



Management Accounting Pillar

Managerial Level Paper

P2 – Management Accounting - Decision Management

21 November 2007 – Wednesday Morning Session

Instructions to candidates

You are allowed three hours to answer this question paper.

You are allowed 20 minutes reading time **before the examination begins** during which you should read the question paper and, if you wish, highlight and/or make notes on the question paper. However, you will **not** be allowed, **under any circumstances**, to open the answer book and start writing or use your calculator during the reading time.

You are strongly advised to carefully read ALL the question requirements before attempting the question concerned (that is, all parts and/or sub-questions). The requirements for the questions in Sections B and C are contained in a dotted box.

ALL answers must be written in the answer book. Answers or notes written on the question paper will **not** be submitted for marking.

Answer the ONE compulsory question in Section A. This has eight sub-questions and is on pages 2 to 4.

Answer ALL THREE compulsory questions in Section B on pages 5 to 7.

Answer TWO of the three questions in Section C on pages 8 to 13.

Maths Tables and Formulae are provided on pages 15 to 17. These pages are detachable for ease of reference.

The list of verbs as published in the syllabus is given for reference on the inside back cover of this question paper.

Write your candidate number, the paper number and examination subject title in the spaces provided on the front of the answer book. Also write your contact ID and name in the space provided in the right hand margin and seal to close.

Tick the appropriate boxes on the front of the answer book to indicate which questions you have answered.

P2 – Decision Management

TURN OVER

SECTION A – 20 MARKS

[the indicative time for answering this section is 36 minutes]

ANSWER ALL EIGHT SUB-QUESTIONS

Instructions for answering Section A:

The answers to the eight sub-questions in Section A should ALL be written in your answer book.

Your answers should be clearly numbered with the sub-question number and then ruled off, so that the markers know which sub-question you are answering. **For multiple choice questions, you need only write the sub-question number and the letter of the answer option you have chosen.** You do not need to start a new page for each sub-question.

For sub-questions **1.6, 1.7** and **1.8** you should show your workings as marks are available for the method you use to answer these sub-questions.

Question One

1.1

- (i) Penetration pricing is a strategy that is often used in the decline phase of a product's life cycle.
- (ii) In the context of quality costs, Conformance Costs are always equal to Internal Failure Costs.

Which of the above statements are correct?

- A** (i) only
- B** (ii) only
- C** Both
- D** Neither

(2 marks)

Section A continues on the opposite page

1.2 The following details relate to Product Z:

	<i>\$/unit</i>
Selling price	45.00
Purchased components	14.00
Labour	10.00
Variable overhead	8.50
Fixed overhead	4.50
Time on bottleneck resource	10 minutes

Product return per minute is

- A** \$0.80
- B** \$1.25
- C** \$2.10
- D** \$3.10

(2 marks)

1.3 In the context of quality costs, customer compensation costs and test equipment running costs would be classified as:

	<i>Customer compensation costs</i>	<i>Test equipment running costs</i>
A	Internal Failure Costs	Prevention Costs
B	Internal Failure Costs	Appraisal Costs
C	External Failure Costs	Appraisal Costs
D	External Failure Costs	Prevention Costs

(2 marks)

1.4 A company has an annual money cost of capital of 20% and inflation is 8% per annum. Calculate the company's annual real percentage cost of capital to 2 decimal places.

(2 marks)

1.5 A project has a net present value of \$683,000. The present value of the direct material cost is \$825,000. Calculate the sensitivity of the project to changes in the direct material cost to 2 decimal places.

(2 marks)

Section A continues on the next page

TURN OVER

- 1.6** RDE plc uses an activity based costing system to attribute overhead costs to its three products. The following budgeted data relates to the year to 31 December 2008:

Product	X	Y	Z
Production units (000)	15	25	20
Batch size (000 units)	2.5	5	4

Machine set up costs are caused by the number of batches of each product and have been estimated to be £600,000 for the year.

Calculate the machine set up costs that would be attributed to each unit of product Y.

(3 marks)

- 1.7** A company is considering an investment of \$400,000 in new machinery. The machinery is expected to yield incremental profits over the next five years as follows:

Year	Profit (\$)
1	175,000
2	225,000
3	340,000
4	165,000
5	125,000

Thereafter, no incremental profits are expected and the machinery will be sold. It is company policy to depreciate machinery on a straight line basis over the life of the asset. The machinery is expected to have a value of \$50,000 at the end of year 5.

Calculate the payback period of the investment in this machinery to the nearest 0.1 years.

