

If the company chooses site B it has the facility to abandon the project at the end of the first year and to sell the site to an interested purchaser for £150 000. This facility is not available at site A.

The company's investment criterion for this type of project is 10% DCF. Its policy would be to abandon the project on site B and to sell the site at the end of year 1 if its expected future cash flows for year 2 were less than the disposal value.

You are required to:

- (a) calculate the NPV of the project on site A; (7 marks)
- (b) (i) explain, based on the data given, the specific circumstances in which the company would abandon the project on site B;
  - (ii) calculate the NPV of the project on site B taking account of the abandonment facility; (14 marks)
- (c) calculate the financial effect of the facility for abandoning the project on site B, stating whether it is positive or negative. (4 marks)

Ignore tax and inflation.

*CIMA P3 Management Accounting*

### *Extra questions for Chapter 13 Capital investment decisions: appraisal methods*

#### **13.1 Discussion of alternative investment appraisal techniques and the calculation of payback and NPV for two mutually exclusive projects**

- (a) Explain why Net Present Value is considered technically superior to Payback and Accounting Rate of Return as an investment appraisal technique even though the

latter are said to be easier to understand by management. Highlight the strengths of the Net Present Value method and the weaknesses of the other two methods.

(8 marks)

- (b) Your company has the option to invest in projects T and R but finance is only available to invest in one of them.

You are given the following projected data:

Project	T £	R £
Initial Cost	70 000	60 000
Profits: Year 1	15 000	20 000
Year 2	18 000	25 000
Year 3	20 000	(50 000)
Year 4	32 000	10 000
Year 5	18 000	3 000
Year 6		2 000

You are told:

- (1) All cash flows take place at the end of the year apart from the original investment in the project which takes place at the beginning of the project.
- (2) Project T machinery is to be disposed of at the end of year 5 with a scrap value of £10 000.
- (3) Project R machinery is to be disposed of at the end of the year 3 with a nil scrap value and replaced with new project machinery that will cost £75 000
- (4) The cost of this additional machinery has been deducted in arriving at the profit projections for R for year 3. It is projected that it will last for three years and have a nil scrap value.
- (5) The company's policy is to depreciate its assets on a straight line basis.
- (6) The discount rate to be used by the company is 14%.

Required:

- (i) If investment was to be made in project R determine whether the machinery should be replaced at the end of year 3. (4 marks)
- (ii) Calculate for projects T and R, taking into consideration your decision in (i) above: (a) Payback period
- (b) Net present value and advise which project should be invested in, stating your reasons. (10 marks)
- (c) Explain what the discount rate of 14% represents and state two ways in which it might have been arrived at. (3 marks)

(Total 25 marks)

*AAT Cost Accounting and Budgeting*

### 13.2 Intermediate: Calculation of break-even point involving PV calculations

CD is an aviation company engaged in providing transport services to tour operators and industrial customers. CD's cost of money is 10%.

CD is considering the acquisition of three new aircraft which have a cost price of £2 000 000 each. Each aircraft has a useful life of five years, requires an overhaul (costing £600 000 at the end of the third year of its life, incurs fixed operating costs of

£100 000 per year and has nil residual value at the end of its useful life.

If an aircraft is purchased and fully utilised then it flies for 2400 hours per year and generates an expected contribution of £1 600 000 per year.

As an alternative to buying an aircraft, it is possible to rent it via a broker. The terms of the rental are a fixed fee of £250 000 per year (payable annually in advance) and a variable charge of £361 per flying hour (calculated and paid annually in arrears). If an aircraft is rented, then CD will avoid fixed operating and overhaul costs. However, CD will incur the same variable operating costs regardless of whether the aircraft is purchased or rented.

Requirements:

- (a) Advise CD on the minimum average flying hours per year required in order to
- make renting an aircraft a viable proposition,
  - make buying an aircraft a viable proposition,
- and advise CD on the average flying hours per year required in order to make buying and renting an aircraft equally viable propositions. (15 marks)
- (b) Advise CD as to how many aircraft it should acquire, and how it should acquire them (purchase or rent) on the basis of a flying hour requirement forecast of 5750 hours per year for five years.

Support your advice with a full financial analysis.

*Note:* You may ignore tax and inflation. (10 marks)  
(Total 25 marks)

*CIMA Stage 3 Management Accounting Applications*

### **13.3 Intermediate: Calculation of NPVs of two projects**

In the manufacture of a company's range of products, the processes give rise to two main types of waste material.

Type A is the outcome of the company's original processes. This waste is sold at £2 per tonne, but this amount is treated as sundry income and no allowance for this is made in calculating product costs.

Type B is the outcome of newer processes in the company's manufacturing activity. It is classified as hazardous, has needed one employee costing £9000 per year specially employed to organise its handling in the factory, and has required special containers whose current resale value is assessed at £18 000. At present the company pays a contractor £14 per tonne for its collection and disposal.

Company management has been concerned with both types of waste and after much research has developed the following proposals.

#### *Type A waste*

This could be further processed by installing plant and equipment costing £20 000 and incurring extra direct costs of £2.50 per tonne and extra fixed costs of £10 000 per annum.

Extra space would be needed, but this could be obtained by taking up some of the space currently used as a free car park for employees. The apportioned rental cost of that land is £2500 per annum and a 'compensation' payment totalling £500 per annum would need to be paid to those employees who would lose their car-parking facilities.

The selling price of the processed waste would be £12.50 per tonne and the quantity available would be 2000 tonnes per annum.

### *Type B waste*

Using brand-new technology, this could be further processed into a non-hazardous product by installing a plant costing £120 000 on existing factory space whose apportioned rental cost is £12 500 per annum.

This plant cost includes a pipeline that would eliminate any special handling of the hazardous waste. Extra direct costs would be £13.50 per tonne and extra fixed costs of £20 000 per annum would be incurred.

The new product would be saleable to a limited number of customers only, but the company has been able to get the option of a contract for two years' sales renewable for a further two years. This would be at a price of £11 per tonne and the output over the next few years is expected to be 4000 tonnes per year.

For Type A waste project, the board wants to achieve an 8% DCF return over four years. For Type B waste project, it wants a 15% DCF return over six years.

You are required

- (a) to recommend whether the company should invest in either or both of the two projects. Give supporting figures and comments. Assume that no capital rationing exists. (20 marks)
- (b) to explain briefly in respect of Type B waste project what major reservations (apart from the cost and investment figures) you might have about the project, irrespective of whether you recommend it in (a) above. (5 marks)

Ignore inflation and taxation.

(Total 25 marks)

*CIMA Stage 4 Management Accounting Decision Making*

### **13.4 Advanced: Accounting Rate of Return**

Armcliff Ltd is a division of Shevin plc which requires each of its divisions to achieve a rate of return on capital employed of at least 10% p.a. For this purpose, capital employed is defined as fixed capital and investment in stocks. This rate or return is also applied as a hurdle rate for new investment projects. Divisions have limited borrowing powers and all capital projects are centrally funded.

The following is an extract from Armcliff's divisional accounts:

#### **Profit and loss account for the year ended 31 December**

	(£m)
Turnover	120
Cost of sales	<u>(100)</u>
Operating profit	20

#### **Assets employed as at 31 December 1994**

	(£m)	(£m)
Fixed (net):		75
Current assets (inc. stocks £25m)	45	
Current liabilities	<u>(32)</u>	<u>13</u>
Net capital employed		<u>88</u>

Armcliff's production engineers wish to invest in a new computer-controlled press. The equipment cost is £14m. The residual value is expected to be £2m after four years operation, when the equipment will be shipped to a customer in South America.

The new machine is capable of improving the quality of the existing product and also of producing a higher volume. The firm's marketing team is confident of selling the increased volume by extending the credit period. The expected additional sales are:

Year 1	2 000 000 units
Year 2	1 800 000 units
Year 3	1 600 000 units
Year 4	1 600 000 units

Sales volume is expected to fall over time due to emerging competitive pressures. Competition will also necessitate a reduction in price by £0.5 each year from the £5 per unit proposed in the first year. Operating costs are expected to be steady at £1 per unit, and allocation of overheads (none of which are affected by the new project) by the central finance department is set at £0.75 per unit.

Higher production levels will require additional investment in stocks of £0.5m, which would be held at this level until the final stages of operation of the project. Customers at present settle accounts after 90 days on average.

Required:

- (a) Determine whether the proposed capital investment is attractive to Armcliff, using the average rate of return on capital method, as defined as average profit-to-average capital employed, ignoring debtors and creditors.

[Note: Ignore taxes] (7 marks)

- (b) (i) Suggest *three* problems which arise with the use of the average return method for appraising new investment. (3 marks)

- (ii) In view of the problems associated with the ARR method, why do companies continue to use it in project appraisal? (3 marks)

(Total 13 marks)

*ACCA Paper 8 Managerial Finance*

### 13.5 Advanced: Calculation of minimum selling price of a machine based on PV of future cash flows

FG Ltd has two machines used on a contract for a large customer, LC Ltd. Each machine can produce the same product and has a capacity of 40 000 units per year, but each has different characteristics resulting in the following total annual costs at different production levels which must be in lots of 10 000 units:

Annual production level (units)	Annual total costs	
	Machine X (£000)	Machine X (£000)
Nil	52*	65*
10 000	105	108
20 000	132	122
30 000	148	131
40 000	174	204

\*This figure includes:

Direct materials	} usable in other sections of the company if the machine were disposed of
Direct labour	
Direct expenses	
Depreciation	£8000 p.a.
Apportioned production overhead	£12 000 p.a.

The contract price to LC Ltd is £6.00 per unit. The company's cost of capital is 13%. FG Ltd expects that sales will end in five years' time and that the quantities required by LC Ltd will average 75% of its present total capacity. FG Ltd has received an invitation to sell either of the machines to an overseas organization and must decide whether it should do so and, if so, at what price. If it retains either or both machines each is expected to have a scrap value of £20 000 in five years' time. If one of the machines is sold to the overseas organization, FG Ltd will not have to pay any penalty to LC Ltd on account of any shortfall in delivery.

You are required

- (a) to set out a table from 10 000 to 80 000 units to show which machine or combination of machines should be used at each level to yield minimum costs to FG Ltd; (7 marks)
- (b) to recommend to FG Ltd
- which level of total unit sales will yield the largest profit, (3 marks)
  - which machine it should offer to the overseas company and the minimum price at which it should offer that machine (to the nearest £1000 upwards); (9 marks)

Show your supporting calculations.

- (c) assuming that the price at (b) (ii) above is acceptable, to explain briefly *three* major factors that FG Ltd should consider when making its eventual decision. (6 marks)

Ignore taxation

(25 marks)

*CIMA Stage 4 Management Accounting - Decision Making*

### **13.6 Advanced: Calculation of target sales required to meet the objectives specified by the Management Board of a theatre**

A theatre with some surplus accommodation proposes to extend its catering facilities to provide light meals to its patrons.

The Management Board is prepared to make initial funds available to cover capital costs. It requires that these be repaid over a period of five years at a rate of interest of 14%.

The capital costs are estimated at £60 000 for equipment that will have a life of five years and no residual value. Running costs of staff, etc. will be £20 000 in the first year, increasing by £2000 in each subsequent year. The Board proposes to charge £5000 per annum for lighting, heating and other property expenses, and wants a nominal £2500 per annum to cover any unforeseen contingencies. Apart from this, the Board is not looking for any profit, as such, from the extension of these facilities, because it believe that this will enable more theatre seats to be sold. It is proposed that costs should be recovered by setting prices for the food at double the direct costs.

It is not expected that the full sales level will be reached until Year 3. The proportions of

that level estimated to be reached in Years 1 and 2 are 35% and 65% respectively.

You are required to

(a) calculate the sales that need to be achieved in *each* of the *five* years to meet the Board's targets; (13 marks)

(b) comment briefly on *five* aspects of the proposals that you consider merit further investigation. (7 marks)

Ignore taxation and inflation.

