



Management Accounting Pillar

Managerial Level Paper

P2 – Management Accounting - Decision Management

25 May 2005 – 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, add or use your calculator during this reading time.
You are strongly advised to carefully read the question requirement before attempting the question concerned. 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 is comprised of eight sub-questions and is on pages 2 to 5.
Answer ALL THREE compulsory questions in Section B on pages 6 to 8.
Answer TWO of the three questions in Section C on pages 9 to 13.
Maths Tables and Formulae are provided on pages 15 to 17. 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.

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 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** The following details relate to ready meals that are prepared by a food processing company:

<i>Ready meal</i>	<i>K \$/meal</i>	<i>L \$/meal</i>	<i>M \$/meal</i>
Selling price	5.00	3.00	4.40
Ingredients	2.00	1.00	1.30
Variable conversion costs	1.60	0.80	1.85
Fixed conversion costs*	0.50	0.30	0.60
Profit	0.90	0.90	0.65
Oven time (minutes per ready meal)	10	4	8

Each of the meals is prepared using a series of processes, one of which involves cooking the ingredients in a large oven. The availability of cooking time in the oven is limited and, because each of the meals requires cooking at a different oven temperature, it is not possible to cook more than one of the meals in the oven at the same time.

*The fixed conversion costs are general fixed costs that are not specific to any type of ready meal.

The most and least profitable use of the oven is

	<i>Most profitable</i>	<i>Least profitable</i>
A	Meal K	Meal L
B	Meal L	Meal M
C	Meal L	Meal K
D	Meal M	Meal L

(2 marks)

- 1.2** A company provides three different levels of customer service support for one of its software products.

The following data relate to these three levels of support:

<i>Support level</i>	<i>Superior \$ per contract</i>	<i>Standard \$ per contract</i>	<i>Basic \$ per contract</i>
Annual fee	1,000	750	400
Annual variable costs	450	250	180
Annual fixed costs (see note below)	200	100	50
Profit	350	400	170

Note: The total annual fixed costs are budgeted to be \$1,000,000. None of these costs are specific to any type of customer service support.

Assuming that the number of customer service support contracts sold are in the proportion:

Superior 20% Standard 30% Basic 50%

The annual revenue needed to be generated to break even is closest to

- A** \$1,690,000
- B** \$1,695,000
- C** \$1,710,000
- D** \$2,270,000

(2 marks)

- 1.3** A company is preparing a quotation for a one-month consultancy project and seeks your help in determining the relevant cost of one of the members of its project team. Currently the company employs the consultant on an annual salary of £36,000. In addition, the company provides the consultant with a company car which incurs running costs of £6,000 each year. The car will continue to be provided to the consultant whether this project is undertaken by the company or not.

This consultant is fully employed on current projects and, if she were to be transferred to this new project, then an existing junior consultant would be used to cover her current work. The junior consultant would be paid a bonus of £5,000 for undertaking this additional responsibility.

Another alternative that the company is considering is hiring an external consultant who has the necessary technical knowledge to work on the new consultancy project on a one month contract at a cost of £4,500.

The relevant cost to be used in preparing the quotation is

- A** £3,000
- B** £3,500
- C** £4,500
- D** £5,000

(2 marks)

TURN OVER

- 1.4** A company has determined that the net present value of an investment project is \$12,304 when using a 10% discount rate and \$(3,216) when using a discount rate of 15%.

Calculate the Internal Rate of Return of the project to the nearest 1%.

(2 marks)

- 1.5** A company has a nominal (money) cost of capital of 18% per annum. If inflation is 6% each year, calculate the company's real cost of capital to the nearest 0.01%.

(2 marks)

- 1.6** A company is considering the price that it should charge for a repeat order. Fifteen units of the product have already been made and supplied to the customer and the company has experienced an 80% learning curve so far. The first unit required 54 hours of labour to complete the manufacture, assembly and testing processes.

