ACCOUNTING FOR DECISION MAKING

Professional 1 examination
June 2000

MARKING SCHEME

Question 1 (Lynx Electronics)

(a)

1 The table below shows the Division's results for the financial year just ending.

Model	**A**	**B**	**C**	**D**	**Total**	
Unit Selling Price	35	48	90	45		
Variable cost per unit	6	6	19	8		
Contribution per unit	29	42	71	37		*1½*
Sales Volume	20,000	87,000	8,000	6,000		
Sales Income	700,000	4,176,000	720,000	270,000	5,866,000	
Total Contribution	580,000	3,654,000	568,000	222,000	5,024,000	*2*
Fixed Costs	(596,659)	(3,559,495)	(613,706)	(230,140)	(5,000,000)	*1½*
Profit	(16,659)	94,505	(45,706)	(8,140)	24,000	*2*
Target	28,000	167,040	28,800	10,800	234,640	*1*
Profit as a % of sales income	-2%	2%	-6%	-3%	0.4%	*1*

Other forms of comparison against target are acceptable
Plus 1 for presentation

(b) **Re-launch of Model A**

	Sales Volume Unchanged	**Sales Volume up 20%**	**Sales Volume up 30%**		
Probability	20%	50%	30%		
Sales Volume	20,000	24,000	26,000		
Sales Income	700,000	840,000	910,000		*½*
Variable costs	(120,000)	(144,000)	(156,000)		*½*
One off re-launch costs	(100,000)	(100,000)	(100,000)		*½*
Net contribution	480,000	596,000	654,000		*½*
Probability weighted contribution	96,000	298,000	196,200		*½*
Expected contribution				590,200	*½*

The above figures show that there is only a 20% risk of a reduced contribution resulting from the re-launch. The "expected" contribution is higher than the current figure. This suggests that unless the company is particularly risk averse it would be well advised to go ahead and re-launch model A. *1*

The "expected" contribution is not an amount we actually expect in any of the specified scenarios. It is an average of the possible outcomes weighted by their probabilities. It is generally thought to be a good basis for decision making when faced with an element of uncertainty, provided you are prepared to take

the associated risks ("risk neutrality"). In this case the significant risk is a 20% chance that contribution will actually fall. *2*

Price Increase for Model C

	10% price increase	20% price increase
Selling price per unit (£)	99	108
Sales volume	8,000	7,680
Sales income (£)	792,000	829,440
Variable costs (£)	(152,000)	(145,920)
Net contribution (£)	640,000	683,520

2

These figures suggest that 20% price increase would be more advantageous in spite of the resulting drop in demand. *1*

Model D

Model D makes the smallest contribution of all 4 products. However, if it were to be withdrawn then that £222,000 would be lost to the company. On the other hand the company's fixed costs would drop by £175,000. So the net impact on the company would be a loss of £47,000. *1*

In addition to this loss would be the disruption caused by the closing down of a production line. Some of the variable and fixed costs saved would, no doubt, relate to staff so the company would perhaps need to make employees redundant.

On balance it would seem sensible to retain this product for the time being, though its performance should be kept under regular review. Perhaps it would be wise to prepare plans for a quick withdrawal if the position deteriorates. *1*

(c) Profit Margin as a Target

The company sets a target that each product should achieve a 4% profit margin. This does not seem appropriate since it could lead to incorrect decisions. For example, model D makes a loss, but as we have seen there is nevertheless a case for continuing to produce it. *1*

The product profit margins are based on a number of factors, some of which are outside the control of the divisional managers, for example the fixed cost apportionment method and the size of central company overheads. *2*

The factors which are within the divisional managers' control are sales income and direct costs. So perhaps the best target for a divisional manager would be a

specified level of divisional contribution to central overheads. The required level could be set to cover overheads and achieve the company's required profit level. *1*

(Examiner's comment: the mark can be awarded for any sensible type of target provided it is not product specific.)