(Total 20 marks)

*CIMA Stage 4 Management Accounting - Decision Making*

### **Extra questions for Chapter 14 Capital investment decisions: 2**

#### **14.1 Intermediate: Computation of NPV and tax payable**

Sound Equipment Ltd was formed five years ago to manufacture parts for hi-fi equipment. Most of its customers were individuals wanting to assemble their own systems. Recently, however, the company has embarked on a policy of expansion and has been approached by JBZ plc, a multinational manufacturer of consumer electronics. JBZ has offered Sound Equipment Ltd a contract to build an amplifier for its latest consumer product. If accepted, the contract will increase Sound Equipment's turnover by 20%.

JBZ's offer is a fixed price contract over three years, although it is possible for Sound Equipment to apply for subsequent contracts. The contract will involve Sound Equipment purchasing a specialist machine for £150 000. Although the machine has a 10-year life, it would be written off over the three years of the initial contract as it can only be used in the manufacture of the amplifier for JBZ.

The production director of Sound Equipment has already prepared a financial appraisal of the proposal. This is reproduced below. With a capital cost of £150 000 and total profits of £60 300, the production director has calculated the return on capital employed as 40.2%. As this is greater than Sound Equipment's cost of capital of 18%, the production director is recommending that the board accepts the contract.

	<b>Year 1</b> <b>(£)</b>	<b>Year 2</b> <b>(£)</b>	<b>Year 3</b> <b>(£)</b>	<b>Total</b>
Turnover	180 000	180 000	180 000	540 000
Materials	60 000	60 000	60 000	180 000
Labour	40 000	40 000	40 000	120 000
Depreciation	50 000	50 000	50 000	150 000
Pre-tax profit	30 000	30 000	30 000	90 000
Corporation tax at 33%	9 900	9 900	9 900	29 700
After-tax profit	20 100	20 100	20 100	60 300

You are employed as the assistant accountant to Sound Equipment Ltd and report to John Green, the financial director, who asks you to carry out a full financial appraisal of the proposed contract. He feels that the production director's presentation is inappropriate. He provides you with the following additional information:

- Sound Equipment pays corporation tax at the rate of 33%;
- the machine will qualify for a 25% writing-down allowance on the reducing balance;

- the machine will have no further use other than in manufacturing the amplifier for JBZ;
- on ending the contract with JBZ, any outstanding capital allowances can be claimed as a balancing allowance;
- the company's cost of capital is 18%;
- the cost of materials and labour is forecast to increase by 5% per annum for years 2 and 3.

John Green reminds you that Sound Equipment operates a just-in-time stock policy and that production will be delivered immediately to JBZ, who will, under the terms of the contract, immediately pay for the deliveries. He also reminds you that suppliers are paid immediately on receipt of goods and that employees are also paid immediately.

Write a report to the financial director. Your report should:

- (a) use the net present value technique to identify whether or not the initial three-year contract is worthwhile;
- (b) explain your approach to taxation in your appraisal;
- (c) identify *one* other factor to be considered before making a final decision.

*Notes:*

For the purpose of this task, you may assume the following:

- the machine would be purchased at the beginning of the accounting year;
- there is a one-year delay in paying corporation tax;
- all cashflows other than the purchase of the machine occur at the end of each year;
- Sound Equipment has no other assets on which to claim capital allowances.

*AAT Technicians Stage*

### **14.2 Advanced: Timing of replacement decision**

XYZ plc uses 10 very old injection moulding machines, which are of a type which are no longer obtainable. It is proposed that they be replaced by 4 'new model' machines with the same total capacity.

The old machines have a further life of 3 years and will have no salvage value at that time - the present salvage value averages £5000 per machine. Annual operating costs are £10 000 per machine.

Each new machine, which has a life of 7 years, costs £52 000 and is expected to have an end of life scrap value of £4000. Total annual operating costs are £15 000 per machine.

The 6 operators who would be released following replacement of the old machines would be redeployed within the firm thereby saving some additional external recruitment.

There is the possibility that the installation of the new machines would entail modifications, costing £60 000, to the factory building.

An appropriate discount rate suitable for the appraisal of all cash flows relevant to this decision is 12%.

**Required:**

Ignoring the possibility of modifications to the factory building determine whether the old machines should be replaced now or operated for a further 3 years.

Indicate how the costs of modifying the factory building should be included in the analysis.

Specify any assumptions and outline the deficiencies inherent in your analysis. Taxation may be ignored. (12 marks)

*ACCA Level 3 Financial Management*

**14.3 Advanced: Evaluation of projects with unequal lives**

A2Z p.l.c. supports the concept of terotechnology or life cycle costing for new investment decisions covering its engineering activities. The financial side of this philosophy is now well established and its principles extended to all other areas of decision making.

The company is to replace a number of its machines and the Production Manager is torn between the Exe machine, a more expensive machine with a life of 12 years, and the Wye machine with an estimated life of 6 years. If the Wye machine is chosen it is likely that it would be replaced at the end of 6 years by another Wye machine. The pattern of maintenance and running costs differs between the two types of machine and relevant data are shown below.

	<b>Exe (£)</b>	<b>Wye (£)</b>
Purchase price	19 000	13 000
Trade-in value	3 000	3 000
Annual repair costs	2 000	2 600
Overhaul costs	4 000	2 000
	(at year 8)	(at year 4)
Estimated financing costs averaged over machine life	10% p.a.	10% p.a.

You are required to

- (a) recommend, with supporting figures, which machine to purchase, stating any assumptions made; (10 marks)
  - (b) describe an appropriate method of comparing replacement proposals with unequal lives; (4 marks)
  - (c) describe life cycle costing and give the benefits that are likely to accrue from its use. Support your answer with examples of changes in practice that could occur from adopting this philosophy. (6 marks)
- (Total 20 marks)

*CIMA Stage 3 Management Accounting Techniques*

**14.4 Advanced: Adjusting cash flows for inflation and identification of relevant cash flows**

Ramelton plc is a large entirely equity financed engineering company, whose financial year ends on 31 December.

The company's objective is to maximise shareholder's wealth, and it generates sufficient taxable profits to relieve all capital allowances at the earliest opportunity.

Currently one of the company's divisional managers has to fulfil a particular contract, and he can do this in one of two ways.

Under the first (Proposal 1), he can purchase plant and machinery; while under the second (Proposal 2), he can use a machine already owned by the company.

The end-year operating net cash inflows in nominal (i.e. money) terms and before corporation tax are as follows:

	<b>2001</b>	<b>2002</b>	<b>2003</b>
	<b>£</b>	<b>£</b>	<b>£</b>
Proposal 1	40 000	55 000	70 000
Proposal 2	70 000	70 000	—

#### *Proposal 1*

Under the first proposal the company will incur an outlay of £62 500 on 31 December 2000 for the purchase of plant and machinery.

The labour force required under this proposal will have to be recruited locally, and budgeted wages have been taken into account in preparing the estimates of future nominal net cash inflows given above.

The plant and machinery is expected to be scrapped on 31 December 2003, the nominal cash proceeds at that date being projected as £5000.

#### *Proposal 2*

The second proposal covers a two year period from 31 December 2000. It will require the company to use a machine which was purchased for £150 000 a number of years ago when 100% first year capital allowances were available and which is therefore fully written down for tax purposes. The company has no current use for the machine, and its net realisable value at 31 December 2000 is £50 000.

However, if retained unused there would be no incremental costs of keeping it, and it would be sold on 1 January 2002 for an estimated £60 000 in nominal money terms. If used under the second proposal, the expected residual value of the machine would be zero at the end of the two year period.

The labour force required under the second proposal would be recruited from elsewhere within the company, and in end-year nominal cash flow terms would be paid £20 000 and £21 600 respectively for 2001 and 2002. However, the staff that would have to be taken on in other divisions to replace those switched over to the new project would in corresponding end-year nominal cash flow terms cost £22 000 for 2001 and £23 760 for 2002.

The end-year nominal net cash inflows of £70 000 for both 2001 and 2002 which are associated with the second proposal are after deducting the remuneration of the work force actually employed on the scheme.

#### *Working capital requirements*

Working capital requirements in nominal money terms at the beginning of each year are estimated at 10% of the end-year operating net cash inflows referred to in the table above.

The working capital funds will be released when a proposal is completed.

There are no tax effects associated with changes in working capital.

#### *Other information*

Expected annual inflation rates over the next four calendar years are:

<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>
10%	8%	6%	5%

The company's real cost of capital is estimated at 10% per annum and is expected to remain at that rate for the foreseeable future.

The corporation is expected to be 50% over the planning period, tax being payable twelve months after the accounting year end to which it relates.

The annual writing down allowance for plant and machinery is 20% reducing balance. A full writing down allowance is given in the year of acquisition, but none in the year of disposal. Any balancing charges or allowances are calculated for individual assets (ie. they are not part of the general pool for tax purposes).

Requirements:

- (a) Calculate the net present value at 31 December 2000 of each of the two mutually exclusive projects; and (15 marks)
- (b) indicate briefly any reservations you might have in basing an investment decision on these figures. (3 marks)

*Note:* Calculate to the nearest £.

Show all calculations clearly.

Repetition of a project is not possible.

(Total 18 marks)

*ICAEW Management Accounting and Financial Management 1*

#### **14.5 Advanced: Calculation of the internal rate of return using the interpolation method and a discussion of asset betas**

Amble plc is evaluating the manufacture of a new consumer product. The product can be introduced quickly, and has an expected life of four years before it is replaced by a more efficient model. Costs associated with the product are expected to be:

*Direct costs* (per unit)

Labour:

3.5 skilled labour hours at £5 per hour

4 unskilled labour hours at £3 per hour

Materials:

6 kilos of material Z at £1.46 per kilo

Three units of component P at £4.80 per unit

One unit of component Q at £6.40

Other variable costs: £2.10 per unit

*Indirect costs*

Apportionment of management salaries £105 000 per year

Tax allowable depreciation of machinery £213 000 per year

Selling expenses (not including any salaries) £166 000 per year

Apportionment of head office costs £50 000 per year

Rental of buildings £100 000 per year

Interest charges £104 000 per year

Other overheads £70 000 per year (including apportionment of building rates £20 000.

NB rates are a local tax on property).

If the new product is introduced it will be manufactured in an existing factory, and will have no effect on rates payable. The factory could be rented for £120 000 per year (not

including rates), to another company if the product is not introduced.

New machinery costing £864 000 will be required. The machinery is to be depreciated on a straight-line basis over four years, and has an expected salvage value of £12 000 after four years. The machinery will be financed by a four year fixed rate bank loan at an interest rate of 12% per year. Additional working capital requirements may be ignored. The product will require two additional managers to be recruited at an annual gross cost of £25 000 each, and one manager currently costing £20 000 will be moved from another factory where he will be replaced by a deputy manager at a cost of £17 000 per year. 70 000 kilos of material Z are already in stock and are not required for other production. The realisable value of the material is £99 000.

The price per unit of the product in the first year will be £110, and demand is projected at 12 000, 17 500, 18 000 and 18 500 units in years 1 to 4 respectively.

The inflation rate is expected to be approximately 5% per year, and prices will be increased in line with inflation. Wage and salary costs are expected to increase by 7% per year, and all other costs (including rent) by 5% per year. No price or cost increases are expected in the first year of production.

Corporate tax is at the rate of 35% payable in the year the profit occurs. Assume that all sales and costs are on a cash basis and occur at the end of the year, except for the initial purchase of machinery which would take place immediately. No stocks will be held at the end of any year.

Required:

(a) Calculate the expected internal rate of return (IRR) associated with the manufacture of the new product. (15 marks)

(b) What is meant by an asset beta?

If you were told that the company's asset beta is 1.2, the market return is 15% and the risk free rate is 8% discuss whether you would recommend introducing the new product. (5 marks)

(c) Amble is worried that the government might increase corporate tax rates.