Assuming that the 80% learning curve continues, calculate the expected time to be taken for the 16th unit.

Note: The learning index for an 80% learning curve is -0.3219.

(3 marks)

- 1.7** A company has estimated the selling prices and variable costs of one of its products as follows:

<i>Selling price per unit</i>		<i>Variable cost per unit</i>	
\$	<i>Probability</i>	\$	<i>Probability</i>
40	0.30	20	0.55
50	0.45	30	0.25
60	0.25	40	0.20

Given that the company will be able to supply 1,000 units of its product each week irrespective of the selling price, and that selling price and variable cost per unit are independent of each other, calculate the probability that the weekly contribution will exceed \$20,000.

(3 marks)

Section A continues on the next page

- 1.8** A company is considering the pricing of one of its products. It has already carried out some market research with the following results:

The quantity demanded at a price of \$100 will be 1,000 units

The quantity demanded will increase / decrease by 100 units for every \$50 decrease / increase in the selling price

The marginal cost of each unit is \$35

Note that if Selling Price (P) = $a - bx$ then Marginal Revenue = $a - 2bx$

Calculate the selling price that maximises company profit.

(4 marks)

(Total for Section A = 20 marks)

End of Section A

Section B starts on the next page

TURN OVER

SECTION B – 30 MARKS

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

ANSWER ALL THREE QUESTIONS

Question Two

The X group is a well-established manufacturing group that operates a number of companies using similar production and inventory holding policies. All of the companies are in the same country though there are considerable distances between them.

The group has traditionally operated a constant production system whereby the same volume of output is produced each week, even though the demand for the group's products is subject to seasonal fluctuations. As a result there is always finished goods inventory in the group's warehouses waiting for customer orders. This inventory will include a safety inventory equal to two weeks' production.

Raw material inventories are ordered from suppliers using the Economic Order Quantity (EOQ) model in conjunction with a computerised inventory control system which identifies the need to place an order when the re-order level is reached. The purchasing department is centralised for the group. On receiving a notification from the computerised inventory control system that an order is to be placed, a series of quotation enquiries are issued to prospective suppliers so that the best price and delivery terms are obtained for each order. This practice has resulted in there being a large number of suppliers to the X group. Each supplier delivers directly to the company that requires the material.

The Managing Director of the X group has recently returned from a conference on World Class Manufacturing and was particularly interested in the possible use of Just In Time (JIT) within the X group.

Required:

Write a report, addressed to the Managing Director of the X group, that explains how the adoption of JIT might affect its profitability.

(10 marks)

Question Three

A company is considering the replacement of its delivery vehicle. It has chosen the vehicle that it will acquire but it now needs to decide whether the vehicle should be purchased or leased.

The cost of the vehicle is £15,000. If the company purchases the vehicle it will be entitled to claim tax depreciation at the rate of 25% per year on a reducing balance basis. The vehicle is expected to have a trade-in value of £5,000 at the end of three years.

If the company leases the vehicle, it will make an initial payment of £1,250 plus annual payments of £4,992 at the end of each of three years. The full value of each lease payment will be an allowable cost in the computation of the company's taxable profits of the year in which the payments are made.

The company pays corporation tax at the rate of 30% of its profits.

50% of the company's corporation tax is payable in the year in which profits are made and 50% in the following year. Assume that the company has sufficient profits to obtain tax relief on its acquisition of the vehicle in accordance with the information provided above.

The company's after tax cost of capital is 15% per year.

Note: Tax depreciation is not a cash cost but is allowed as a deduction in the calculation of taxable profits.

Required:

Calculate whether the company should purchase or lease the vehicle and clearly state your recommendation to the company.

