COST ACCOUNTING AND QUANTITATIVE ANALYSIS

Foundation stage
December 1999

MARKING SCHEME

Question 1

Part (a) **Least Squares Regression Analysis**

Year	Units 000s (x)	Costs 000s (y)
1994	33	116
1995	27	104
1996	20	90
1997	30	110
1998	40	130

x	y	xy	x^2	y^2
33	116	3,828	1,089	13,456
27	104	2,808	729	10,816
20	90	1,800	400	8,100
30	110	3,300	900	12,100
40	130	5,200	1,600	16,900
150	550	16,936	4,718	61,372
½	*½*	*1*	*1*	*1*

(4)

Total costs are given by the function $y = a + bx$
Where y is the total costs
a is the fixed cost
b is the variable cost per unit
x is the number of units.

b $= (n\Sigma xy - \Sigma x\Sigma y) / (n\Sigma x^2 - (\Sigma x)^2)$
$= (5*16,936) - (150*550) / 5(4718) - (150*150)$
$= (84,680 - 82,500) / (23590 - 22500)$
$= 2180 / 1090$
$= £2.00$ per unit

a $= \Sigma y/n - b\Sigma x/n$
$= 550/5 - 2(150)/5$
$= 110 - 60$
$= £50,000$

Fixed Overheads are therefore £50,000. *2*
Variable overheads are therefore £2.00 per unit. *2*

(8)

(b) Break even point is given by Fixed costs ÷ contribution per unit
Contribution per unit is calculated :-

Sales revenue per unit (£297,000 /33,000)	=	9.00	
Direct Material (£46,200 / 33,000)	=	1.40	
Direct Labour (£132,000 / 33,000)	=	4.00	
Variable overheads		2.00	
Total Variable costs			7.40
Contribution per unit			1.60

Break-even point in units £50,000 / 1.60 = 31,250 (rounding up) *1½*

Contribution Sales Ratio is calculated:-

Contribution per unit / Sales revenue per unit

i.e. £1.60 / £9.00 = 17.77778 %

Break-even point in sales revenue is given by:

Fixed costs / Contribution Sales Ratio

i.e. £50,000 / 17.77778% = £281,250 *1½*

(3)

(c) 95% confidence limits using student's t distribution.

Calculation of standard deviation:

X	**X-(X/n)**	**(X-X/n)²**
33	-3	9
27	3	9
20	10	100
30	0	0
40	-10	100
150	0	218
	1	*1*

n = 5 Average = 30

Either calculation acceptable

$$s = \sqrt{\frac{\sum (c - \bar{c})^2}{n}} \qquad s = \sqrt{\frac{\sum (c - \bar{c})^2}{n-1}}$$

$$= \sqrt{\frac{218}{5}} \qquad = \sqrt{\frac{218}{4}}$$

$$= \sqrt{43.6} \qquad = \sqrt{54.5}$$

$$= 6.60 \qquad = 7.38$$

$\bar{c} = 30$ $n = 5$ Degrees of Freedom $v = n - 1 = 4$

$$m = \bar{c} \pm t \frac{s}{\sqrt{n}}$$

where s = 7.38 where s = 6.60 *1*

$$\mu = 30 \pm 2.776 \text{ x } \frac{7.38}{\sqrt{5}} \qquad \mu = 30 \pm 2.776 \text{ x } \frac{6.60}{\sqrt{5}}$$

$$= 30 \pm 2.766 \text{ x } \frac{7.38}{2.236} \qquad = 30 \pm 2.776 \text{ x } \frac{6.60}{2.236}$$

$= 30 \pm 2.776 \times 3.30$	$= 30 \pm 2.776 \times 2.95$
$= 30 \pm 9.162$	$= 30 \pm 8.19$
$= 20.84 \longrightarrow 39.16$	$= 21.81 \longrightarrow 38.19$
= 20,840 to 39,160	= 21,810 to 38,190

S.D = 7.38 or S.D = 6.60

Range 20,840 to 39,160 or 21,810 to 38,190 *2*

(8)

1

(d) The reduction in price will lead to extra sales but a reduction in the contribution per unit and an increase in the break-even point.
Revised contribution is calculated:
Reduction in price = £9.00 x 10% = £0.90
Reduced contribution per unit is £1.60 - £0.90 = £0.70 per unit. *1*
Revised Break-even point is £50,000 / £0.70 = 71,428 units *2*
It is therefore not advisable to reduce the selling price, if it will only increase sales to 45,000 units.