(3 marks)

- 1.8** A company has determined its activity level and is now predicting its costs for the quarter ended 31 March 2008. It has made the following predictions:

Variable costs	Probability	Fixed costs	Probability
\$560,000	0.3	\$440,000	0.15
\$780,000	0.5	\$640,000	0.55
\$950,000	0.2	\$760,000	0.30

Calculate the expected value of total cost and its standard deviation.

Note: $SD = \sqrt{\frac{\sum(x - \bar{x})^2}{n}}$

(4 marks)

(Total for Section A = 20 marks)

Reminder

All answers to Section A must be written in your answer book.
Answers to Section A written on the question paper will **not** be submitted for marking.

End of Section A. Section B starts on page 5.

SECTION B – 30 MARKS

[the indicative time for answering this section is 54 minutes]

ANSWER ALL THREE QUESTIONS

Question Two

You are the management accountant of a new small company that has developed a new product using a labour intensive production process. You have recently completed the budgets for the company for next year and, before they are approved by the Board of Directors, you have been asked to explain your calculation of the labour time required for the budgeted output. In your calculations, you anticipated that the time taken for the first unit would be 40 minutes and that a 75% learning curve would apply for the first 30 units.

Required:

- (a) Explain the concept of the learning curve and why it may be relevant to the above company.
(3 marks)
- (b) Calculate the expected time for the 6th unit of output.
(3 marks)
- (c) Discuss the implications of the learning curve for a company adopting a penetration pricing policy.
(4 marks)

(Total for Question Two = 10 marks)

Note: The learning index for a 75% learning curve is -0.415

Section B continues on the next page

TURN OVER

Question Three

HS manufactures components for use in computers. The business operates in a highly competitive market where there are a large number of manufacturers of similar components. HS is considering its pricing strategy for the next twelve weeks for one of its components. The Managing Director seeks your advice to determine the selling price that will maximise the profit to be made during this period.

You have been given the following data:

Market Demand

The current selling price of the component is \$1,350 and at this price the average weekly demand over the last four weeks has been 8,000 components. An analysis of the market shows that for every \$50 increase in selling price the demand reduces by 1,000 components per week. Equally, for every \$50 reduction in selling price the demand increases by 1,000 components per week.

Costs

The direct material cost of each component is \$270. This price is part of a fixed price contract with the material suppliers and the contract does not expire for another year.

Production labour and conversion costs, together with other overhead costs and the corresponding output volumes, have been collected for the last four weeks and they are as follows:

Week	Output volume (units)	\$000
1	9,400	7,000
2	7,600	5,688
3	8,500	6,334
4	7,300	5,446

No significant changes in cost behaviour are expected over the next twelve weeks.

Required:

- (a) Calculate the optimum (profit maximising) selling price of the component for the period.

Note: If Price = $a - bq$ then Marginal Revenue = $a - 2bq$

(6 marks)

- (b) Identify and explain two reasons why it may be inappropriate for HS to use this theoretical pricing model in practice.

(4 marks)

(Total for Question Three = 10 marks)

Question Four

The owner of a tourist hotel is facing a difficult decision. It is low season and because the weather is unpredictable at this time of the year it is difficult to predict the demand for the hotel's facilities. If the weather is poor then there will be 200 room nights demanded for the hotel's facilities. There is a 70% likelihood of the weather being poor. If the weather is good then there will be 600 room nights demanded for the hotel's facilities, but there is only a 30% chance that the weather will be good.

The owner of the hotel is considering advertising some reduced prices locally or nationally in order to improve the demand during this period.

If the reduced prices are advertised locally and if the weather is poor, then there is a 60% chance that the lower prices would affect demand and would cause there to be 300 room nights demanded, but if the weather is good, then there is a 40% chance that the lower prices would affect demand and would cause there to be 800 room nights demanded.

If these lower prices were advertised nationally there is a 50% chance that these demand levels would increase to 400 room nights and 900 room nights respectively.

The earnings expected, (before deducting the costs of any local or national advertising), at different levels of demand are as follows:

<i>Room nights demanded</i>	<i>Earnings (\$)</i>
200	(35,000)
300	(15,000)
400	(5,000)
500	20,000
600	30,000
700	45,000
800	65,000
900	90,000

The costs of advertising locally and nationally are \$10,000 and \$25,000 respectively.

Required:

- (a) Prepare a decision tree to illustrate the above problem and use this to recommend, with reasons, the best course of action for the owner of the hotel.