Question 2 (Clampdown NHS Trust)

(a) (i) Establish full cost of operation A. Firstly, apply specified order of closure method to determine support service overheads chargeable to theatres:

	Estates £000	F/ IT £000	HR £000	Theatres £000	Other Medical Depts £000
Cost B/F	9,000	4,000	800		
App'n Est.	(9,000)	584.4	350.7	1051.9	7013.0
App'n F/IT	-	(4584.4)	509.4	1018.8	3056.2
App'n HR	-	-	(1660.1)	150.9	1509.2
Total	-	-	-	**2221.6**	**11,578.4**

Of the £2,221,600 overhead, 20% goes to private patients, i.e. £444,320. Together with £270,000 overhead from administrative staff, equipment capital charges & hotel expenses, gives total overhead for absorption of £714,320. This is absorbed as follows:

$$\frac{£714,320}{3,600} = £198.42 \text{ per hour (see note 1)}$$

=> full unit cost of operation A is:

	£
Nursing/Medical Staff	400
Medical & Surgical Supplies	100
Drugs	100
Overheads: (198.42 x 3 hrs.)	595.27
Total	**1195.27**

=> so total price would be £35,858 (1195.27 x 1.5 x 20 ops.)

Note 1: Students may also justifiably add the extra 60 hours of these Operation A's to the absorption base, producing an absorption rate of £195.17 per hour and a unit cost of £1,185.51, and total price of £35,565.

(ii) Opportunity cost if no effect on operation B's volume:

	£
Nursing/Medical staff (50% higher)	600
Medical & Surgical Supplies	100
Drugs	100
Variable Overheads (198.42 x 10% x 3)	59.53
Total	**859.53**

=> so total cost for 20 ops. is £17,190.6

alternative answer, based on note 1

	£
Nursing/Medical staff (50% higher)	600
Medical & Surgical Supplies	100
Drugs	100
Variable Overheads (195.17 x 10% x 3)	58.55
Total	**858.55**

=> so total cost for 20 ops. is £17,171
So including B, and using £859.53 per operation cost will be £28,877

Opportunity cost if operation B's volume is cut by 10 operations: contribution is £2,000 less variable costs of £829.37 (see note 2) = £1,170.63, giving total foregone contribution of £11,706, and hence total opportunity cost of £28,897, using £858.55 per operation.

Note 2: Staff + MSS + Drugs + Overheads of 198.42 x 0.1 x 4
300 + 200 + 250 + 79.37 = £829.37

Correct application of specified order of closure method	*6 (2 marks per cost item)*
Consistent total overhead charged to theatres	*1*
Consistent total full cost plus price for 20 operations	*2*
Consistent opportunity cost without effect on B	*2½*
Consistent opportunity cost with effect on B	*2½*

(b) **Use of full cost plus pricing - advantages & disadvantages**

- consistency with current methods, therefore simpler to operate and less likely to cause problems with regular customers *1½*
- may not win contribution-generating business, and hence worse off than could otherwise be if the work is taken on *1*
- apportionment of overheads is inherently quite arbitrary and so it's debatable whether this should affect prices charged in a rigid fashion *1*

Use of opportunity cost pricing - advantages & disadvantages

- sets the minimum price, such that any price above this will provide contribution and therefore make the Trust better off than it would otherwise be *1*
- danger of understating relevant costs e.g. by assuming most overheads are fixed, and by not employing ABC there is no identification of the activities that may be affected by this extra work *1½*
- danger of creating a precedent such that the customer may expect such a price for future work *1*

Other relevant arguments may attract credit up to a maximum of 2

(c) **Other factors:**

- level of absorption of overheads by regular planned work may affect price wish to charge
- what the neighbouring private hospital is prepared to pay
- what competitors may charge
- long term effect on regular customers should operation Bs need to be cancelled

1 mark per point

Other relevant points can attract credit up to a maximum of 2

Question 3 (Jimmyjazz Plc)

(a) Profit earned last month:

	X £	Y £	Z £	Total £
Price	50	80	100	
VC	30	50	60	
Contribution	20	30	40	
Sales (units)	20,000	25,000	30,000	
Total Contribution	400,000	750,000	1,200,000	2,350,000
Fixed Costs				1,875,000
Profit				475,000

To determine mix that would have maximised profit, need to establish whether there were any scarce resources, taking account of the total potential demand for each product:

Materials: (20,000x2) + (30,000x5) + (35,000x7) = 435,000 Kgs. => NOT scarce

Labour: (20,000x4) + (30,000x5) + (35,000x5) = 405,000 Hrs. => scarce as only 355,000 hrs. available

Machines: (20,000x10) + (30,000x12) + (35,000x18) = 1,190,000 Hrs. => NOT scarce

Therefore to determine profit maximising mix need to identify unit contribution per labour hour of each product:

Product X: 20/4 = 5
Product Y: 30/5 = 6
Product Z: 40/5 = 8

=> Ranking order for profit maximising production is Z, then Y, then X.