Note. Other methodologies which lead to the same conclusion ie construction of profit statements should be given equal credit.

3 marks for appropriate comment

(6)

(25)

Question 2

(a) Calculation of stock levels

	Hook April	Hook May	Slice April	Slice May
Opening Stock	nil	4,000	nil	2,000
Production	14,000	17,000	7,000	5,000
Sales	10,000	18,000	5,000	6,500
Closing Stock	4,000	3,000	2,000	500

½ mark for each correct closing stock figure
2

Overhead recovery

	Hook	Slice	Total
Monthly Production	15,000	6,000	
Labour Cost	75,000	15,000	90,000
Fixed Overheads			45,000
Recovery Rate			50%

2 marks for correct recovery rate
1 mark only if methodology correct but answer wrong.
Half the marks should be given if different methodology used but results correctly applied to the statement.

Value of Closing Stocks

	Hook	Slice	
Material	7.00	14.00	
Labour	5.00	2.50	
Variable Production Overhead	1.50	1.00	
Variable Production Cost	13.50	17.50	*1*
Fixed Production Overhead	2.50	1.25	
Absorption Cost per unit	16.00	18.75	*1*

(6)

Absorption Costing Statement

	April			May			
	Hook	**Slice**	**Total**	**Hook**	**Slice**	**Total**	
Sales Revenue	200,000	150,000	350,000	360,000	195,000	555,000	
Direct Costs							
Materials	98,000	98,000	196,000	119,000	70,000	189,000	
Labour	70,000	17,500	87,500	85,000	12,500	97,500	
Variable Production Overhead	21,000	7,000	35,000	25,500	5,000	30,500	
Fixed Production Overhead	35,000	8,750	43,750	42,500	6,250	48,750	*4*
Sub - Total	224,000	131,250	362,250	272,000	89,250	361,250	
Opening Stock	-	-	-	64,000	37,500	101,500	
Closing stocks	64,000	37,500	101,500	48,000	9,375	57,375	*2*
Over /Under Absorbed Overhead	2,500	-1,250	1,250	-5,000	1,250	-3,750	*4*
Total Production Cost	162,500	92,500	255,000	283,000	118,625	401,625	
Selling and Distribution			60,000			87,000	
Administration			10,000			10,000	
Total Cost			325,000			498,625	
Profit			25,000			51,875	*2*

(12)
(18)

(b) Reconciliation Statement:

	£	**£**	
Absorption Profit	25,000	51,875	
Fixed costs in Stock valuation	12,500	-4,375	*1*
Marginal Profit	12,500	56,250	

1 mark for statement in good format
(2)

(c) Uses include:
- Preparation of budgets;
- Budgetary control;
- Review of overhead recovery rates;
- Assess seasonal fluctuations;
- Determine trends.

1 mark for each valid point up to a maximum of 5
(25)

Question 3

(a) Standard Cost Card for one Combisplint.

Cost Item	Quantity	Unit cost £	Quantity x Unit cost £	Standard cost £	
Materials					
Padding	10 gms	0.50	5.00		*1*
Bandage	5 mtrs	1.00	5.00		*1*
Part 107	1	15.00	15.00	25.00	
Labour					
Medical Technicians	2 hours	7.50	15.00		*1*
Laboratory Technicians	3 hours	5.00	15.00	30.00	*1*
Total Standard Cost				55.00	*1*

(5)

(b) Basic (Historic) – constructed over time
Ideal – can be achieved only in ideal conditions
Attainable – can be achieved in normal working conditions
Current – can be achieved in the conditions currently in force.
½ mark for each standard reasonably explained

Where candidates combine Attainable and Current credit should be given if the candidate explains clearly. Merely listing the standards can be given half the marks only.

(c) Annual Budget for 24,000 combisplints.

Cost Item	Quantity	Unit cost £	Quantity x Unit cost £	Budget for 24,000 units £000s	
Materials					
Padding	10 gms	0.50	5.00	120	*1*
Bandage	5 mtrs	1.00	5.00	120	*1*
Part 107	1	15.00	15.00	360	
Total Material				600	
Labour					
Medical Technicians	2 hours	7.50	15.00	360	*1*
Laboratory	3 hours	5.00	15.00	360	*1*

Technicians				
Total Labour				720
Total Budget				1320

1
(5)

(d) Variances for Month of April.