(7 marks)

- (b) Briefly discuss the limitations of using a decision tree to solve this problem.

(3 marks)

(Total for Question Four =10 marks)

(Total for Section B = 30 marks)

End of Section B
Section C starts on the next page

TURN OVER

SECTION C – 50 MARKS

[the indicative time for answering this section is 90 minutes]

ANSWER TWO QUESTIONS OUT OF THREE

Question Five

SQ manufactures and sells a range of products. Details for one of the products, product Q, are shown below.

Existing Production Facility

The present production facility can continue to be used to produce up to 120,000 units of product Q each year. It is estimated that the facility can be used for a further five years but annual maintenance costs will rise substantially. An analysis of the latest costs is set out below:

	<i>\$ per unit</i>
Direct materials	50
Direct labour	30
Variable production overhead	25
Fixed production overhead*	20
Variable selling and distribution overhead**	10

* The fixed production overhead costs are absorbed into product costs using an absorption rate which is 25% of prime cost. These fixed overhead costs are mainly central production facility costs that are not specific to any particular product or activity and would continue to be incurred regardless of the production method used by SQ. However they also include facility maintenance costs (see above). In addition SQ incurs annual fixed non-production costs of \$24 million.

** These are selling and distribution costs that are not affected by the production method that is used for the product.

Proposed New Production Facility

The company is considering an investment of \$4 million in a new production facility for product Q. The new facility is to be operational from 1 January 2008. It will have a life of five years and at the end of its life it will have a residual value of \$0.4 million. It is expected that the facility will have significant benefits. Firstly it will increase SQ's production capacity for product Q by 30%, secondly it will reduce product Q's direct labour and variable production overhead costs by 20% per unit and finally the savings in annual maintenance costs will be as follows:

<i>Year</i>	<i>\$000</i>
2008	70
2009	80
2010	80
2011	110
2012	130

You have also obtained the following further information:

Demand

Currently SQ produces 120,000 units of product Q each year and these sell for \$150 per unit. There is significant demand for the product and SQ estimates that it could sell more units if it had the capacity to produce them. If the selling price remains unchanged, customer demand for 2008 and future years is estimated to be as shown in the following table:

<i>Year</i>	<i>Customer demand (units)</i>
2008	130,000
2009	140,000
2010	147,000
2011	154,000
2012	162,000

Cost Structure

No changes are expected to either cost structure or to cost levels other than those referred to above.

Taxation

SQ pays corporation tax at the rate of 30% of its taxable profits. Half of this tax is payable in the year in which the profit is earned and the other half is payable one year later. If the investment in the new production facility goes ahead on 1 January 2008 (the first day of SQ's accounting year) it will qualify for tax depreciation at the rate of 25% per annum on a reducing balance basis.

Cost of Capital

SQ's after tax cost of capital is 12% per annum.

Required:

(a)

- (i) Calculate the Net Present Value (NPV) of the investment in the new facility.

(14 marks)

- (ii) Explain **two** other factors that SQ should consider before making its decision.

(4 marks)

(b) A company is thinking of investing in a new project. The details are as follows:

Investment	\$15,000
Time span	3 years
Annual cash inflows	\$30,000
Annual cash outflows	\$22,500
Cost of capital	10%
NPV @ 10%	\$3,652.50

The project does not have a residual value. Ignore taxation.

- (i) Calculate the Internal Rate of Return (IRR) of the investment proposal.

(3 marks)

- (ii) Calculate the sensitivity of the investment to changes in the annual cash inflows.

(4 marks)

(Total for Question Five = 25 marks)

Section C continues on the next page

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Question Six

DFG manufactures two products from different combinations of the same resources. Unit selling prices and unit cost details for each product are as follows:

Product	D £/unit	G £/unit
Selling price	115	120
Direct material A (£5 per kg)	20	10
Direct material B (£3 per kg)	12	24
Skilled labour (£7 per hour)	28	21
Variable overhead (£2 per machine hour)	14	18
Fixed overhead*	28	36
Profit	13	11

*Fixed overhead is absorbed using an absorption rate per machine hour. It is an unavoidable central overhead cost that is not affected by the mix or volume of products produced.