Production levels	**Labour hrs.**
	355,000
Make 35,000 Z @ 5 hrs each	(175,000)
Make 30,000 Y @ 5 hrs each	(150,000)
Make 7,500 X @ 4 hrs each	(30,000)

This produces total contribution as follows:

Production levels	**Contribution**	**£000's**
35,000 Z	1,400	
30,000 Y	900	
7,500 X	150	
	2,450	

....an increased contribution/profit of £100,000

Correct calculation of profit earned	*2*
Determination of labour as only scarce resource	*3*
Use of consistent ranking system based on contribution per unit of scarce resource to establish profit maximising mix of production	*1*
Determination of consistent profit maximising mix of products	*2*
Calculation of change in contribution/profit	*1*

NB: Students who use linear programming but derive the correct outcome should get full credit.

(b) Constraints will be:

Materials: $5Y + 7Z \leq 445{,}000$ ①
Labour: $5Y + 5Z \leq 355{,}000$ ②
Machines: $12Y + 18Z \leq 1{,}000{,}000$ ③
Policy: $Y \geq Z$ ④
Objective function: maximise $30Y + 40Z$

See graph. Feasible region is OABC. From isoprofit line optimum is either point B or C. Their respective contributions can be determined as follows:

Point B:

$5Y + 5Z = 355$
$12Y + 18Z = 1{,}000$

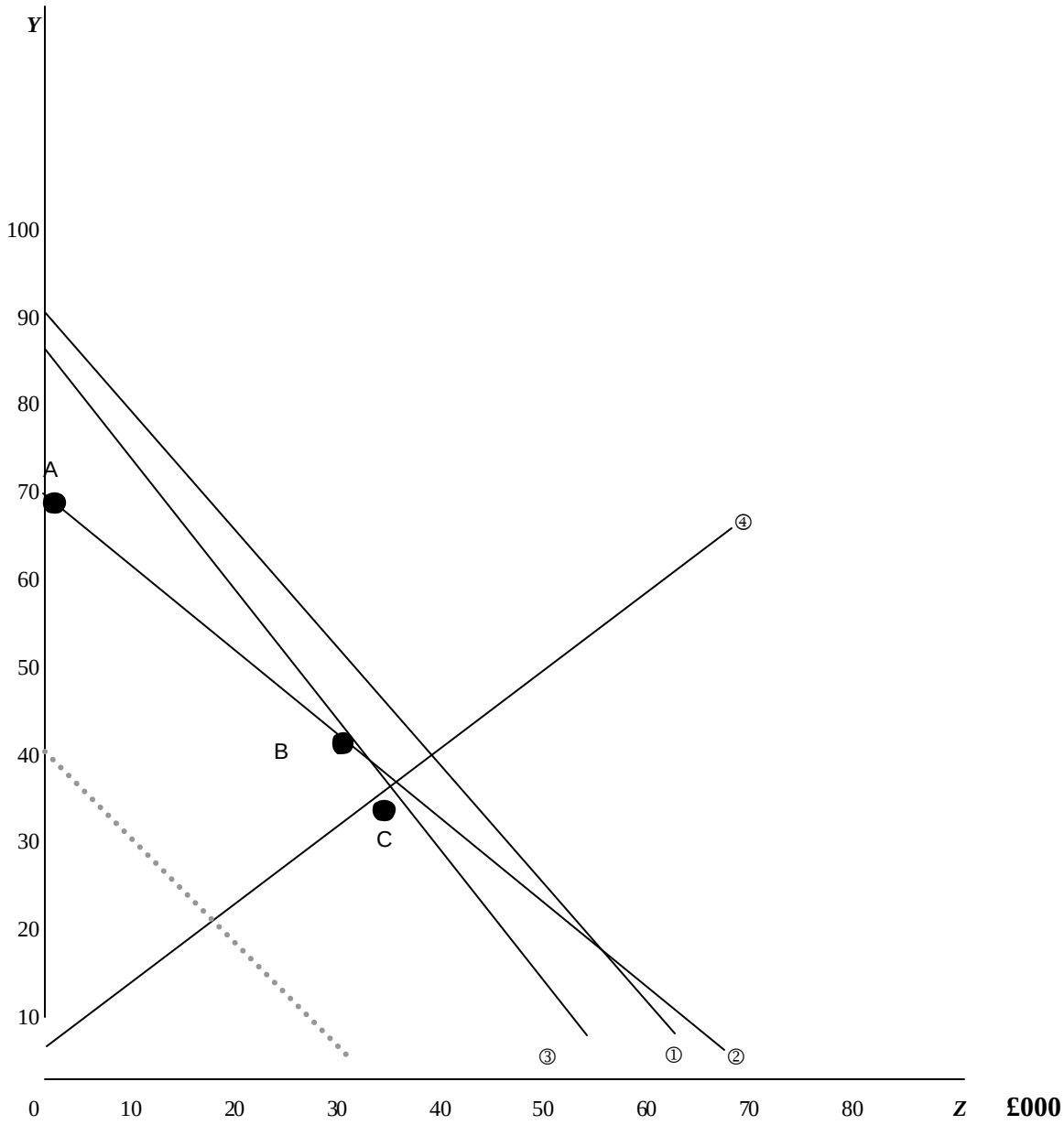
$\Rightarrow 12Y + 12Z = 852$
$\Rightarrow 6Z = 148$
$\Rightarrow Z = 24.66$, $Y = 46.33$ (i.e. 24,666.666 & 46,333.333 respectively)
Contribution = £2,376,666.66