Show by how much the tax rate would have to change before the project is not financially viable. A discount rate of 17% per year may be assumed for part (c).

(5 marks)

(Total 25 marks)

*ACCA Level 3 Financial Management*

#### **14.6 Advanced: Expected net present value and value of additional information**

The directors of Astros plc are considering the purchase and exploitation of a disused tin mine which is being offered for sale for £50 000. A review of the mine's history shows that the total amount of pure tin that can be extracted depends upon the type of rock formations in the area and that only the following three possibilities exist:

<b>Rock type</b>	<b>Total tin output</b>	<b>Probability</b>
A	240 tonnes	0.4
B	120 tonnes	0.4
C	72 tonnes	0.2

If Astros purchases the mine, the first year of ownership will be spent in making the mine and associated smelting plants operational, at a cost of £95 000 payable at the end

of the year. Production will start at the beginning of the second year of ownership, when the output of pure tin will be 2 tonnes per month, whatever the type of rock formations. This production rate will remain unchanged until the mine is exhausted. During the first year of production, the directors expect that the resale value of the tin will be £9900 per tonne and that labour and other production costs will be £187 000. These revenues and costs are expected to rise by 10% per annum in subsequent years. These cash flows can be assumed to occur at the end of the year in which they arise.

Special mining equipment will also be purchased at the beginning of the first year of production at a cost of £48 000. This equipment will be sold immediately on the cessation of production, at an amount expected to equal its purchase price, less £200 for every tonne of tin produced during its life. Other revenues from the sale of the mine at the end of production are expected to equal the closure costs exactly.

Astros plc has received permission from the present owners of the mine to carry out a geological survey of the area. The survey would cost £10 000 and would reveal for certain the type of rock formations in the area and hence how much tin could be produced from the mine.

Astros plc has a money cost of capital of 21% per annum for this type of project.

You are required to:

- (a) calculate the expected net present value of purchasing the mine, assuming that the geological survey is *not* undertaken. (15 marks)
- (b) advise the directors of Astros plc whether or not they should commission the geological survey. (10 marks)

Ignore taxation.

(Total 25 marks)

*ICAEW P2 Financial Management*

### *Extra questions for Chapter 15 The budgeting process*

#### **15.1 Advanced**

- (a) ‘... corporate planning and budgeting are complementary, rather than the former superseding the latter.’  
Compare the aims and main features of ‘corporate planning’ and ‘budgeting’ systems. (12 marks)
- (b) The aims of zero-base budgeting have been described recently in the following terms: ‘Zero-base budgeting is a general management tool that can provide a systematic way to evaluate all operations and programmes; a means of establishing a working structure to recognise priorities and performance measures for current and future plans; in essence, a methodology for the continual redirection of resources into the highest priority programmes, and to explicitly identify tradeoffs among long-term growth, current operations, and profit needs.’  
Explain how a system of zero-base budgeting works, and to assess its likely success in attaining the aims set out above. (13 marks)

*ICAEW Management Accounting*

#### **15.2 Intermediate: Calculation of sales to achieve target profit and preparation of functional budgets**

There is a continuing demand for three sub-assemblies -A, B, and C - made and sold by

MW Limited. Sales are in the ratios of A 1, B 2, C 4 and selling prices are A £215, B £250, C £300.

Each sub-assembly consists of a copper frame onto which are fixed the same components but in differing quantities as follows:

<b>Sub-assembly</b>	<b>Frame</b>	<b>Component D</b>	<b>Component E</b>	<b>Component F</b>
A	1	5	1	4
B	1	1	7	5
C	1	3	5	1
Buying in costs, per unit	£20	£8	£5	£3

Operation times by labour for each sub-assembly are:

<b>Sub-assembly</b>	<b>Skilled hours</b>	<b>Unskilled hours</b>
A	2	2
B	1½	2
C	1½	3

The skilled labour is paid £6 per hour and unskilled £4.50 per hour. The skilled labour is located in a machining department and the unskilled labour in an assembly department. A five-day week of 37½ hours is worked and each accounting period is for four weeks. Variable overhead per sub-assembly is A £5, B £4 and C £3.50. At the end of the current year, stocks are expected to be as shown below but because interest rates have increased and the company utilises a bank overdraft for working capital purposes, it is planned to effect a 10% reduction in all finished sub-assemblies and bought-in stocks during Period 1 of the forthcoming year.

Forecast stocks at current year end:

<b>Sub-assembly</b>	<b>Copper frames</b>	<b>1 000</b>
A	300	Component D 4 000
B	700	Component E 10 000
C	1600	Component F 4 000

Work-in-progress stocks are to be ignored.

Overhead for the forthcoming year is budgeted to be Production £728 000, Selling and Distribution £364 000 and Administration £338 000. These costs, all fixed, are expected to be incurred evenly throughout the year and are treated as period costs.

Within Period 1 it is planned to sell one thirteenth of the annual requirements which are to be the sales necessary to achieve the company profit target of £6.5 million before tax.

You are required:

- (a) to prepare budgets in respect of Period 1 of the forthcoming year for
  - (i) sales, in quantities and value;
  - (ii) production, in quantities only;
  - (iii) materials usage, in quantities;

- (iv) materials purchases, in quantities and value;
  - (v) manpower budget, i.e. numbers of people needed in each of the machining department and the assembly department; (20 marks)
  - (b) to discuss the factors to be considered if the bought-in stocks were to be reduced to one week's requirements - this has been proposed by the purchasing officer but resisted by the production director. (5 marks)
- (Total 25 marks)
- CIMA Stage 2 Cost Accounting*

### 15.3 Intermediate: Preparation of functional budgets

#### *Data*

Wilmslow Ltd makes two products, the Alpha and the Beta. Both products use the same material and labour but in different amounts. The company divides its year into four quarters, each of twelve weeks. Each week consists of five days and each day comprises 7 hours.

You are employed as the management accountant to Wilmslow Ltd and you originally prepared a budget for quarter 3, the twelve weeks to 17 September. The basic data for that budget is reproduced below.

#### **Original budgetary data: quarter 3 12 weeks to 17 September**

Product	Alpha	Beta
Estimated demand	1800 units	2100 units
Material per unit	8 kilograms	12 kilograms
Labour per unit	3 hours	6 hours

Since the budget was prepared, three developments have taken place.

1. The company has begun to use linear regression and seasonal variations to forecast sales demand. Because of this, the estimated demand for quarter 3 has been revised to 2000 Alphas and 2400 Betas.
2. As a result of the revised sales forecasting, you have developed more precise estimates of sales and closing stock levels.
  - The sales volume of both the Alpha and Beta in quarter 4 (the twelve weeks ending 10 December) will be 20% more than in the revised budget for quarter 3 as a result of seasonal variations.
  - The closing stock of finished Alphas at the end of quarter 3 should represent 5 days sales for quarter 4.
  - The closing stock of finished Betas at the end of quarter 3 should represent 10 days sales for quarter 4.
  - Production in quarter 4 of both Alpha and Beta is planned to be 20% more than in the revised budget for quarter 3. The closing stock of materials at the end of quarter 3 should be sufficient for 20 days production in quarter 4.
3. New equipment has been installed. The workforce is not familiar with the equipment. Because of this, for quarter 3, they will only be working at 80% of the efficiency assumed in the original budgetary data.

Other data from your original budget which has not changed is reproduced below:

- 50 production employees work a 35 hour week and are each paid £210 per week;

- overtime is paid for at £9 per hour;
- the cost of material is £10 per kilogram;
- opening stocks at the beginning of quarter 3 are as follows:
  - finished Alphas 500 units
  - finished Betas 600 units
  - material 12 000 kilograms
- there will not be any work in progress at any time.

### *Task 1*

The production director of Wilmslow Ltd wants to schedule production for quarter 3 (the twelve weeks ending 17 September) and asks you to use the revised information to prepare the following:

- the revised production budget for Alphas and Betas;
- the material purchases budget in kilograms;
- a statement showing the cost of the material purchases;
- the labour budget in hours;
- a statement showing the cost of labour.

### *Data*

Margaret Brown is the financial director of Wilmslow Ltd. She is not convinced that the use of linear regression, even when adjusted for seasonal variations, is the best way of forecasting sales volumes for Wilmslow Ltd.

The quality of sales forecasting is an agenda item for the next meeting of the Board of Directors and she asks for your advice.

### *Task 2*

Write a *brief* memo to Margaret Brown. Your memo should:

- identify *two* limitations of the use of linear regression as a forecasting technique;
- suggest *two* other ways of sales forecasting.

*AAT Contribution to the planning and allocation of resources*

## **15.4 Intermediate: Preparation of cash budgets and calculation of stock, debtor and creditor balances**

In the near future a company will purchase a manufacturing business for £315 000, this price to include goodwill (£150 000), equipment and fittings (£120 000), and stock of raw materials and finished goods (£45 000). A delivery van will be purchased for £15 000 as soon as the business purchase is completed. The delivery van will be paid for in the second month of operations.

The following forecasts have been made for the business following purchase:

- Sales (before discounts) of the business's single product, at a mark-up of 60% on production cost, will be:

Month	1	2	3	4	5	6
(£000)	96	96	92	96	100	104

25% of sales will be for cash; the remainder will be on credit, for settlement in the month following that of sale. A discount of 10% will be given to selected credit customers, who represent 25% of gross sales.

(ii) Production cost will be £5.00 per unit. The production cost will be made up of:

raw materials	£2.50
direct labour	£1.50
fixed overhead	£1.00

- (iii) Production will be arranged that closing stock at the end of any month is sufficient to meet sales requirements in the following month. A value of £30 000 is placed on the stock of finished goods which was acquired on purchase of the business. This valuation is based on the forecast of production cost per unit given in (ii) above.
- (iv) The single raw material will be purchased so that stock at the end of a month is sufficient to meet half of the following month's production requirements. Raw material stock acquired on purchase of the business (£15 000) is valued at the cost per unit which is forecast as given in (ii) above. Raw materials will be purchased on one month's credit.
- (v) Costs of direct labour will be met as they are incurred in production.
- (vi) The fixed production overhead rate of £1.00 per unit is based upon a forecast of the first year's production of 150 000 units. This rate includes depreciation of equipment and fittings on a straight-line basis over the next five years.
- (vii) Selling and administration overheads are all fixed, and will be £208 000 in the first year. These overheads include depreciation of the delivery van at 30% per annum on a reducing balance basis. All fixed overheads will be incurred on a regular basis, with the exception of rent and rates. £25 000 is payable for the year ahead in month one for rent and rates.

Required:

- (a) Prepare a monthly cash budget. You should include the business purchase and the first four months of operations following purchase. (17 marks)
- (b) Calculate the stock, debtor, and creditor balances at the end of the four month period. Comment briefly upon the liquidity situation. (8 marks)
- (Total 25 marks)

*ACCA Level 1 Costing*

### **15.5 Intermediate: Preparation of cash budgets**

A redundant manager who received compensation of £80 000 decides to commence business on 4 January, manufacturing a product for which he knows there is a ready market. He intends to employ some of his former workers who were also made redundant but they will not all commence on 4 January. Suitable premises have been found to rent and second-hand machinery costing £60 000 has been bought out of the £80 000. This machinery has an estimated life of five years from January and no residual value.