The maximum weekly demand for products D and G is 400 units and 450 units respectively and this is the normal weekly production volume achieved by DFG. However, for the next four weeks the achievable production level will be reduced due to a shortage of available resources. The resources that are expected to be available are as follows:

Direct material A	1,800kg
Direct material B	3,500kg
Skilled labour	2,500 hours
Machine time	6,500 machine hours

Required:

- (a) Using graphical linear programming identify the weekly production schedule for products D and G that maximises the profits of DFG during the next four weeks.
(15 marks)
- (b) The optimal solution to part (a) shows that the shadow prices of Skilled labour and Direct material A are as follows:

Skilled labour £Nil
Direct material A £5.82

Explain the relevance of these values to the management of DFG.
(6 marks)
- (c) Using the graph you have drawn in part (a) explain how you would calculate by how much the selling price of Product D could rise before the optimal solution would change.

Note: Assume that demand is not affected by the selling price. You are **not** required to perform any calculations.

(4 marks)

(Total for Question Six = 25 marks)

Section C continues on the next page

TURN OVER

Question Seven

A small retail outlet sells four main groups of products: Basic Foods (milk, bread, etc); Newspapers & Magazines; Frozen Foods; and Canned Foods. A budgeted weekly profit statement is shown below:

	<i>Basic Foods</i>	<i>Newspapers and Magazines</i>	<i>Frozen Foods</i>	<i>Canned Foods</i>
	\$	\$	\$	\$
Sales revenue	800	1,000	1,500	2,400
Cost of sales	600	700	550	1,200
Gross margin	200	300	950	1,200
Power for freezers*			100	
Overheads**	100	100	200	400
Net margin	100	200	650	800

*The freezers would be emptied and switched off as necessary during redecoration.

**Overhead costs comprise general costs of heating and lighting, rent and rates, and other general overhead costs. These costs are attributed to products in proportion to the floor area occupied by each product group which is as follows:

	<i>Basic Foods</i>	<i>Newspapers and Magazines</i>	<i>Frozen Foods</i>	<i>Canned Foods</i>
Floor area (m ²)	50	50	100	200

For each product group, analysis has shown that the sales revenue achieved changes in direct proportion to the floor space allocated to the product.

The owner of the retail outlet has decided that the premises need to be redecorated but is undecided as to which of the following two options would be the most profitable.

Option 1

Close the retail outlet completely for four weeks while the redecoration takes place. The company that is to complete the redecoration would charge \$2,500 under this option. It is expected that following the re-opening of the retail outlet there would be a loss of sales for the next 12 weeks because customers would have had to find alternative suppliers for their goods. The reduction in sales due to lost customers has been estimated to be 30% of the budgeted sales during the first four weeks of reopening; 20% during the next four weeks; and 10% during the third four weeks. In addition, in order to encourage customers to return to the retail outlet, there would be a 10% price reduction on all Basic Foods and Canned Foods for the entire 12 week period.

Option 2

Continue to open the retail outlet while the redecoration takes place but with a reduced amount of floor area. The useable floor area would be reduced to 40% of that originally available. After three weeks, the retail outlet would be closed for 0.5 weeks while the goods are moved to the newly redecorated area. The retail outlet would then continue to operate using 40% of its original floor area for a further three weeks before the work was fully completed. The company that is to complete the redecoration would charge \$3,500 under this option, and in addition there would be product movement costs of \$1,000. The owner has determined that in order to avoid losing customers there should be no reduction in the amount of floor area given to Basic Foods and Newspapers and Magazines throughout this period. The floor area to be used by Frozen Foods and Canned Foods should be determined on the basis of their profitability per unit of

area. However, the Frozen Foods are presently kept in four freezers, and therefore any reductions in floor area must be determined by complete freezer units. It may be assumed that each freezer unit incurs equal amounts of power costs.

Required:

- (a) Advise the owner of the retail outlet which option to choose in order to minimise the losses that will occur as a result of the decision. All workings must be shown.

(15 marks)

- (b) Explain how Activity Based Costing may be used in a retail environment to improve the decision making and profitability of the business.

(10 marks)

(Total for Question Seven = 25 marks)

(Total for Section C = 50 marks)

End of question paper.

Maths Tables and Formulae are on pages 15 to 17

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PRESENT VALUE TABLE

Present value of \$1, that is $(1+r)^{-n}$ where r = interest rate; n = number of periods until payment or receipt.