Point C:

12Y + 18Z = 1,000 ▶
Y=Z ▶
=> 30Z = 1,000 (by substituting equation ▶ into equation ▶)
=> Z = 33,333.33, Y = 33,333.33 (i.e. 33,333.333 each)
Contribution = £2,333,333.33

=> Point B is the optimum, producing profit of £501,667 (i.e. 2,376,666.66 – 1,875,000).

£000



Objective function	*1*
Consistent determination of constraints *(½ mark each)*	*2*
Consistent determination of feasible region	*4*
Identification of consistent optimum point	*2*
Calculation of profit at identified optimum	*1*

(c) Shadow price can be calculated for either scarce resource, labour or machine hours, though credit should be given for correct calculations that are consistent with earlier results.

For labour:

5Y + 5Z = 355,001
12Y + 18Z = 1,000,000
12Y + 12Z = 852,002.4
=> 6Z = 147,997.6
=> Z = 24,666.266, Y = 46,333.934
=> contribution = £2,376,668.66, a rise of £2 per hour

Or, for machines:

5Y + 5Z = 355,000
12Y + 18Z = 1,000,001
12Y +12Z = 852,000
=> 6Z = 148,001
=> Z = 24,666.833, Y = 46,333.167
=> contribution = £2,376,668.33, a rise of £1.70 per hour.

N.B. Allowance should be made for students who round slightly their product volumes.

For any scarce resource the shadow price indicates the gain in contribution that can be realised from extra availability of a scarce resource. It therefore represents the maximum premium payable for such a resource.

The shadow price therefore represents the rate of gain in contribution (less any premium payable) from extra availability of the scarce resource until another, currently slack, resource/constraint is reached. For example, for labour, increased hours would only be desired until the point where line 3 (machine constraint) intersects the Y axis @ Y= 83,333.33. For Machine hours, the upper limit for extra machine time would be defined by the intersection between the labour constraint and the Y=Z constraint.

Calculation of consistent shadow price for a scarce resource	*3*
Explanation of shadow price as maximum premium payable	*2*
Explanation of impact of currently slack resources	*1*

Question 4 (HMS Costcutter)

(a) The net present value of the project is a positive amount of £2.54 million. The time taken to pay back the initial investment is ten years after the completion of installation. The calculation is shown in the attached spreadsheet.

See spreadsheet

(b) A 10.55% drop in the annual saving figure would reduce the NPV to approximately £0.

See spreadsheet

(c) Briefing Note *1 for format*

To Chief Executive, Ships Services Agency
From Trainee Accountant
Subject Financial Appraisal of Proposal to Fit a Nuclear Power Plant in HMS Costcutter

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1 The attached spreadsheet summarises the costs and savings expected to arise from the installation of a nuclear power plant in HMS Costcutter.