*Other data*

1. Production will begin on 4 January and 25% of the following month's sales will be manufactured in January. Each month thereafter the production will consist of 75% of the current month's sales and 25% of the following month's sales.
2. Estimated sales are

	(units)	(£)
January	Nil	Nil
February	3200	80 000
March	3600	90 000
April	4000	100 000
May	4000	100 000

3. Variable production cost per unit

	(£)
Direct materials	7
Direct wages	6
Variable overhead	<u>2</u>
	<u>15</u>

4. Raw material stocks costing £10 000 have been purchased (out of the manager's £80 000) to enable production to commence and it is intended to buy, each month, 50% of the materials required for the following month's production requirements. The other 50% will be purchased in the month of production. Payment will be made 30 days after purchase.
5. Direct workers have agreed to have their wages paid into bank accounts on the seventh working day of each month in respect of the previous month's earnings.
6. Variable production overhead: 60% is to be paid in the month following the month it was incurred and 40% is to be paid one month later.
7. Fixed overheads are £4000 per month. One quarter of this is paid in the month incurred, one half in the following month, and the remainder represents depreciation on the second-hand machinery.
8. Amounts receivable: a 5% cash discount is allowed for payment in the current month and 20% of each month's sales qualify for this discount. 50% of each month's sales are received in the following month, 20% in the third month and 8% in the fourth month. The balance of 2% represents anticipated bad debts.

You are required to:

- (a) (i) prepare a cash budget for each of the first four months, assuming that overdraft facilities will be available, (17 marks)
- (ii) state the amount receivable from customers in May; (4 marks)
- (b) describe briefly the benefits to cash budgeting from the use of a particular type of software package. (4 marks)

(Total 25 marks)

*CIMA Stage 2 Cost Accounting 2*

## Extra questions for Chapter 16 Management control systems

### 16.1 Advanced

A local government authority is organized so that some operating departments (e.g. building, transport, printing, catering) supply services to several functional departments (e.g. education, recreational facilities, road works, fire service). At present the total cost of each service department is allocated on a simple proportional basis to user departments.

As an aid to cost control the authority has decided to charge the user departments for these services on the basis of cost or market price whichever is the lower.

You are required to:

- (a) indicate the benefits likely to arise from this decision;
- (b) outline the problems you expect may be encountered in putting the decision into practice;
- (c) state how these problems might be overcome. (20 marks)

*CIMA P3 Management Accounting*

### 16.2 Advanced

- (a) Budgetary controls have been likened to a system of thermostatic control.
  - (i) In what respects is the analogy inappropriate? (10 marks)
  - (ii) What are the matters raised in (a) (i) above that need to be considered when setting a structure for an effective budgetary control system? (8 marks)
- (b) Describe the pre-conditions which should exist if budget variance analysis is to be of value to an organization. (7 marks)

(Total 25 marks)

*CIMA Stage 4 - Control and Audit*

### 16.3 Intermediate: Preparation of flexible budgets based on an analysis of past cost behaviour and an adjustment for inflation

TJ Limited is an industry sector which is recovering from the recent recession. The directors of the company hope next year to be operating at 85% of capacity, although currently the company is operating at only 65% of capacity. 65% of capacity represents output of 10 000 units of the single product which is produced and sold. One hundred direct workers are employed on production for 200 000 hours in the current year.

The flexed budgets for the current year are:

Capacity level	55% (£)	65% (£)	75% (£)
Direct materials	846 200	1 000 000	1 153 800
Direct wages	1 480 850	1 750 000	2 019 150
Production overhead	596 170	650 000	703 830
Selling and distribution overhead	192 310	200 000	207 690
Administration overhead	<u>120 000</u>	<u>120 000</u>	<u>120 000</u>
Total costs	<u>3 235 530</u>	<u>3 720 000</u>	<u>4 204 470</u>

Profit in any year is budgeted to be  $16\frac{2}{3}\%$  of sales.

The following percentage increases in costs are expected for next year.

	<b>Increase %</b>
Direct materials	6
Direct wages	3
Variable production overhead	7
Variable selling and distribution overhead	7
Fixed production overhead	10
Fixed selling and distribution overhead	7.5
Administration overhead	10

You are required:

- (a) to prepare for next year a flexible budget statement on the assumption that the company operates at 85% of capacity; your statement should show both contribution and profit; (14 marks)
- (b) to discuss briefly three problems which may arise from the change in capacity level; (6 marks)
- (c) to state who is likely to serve on a budget committee operated by TJ Limited and explain the purpose of such a committee. (5 marks)

(Total 25 marks)

*CIMA Stage 2 Cost Accounting*

**16.4** A manufacturing company has the following budgeted costs for one month which are based on a normal capacity level of 40 000 hours.

A departmental overhead absorption rate of £4.40 per hour has been calculated, as follows:

	<b>Fixed (£000)</b>	<b>Variable per hour (£)</b>
Overhead:		
Management and supervision	30	—
Shift premium	—	0.10
National Insurance and pension costs	6	0.22
Inspection	20	0.25
Consumable supplies	6	0.18
Power for machinery	—	0.20
Lighting and heating	4	—
Rates	9	—
Repairs and maintenance	8	0.15
Materials handling	10	0.30
Depreciation of machinery	15	—
Production administration	<u>12</u>	<u>—</u>
	<u>120</u>	
Overhead rate per hour:	Variable	1.40
	Fixed	<u>3.00</u>
	Total	<u>£4.40</u>

During the month of April, the company actually worked 36 000 hours producing 36 000 standard hours of production and incurred the following overhead costs:

	(£000)
Management and supervision	30.0
Shift premium	4.0
National Insurance and pension costs	15.0
Inspection	28.0
Consumable supplies	12.7
Power for machinery	7.8
Lighting and heating	4.2
Rates	9.0
Repairs and maintenance	15.1
Materials handling	21.4
Depreciation of machinery	15.0
Production administration	11.5
Idle time	<u>1.6</u>
	<u>175.3</u>

You are required to:

- (a) prepare a statement showing for April the flexible budget for the month, the actual costs and the variance for each overhead item;
- (b) comment on each variance of £1000 or more by suggesting possible reasons for the variances reported;
- (c) state, for control purposes, with reasons to support your conclusions:
  - (i) whether (b) above is adequate; and
  - (ii) whether the statement prepared in respect of the request in (a) above could be improved, and if so, how.

*CIMA Stage 2 Cost Accounting  
Pilot Paper*

### *Extra questions for Chapter 17 Standard costing and variance analysis 1*

#### **17.1 Intermediate: Computation of labour and material variances for a hotel**

You work as the assistant to the management accountant for a major hotel chain, Stately Hotels plc. The new manager of one of the largest hotels in the chain, the Regent Hotel, is experimenting with the use of standard costing to plan and control the costs of preparing and cleaning the hotel bedrooms.

Two of the costs involved in this activity are cleaning labour and the supply of presentation soap packs.

##### *Cleaning labour:*

Part-time staff are employed to clean and prepare the bedrooms for customers. The employees are paid for the number of hours that they work, which fluctuates on a daily basis depending on how many rooms need to be prepared each day.

The employees are paid a standard hourly rate for weekday work and a higher hourly

rate at the weekend. The standard cost control system is based on an average of these two rates, at £3.60 per hour.

The standard time allowed for cleaning and preparing a bedroom is fifteen minutes.

*Presentation soap packs:*

A presentation soap pack is left in each room every night. The packs contain soap, bubble bath, shower gel, hand lotion etc. Most customers use the packs or take them home with them, but many do not. The standard usage of packs used for planning and control purposes is one pack per room night.

The packs are purchased from a number of different suppliers and the standard price is £1.20 per pack. Stocks of packs are valued in the accounts at standard price.

*Actual results for May:*

During May 8400 rooms were cleaned and prepared. The following data were recorded for cleaning labour and soap packs.

Cleaning labour paid for:

Weekday labour	1850 hours at £3 per hour
Weekend labour	<u>700</u> hours at £4.50 per hour
	<u>2550</u>

Presentation soap packs purchased and used:

6530 packs at £1.20 each
920 packs at £1.30 each
<u>1130</u> packs at £1.40 each
<u>8580</u>

*Task*

- (a) Using the data above, calculate the following cost variances for May:
- (i) soap pack price;
  - (ii) soap pack usage;
  - (iii) cleaning labour rate;
  - (iv) cleaning labour utilization or efficiency.
- (b) Suggest one possible cause for each of the variances which you have calculated, and outline any management action which may be necessary.

*AAT Technicians Stage*

**17.2 Intermediate: Computation of labour and material variances and reconciliation statements**

Malton Ltd operates a standard marginal costing system. As the recently appointed management accountant to Malton's Eastern division, you have responsibility for the preparation of that division's monthly cost reports. The standard cost report uses variances to reconcile the actual marginal cost of production to its standard cost. The Eastern division is managed by Richard Hill. The division only makes one product, the Beta. Budgeted Beta production for May was 8000 units, although actual production was 9500 units.

In order to prepare the standard cost report for May, you have asked a member of your staff to obtain standard and actual cost details for the month of May. This information is reproduced below:

Unit standard cost				Actual details for May		
	Quantity	Unit price	Cost per Beta (£)		Quantity	Total cost (£)
Material	8 litres	£20	160	Material	78 000 litres	1 599 000
Labour	4 hours	£6	<u>24</u>	Labour	39 000 hours	249 600
			<u>184</u>			1 848 600

*Task 1*

(a) Calculate the following:

- (i) the material price variance;
- (ii) the material usage variance;
- (iii) the labour rate variance;
- (iv) the labour efficiency variance (sometimes called the utilization variance); (b)

Prepare a standard costing statement reconciling the actual marginal cost of production with the standard marginal cost of production.

After Richard Hill has received your standard costing statement, you visit him to discuss the variances and their implications. Richard, however, raises a number of queries with you. He makes the following points:

- An index measuring material prices stood at 247.2 for May but at 240.0 when the standard for the material price was set.
- The Eastern division is budgeted to run at its normal capacity of 8000 units of production per month, but during May it had to manufacture an additional 1500 Betas to meet a special order agreed at short notice by Melton's sales director.
- Because of the short notice, the normal supplier of the raw material was unable to meet the extra demand and so additional materials had to be acquired from another supplier at a price per litre of £22.
- This extra material was not up to the normal specification, resulting in 20% of the special purchase being scrapped *prior* to being issued to production.
- The work force could only produce the special order on time by working overtime on the 1500 Betas at a 50% premium.

*Task 2*

- (a) Calculate the amounts within the material price variance, the material usage variance and the labour rate variance which arise from producing the special order.
- (b) (i) Estimate the revised standard price for materials based on the change in the material price index.  
(ii) For the 8000 units of normal production, use your answer in (b) (i) to estimate how much of the price variance calculated in Task 1 is caused by the general change in prices.
- (c) Using your answers to parts (a) and (b) of this task, prepare a revised standard costing statement. The revised statement should subdivide the variances prepared in Task 1 into those elements controllable by Richard Hill and those elements caused by factors outside his divisional control.
- (d) Write a *brief* note to Richard Hill justifying your treatment of the elements you believe are outside his control and suggesting what action should be taken by the company.

### 17.3 Intermediate: Reconciliation of actual and budgeted profit (including overhead variances)

A local restaurant has been examining the profitability of its set menu. At the beginning of the year the selling price was based on the following predicted costs:

		(£)
<i>Starter</i>	<i>Soup of the day</i>	
	100 grams of mushrooms @ £3.00 per kg	0.30
	Cream and other ingredients	0.20
<i>Main course</i>	<i>Roast beef</i>	
	Beef 0.10 kg @ £15.00 per kg	1.50
	Potatoes 0.2 kg @ £0.25 per kg	0.05
	Vegetables 0.3 kg @ £0.90 per kg	0.27
	Other ingredients and accompaniments	0.23
<i>Dessert</i>	<i>Fresh tropical fruit salad</i>	
	Fresh fruit 0.15 kg @ £3.00 per kg	0.45

The selling price was set at £7.50, which produced an overall gross profit of 60%.

During October the number of set menus sold was 860 instead of the 750 budgeted: this increase was achieved by reducing the selling price to £7.00. During the same period an analysis of the direct costs incurred showed:

	(£)
90 kg of mushrooms	300
Cream and other ingredients	160
70 kg of beef	1148
180 kg of potatoes	40
270 kg of vegetables	250
Other ingredients and accompaniments	200
140 kg of fresh fruit	450

There was no stock of ingredients at the beginning or end of the month.