Cost Item	Quantity	Unit cost £	Quantity x Unit cost £	Standard cost for 1750 £	Actual Cost £	Variance £
Materials						
Padding	10 gms	0.50	5.00	8,750	9,000	250 (A)
Bandage	5 mtrs	1.00	5.00	8,750	9,975	1,225 (A)
Part 107	1	15.00	15.00	26,250	27,000	750 (A)
Labour						
Medical Technicians	2 hours	7.50	15.00	26,250	25,840	410 (F)
Laboratory Technicians	3 hours	5.00	15.00	26,250	25,650	600 (F)
Variable Overheads	5 hours	2.00	10.00	17,500	18,480	980 (A)
Fixed Overheads			12.00	21,000	24,000	3,000 (A)

Variances Detail:

Materials

Padding

Price	20,000 gms should cost £10,000 did cost £9,000	£1,000 (F)
Usage	1750 units should use 17,500 gms, did use 20,000 gms	
	2,500 gms (A) at £0.50	£1,250 (A)
	Total Variance for Padding	£250 (A)

Bandage

Price	9,500 metres should cost £9,500 did cost £9,975	£475 (A)
Usage	1750 units should use 8,750 metres did use 9,500 metres	
	750 metres (A) at £1.00	£750 (A)
	Total Variance for Bandage	£1,225 (A)

Part 107

Price	1,800 should cost £27,000 did cost £27,000	£0
Usage	1750 units should use 1750 parts did use 1800	
	50 (A) at £15.00	£750 (A)
	Total Variance for Part 107	£750 (A)

Labour

Medical Technicians

Rate 3,400 hours should cost £25,500 did cost £25,840	£340 (A)
Efficiency	
1750 units should take 3,500 hours did take	3,400 hours
100 hours (F) at £7.50	£750 (F)
Total Variance for Medical Technicians	£410 (F)
Laboratory Technicians	
Rate 5,400 hours should cost £27,000 did cost £25,650	£1,350 (F)
Efficiency	
1750 units should take 5,250 hours did take 5,400 hours	
150 hours (A) at £5.00	£750 (A)
Total Variance for Laboratory Technicians	£600 (F)
Variable Overheads	
Rate 8,800 hours should cost £17,600 did cost £18480	£880 (A)
Efficiency 1750 units should take 8,750 hours did take 8,800 hours	
50 hours (A) at £2.00 per D.L.H.	£100 (A)
Total Variance for Variable Overheads	£980 (A)
Fixed Overheads	
1750 units recovers £21,000 should recover £24,000	£3,000 (A)

½ mark for element of each variance i.e. 1½ marks for price, usage and total variance
(8)

(e)
Possible reasons for variances :

Padding -	purchased padding cheaper than budgeted.
	more waste as a result of purchasing cheaper padding.
Bandage -	estimated cost of bandage wrong.
	error on production line resulting in wasted bandage.
Part 107-	same error resulting in wastage of part 107.

Labour

Medical Technicians -	paid more than budgeted perhaps to supervise inexperienced Lab technicians.
	worked more efficiently than budgeted.
Laboratory Technicians -	Paid less than budgeted, perhaps less experienced technicians employed.
	Worked less efficiently than budgeted perhaps because of less experience.

1 mark for each valid reason identified up to a maximum of 5
To obtain full marks reasons must bear on the scenario and be logically linked.
(25)

Question 4

A probability payoff table is set out below.

Price £	Seats	Revenue £	Variable Costs £	Contribution £	Bar contribution £	Total contribution £	Fixed costs £	Profit £	Probability	Profit x prob (a)	Expected Profit £ (b)
20	250	5,000	1,500	3,500	375	3,875	4,000	(125)	0.6	(75)	
	275	5,500	1,650	3,850	412.50	4,262.50	4,000	262.50	0.3	78.75	
	375	7,500	2,250	5,250	562.50	5,812.50	5,000	812.50	0.1	81.25	85
18	275	4,950	1,650	3,300	412.50	3,712.50	4,000	(287.50)	0.2	(57.5)	
	325	5,850	1,950	3,900	487.50	4,387.50	4,000	387.5	0.5	193.75	
	375	6,750	2,250	4,500	562.50	5,062.50	5,000	62.50	0.3	18.75	156.8
17.50	350	6,125	2,100	4,025	525	4,550	4,000	550	0.1	55	
	375	6,562.50	2,250	4,312.50	562.5	4,875	5,000	(125)	0.3	(37.5)	
	400	7,000	2,400	4,600	600	5,200	5,000	200	0.6	120	137.5