(10 marks)

Section B continues over the page

TURN OVER

Question Four

Z manufactures three joint products (M, N and P) from the same common process. The following process account relates to the common process last month and is typical of the monthly results of operating this process:

Common Process Account

	Litres	\$		Litres	\$
Opening work in process	1,000	5,320	Normal loss	10,000	20,000
Materials	100,000	250,000	Output M	25,000	141,875
Conversion costs:			Output N	15,000	85,125
Variable		100,000	Output P	45,000	255,375
Fixed		180,000	Closing work in process	800	3,533
			Abnormal loss	5,200	29,412
	<u>101,000</u>	<u>535,320</u>		<u>101,000</u>	<u>535,320</u>

Each one of the products can be sold immediately after the common process, but each one of them can be further processed individually before being sold. The following further processing costs and selling prices per litre are expected:

Product	Selling price after common process	Selling price after further processing	Further variable processing cost
	\$/litre	\$/litre	\$/litre
M	6.25	8.40	1.75
N	5.20	6.45	0.95
P	6.80	7.45	0.85

Required:

- (a) State the method used to apportion the common costs between the products M, N and P and comment on its acceptability. Explain why it is necessary to apportion the common costs between each of the products.

(5 marks)

- (b) Evaluate the viability of the common process, and determine the optimal processing plan for each of the three products showing appropriate calculations.

(5 marks)

(Total for Question Four = 10 marks)

(Total for Section B = 30 marks)

End of Section B

Section C starts on the next page

SECTION C – 50 MARKS

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

ANSWER TWO QUESTIONS OUT OF THREE

Question Five

A printing company is considering investing in new equipment which has a capital cost of £3 million. The machine qualifies for tax depreciation at the rate of 25% per year on a reducing balance basis and has an expected life of five years. The residual value of the machine is expected to be £300,000 at the end of five years.

An existing machine would be sold immediately for £400,000 if the new machine were to be bought. This existing machine has a tax written down value of £250,000.

The existing machine generates annual revenues of £4 million and earns a contribution of 40% of sales. The new machine would reduce unit variable costs to 80% of their former value and increase output capacity by 20%. There is sufficient sales demand at the existing prices to make full use of this additional capacity.

The printing company pays corporation tax on its profits at the rate of 30%, with half of the tax being payable in the year that the profit is earned and half in the following year.

The company's after tax cost of capital is 14% per year.

Required:

- (a) Evaluate the proposed purchase of the new printing machine from a financial perspective using appropriate calculations, and advise the company as to whether the investment is worthwhile. (15 marks)
- (b) Explain sensitivity analysis and prepare calculations to show the sensitivity of the decision to independent changes in each of the following:
- (i) annual contribution;
 - (ii) rate of corporation tax on profits.
- (10 marks)

(Total for Question Five = 25 marks)

TURN OVER

Question Six

- (a) The CS group is planning its annual marketing conference for its sales executives and has approached the VBJ Holiday company (VBJ) to obtain a quotation.

VBJ has been trying to win the business of the CS group for some time and is keen to provide a quotation which the CS group will find acceptable in the hope that this will lead to future contracts.

The manager of VBJ has produced the following cost estimate for the conference:

	\$
Coach running costs	2,000
Driver costs	3,000
Hotel costs	5,000
General overheads	<u>2,000</u>
Sub total	12,000
Profit (30%)	<u>3,600</u>
Total	<u>15,600</u>

You have considered this cost estimate but you believe that it would be more appropriate to base the quotation on relevant costs. You have therefore obtained the following further information:

Coach running costs represent the fuel costs of \$1,500 plus an apportionment of the annual fixed costs of operating the coach. No specific fixed costs would be incurred if the coach is used on this contract. If the contract did not go ahead, the coach would not be in use for eight out of the ten days of the conference. For the other two days a contract has already been accepted which contains a significant financial penalty clause. This contract earns a contribution of \$250 per day. A replacement coach could be hired for \$180 per day.

Driver costs represent the salary and related employment costs of one driver for 10 days. If the driver is used on this contract the company will need to replace the driver so that VBJ can complete its existing work. The replacement driver would be hired from a recruitment agency that charges \$400 per day for a suitably qualified driver.