Requirements:

- Calculate the budgeted profit for the month of October. (2 marks)
- Calculate the actual profit for the month of October. (3 marks)
- Prepare a statement which reconciles your answers to (a) and (b) above, showing the variances in as much detail as possible. (14 marks)
- Prepare a report, addressed to the restaurant manager, which identifies the two most significant variances, and comments on their possible causes. (6 marks)

(Total 25 marks)

*CIMA State 2 Operational Cost Accounting*

#### 17.4 Intermediate: Variance analysis and reconciliation of budgeted and actual profit

The Perseus Co. Ltd, a medium-sized company, produces a single produce in its one overseas factory. For control purposes, a standard costing system was recently introduced and is now in operation.

The standards set for the month of May were as follows:

Production and sales	16 000 units
Selling price (per unit)	£140
Materials	
Material 007	6 kilos per unit at £12.25 per kilo
Material XL90	3 kilos per unit at £3.20 per kilo
Labour	4.5 hours per unit at £8.40 per hour

Overheads (all fixed) at £86 400 per month are not absorbed into the product costs.

The actual data for the month of May, are as follows:

Produced 15 400 units, which were sold at £138.25 each.

Materials

Used 98 560 kilos of material 007 at a total cost of £1 256 640

Used 42 350 kilos of material XL90 at a total cost of £132 979

Labour

Paid an actual rate of £8.65 per hour to the labour force. The total amount paid out amounted to £612 766

Overheads (all fixed) £96 840

Required:

- Prepare a standard costing profit statement, and a profit statement based on actual figures for the month of May. (6 marks)
- Prepare a statement of the variances which reconcile the actual with the standard profit or loss figure. (9 marks)
- Explain briefly the possible reasons for inter-relationships between material variances and labour variances. (5 marks)

(Total 20 marks)

*ACCA Paper 8 Management Finance*

#### 17.5 Intermediate: Calculation of labour, material and overhead variances

The summary production budget of a factory with a single product for a four week period is as follows:

Production quantity	240 000 units
Production costs:	
Material:	336 000 kg at £4.10 per kg
Direct labour:	216 000 hours at £4.50 per hour
Variable overheads:	£475 200

Fixed overheads: £1 521 600

Variable overheads are absorbed at a predetermined direct labour hour rate. Fixed overheads are absorbed at a predetermined rate per unit of output.

During the four week period the actual production was 220 000 units which incurred the following costs:

Material: 313 060 kg costing £1 245 980  
Direct labour: 194 920 hours costing £886 886  
Variable overheads: £433 700  
Fixed overheads: £1 501 240

Required:

(a) Calculate the cost variances for the period. (12 marks)

(b) Give reasons in each case why the direct labour efficiency, variable overhead efficiency and fixed overhead volume variances may have arisen. (8 marks)

(Total 20 marks)

*ACCA Level 1*

*Cost and Management Accounting 1*

### **17.6 Intermediate: Computation of variable overhead variances**

The following details have been extracted from the standard cost card for product X:

	(£/unit)
Variable overhead	
4 machine hours at £8.00/hour	32.00
2 labour hours at £4.00/hour	8.00
Fixed overhead	20.00

During October 5450 units of the product were made compared to a budgeted production target of 5500 units. The actual overhead costs incurred were:

Machine-related variable overhead £176 000  
Labour-related variable overhead £42 000  
Fixed overhead £109 000

The actual number of machine hours was 22 000 and the actual number of labour hours was 10 800.

Required:

(a) Calculate the overhead cost variances in as much detail as possible from the data provided. (12 marks)

(b) Explain the meaning of, and give possible causes for, the variable overhead variances which you have calculated. (8 marks)

(c) Explain the benefits of using multiple activity bases for variable overhead absorption. (5 marks)

(Total 25 marks)

*CIMA Stage 2 Operational Cost Accounting*

**17.7 Intermediate: Material price and usage variances and calculation of material price and usage working backwards from variances**

AB Ltd manufactures a range of products. One of the products, Product M, requires the use of materials X and Y. Standard material costs for the manufacture of an item of product M in period 1 included:

Material X: 9 kilos at 1.20 per kilo

Total purchases of material X in period 1, for use in all products, were 142 000 kilos, costing £171 820. 16 270 kilos were used in the period in the manufacture of 1790 units of product M.

In period 2 the standard price of material X was increased by 6%, whilst the standard usage of the material in product M was left unchanged. 147 400 kilos of material X were purchased in period 2 at a favourable price variance of £1031.80. A favourable usage variance of 0.5% of standard occurred on material X in the manufacture of product M in the period.

Required:

(a) Calculate:

- (i) the total price variance on purchases of material X in period 1; (2 marks)
- (ii) the material X usage variance arising from the manufacture of product M in period 1; (3 marks)
- (iii) the actual cost inflation of material X from period 1 to period 2 (calculate as a percentage increase to one decimal place); (5 marks)
- (iv) the percentage change in actual usage of material X per unit of product M from period 1 to period 2 (calculate to one decimal place). (5 marks)

(b) Describe, and contrast, the different types of standards that may be set for raw material usage and labour efficiency. (10 marks)

(Total 25 marks)

*ACCA Cost and Management Accounting 1*

**17.8 Advanced: Preparation of an operating control statement and the calculation of labour, material and overhead variances**

The following statement has been produced for presentation to the general manager of Department X.

**Month ended 31 October**

	<b>Original budget (£)</b>	<b>Actual result (£)</b>	<b>Variance (£)</b>
Sales	<u>600 000</u>	<u>550 000</u>	(50 000)
Direct materials	150 000	130 000	20 000
Direct labour	200 000	189 000	11 000
Production overhead:			
Variable with direct labour	50 000	46 000	4 000
Fixed	25 000	29 000	(4 000)
Variable selling overhead	75 000	72 000	3 000
Fixed selling overhead	<u>50 000</u>	<u>46 000</u>	<u>4 000</u>
Total costs	<u>550 000</u>	<u>512 000</u>	<u>38 000</u>
Profit	<u>50 000</u>	<u>38 000</u>	(12 000)
Direct labour hours	50 000	47 500	
Sales and production units	5 000	4 500	

*Note:* There are no opening and closing stocks.

The general manager says that this type of statement does not provide much relevant information for him. He also thought that the profit for the month would be well up to budget and was surprised to see a large adverse profit variance.

You are required to

- (a) re-draft the above statement in a form which would be more relevant for the general manager; (6 marks)
- (b) calculate all sales, material, labour and overhead variances and reconcile to the statement produced in (a); (9 marks)
- (c) produce a short report explaining the principles upon which your re-drafted statement is based and what information it provides. (7 marks)

(Total 22 marks)

*CIMA Stage 3 Management Accounting Techniques*

### ***Extra questions for Chapter 18 Standard costing and variance analysis 2: further aspects***

#### **18.1 Intermediate: Accounting entries for a standard costing system**

A company uses Material Z in several of its manufacturing processes. On 1 November, 9000 kilos of the material were in stock. These materials cost £9630 when purchased. Receipts and issues of Material Z during November were:

##### *Receipts*

4 November, 10 000 kilos costing £10 530

23 November, 8000 kilos costing £8480

##### *Issues*

2 November, 2000 kilos to Process 1

7 November, 4500 kilos to Process 2

20 November, 4000 kilos to Process 1

27 November, 6000 kilos to Process 3

The company operates a standard costing system. The standard cost of Material Z during November was £1.04 per kilo.

Process 1 is exclusively concerned with the production of Product X. Production information for November is as follows:

Opening work-in-process, 6000 units

- complete as to materials; 50% complete for direct labour and overheads.

Completed units, 9970.

Closing work-in-process, 8000 units

- complete as to materials; 75% complete for direct labour and overheads.

The standard cost per unit of Product X comprises the following:

Material Z, 0.5 kilos at £1.04 per kilo

Direct labour, 0.1 hours at £4.80 per hour

Overhead, absorbed on direct labour hours at £5.00 per hour.

Costs (other than Material Z) incurred in Process 1 during November were:

Direct labour, 1340 hours at £4.80 per hour

Overheads, £6680.

Required:

- (a) Prepare the stock account and material price variance account for Material Z for the month of November on the assumption that:
- (i) The material price variance is identified on purchase of material.
  - (ii) The material price variance is identified at the time of issue of material to production (assume that the weighted average pricing method is used). (9 marks)
- (b) State which of the above two methods, (a) (i) or (a) (ii), you would prefer. State briefly the reasons for your preference. (4 marks)
- (c) Prepare the account for Process 1 for the month of November. (Assume that Material Z is charged to the process at standard price.) (12 marks)

(Total 25 marks)

*ACCA Level 1 Costing*

### 18.2 Advanced: Labour mix and yield variances

A large manufacturing company with a diverse range of products is developing the use of standard costing throughout its divisions. A full standard costing system has already been implemented in Division A, including the use of mix and yield material variances, and attention has now turned to Division B where the main problem concerns labour.

Division B makes highly complex work stations which incorporate material handling, automatic controls and robotics. Manufacture is a team effort and the team specified for work station No. 26 comprises:

- 2 supervisors paid £8 per hour
- 10 fitters paid £6 per hour
- 6 electricians paid £6 per hour
- 2 electronics engineers paid £7 per hour
- 4 labourers paid £4 per hour

Output is measured in standard hours and 90 standard hours are expected for every 100 clock hours. During a period the following data were recorded.

	<b>Actual hours</b>	<b>Actual pay (£)</b>
Supervisors	170	1 394
Fitters	820	4 920
Electricians	420	2 562
Electronics engineers	230	1 725
Labourers	<u>280</u>	<u>1 120</u>
Total	<u>1920</u>	<u>£11 721</u>

1650 standard hours were produced.

The factory director of Division B is anxious to gain the maximum information possible from the standard costing system. He sees no reason why the normal labour efficiency variance could not be divided into sub-variances in order to show separately the effects of non-standard team composition and team productivity in a similar fashion to the material usage variance which can be sub-divided into mix and yield variances.

You are required

(a) to calculate the labour rate variance; (3 marks)

(b) to calculate

(i) the team composition variance,

(ii) the team productivity variance and

(iii) labour efficiency variance; (11 marks)

(c) to comment on the meaning of the variances calculated in (b) and their weaknesses.

(6 marks)

(Total 20 marks)

*CIMA Stage 3 Management Accounting Techniques*

### 18.3 Advanced: Accounting disposition of variances

(a) Mingus Ltd produces granoids. It revises its cost standards annually in September for the year commencing 1 December.

At a normal annual volume of output of 40 000 granoids its standard costs, including overheads, for the year to 30 November 2001 were:

Cost	Standard	Per unit (£)	Total (£000)
Direct materials	5 kg at £10 per kg	50	2000
Direct labour	2 hrs at £5 per hr	10	400
Variable overheads	£1 per kg of direct material	5	200
Fixed overheads	£5 per hr of direct labour	<u>10</u>	<u>400</u>
		<u>75</u>	<u>3000</u>

The actual expenditure incurred in that year to produce an actual output of 50 000 granoids was:

Cost	Total expenditure (£000)	Further details
Direct materials	2880	320 000 kg at £9 per kg
Direct labour	540	90 000 hr at £6 per hr
Variable overheads	280	
Fixed overheads	<u>380</u>	
	<u>4080</u>	

Due to an industrial dispute in 2000 there was no stockholding of materials, work in progress, or completed granoids at 1 December 2000. At 30 November 2001 there was an inventory of 10 000 completed granoids, but no work in progress, and no raw materials inventory.

You are required to calculate in each case the balance which would remain in the finished goods inventory account if each of the following six costing systems were used: (i) actual absorption costing,

(ii) standard absorption costing with variances written off,

(iii) standard absorption costing with variances pro-rated between cost of sales and inventory,

(iv) actual direct costing,

(v) standard direct costing with variances written off,

(vi) standard direct costing with variances pro-rated between cost of sales and inventory.

