



CIMA

Management Accounting Pillar

Managerial Level Paper

P2 – Management Accounting -
Decision Management

22 November 2006 – 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, make annotations 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 this 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.

Answer the ONE compulsory question in Section A. This has eight sub-questions and is on pages 2 to 5.

Answer ALL THREE compulsory questions in Section B on pages 7 to 11.

Answer TWO of the three questions in Section C on pages 12 to 15.

Maths Tables and Formulae are provided on pages 17 to 19. These pages are detachable for ease of reference.

Write your full examination number, paper number and the examination subject title in the spaces provided on the front of the examination 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 A processing company operates a common process from which three different products emerge. Each of the three products can then either be sold in a market that has many buyers and sellers or further processed independently of each other in three other processes. After further processing each of the products can be sold in the same market for a higher unit selling price. Which of the following is required to determine whether or not any of the products should be further processed?

- (i) Total cost of the common process
- (ii) The basis of sharing the common process cost between the three products
- (iii) The total cost of each of the three additional processes
- (iv) The unit selling price of each product after further processing
- (v) The unit selling price of each product before further processing
- (vi) The percentage normal loss of each further process
- (vii) The actual units of output of each product from the common process.

- A** (iii), (iv), (vi) and (vii) only
- B** (i), (ii), (iii), (iv), (vi) and (vii) only
- C** (i), (ii), (v) and (vii) only
- D** (iii), (iv), (v), (vi) and (vii) only

(2 marks)

Section A continues on the opposite page

- 1.2** Z plc is preparing a quotation for a one off contract to manufacture an item for a potential customer. The item is to be made of steel and the contract would require 300 kgs of steel. The steel is in regular use by Z plc and, as a consequence, the company maintains an inventory of this steel and currently has 200 kgs in inventory. The company operates a LIFO basis of inventory valuation and its most recent purchases were as follows:

20 November 2006 150 kgs costing £600
3 November 2006 250 kgs costing £1,100

The steel is easily available in the market where its current purchase price is £4.25 per kg. If the steel currently held in inventory was to be sold it could be sold for £3.50 per kg.

The relevant cost of the steel to be included in the cost estimate is

- A** £1,050
- B** £1,260
- C** £1,275
- D** £1,300

(2 marks)

-
- 1.3** X is considering the following five investments:

<i>Investment</i>	<i>J</i>	<i>K</i>	<i>L</i>	<i>M</i>	<i>N</i>
	<i>\$000</i>	<i>\$000</i>	<i>\$000</i>	<i>\$000</i>	<i>\$000</i>
Initial investment	400	350	450	500	600
Net Present Value	125	105	140	160	190

Investments J and L are mutually exclusive, all of the investments are divisible and none of them may be invested in more than once. The optimum investment plan for X assuming that the funding available is limited to \$1m is

- A** \$400,000 in J plus \$600,000 in N.
- B** \$400,000 in M plus \$600,000 in N.
- C** \$500,000 in M plus \$500,000 in N.
- D** \$350,000 in K plus \$600,000 in N plus \$50,000 in M.

(2 marks)

Section A continues on the next page

TURN OVER

- 1.4** A hospital is considering investing \$80,000 in a new computer system that will reduce the amount of time taken to process a patient's records when making an appointment. It is estimated that the cash benefit of the time saved will be \$20,000 in the first year, \$30,000 in the second year and \$50,000 in each of the next three years. At the end of five years the computer system will be obsolete and will need to be replaced. It is not expected to have any residual value.

Calculate the payback period to one decimal place of one year.

(2 marks)

- 1.5** An investment company is considering the purchase of a commercial building at a cost of £0.85m. The property would be rented immediately to tenants at an annual rent of £80,000 payable in arrears in perpetuity.

Calculate the net present value of the investment assuming that the investment company's cost of capital is 8% per annum.

Ignore taxation and inflation.