2 The figures have been discounted at the Treasury Test Discount Rate of 6% to give a net present value for the project of £2.54 million. The fact that this is positive suggests that the project is financially worthwhile. *1*

3 The costs included in the appraisal include the installation and disposal costs for the power plant. The delay in incurring the disposal cost of nuclear facilities at the dockyard has also been taken into account.

4 You have suggested that projects of this scale should only be implemented if they can be shown to pay back their initial cost within 10 years of the start of the project. This project has a capital cost of £20 million and would save £2 million a year. However, savings would not start until the second year after the project started. So strictly speaking it would fail your suggested criterion since full pay back would be 11 years after the start of the project. *2*

5 Could I suggest that the net present value (NPV) provides a better basis for financial appraisal of spend to save projects. The payback period has two disadvantages relative to the NPV.

6 The first is that the use of a specific payback period ignores any costs and savings which occur after the end of the payback period. This is particularly relevant here since there is a significant disposal cost at the end of the useful life of the power plant. *1*

7 The second is that cashflows arising at different times cannot be compared directly. For example, this project will delay the disposal cost of dockyard facilities by 1 year. This delay has a value in the sense that the funds required to meet this cost can earn interest during that year. The use of discounting to arrive at an NPV allows for these differences of timing. *1*

8 The expected cost saving of £2 million a year could turn out to be over optimistic. I have calculated that if this figure turned out to be much more than 10% less than expected, then the NPV would become negative, indicating that the costs now outweighed the benefits. *1*

9 In conclusion it is my view that the installation of the new power plant in HMS Costcutter would appear to be financially worthwhile, provided we can be confident that the cost savings will not turn out to be more than 10% below the £2 million expected. *1*

Examiner's note: marks can be awarded in part (c) for other valid comments, such as a reference to the discounted payback period, up to a maximum of 4

(d) The answer to this part of the question depends on whether project A can be split and provide a constant return to scale. The results are shown in the attached spreadsheet

See spreadsheet

Financial Appraisal of the Installation of a Nuclear Power Plant in HMS Costcutter

Part (a)

Cashflows (£ million)	**Year**				
	0	**1**	**2 - 25**	**26**	
Capital costs	(10)	(10)			*1*
Delayed closure of dockyard nuclear facilities	1	(1)			*2*
Disposal costs				(10)	*1*
Savings			2	2	*1*
Net cash flow	(9)	(11)	2	(8)	
Present value factors at 6%	1	0.9434	11.8396	0.2198	*1*
Discounted cash flow	(9.0000)	(10.3774)	23.6792	(1.7584)	*1*

Net present value 2.5434 (If the PVF for years 2-25 is taken to 3 rather than 4 decimal places the resulting NPV is £2.5442.) *1*

Pay back period = 10 years (£20m / £2m) after completion of the installation; I.e. at the end of year 11. *2*

Part (b)

Annual equivalent of NPV over years 2 - 26 = 2.5434 ÷ 12.0594 = 0.2109 *1*

Note; 12.0594 is the cumulative present value factor for years 2-26.

Percentage drop in annual savings needed to make the NPV equal to £0 = 0.2109 ÷ 2 = 10.55% *2* *(1 only if based on Cum. PVF for yrs 1-25)*

An alternative calculation is to take the NPV as a percentage of the present value of £2,000 a year for years 2 - 26:

2.5434 ÷ 2 x 12.0594) = 10.55%

Part (d)

Capital Rationing Exercise:

Project	Capital Cost (£m)	Net Present Value (£m)	Profitability Index	*Marks*	
A	170	21	1.12		
B	150	19	1.13		
C	100	14	1.14		
D	40	4	1.10		
Power plant	20	2.5	1.13	*1*	*for PIs*

The answer to this question depends on whether project A can be split and provide a constant return to scale. If it can then the following is the optimal capital budget:

Budget based on Profitability Indexes:

C	100	14		
B	150	19		
Power plant	20	2.5		
A (part)	50	6.1		
Totals	320	41.6	*1*	*Selecting projects*
			1	*NPV achieved (add 1 if correct but no PIs calculated)*