(10 marks)

- (b) You are required to comment briefly in general terms on the main effects of applying to inventory valuation the various costing systems set out above, referring to your calculations in part (a) if you wish. (5 marks)
- (c) Overhead cost absorption may be used in connection with various other matters. You are required to discuss the use of overhead cost absorption procedures for either
- (i) pricing, *or*
  - (ii) control of costs. (10 marks)

(Total 25 marks)

*ICAEW Management Accounting*

#### **18.4 Advanced: Planning and operating variances plus mix and yield variances**

County Preserves produce jams, marmalade and preserves. All products are produced in a similar fashion; the fruits are low temperature cooked in a vacuum process and then blended with glucose syrup with added citric acid and pectin to help setting.

Margins are tight and the firm operates a system of standard costing for each batch of jam.

The standard cost data for a batch of raspberry jam are:

Fruit extract	400 kg at £0.16 per kg
Glucose syrup	700 kg at £0.10 per kg
Pectin	99 kg at £0.332 per kg
Citric acid	1 kg at £2.00 per kg
Labour	18 hrs at £3.25 per hour

Standard processing loss 3%.

The summer proved disastrous for the raspberry crop with a late frost and cool, cloudy conditions at the ripening period, resulting in a low national yield. As a consequence, normal prices in the trade were £0.19 per kg for fruit extract although good buying could achieve some savings. The impact of exchange rates on imports of sugar has caused the price of syrup to increase by 20%.

The actual results for the batch were:

Fruit extract	428 kg at £0.18 per kg
Glucose syrup	742 kg at £0.12 per kg
Pectin	125 kg at £0.328 per kg
Citric acid	1 kg at £0.95 per kg
Labour	20 hrs at £3.00 per hour

Actual output was 1164 kg of raspberry jam.

You are required to

- (a) calculate the ingredients planning variances that are deemed uncontrollable; (4 marks)
- (b) calculate the ingredients operating variances that are deemed controllable; (4 marks)
- (c) comment on the advantages and disadvantages of variance analysis using planning and operating variances; (4 marks)
- (d) calculate the mixture and yield variances; (5 marks)
- (e) calculate the total variance for the batch. (3 marks)

(Total 20 marks)

*CIMA Stage 3 Management Accounting Techniques*

**18.5 Advanced: Variable costing reconciliation of budgeted and actual contribution and a discussion of the role of standard costing in a modern manufacturing environment**

XYZ Ltd makes a single product and uses standard marginal costing. The standard cost data for the product are:

<b>Standard cost data per unit</b>	<b>(£)</b>
Selling price	<u>175</u>
Direct materials (8 kg at £2)	16
Direct labour (4 hours at £5)	20
Variable overhead (4 hours @ £15)	<u>60</u>
= Marginal cost	<u>96</u>

The average production volume per period is 500 units but during Period 6 only 450 units were made and sold. At the end of the period the following variance statement was prepared.

<b>Results for period 6</b>				
	<b>Budget</b>		<b>Actual</b>	<b>Variences</b>
	<b>(500 units)</b>		<b>(450 units)</b>	
	<b>(£)</b>		<b>(£)</b>	<b>(£)</b>
Sales	<u>87 500</u>		<u>83 250</u>	<u>4 250 Adv</u>
<i>Less: Marginal cost</i>				
Direct materials	8 000	(3690 kg used)	7 650	350 Fav
Direct labour	10 000	(1840 hours worked)	8 100	1 900 Fav
Variable overheads	<u>30 000</u>		<u>28 350</u>	<u>1 650 Fav</u>
= Marginal cost	48 000		44 100	
Contribution	39 500		39 150	350 Adv
<i>Less: Fixed costs</i>	25 000		24 650	350 Fav
= Profit	14 500		14 500	-

After studying the above report, the General Manager expressed surprise that all the cost variances were favourable as he understood that there had been some production problems. Furthermore, the Sales Manager had told him that he had been able to make some excellent sales during the period which seemed at odds with the statement.

You are required:

- to reconcile budgeted contribution to actual contribution, adjust for fixed cost, and disclose the actual profit; (14 marks)
- to explain briefly why your revised presentation differs from the original statement. (3 marks)
- The General Manager mentions that he has seen an article stating that standard costing is becoming less useful in modern factories. He is puzzled by this and wonders whether the company should stop using the technique.

You are required to prepare a reply to the General Manager explaining what the article refers to, and giving your opinion whether standard costing should continue to be used within the company. (5 marks)

(Total 22 marks)

*Extra questions for Chapter 20 Transfer pricing in divisionalized companies*

**20.1 Advanced**

The production director of a company is concerned with the problem of measuring the efficiency of process managers. In the production department there are six processes and all products processed pass through a combination of these processes. One specific area of investigation is the measurement of output values which involves the use of transfer prices.

You have been asked by the production director to tabulate the advantages and disadvantages of using each of the following systems of transfer pricing as related to process costing:

- (a) absorption cost;
- (b) marginal cost;
- (c) cost plus profit;
- (d) standard cost.

(20 marks)

*CIMA P1 Cost Accounting 2*

**20.2 Advanced**

It has been argued that full cost is an inappropriate basis for setting transfer prices.

Outline the objections which can be levied at this basis.

(9 marks)

*ACCA Level2 Management Accounting*

**20.3 Advanced: Market based transfer prices**

A group has two companies -

K Ltd, which is operating at just above 50% capacity, and

L Ltd, which is operating at full capacity (7000 production hours).

L Ltd produces two products, X and Y, using the same labour force for each product. For the next year its budgeted capacity involves a commitment to the sale of 3000 kg of Y, the remainder of its capacity being used on X.

Direct costs of these two products are:

	<b>X (£ per kg)</b>	<b>(Y (£ per kg)</b>
Direct materials	18	14
Direct wages	15	10
	(1 production hour)	(2/3 production hour)

The company's overhead is £126 000 per annum relating to X and Y in proportion to their direct wages. At full capacity, £70 000 of this overhead is variable. L Ltd prices its products with a 60% mark-up on its total costs.

For the coming year, K Ltd wishes to buy from L Ltd 2000 kg of product X which it proposes to adapt and sell, as product Z, for £100 per kg. The direct costs of adaptation are £15 per kg. K Ltd's total fixed costs will not change, but variable overhead of £2 per kg will be incurred.

You are required to recommend, as group management accountant,

- (a) at what range of transfer prices, if at all, 2000 kg of product X should be sold to K

- Ltd; (14 marks)
- (b) what other points should be borne in mind when making any recommendations about transfer prices in the above circumstances. (6 marks)
- (Total 20 marks)

*CIMA Stage 4 Management Accounting - Decision Making*

**20.4 Advanced: Computation of divisional profits using market based transfer prices and a discussion of market based transfer prices where market imperfections exist**

L Ltd and M Ltd are subsidiaries of the same group of companies.

L Ltd produces a branded product sold in drums at a price of £20 per drum. Its direct product costs per drum are:

- Raw material from M Ltd: At a transfer price of £9 for 25 litres.
- Other products and services from outside the group: At a cost of £3.

L Ltd's fixed costs are £40 000 per month. These costs include process labour whose costs will not alter until L Ltd's output reaches twice its present level.

A market research study has indicated that L Ltd's market could increase by 80% in volume if it were to reduce its price by 20%.

M Ltd produces a fairly basic product which can be converted into a wide range of end products. It sells one third of its output to L Ltd and the remainder to customers outside the group.

M Ltd's production capacity is 1000 kilolitres per month, but competition is keen and it budgets to sell no more than 750 kilolitres per month for the year ending 31 December.

Its variable costs are £200 per kilolitre and its fixed costs are £60 000 per month.

The current policy of the group is to use market prices, where known, as the transfer price between its subsidiaries. This is the basis of the transfer price between M Ltd and L Ltd.

You are required

- (a) to calculate the monthly profit position for each of L Ltd and M Ltd if the sales of L Ltd are
- (i) at their present level, and
  - (ii) at the higher potential level indicated by the market research, subject to a cut in price of 20%; (10 marks)
- (b) (i) to explain why the use of a market price as the transfer price produces difficulties under the conditions outlined in (a) (ii) above; (3 marks)
- (ii) to explain briefly, as chief accountant of the group, what factors you would consider in arriving at a proposal to overcome these difficulties; (7 marks)
- (c) to recommend, with supporting calculations, what transfer prices you would propose. (5 marks)
- (Total 25 marks)

*CIMA Stage 4 Management Accounting - Decision Making*

### 20.5 Advanced: Demonstration of how a badly designed transfer pricing system can distort decision-making involving the use of calculus

AB Ltd comprises two divisions. Division A produces the aye - a component sold to outside customers and transferred to division B. Division B produces the bee - each unit of which incorporates one aye in its construction. Divisional Managers are paid an incentive bonus linked to divisional profit.

Demand for the two products from outside customers for the next year is forecast to be as follows:

Product aye	2000 units demanded at £40 unit selling price
Produce bee	1000 units demanded at £100 unit selling price
Produce aye	40 units change in demand with each £1 change in unit selling price
Product bee	10 units change in demand with each £1 change in unit selling price

The marginal cost of producing 1 unit of aye is £20, and that of producing 1 unit of bee (not including the aye) is £25 - in both cases, at all levels of output.

AB Ltd's Chief Accountant comments that

Setting selling prices is simply an exercise in mathematics. Once you understand the cost and revenue structures of a business, then it is an easy matter to find the unique selling price for each product that maximizes profit.

Requirements:

- Calculate the unit selling price and output that divisions A and B should adopt for the next year in order to maximize the profit of AB Ltd. (10 marks)
- Calculate the unit selling price and output that divisions A and B are likely to adopt in the next year if the manager of division A is instructed to transfer units of aye to division B at 'market price' and with no other constraints.  
You may assume that divisional managers will always adopt unit selling prices and output levels that maximize the profit of their own division. (10 marks)
- Critically evaluate the Chief Accountant's comment. (5 marks)

(Total 25 marks)

*CIMA Stage 3 Management Accounting Applications*

### 20.6 Advanced: Calculating optimum transfer prices and profits using differential calculus

Megacorp plc is a divisionalized enterprise. Among its divisions are Chem and Drink. Both of these divisions have a wide range of independent activities. One product, Fizz, is made by Chem for Drink. Chem does not have any external customers for the product. The central management of Megacorp plc delegates all pricing decisions to divisional management, and the pricing of Fizz has been a contentious issue. It has been suggested that Chem should give a transfer price schedule for the supply of Fizz, based on Chem's own production costs, and that all transfers would be made at Chem's marginal cost. Drink would then order the quantity it requires each month.

Chem estimates its monthly total costs,  $TC_c$ , for producing Fizz are as follows:

$$TC_c = £10\,000 + £5.50Q_c + £0.002Q_c^2$$

where  $Q_c$  is the quantity of Fizz manufactured.

Drink incurs costs in using Fizz. Its monthly total costs ( $TC_D$ ) in using Fizz, excluding the transfer price, are:

$$TC_D = £15\,000 + £11Q_D + £0.001Q_D^2$$

where  $Q_D$  is the quantity of product, each unit of which incorporates one unit of Fizz. Drink estimates that the demand function for its product incorporating Fizz is:

$$P_D = £45 - £0.0008Q_D$$

where  $P_D$  is the price per unit of the product incorporating Fizz. Neither division holds any stocks of Fizz.