(2 marks)

- 1.6** A bakery produces three different sized fruit pies for sale in its shops. The pies all use the same basic ingredients. Details of the selling prices and unit costs of each pie are as follows:

	<i>Small</i> \$ per pie	<i>Medium</i> \$ per pie	<i>Large</i> \$ per pie
Selling price	3.00	5.00	9.00
Ingredients	1.80	2.40	4.60
Direct labour	0.40	0.50	0.60
Variable overhead	0.30	0.50	0.80
Weekly demand (pies)	200	500	300
Fruit (kgs per pie)	0.2	0.3	0.6

The fruit used in making the pies is imported and the bakery has been told that the amount of fruit that they will be able to buy for next week is limited to 300 kgs. The bakery has established its good name by baking its pies daily using fresh fruit, so it is not possible to buy the fruit in advance.

Determine the mix of pies to be made and sold in order to maximise the bakery's contribution for next week.

(3 marks)

- 1.7 H is launching a new product which it expects to incur a variable cost of \$14 per unit. The company has completed some market research to try to determine the optimum selling price with the following results. If the price charged was to be \$25 per unit then the demand would be 1,000 units each period. For every \$1 increase in the selling price, demand would reduce by 100 units each period. For every \$1 reduction in the selling price, the demand would increase by 100 units each period.

Calculate the optimum selling price.

Note: If Price (P) = a – bx; then Marginal Revenue = a – 2bx

(3 marks)

-
- 1.8 A company sells three different levels of TV maintenance contract to its customers: Basic, Standard and Advanced. Selling prices, unit costs and monthly sales are as follows:

	<i>Basic</i>	<i>Standard</i>	<i>Advanced</i>
	£	£	£
Selling price	50	100	135
Variable cost	30	50	65
Monthly contracts sold	750	450	300

Calculate the average contribution to sales ratio of the company

- (i) based on the sales mix stated above; and
- (ii) if the total number of monthly contracts sold remains the same, but equal numbers of each contract are sold.

(4 marks)

(Total for Section A = 20 marks)

End of Section A

Section B starts on page 7

TURN OVER

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SECTION B – 30 MARKS

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

ANSWER ALL THREE QUESTIONS

Question Two

AVN designs and assembles electronic devices to allow transmission of audio / visual communications between the original source and various other locations within the same building. Many of these devices require a wired solution but the company is currently developing a wireless alternative. The company produces a number of different devices depending on the number of input sources and the number of output locations, but the technology used within each device is identical. AVN is constantly developing new devices which improve the quality of the audio / visual communications that are received at the output locations.

The Managing Director recently attended a conference on world class manufacturing entitled “The extension of the value chain to include suppliers and customers” and seeks your help.

Required:

Explain

(i) the components of the extended value chain; and

(3 marks)

(ii) how each of the components may be applied by AVN.

(7 marks)

(Total for Question Two = 10 marks)

Section B continues on the next page

TURN OVER

Question Three

W has recently completed the development and testing of a new product which has cost \$400,000. It has also bought a machine to produce the new product costing \$150,000. The production machine is capable of producing 1,000 units of the product per month and is not expected to have a residual value due to its specialised nature.

The company has decided that the unit selling prices it will charge will change with the cumulative numbers of units sold as follows:

<i>Cumulative sales units</i>	<i>Selling price \$ per unit in this band</i>
0 to 2,000	100
2,001 to 7,000	80
7,001 to 14,500	70
14,501 to 54,500	60
54,501 and above	40

Based on these selling prices, it is expected that sales demand will be as shown below:

<i>Months</i>	<i>Sales demand per month (units)</i>
1 - 10	200
11 - 20	500
21 - 30	750
31 - 70	1,000
71 - 80	800
81 - 90	600
91 - 100	400
101 - 110	200
Thereafter	NIL

Unit variable costs are expected to be as follows:

	<i>\$ per unit</i>
First 2,000 units	50
Next 12,500 units	40
Next 20,000 units	30
Next 20,000 units	25
Thereafter	30

W operates a Just in Time (JIT) purchasing and production system and operates its business on a cash basis.