Periods (n)	Interest rates (r)									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180
19	0.828	0.686	0.570	0.475	0.396	0.331	0.277	0.232	0.194	0.164
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149

Periods (n)	Interest rates (r)									
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694
3	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579
4	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482
5	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402
6	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335
7	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279
8	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233
9	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.225	0.209	0.194
10	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162
11	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135
12	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112
13	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093
14	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078
15	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.079	0.065
16	0.188	0.163	0.141	0.123	0.107	0.093	0.081	0.071	0.062	0.054
17	0.170	0.146	0.125	0.108	0.093	0.080	0.069	0.060	0.052	0.045
18	0.153	0.130	0.111	0.095	0.081	0.069	0.059	0.051	0.044	0.038
19	0.138	0.116	0.098	0.083	0.070	0.060	0.051	0.043	0.037	0.031
20	0.124	0.104	0.087	0.073	0.061	0.051	0.043	0.037	0.031	0.026

Cumulative present value of \$1 per annum, Receivable or Payable at the end of each year for n years $\frac{1-(1+r)^{-n}}{r}$

Periods (n)	Interest rates (r)									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201
19	17.226	15.679	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365
20	18.046	16.351	14.878	13.590	12.462	11.470	10.594	9.818	9.129	8.514

Periods (n)	Interest rates (r)									
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327
12	6.492	6.194	5.918	5.660	5.421	5.197	4.988	4.793	4.611	4.439
13	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14	6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675
16	7.379	6.974	6.604	6.265	5.954	5.668	5.405	5.162	4.938	4.730
17	7.549	7.120	6.729	6.373	6.047	5.749	5.475	5.222	4.990	4.775
18	7.702	7.250	6.840	6.467	6.128	5.818	5.534	5.273	5.033	4.812
19	7.839	7.366	6.938	6.550	6.198	5.877	5.584	5.316	5.070	4.843
20	7.963	7.469	7.025	6.623	6.259	5.929	5.628	5.353	5.101	4.870

FORMULAE

Time series

Additive model:

$$\text{Series} = \text{Trend} + \text{Seasonal} + \text{Random}$$

Multiplicative model:

$$\text{Series} = \text{Trend} * \text{Seasonal} * \text{Random}$$

Regression analysis

The linear regression equation of Y on X is given by:

$$Y = a + bX \quad \text{or} \quad Y - \bar{Y} = b(X - \bar{X}),$$

where:

$$b = \frac{\text{Covariance}(XY)}{\text{Variance}(X)} = \frac{n \sum XY - (\sum X)(\sum Y)}{n \sum X^2 - (\sum X)^2}$$

and
or solve

$$a = \bar{Y} - b \bar{X}$$

$$\sum Y = na + b \sum X$$

$$\sum XY = a \sum X + b \sum X^2$$

Exponential

$$Y = ab^x$$

Geometric

$$Y = aX^b$$

Learning curve

$$Y_x = aX^b$$

where:

Y_x = the cumulative average time per unit to produce X units;

a = the time required to produce the first unit of output;

X = the cumulative number of units;

b = the index of learning.

The exponent b is defined as the log of the learning curve improvement rate divided by log 2.

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LIST OF VERBS USED IN THE QUESTION REQUIREMENTS

A list of the learning objectives and verbs that appear in the syllabus and in the question requirements for each question in this paper.

It is important that you answer the question according to the definition of the verb.

LEARNING OBJECTIVE	VERBS USED	DEFINITION
1 KNOWLEDGE What you are expected to know.	List State Define	Make a list of Express, fully or clearly, the details of/facts of Give the exact meaning of
2 COMPREHENSION What you are expected to understand.	Describe Distinguish Explain Identify Illustrate	Communicate the key features Highlight the differences between Make clear or intelligible/State the meaning of Recognise, establish or select after consideration Use an example to describe or explain something
3 APPLICATION How you are expected to apply your knowledge.	Apply Calculate/compute Demonstrate Prepare Reconcile Solve Tabulate	To put to practical use To ascertain or reckon mathematically To prove with certainty or to exhibit by practical means To make or get ready for use To make or prove consistent/compatible Find an answer to Arrange in a table
4 ANALYSIS How you are expected to analyse the detail of what you have learned.	Analyse Categorise Compare and contrast Construct Discuss Interpret Produce	Examine in detail the structure of Place into a defined class or division Show the similarities and/or differences between To build up or compile To examine in detail by argument To translate into intelligible or familiar terms To create or bring into existence
5 EVALUATION How you are expected to use your learning to evaluate, make decisions or recommendations.	Advise Evaluate Recommend	To counsel, inform or notify To appraise or assess the value of To advise on a course of action

Management Accounting Pillar

Managerial Level

*P2 – Management Accounting –
Decision Management*

November 2007

Wednesday Morning Session