#### Requirements

- (a) (i) Calculate the quantity of Fizz production which would maximize profits for Megacorp plc;  
(ii) calculate the transfer price corresponding to that production if Chem's marginal cost is adopted for transfer pricing, and show the resulting profits for each division. (6 marks)
- (b) (i) Calculate the quantity of Fizz which Drink would take (at Chem's marginal cost) *if it wanted to maximize its own profits*;  
(ii) calculate the transfer price corresponding to that quantity, and show the resulting profits for each division. (5 marks)
- (c) Examine the implications for Megacorp plc of the transfer pricing issues involved in requirements (a) and (b). (6 marks)
- (d) Briefly describe the other main methods of transfer pricing and discuss their limitations. (8 marks)
- (Total 25 marks)

*ICAEW Management Accounting*

### *Extra questions for Chapter 21 Cost management*

#### **21.1 Advanced**

- (a) You are required to:
- (i) explain the basic principles on which value for money audits (VFM) in local authorities are conducted;
- (ii) give *three* specific examples of methods of analysis which may be employed in practice (10 marks)
- (b) Discuss the problems experienced with programme planning and budgeting systems (PPBS) and the major differences between PPBS and VFM. (10 marks)
- (Total 20 marks)

*CIMA Stage 4 Management Accounting - Control and Audit*

## Extra questions for Chapter 23 Cost estimation and cost behaviour

### 23.1 Advanced: Regression analysis and confidence intervals

CB p.l.c. produces a wide range of electronic components including its best selling item, the Laser Switch. The company is preparing the budgets for 2001 and knows that the key element in the Master Budget is the contribution expected from the Laser Switch. The records for this component for the past four years are summarized below, with the costs and revenues adjusted to 2001 values:

	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>
Sales (units)	<u>150 000</u>	<u>180 000</u>	<u>200 000</u>	<u>230 000</u>
	(£)	(£)	(£)	(£)
Sales revenue	292 820	346 060	363 000	448 800
Variable costs	<u>131 080</u>	<u>161 706</u>	<u>178 604</u>	<u>201 160</u>
Contribution	<u>161 740</u>	<u>184 354</u>	<u>184 396</u>	<u>247 640</u>

It has been estimated that sales in 2001 will be 260 000 units.

You are required:

- as a starting point for forecasting 2001 contribution, to project the trend, using linear regression; (10 marks)
  - to calculate the 95% confidence interval of the individual forecast for 2001 if the standard error of the forecast is £14 500 and the appropriate  $t$  value is 4.303, and to interpret the value calculated; (3 marks)
  - to comment on the advantages of using linear regression for forecasting and the limitations of the technique. (7 marks)
- (Total 20 marks)

*CIMA Stage 3 Management Accounting Techniques*

### 23.2 Advanced: Regression analysis and an analysis of costs where unit variable cost is not constant

Babel Ltd produces a single product. The company's directors want to explore new markets, and they require an accurate analysis of the firm's cost structure for both forecasting and pricing purposes. An attempt to provide this analysis from the aggregation of individual costs has produced a poor correspondence between actual and predicted costs. You are an accountant employed by Babel Ltd, and you have been asked to provide a statistical approach to the problem.

The financial director has given you the following data:

<b>Month</b>	<b>Output (000 units)</b>	<b>Average unit cost (£)</b>
January	9	12.8
February	14	13.0
March	11	11.4
April	8	12.0
May	6	13.0
June	12	11.7

You obtain the following further information:

- (1) The costs from which the averages have been computed consist of the firm's entire costs for the relevant month.
- (2) Fixed costs can be assumed to be unaffected by seasonal factors except for winter heating. In January and February a supplementary heating system was employed; this cost £10 000 per month to operate.

You are asked to transform the original data in any way which may be necessary. Work to the nearest £100 for total costs and to the nearest £0.10p for unit cost calculations.

#### Requirements

- (a) Estimate Babel Ltd's normal fixed and variable cost of production using linear regression, showing full workings. (7 marks)
- (b) Draw a graph of Babel Ltd's costs versus output to provide a better analysis of costs than the regression estimates in part (a), estimate the point at which variable costs change and estimate the linear cost relationships over the relevant ranges. (5 marks)
- (c) Use your answer from part (b) to provide an analysis of costs from January to June, set out in spreadsheet format (i.e. rows and columns). Divide the rows into relevant cost categories to explain observed costs, and treat any residual amounts as unexplained differences. (6 marks)
- (d) Discuss the difficulties which may be encountered in preparing and using statistical cost estimation in practice. (7 marks)

(Total 25 marks)

*ICAEW P2 Management Accounting*

### 23.3 Advanced: Learning curve and the calculation of NPV

RS p.l.c. manufactures domestic food mixers. It is investigating whether or not to accept a three-year contract to make a new model for sale through a supermarket chain. The contract uses skilled labour which cannot be increased above that currently available and RS p.l.c. will receive a fixed price of £42 per mixer for all the mixers it can produce in the three-year period. The following estimates have been made:

Capital investment	£50 000 payable now, with nil scrap value.
Additional overhead	£25 000 per annum.
Materials	£30 per mixer.
Labour	£6 per hour.

The factory manager knows from experience of similar machines that there will be a learning effect for labour. He estimates that this will take the form:

$$y = ax^{-0.3}$$

where  $y$  = average labour hours per unit

$a$  = labour hours for first unit

$x$  = cumulative production

He estimates that the first mixer will take 10 hours to produce and that the fixed amount of labour available will enable 5000 mixers to be produced in the first year.

Apart from the capital investment, all cash flows can be assumed to arise at year ends. The company has a cost of capital of 15%.

You are required

(a) to calculate the NPV of the proposed contract; (16 marks)

(b) to state what other factors need to be considered before a final decision is made.

(6 marks)

(Total 22 marks)

*CIMA Stage 3 Management Accounting Techniques*

### **23.4 Advanced: Construction of cost and revenue functions when learning curve effects exist**

Delroads Electronics Ltd (DEL) produces a variety of products including an electronic navigational unit for use in ships. Construction of the unit is a delicate assembly operation by a team of highly-skilled operatives. Components used in the unit are purchased from outside manufacturers. The unit is sold in relatively small numbers, and a new model is produced each year.

Costs associated with production of the new model of the unit are:

- fixed costs           £35 000
- variable costs       £20 wages per labour hour worked, plus £20 materials per unit

Production of the first unit of the new model will take 60 labour hours, and work of the operatives is known to be subject to an 83% learning curve effect. Learning curve effects are achieved only within a model.

Market research has forecast that annual sales of the new model are associated with unit prices as follows:

1 unit can be sold at unit price £10 000

500 units can be sold at unit price £327.80

Requirements:

(a) Explain what a learning curve effect is, and suggest reasons for the effect in this particular case. (6 marks)

(b) Draw a diagram (accurately to scale) on the graph paper supplied, demonstrating the relationship between units of output, total costs and total revenues in respect of the new model. Set out sufficient workings to justify your diagram. (12 marks)

(c) Use your diagram and supporting workings to identify the profit-maximizing units of output and unit price in respect of the new model. (7 marks)

*Notes:* In evaluating learning curve effects you should use the cumulative average time equation

$$y = a/x^{0.269} \text{ or } y = ax^{-0.269}$$

In evaluating the link between revenue and output you should use the equation

$$y = ax^n$$

(Total 25 marks)

*CIMA Stage 3 Management Accounting Applications*

## *Extra questions for Chapter 24 Quantitative models for the planning and control of stocks*

### **24.1 Intermediate**

- (a) Write short notes to explain each of the following in the context of materials control:
- (i) Continuous stocktaking.
  - (ii) Perpetual inventory system.
  - (iii) ABC inventory analysis. (9 marks)
- (b) State the factors that should influence the decision regarding economic order quantities of raw materials. (7 marks)
- (c) Calculate three normal control levels, which may be used in stock control systems, from the following information for a particular raw material:

Economic order quantity, 12 000 kilos

Lead time, 10 to 14 working days

Average usage, 600 kilos per day

Minimum usage, 400 kilos per day

Maximum usage, 800 kilos per day

(9 marks)

(Total 25 marks)

*ACCA Level 1 Costing*

### **24.2 Intermediate: Calculation of EOQ using tabulation and formula method**

A large local government authority places orders for various stationery items at quarterly intervals.

In respect of an item of stock coded A32, data are:

annual usage quantity	5000 boxes
minimum order quantity	500 boxes
cost per box	£2

Usage of material is on a regular basis and on average, half of the amount purchased is held in inventory. The cost of storage is considered to be 25% of the inventory value. The average cost of placing an order is estimated at £12.5.

The chief executive of the authority has asked you to review the present situation and to consider possible ways of effecting cost savings.

You are required to:

- (a) tabulate the costs of storage and ordering item A32 for each level of orders from four to twelve placed per year;
- (b) ascertain from the tabulation the number of orders which should be placed in a year to minimize these costs;
- (c) produce a formula to calculate the order level which would minimize these costs - your answer should explain each constituent part of the formula and their relationships;
- (d) give an example of the use of the formula to confirm the calculation in (b) above;
- (e) calculate the percentage saving on the annual cost which could be made by using the economic order quantity system;
- (f) suggest *two* other approaches which could be introduced in order to reduce the present cost of storage and ordering of stationery.

### 24.3 Intermediate: Calculation of EOQ

XYZ Ltd produces a product which has a constant monthly demand of 4000 units. The product requires a component which XYZ Ltd purchases from a supplier at £10 per unit. The component requires a three-day lead time from the date of order to the date of delivery. The ordering cost is £0.60 per order and the holding cost is 10% per annum. (a) You are required to calculate:

- (i) The economic order quantity.
  - (ii) The number of orders required per year.
  - (iii) The total cost of ordering and holding the components for the year.
- (b) Assuming that there is no safety stock and that the present stock level is 400 components, when should the next order be placed? (Assume a 360-day year.)
- (c) Discuss the problems which most firms would have in attempting to apply the EOQ formula.

### 24.4 Intermediate: Calculation of re-order and maximum stock levels

A retail company has been reviewing the adequacy of its stock control systems and has identified three products for investigation. Relevant details for the three products are set out below:

Item code EOQ	Stock (warehouse and stores)			Weekly sales (£000)			Gross* margin (% of sales)
	(000 units)	(000 units)	(£.unit at cost)	minimum	normal	maximum	
14/363	25	32.5	2.25	26	28	30	42
11/175	500	422.7	0.36	130	143	160	46
14/243	250	190	0.87	60	96	128	37

\*Gross margin = sales - purchase cost of product.

Outstanding order: Item code 14/243 - order for 250 000 units placed 2 trading days ago. There are 6 trading days per week.

All orders are delivered by suppliers into the retailer's central warehouse. The lead time is one week from placement of order. A further week is required by the retailer in order to transfer stock from central warehouse to stores. Both of these lead times can be relied upon.

Required:

- (a) Calculate for each product:
- (i) the minimum and maximum weekly sales units
  - (ii) the stock re-order level
  - (iii) the maximum stock control level.

(9 marks)

- (b) Comment upon the adequacy of the existing stock control of the three products.

(5 marks)

(Total 14 marks)

**24.5 Intermediate: Quantity discounts**

A company uses 50 000 units of material per annum to service a steady demand for its products. Order costs are £100 per order and holding costs are £0.40 per order.

- (a) Determine the optimal order quantity.
- (b) The supplier now offers a quantity discount of £0.02 per unit if it buys in batches of 10 000 units. Should the company take advantage of the quantity discount?

**24.6 Advanced: Calculation of reduction in storage costs arising from the implementation of JIT production and purchasing**

Prodco plc has an annual turnover of £30 000 000 from a range of products. Material costs and conversion costs account for 30% and 25% of turnover respectively.