Hotel costs are the expected costs of hiring the hotel for the conference.

General overheads are based upon the overhead absorption rate of VBJ and are set annually when the company prepares its budgets. The only general overhead cost that can be specifically identified with the conference is the time that has been spent in considering the costs of the conference and preparing the quotation. This amounted to \$250.

Required:

Prepare a statement showing the total relevant cost of the contract. Explain clearly the reasons for each of the values in your quotation and for excluding any of the costs (if appropriate).

(10 marks)

Question Six continues on the opposite page

- (b) Now that the quotation has been prepared, it is realised that there is some uncertainty concerning the hotel cost and the fuel cost. Further investigation has shown that these costs may be higher or lower than the original estimates. Estimated costs with their associated probabilities are as follows:

<i>Estimated hotel cost</i> (\$)	<i>Probability</i> %	<i>Estimated fuel cost</i> (\$)	<i>Probability</i> %
4,000	20	1,200	10
5,000	50	1,500	50
6,000	30	2,000	40

The following two-way data table shows the effect on the total relevant cost of these alternative values. All figures are in \$:

		<i>Hotel</i>		
		<i>\$4,000</i>	<i>\$5,000</i>	<i>\$6,000</i>
<i>Fuel</i>	<i>\$1,200</i>	–1,300	–300	+700
	<i>\$1,500</i>	–1,000	0	+1,000
	<i>\$2,000</i>	–500	+500	+1,500

Required:

- Explain the meaning of the above two-way data table.
- Produce and interpret a table that shows how the two-way data table may be used in conjunction with the probabilities to improve the information available to the manager of VBJ.

(15 marks)

(Total for Question Six = 25 marks)

Section C continues on the next page

TURN OVER

Question Seven

- (a) The Q organisation is a large, worldwide respected manufacturer of consumer electrical and electronic goods. Q constantly develops new products that are in high demand as they represent the latest technology and are “must haves” for those consumers that want to own the latest consumer gadgets. Recently Q has developed a new handheld digital DVD recorder and seeks your advice as to the price it should charge for such a technologically advanced product.

Required:

Explain the relevance of the product life cycle to the consideration of alternative pricing policies that might be adopted by Q.

(10 marks)

- (b) Market research has discovered that the price demand relationship for the item during the initial launch phase will be as follows:

<i>Price (£)</i>	<i>Demand (units)</i>
100	10,000
80	20,000
69	30,000
62	40,000

Production of the DVD recorder would occur in batches of 10,000 units, and the production director believes that 50% of the variable manufacturing cost would be affected by a learning and experience curve. This would apply to each batch produced and continue at a constant rate of learning up to a production volume of 40,000 units when the learning would be complete. Thereafter, the unit variable manufacturing cost of the product would be equal to the unit cost of the fourth batch. The production director estimates that the unit variable manufacturing cost of the first batch would be £60 (£30 of which is subject to the effect of the learning and experience curve, and £30 of which is unaffected), whereas the average unit variable manufacturing cost of all four batches would be £52.71.

There are no non-manufacturing variable costs associated with the DVD recorder.

Question Seven continues on the opposite page

Required:

- (i) Calculate the rate of learning that is expected by the production director.
(4 marks)
- (ii) Calculate the optimum price at which Q should sell the DVD recorder in order to maximise its profits during the initial launch phase of the product.
(8 marks)
- (iii) Q expects that after the initial launch phase the market price will be £57 per unit. Estimated product specific fixed costs during this phase of the product's life are expected to be £15,000 per month. During this phase of the product life cycle Q wishes to achieve a target monthly profit from the product of £30,000.

Calculate the number of units that need to be sold each month during this phase in order that Q achieves this target monthly profit.
(3 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 – 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.

Management Accounting Pillar

Managerial Level

P2 – Management Accounting – Decision Management

May 2005

Wednesday Morning Session