A columnar cash flow statement showing the cumulative cash flow of the product after its Introduction and Growth stages has already been completed and this is set out below:

<i>Months</i>	<i>Introduction</i>	<i>Growth</i>	
	<i>1-10</i>	<i>5,000</i>	<i>7,500</i>
Number of units produced and sold	2,000	5,000	7,500
Selling price per unit	\$100	\$80	\$70
Unit variable cost	\$50	\$40	\$40
Unit contribution	\$50	\$40	\$30
Total contribution	\$100,000	\$425,000	
Cumulative cash flow	(\$450,000)	(\$25,000)	

Required:

- (a) Complete the cash flow statement for each of the remaining two stages of the product's life cycle. **Do not copy the Introduction and Growth stages in your answer.** Ignore the time value of money. *(5 marks)*
- (b) Explain, using your answer to (a) above and the data provided, the possible reasons for the changes in costs and selling prices during the life cycle of the product. *(5 marks)*

(Total for Question Three = 10 marks)

Section B continues on the next page

TURN OVER

Question Four

You are the Assistant Management Accountant of QXY plc, a food manufacturer. The Board of Directors is concerned that its operational managers may not be fully aware of the importance of understanding the costs incurred by the business and the effect that this has on their operational decision making. In addition, the operational managers need to be aware of the implications of their pricing policy when trying to increase the volume of sales.

You are scheduled to make a presentation to the operational managers tomorrow to explain to them the different costs that are incurred by the business, the results of some research that has been conducted into the implications for pricing and the importance of understanding these issues for their decision making. **The diagram on the opposite page has already been prepared for the presentation.**

Required:

You are required to interpret the diagram and explain how it illustrates issues that the operational managers should consider when making decisions. (Note: your answer must include explanations of the Sales Revenue, Total Cost and Fixed Cost lines, and the significance of each of the activity levels labelled A, B, C, D).