Marks for section (a) 1 mark for each profit and 1 mark for good format (10)
Marks for section (b) 1 mark for each expected profit (3)

(c) Evaluation

The highest expected profit is given by a price of £18.00.
This has a 20% chance of making a loss.
The second highest profit is given by a price of £17.50.
This has a 30% chance of making a loss
The lowest expected profit is given by a price of £20.00, which has a 60% chance of making a loss.

1 mark for each valid point up to a maximum of 3

(d) Reservations

Probability distributions represent a test to infinity, this is a single event.
The expected profit will not be the actual profit.
The probabilities themselves are subjective probabilities and may therefore be wrong. The difference between a price of £18.00 and £17.50 is too small to be certain.
The Committee's attitude to risk needs to be taken into account.

1 mark for each valid point up to a maximum of 5

(e)

(i) Sales less variable costs.
(ii) Costs which do not vary with the level of activity.
(iii) Costs which do vary with the level of activity.
(iv) 10% probability that an event will happen. 90% probability that it will not happen.

1 mark for each valid point up to a maximum of 4
(25)

Question 5

(a)

Process 1

	Kg	£		Kg	£
Materials	1,000	2,000	Normal Loss	100	50
Labour		4,200	Output	700	5,600
Overheads		1,050	Abnormal loss	200	1,600
	1,000	7,250		1,000	7,250

Valuation of output : £7,250 - £50 = £7,200 / 900 = £8.00 per kilo

Process 2

	Kg	£		Kg	£
Process 1	700	5,600	Normal Loss	200	34
Materials	300	450	Output	850	14,360.75
Labour		6,000			
Overheads		1,500			
Abnormal Gain	50	844.75			
	1,050	14394.75		1,050	14394.75

Valuation of Output : £13,550 - 34 = £13,516 / 800 = £16.895 per kilo

Normal losses 1 mark each
Abnormal loss and abnormal gain 1 mark each
Correct valuation of output 1 mark for each process
If calculation wrong but methodology correct 1 mark only each
(6)

(b)

Scrap Account

Process 1	50.00	Abnormal Gains	8.50
Process 2	34.00	Cash	175.50
Abnormal Loss	100.00		
	184.00		184.00

Abnormal Losses Account

Process 1	200	1,600			
			Scrap account	200	100.00
			Profit and Loss Account		1,500.00
		1,600.00			1,600.00

Abnormal Gains Account

Scrap Account	50	8.50	Process 2	50	844.75
Profit and Loss Account		836.25			
		844.75			844.75

1 mark for cash figure in Scrap Account or equivalent if alternative format is used
2 marks for each Profit and Loss Account entry in Abnormal losses and Gains Accounts or if accounts combined 4 marks for correct total figure
If methodology correct but calculation wrong then half the total marks available
(5)

(c) Examples include:
- oil refining
- paint manufacture
- chemical manufacture
- brewing

½ mark for each valid example up to a maximum of 2

(d) Calculation of Coefficient of Correlation.

x **Hours**	**y** **Output**	**x^2**	**y^2**	**xy**
1220	950	1,488,400	902,500	1,159,000
1150	980	1,322,500	960,400	1,127,000
1130	820	1,276,900	672,400	926,600
1080	860	1,166,400	739,600	928,800
1050	700	1,102,500	490,000	735,000
5630	4310	6,356,700	3,764,900	4,876,400
		1	*1*	*1*

n= 5 *2*
r = 0.7956 *3*
(8)

? = n? ?? - ? ?? ?

v (N? ?² - (S?)²) x v (n? ?² - (? ?)²)

1 mark for correct application of formula

(e) Perfect correlation is plus or minus 1.00. 0.7956 represents positive correlation therefore there is some relationship between hours reducing and output reducing.
The relationship is not very strong because 0.7956 is much lower than 1.
This would not provide a strong basis for linear regression and forecasting output at various levels of hours.
Management could draw the conclusion that reducing the hours worked in process 1 has reduced output but the exact extent cannot be determined.

1 mark for each valid conclusion up to a maximum of 4
(25)