Other information relating to the company is as follows:

- (i) Stock values are currently at a constant level, being:
  - (a) Raw material stock: 10% of the material element of annual turnover.
  - (b) Work in progress: 15% of the material element of annual turnover together with a proportionate element of conversion costs allowing for 60% completion of work in progress as to conversion costs and 100% completion as to material cost. The material cost : conversion cost ratio is constant for all products.
  - (c) Finished goods stock: 12% of the material element of annual turnover together with a proportionate element of conversion cost.
- (ii) Holding and acquisition costs of materials comprise fixed costs of £100 000 per annum plus variable costs of £0.10 per £ of stock held.
- (iii) Movement and control costs of work in progress comprise fixed costs of £140 000 per annum plus variable costs of £0.05 per £ of material value of work in progress.
- (iv) Holding and control costs of finished goods comprise fixed costs of £180 000 per annum plus variable costs of £0.02 per £ of finished goods (material cost + conversion cost).
- (v) Financial charges due to the impact of stock holding on working capital requirement are incurred at 20% per annum on the value of stocks held.

Prodco plc are considering a number of changes which it is estimated will affect stock levels and costs as follows:

1. Raw material stock: Negotiate delivery from suppliers on a just-in-time basis. Stock levels will be reduced to 20% of the present level. Fixed costs of holding and acquiring stock will be reduced to 20% of the present level and variable costs to £0.07 per £ of stock held.
2. Work in progress: Convert the layout of the production area into a 'dedicated cell' format for each product type instead of the existing system which comprises groups of similar machines to which each product type must be taken. Work in progress volume will be reduced to 20% of the present level with the same stage of completion as at present. Fixed costs of movement and control will be reduced to 40% of the present level and variable costs to £0.03 per £ of material value of work in progress.
3. Finished goods stock: Improved control of the flow of each product type from the production area will enable stocks to be reduced to 25% of the present level. Fixed costs of holding and control will be reduced to 40% of the present level and variable costs to £0.01 per £ of finished goods held.

Required:

- (a) Calculate the annual estimated financial savings from the proposed changes in *each* of raw material stock, work in progress and finished goods stock. (12 marks)
  - (b) Suggest reasons for the reductions in the costs associated with each of raw material stock, work in progress and finished goods stock which it is estimated will occur if the proposed changes are implemented. (6 marks)
  - (c) Discuss additional costs and benefits which may result from the proposed changes about which information should be obtained before implementation of the changes takes place. (12 marks)
- (Total 30 marks)

*ACCA Level 2 Cost and Management Accounting II*

### **24.7 Advanced: Safety stocks and uncertain demand**

DB p.l.c. operates a conventional stock control system based on reorder levels and Economic Ordering Quantities. The various control levels were set originally based on estimates which did not allow for any uncertainty and this has caused difficulties because, in practice, lead times, demands and other factors do vary.

As part of a review of the system, a typical stock item, Part No. X206, has been studied in detail as follows:

#### **Data for Part No. X206**

<i>Lead times</i>	<i>Probability</i>
15 working days	0.2
20 working days	0.5
25 working days	0.3

<i>Demand per working day</i>	<i>Probability</i>
5000 units	0.5
7000 units	0.5

*Note:* it can be assumed that the demands would apply for the whole of the appropriate lead time.

DB p.l.c. works for 240 days per year and it costs £0.15 p.a. to carry a unit of X206 in stock. The re-order level for this part is currently 150 000 units and the re-order cost is £1000.

You are required:

- (a) to calculate the level of buffer stock implicit in a re-order level of 150 000 units; (4 marks)
  - (b) to calculate the probability of a stock-out; (2 marks)
  - (c) to calculate the expected annual stock-outs in units; (3 marks)
  - (d) to calculate the stock-out cost per unit at which it would be worthwhile raising the re-order level to 175 000 units; (3 marks)
  - (e) to discuss the possible alternatives to a re-order level EOQ inventory system and their advantages and disadvantages. (5 marks)
- (Total 17 marks)

*Extra questions for Chapter 25 The application of linear programming to management accounting*

**25.1 Intermediate: Optimal output using the graphical approach**

MNO Ltd produces two products - W and B. Both are components that have a wide range of industrial applications. MNO Ltd's share of the market for W is insignificant but it is one of a limited number of suppliers of B. W is a long-established product and B is a new product.

The market price of W is £128 and that of B is £95. MNO Ltd is unable to influence these prices.

The resource requirements for producing one unit of each of the two products are:

	<b>process hours</b>	<b>kg of material</b>	<b>labour hours</b>
W	4	8	21.8
B	3	14.25	7.5

Materials cost £3 per kg and labour costs £3.20 per hour. Other costs are fixed.

During the coming period the company will have the following resources available to it:

1200 process hours

4000 kg of material

6000 labour hours

You are required, as MNO Ltd's management accountant:

- to advise the company of the output combination of W and B that will maximize its profit in the coming period (support your advice with a full financial analysis);  
(14 marks)
- to write a memorandum suitable for circulation to MNO Ltd's board of directors explaining the commercial limitations of the model you have used in your answer to part (a).  
(6 marks)

(Total 20 marks)

*CIMA Stage 4 Management Accounting - Decision Making*

**25.2 Advanced: Relevant material costs, optimal output and shadow prices using the graphical approach**

The Milton Carpet Company has been manufacturing two ranges of carpet for many years, one range for commercial use, the other for private use. The main difference between the two ranges is in the mix of wool and nylon; with the commercial range having 80% wool and 20% nylon and the private range 20% wool and 80% nylon. The designs of each range are the same and each range can be made in 5 different colours. There are variations in the cost of the dyes used for the different colours in the range, but they are all within 5% of each other so the accountant takes an average cost of dyeing in her costing.

The Board has just decided to use up its remaining stocks of wool and nylon and transfer its production over to making acrylic carpets in three months' time. The company's objective is to maximize the contribution from the running down of the stocks of wool

and nylon over that period subject to any operating constraints. Data concerning its present carpet range is given below. It is assumed that sufficient demand exists to ensure all production can be sold at the stated price.

	Per roll	
	Private use (£)	Commercial use (£)
Selling price	2400	3200
Manufacturing costs:		
Material - Wool	140	700
– Nylon	320	100
Direct labour	90	108
Variable production costs	250	312
Fixed production overheads based on 200% direct labour	<u>180</u>	<u>216</u>
Standard full cost	<u>980</u>	<u>1436</u>
Production requirements:		
Wool (kg)	40	200
Nylon (kg)	160	50
Direct machine time (hours)	30	36

There are 24 000 kg of wool and 25 000 kg of nylon in the stores to be used up. At the end of the quarter, when it changes production to the new carpet, any wool or nylon left can be sold for £1 per kg. The production manager forecasts that the machines can operate for a total of 6600 hours during the next quarter.

You are required to:

- Formulate the above problem in a linear programming format. Solve the problem and provide the production manager with the required output mix of rolls of private and commercial carpets. State whether any of the raw material has to be sold off as scrap at the end and thus what the total contribution for the quarter's production should be. (10 marks)
- Show whether or not it will be necessary to recompute the optimum solution if due to economic difficulties, the costs of the dyes for the carpets are to be increased by £110 and £40 per roll of private and commercial carpet respectively. (4 marks)
- Describe what would happen in physical and financial terms if the availability of one of the fully utilized resources were to be increased by a small amount. (6 marks)
- Comment on the advisability of introducing the concept of opportunity costs into the budgetary control framework, by using the output from the linear programming solution to the optimum production mix. (5 marks)

(Total 25 marks)

*ICAEW P2 Management Accounting*

### 25.3 Advanced: Formulation of initial tableau and interpretation of final tableau

*Hint:* Reverse signs of Final tableau.

D Electronics produces three models of satellite dishes - Alpha, Beta and Gamma - which have contributions per unit of £400, £200 and £100 respectively.

There is a two-stage production process and the number of hours per unit for each process are:

	Alpha	Beta	Gamma
Process 1	2	3	2.5
Process 2	3	2	2

There is an upper limit on process hours of 1920 per period for Process 1 and 2200 for Process 2.

The Alpha dish was designed for a low-power satellite which is now fading and the sales manager thinks that sales will be no more than 200 per period.

Fixed costs are £40 000 per period.

You are required to

(a) formulate these data into a Linear Programming model using the following notation:

$x_1$ : number of Alphas

$x_2$ : number of Betas

$x_3$ : number of Gammas

(5 marks)

(b) formulate (but do not attempt to solve) the initial Simplex Tableau using

$x_4$ : as Slack for Process 1

$x_5$ : as Slack for Process 2

$x_6$ : as Slack for any sales limit

and describe the meaning of Slack;

(5 marks)

(c) interpret the final Simplex Tableau below

	$x_1$	$x_2$	$x_3$	$x_4$	$x_5$	$x_6$	Solution
$x_2$	0	1	0.83	0.33	0	-0.67	506.7
$x_5$	0	0	0.33	-0.67	1	-1.67	586.7
$x_1$	1	0	0	0	0	1	200
Z	0	0	66.67	66.67	0	266.7	181 333.8

(6 marks)

(d) investigate the effect on the solution of each of the following:

(i) an increase of 20 hours per period in Process 1,

(ii) an increase of 10 units per period in the output of Alpha,

(iii) receiving an order, which must be met, for 10 units of Gamma.

(6 marks)

(Total 22 marks)

*CIMA Stage 3 Management Accounting Techniques*

## 25.4 Multi-period capital rationing and minimum profit constraints

Details of projects available to Glaser Ltd, a wholly owned subsidiary of a publicly quoted company, are:

Project	Cash flows at time				NPV (£M)	IRR (%)	Accounting profit in year to time		
	0 (£M)	1 (£M)	2 (£M)	3 (£M)			1 (£M)	2 (£M)	3 (£M)
A	(7)	1.5	2.0	2.0	1.0	10	0.6	0.6	1.4
B	(6)	2.0	1.0	1.0	0.8	21	0.8	0.3	0.8
C	(2)	4.0	(0.5)	(2.0)	(0.6)	-	(0.1)	(0.2)	(0.3)
D		(8.0)	(2.0)	(1.0)	3.0	17		(0.3)	(0.2)
E			(3.0)	1.0	0.7	25			1.5

Each of the projects have cash flows which extend beyond time 3 and this has been reflected in the NPV and IRR calculations. The investment shown is the maximum possible for each project but partial investment in a project is possible and this would result in strictly proportional cash flows, accounting profits and NPV figures. The timing of the start of each project cannot be altered and, if started, a project must run for its whole life.

External funds available for investment are:

- Time 0            up to £12 M, of which £5 M is a loan to be repaid with interest at 10% at time 1.
- Time 1            a new equity injection from Glaser's holding company of £7.5 M.
- Time 2 and 3    nil.

Funds generated from investment in the five available projects will also be available for further investment by Glaser. None of the funds generated by Glaser's existing activities are available for investment in projects A to E or for the payment of interest, or principal, relating to the loan.

At time 0, Glaser's holding company will require the surrender of any cash not used for investment. With effect from time 1 confiscation of surplus cash will cease and excess funds can be put on deposit to earn the competitive risk free interest rate of 8% per year, the gross amount then being available for investment. After time 3 Glaser will be free to seek funds from the capital market.

The holding company requires Glaser to produce accounting profits from projects (i.e. ignoring interest payments or receipts) which are always at least 10% higher than those of the previous year. Existing projects will produce profits of

<b>Year to time</b>	<b>Profits (£M)</b>
0	10
1	10
2	12
3	11

Required:

- (a) Provide an appropriate linear programming formulation which is capable of assisting in, or indicating the impossibility of, deriving a solution to the problem of selecting an optimum mix of projects within the constraints imposed on Glaser. Glaser's objective is to maximize the economic well being of the shareholders of the holding company. Clearly specify how this objective is to be incorporated in the programming formulation. Specify the meaning of each variable and describe the purpose of every constraint used. You are required to formulate the problem, you are not required to attempt a solution. Ignore tax. (10 marks)
- (b) Briefly explain the circumstances under which it may be rational for a firm to undertake a project with a negative NPV, such as project C. (3 marks)
- (c) Outline the main merits and deficiencies of mathematical programming and mathematical modelling in practical financial planning. (7 marks)

(Total 20 marks)