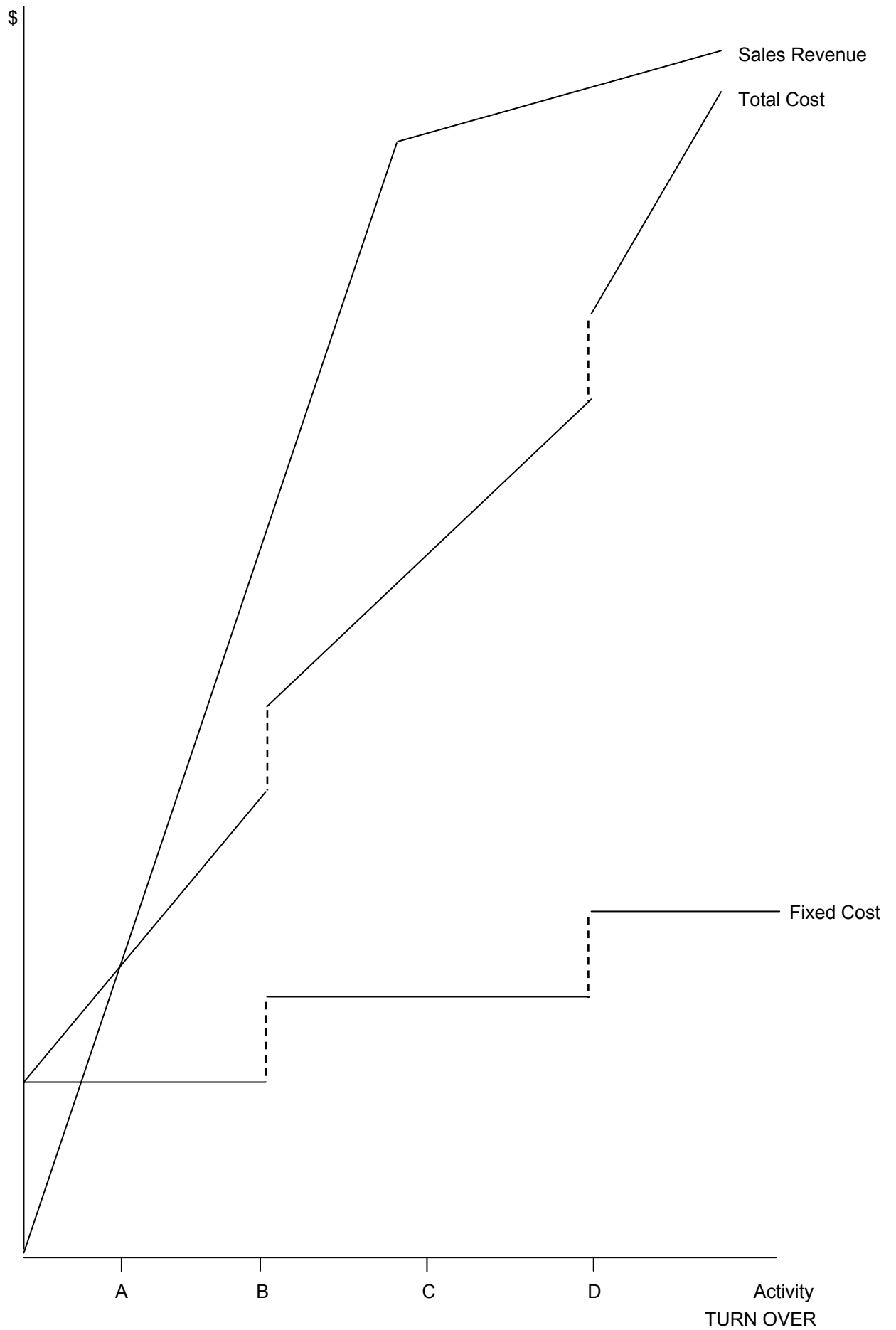
(10 marks)

(Total for Section B = 30 marks)

The diagram for Question Four is on the opposite page

Section C starts on page 12

Diagram for Question Four - Costs and Revenues over a range of activity levels



SECTION C – 50 MARKS

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

ANSWER TWO QUESTIONS OUT OF THREE

Question Five

KL manufactures three products, W, X and Y. Each product uses the same materials and the same type of direct labour but in different quantities. The company currently uses a cost plus basis to determine the selling price of its products. This is based on full cost using an overhead absorption rate per direct labour hour. However, the Managing Director is concerned that the company may be losing sales because of its approach to setting prices. He thinks that a marginal costing approach may be more appropriate, particularly since the workforce is guaranteed a minimum weekly wage and has a three month notice period.

Required:

- (a) Given the Managing Director's concern about KL's approach to setting selling prices, discuss the advantages and disadvantages of marginal cost plus pricing **AND** total cost plus pricing.

(6 marks)

The direct costs of the three products are shown below:

Product	W	X	Y
Budgeted annual production (units)	15,000	24,000	20,000
	\$ per unit	\$ per unit	\$ per unit
Direct materials	35	45	30
Direct labour (\$10 per hour)	40	30	50

In addition to the above direct costs, KL incurs annual indirect production costs of \$1,044,000.

Required:

- (b) Calculate the full cost per unit of each product using KL's current method of absorption costing.

(4 marks)

Question Five continues on the opposite page

An analysis of the company's indirect production costs shows the following:

	\$	Cost driver
Material ordering costs	220,000	Number of supplier orders
Machine setup costs	100,000	Number of batches
Machine running costs	400,000	Number of machine hours
General facility costs	324,000	Number of machine hours

The following additional data relate to each product:

Product	W	X	Y
Machine hours per unit	5	8	7
Batch size (units)	500	400	1,000
Supplier orders per batch	4	3	5

Required:

(c) Calculate the full cost per unit of each product using Activity Based Costing.