If A cannot be split:

Alternative budget

A	170	21		
B	150	19	*1*	*selecting A and B*
	320	40		

Question 5 (TM Contracts plc)

Report *1 for report format*
To Project Manager
From Trainee Accountant
Subject Appraisal of Accommodation Options for Project Team

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1 There are two options for accommodating the project team during the project. These have been appraised financially and the results are as follows:

	Present Value of Cost (£000)
Option 1 – Lease	186
Option 2 – Buy	136

Detailed calculations are shown in the attached spreadsheets. *See attached*

2 The cheapest option is to buy the existing building which is available for £200,000. *1*

3 However, it is important to bear in mind that this option carries significantly greater risk than the option to lease. The reason for this is that the overall cost to the project of option 2 depends to a large extent on the disposal value of the building at the end of five years. The best estimate is that it will be possible to sell it for the same amount that we paid (at today's prices). If the disposal value (at today's prices) were to drop by anything more than 46% then the lease option would be more cost effective. Given the volatility of property prices this risk cannot be totally ruled out. *2+*
See attached

3 The calculation of the figures is based on the following main assumptions:

- All relevant cashflows will increase in line with general inflation (currently 4%);
- All cashflows are treated as if they take place at the end of the year in which they occur; this is a simplification needed to avoid making the discounting too complex.
- The corporation tax rate and capital allowances will remain unchanged for the five years;
- The company's cost of capital will remain unchanged during the period;

Up to 1 mark per assumption to a maximum of 4
Credit for other valid assumptions

Calculation of the Real Cost of Capital

$$\frac{(1+17\%)}{(1+4\%)} - 1 = \frac{1.17}{1.04} - 1 = 1.13 - 1 = 0.13 = 13\%$$ *1*

No marks for simply deducting 4%

Option 1 – Lease

	Year 0	1	2	3	4	5	6	
Moving in costs	(25,000)							
Tax saving on moving in costs		7,500						*1*
Annual costs	(55,000)	(55,000)	(55,000)	(55,000)	(55,000)			*1*
Tax saving on annual costs			16,500	16,500	16,500	16,500	16,500	*1 (see note)*
Net cashflow	(80,000)	(47,500)	(38,500)	(38,500)	(38,500)	16,500	16,500	*1*
Present value factors at 13%	1	0.8850	0.7831	0.6931	0.6133	0.5428	0.4803	*½*
Discounted cashflows	(80,000)	(42,038)	(30,149)	(26,684)	(23,612)	8,956	7,925	
Net present value of cost	(185,602)							*1*

Note: Annual costs are shown starting in year 0 for discounting purposes because they are payable in advance. However, the cost actually relates to the subsequent year. So the tax credit appears in the year after that. (Examiner's note: tax credits starting in year 1 should not be penalized; the resulting NPV would be £(164,330).

Option 2 - Buy
Calculation of tax savings resulting from capita1 allowances:

Year	Written down value	Capital Allowance	Tax saved	
1	200,000	8,000	2,400	½
2	192,000	8,000	2,400	½
3	184,000	8,000	2,400	½
4	176,000	8,000	2,400	½
5	168,000	(32,000)	(9,600)	*1*

	Year 0	1	2	3	4	5	6		
Purchase / Disposal of Freehold	(200,000)					200,000		*1 for disposal income*	
Annual running costs		(18,000)	(18,000)	(18,000)	(18,000)	(18,000)			½
Tax saved on running cost			5,400	5,400	5,400	5,400	5,400		*1*
Tax saved from capital allowances			2,400	2,400	2,400	2,400	(9,600)		
Net cashflow	(200,000)	(18,000)	(10,200)	(10,200)	(10,200)	189,800	(4,200)		*1*
Present value factors	1	0.8850	0.7831	0.6931	0.6133	0.5428	0.4803		
Discounted cashflow	(200,000)	(15,930)	(7,988)	(7,070)	(6,256)	103,023	(2,017)		
Net present value of cost	(136,238)								*1*

Calculation of the percentage drop in disposal price required to increase the NPV of option 2 to the level of that of option 1

(185,602)	-	(136,238)	=	(49,364)	*1*
(49,364)	÷	0.5428	=	(90,943)	*1*

(90,943)	as a % of	200,000	=	45%	*1*