(8 marks)

(d) Explain how Activity Based Costing could provide information that would be relevant to the management team when it is making decisions about how to improve KL's profitability.

(7 marks)

(Total for Question Five = 25 marks)

Section C continues on the next page

TURN OVER

Question Six

A theatre has a seating capacity of 500 people and is considering engaging MS and her orchestra for a concert for one night only. The fee that would be charged by MS would be \$10,000. If the theatre engages MS, then this sum is payable regardless of the size of the theatre audience.

Based on past experience of events of this type, the price of the theatre ticket would be \$25 per person. The size of the audience for this event is uncertain, but based on past experience it is expected to be as follows:

	<i>Probability</i>
300 people	50%
400 people	30%
500 people	20%

In addition to the sale of the theatre tickets, it can be expected that members of the audience will also purchase confectionery both prior to the performance and during the interval. The contribution that this would yield to the theatre is unclear, but has been estimated as follows:

<i>Contribution from confectionery sales</i>	<i>Probability</i>
Contribution of \$3 per person	30%
Contribution of \$5 per person	50%
Contribution of \$10 per person	20%

Required:

- (a) Using expected values as the basis of your decision, advise the theatre management whether it is financially worthwhile to engage MS for the concert.
(5 marks)
- (b) Prepare a two-way data table to show the profit values that could occur from deciding to engage MS for the concert.
(5 marks)
- (c) Explain, using the probabilities provided and your answer to (b) above, how the two-way data table can be used by the theatre management to evaluate the financial risks of the concert, including the probability of making a profit.
(9 marks)
- (d) Calculate the maximum price that the theatre management should agree to pay for perfect information relating to the size of the audience and the level of contribution from confectionery sales.
(6 marks)

(Total for Question Six = 25 marks)

Section C continues on the opposite page

Question Seven

JK plc prepares its accounts to 31 December each year. It is considering investing in a new computer controlled production facility on 1 January 2007 at a cost of £50m. This will enable JK plc to produce a new product which it expects to be able to sell for four years. At the end of this time it has been agreed to sell the new production facility for £1m cash.

Sales of the product during the year ended 31 December 2007 and the next three years are expected to be as follows:

Year ended 31 December	2007	2008	2009	2010
Sales units (000)	100	105	110	108

Selling price, unit variable cost and fixed overhead costs (excluding depreciation) are expected to be as follows during the year ended 31 December 2007:

Selling price per unit	£ 1,200
Variable production cost per unit	750
Variable selling and distribution cost per unit	100
Fixed production cost for the year	4,000,000
Fixed selling and distribution cost for the year	2,000,000
Fixed administration cost for the year	1,000,000

The following rates of annual inflation are expected for each of the years 2008 - 2010:

	%
Selling prices	5
Production costs	8
Selling and distribution costs	6
Administration costs	5

The company pays taxation on its profits at the rate of 30%, with half of this being payable in the year in which the profit is earned and the remainder being payable in the following year. Investments of this type qualify for tax depreciation at the rate of 25% per annum on a reducing balance basis.

The Board of Directors of JK plc has agreed to use a 12% post-tax discount rate to evaluate this investment.

Required:

- (a) Advise JK plc whether the investment is financially worthwhile. (17 marks)
- (b) Calculate the Internal Rate of Return of the investment. (3 marks)
- (c) Define and contrast (i) the real rate of return and (ii) the money rate of return, and explain how they would be used when calculating the net present value of a project's cash flows. (5 marks)

(Total for Question Seven = 25 marks)

(Total for Section C = 50 marks)

End of question paper. Maths Tables and Formulae are on pages 17 to 19

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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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Management Accounting Pillar

Managerial Level

P2 – Management Accounting – Decision Management

November 2006

Wednesday Morning Session