



Management Accounting Pillar
Managerial Level Paper
P1 – Management Accounting –
Performance Evaluation
20 May 2008 – Tuesday 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 Section 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 17 sub-questions and is on pages 2 to 8.
Answer ALL SIX compulsory sub-questions in Section B on pages 10 and 11.
Answer ONE of the two questions in Section C on pages 12 to 15.
Maths Tables and Formulae are provided on pages 17 to 21.
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.

P1 – Performance Evaluation

TURN OVER

SECTION A – 40 MARKS

[the indicative time for answering this section is 72 minutes]

ANSWER ALL SEVENTEEN SUB-QUESTIONS

Instructions for answering Section A:

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

Your answers should be clearly numbered with the sub-question number 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 **1.11** to **1.17** you should show your workings as marks are available for the method you use to answer these sub-questions.

Question One

- 1.1 If inventory levels have increased during the period, the profit calculated using marginal costing when compared with that calculated using absorption costing will be
- A higher.
 - B lower.
 - C equal.
 - D impossible to answer without further information.

(2 marks)

- 1.2 Fixed production overheads will always be under-absorbed when
- A actual output is lower than budgeted output.
 - B actual overheads incurred are lower than budgeted overheads.
 - C overheads absorbed are lower than those budgeted.
 - D overheads absorbed are lower than those incurred.

(2 marks)

The following scenario is to be used for questions 1.3 and 1.4

A company manufactures three products: W, X and Y. The products use a series of different machines, but there is a common machine that is a bottleneck.

The standard selling price and standard cost per unit for each product for the next period are as follows:

	W	X	Y
	£	£	£
Selling price	180	150	150
Cost:			
Direct material	41	20	30
Direct labour	30	20	50
Variable production overheads	24	16	20
Fixed production overheads	<u>36</u>	<u>24</u>	<u>30</u>
Profit	<u>49</u>	<u>70</u>	<u>20</u>
Time (minutes) on bottleneck machine	7	10	7

The company is trying to plan the best use of its resources.

1.3 Using a traditional limiting factor approach, the rank order (best first) of the products would be

- A** W, X, Y
- B** W, Y, X
- C** X, W, Y
- D** Y, X, W

(2 marks)

1.4 Using a throughput accounting approach, the rank order (best first) of the products would be

- A** W, X, Y
- B** W, Y, X
- C** X, W, Y
- D** Y, X, W

(2 marks)

Section A continues on the next page

TURN OVER

1.5 A company's summary budgeted operating statement is as follows:

	\$000
Revenue	400
Variable costs	240
Fixed costs	<u>100</u>
Profit	<u>60</u>

Assuming that the sales mix does not change, the percentage increase in sales volume that would be needed to increase the profit to \$100,000 is

- A 10%
- B 15%
- C 25%
- D 40%

(2 marks)

1.6 Which of the following statements are true?

- (i) Enterprise Resource Planning (ERP) systems are accounting oriented information systems which aid in identifying and planning the enterprise wide resources needed to resource, make, account for and deliver customer orders.
- (ii) Flexible Manufacturing Systems (FMS) are integrated, computer-controlled production systems, capable of producing any of a range of parts and of switching quickly and economically between them.
- (iii) Just-In-Time (JIT) is a system whose objective is to produce, or to procure, products or components as they are required.

- A (i) and (ii) only
- B (i) and (iii) only
- C (ii) and (iii) only
- D (i), (ii) and (iii)

(2 marks)

1.7 Flexed budgets for the cost of medical supplies in a hospital, based on a percentage of maximum bed occupancy, are shown below:

Bed occupancy	82%	94%
Medical supplies cost	\$410,000	\$429,200

During the period, the actual bed occupancy was 87% and the total cost of the medical supplies was \$430,000.

The medical supplies expenditure variance was

- A \$5,000 adverse
- B \$12,000 adverse
- C \$5,000 favourable
- D \$12,000 favourable

(2 marks)

- 1.8** A company uses a standard absorption costing system. The fixed overhead absorption rate is based on labour hours.

Extracts from the company's records for last year were as follows:

	<i>Budget</i>	<i>Actual</i>
Fixed production overhead	\$450,000	\$475,000
Output	50,000 units	60,000 units
Labour hours	900,000	930,000

The under- or over-absorbed fixed production overheads for the year were

- A** \$10,000 under-absorbed
- B** \$10,000 over-absorbed
- C** \$15,000 over-absorbed
- D** \$65,000 over-absorbed

(2 marks)

- 1.9** A flexible budget is a budget that

- A** is changed during the budget period according to changed circumstances.
- B** is continuously updated by adding a further accounting period when the earliest accounting period has expired.
- C** results from the participation of budget holders.
- D** recognises different cost behaviour patterns and is designed to change as the volume of activity changes.

(2 marks)

- 1.10** A company will forecast its quarterly sales units for a new product by using a formula to predict the base sales units and then adjusting the figure by a seasonal index.

The formula is $BU = 4000 + 80Q$

Where BU = Base sales units and Q is the quarterly period number

The seasonal index values are:

Quarter 1	105%
Quarter 2	80%
Quarter 3	95%
Quarter 4	120%

The forecast increase in sales units from Quarter 3 to Quarter 4 is

- A** 25%
- B** 80 units
- C** 100 units
- D** 1,156 units

(2 marks)

Section A continues on the next page

TURN OVER

- 1.11 Product XYZ is made by mixing three materials (X, Y and Z). There is an expected loss of 20% of the total input.

The budgeted and actual results for Period 1 are shown below. There were no opening or closing inventories of any materials or of the finished product.

	<i>Budget</i>		<i>Actual</i>	
Output of XYZ	800 kg		960 kg	
Material				
X	500 kg	@ \$5.00 per kg	600 kg	@ \$4.70 per kg
Y	300 kg	@ \$6.00 per kg	380 kg	@ \$6.50 per kg
Z	<u>200 kg</u>	@ \$7.00 per kg	<u>300 kg</u>	@ \$7.10 per kg
Total input	1,000 kg		1,280 kg	

Calculate for Period 1:

- (i) the total materials mix variance; (2 marks)
- (ii) the total materials yield variance. (2 marks)

(Total for sub-question 1.11 = 4 marks)

- 1.12 Extracts from a company's year-end accounts are shown below:

	\$000
Revenue	9,456
Gross profit	5,872
Operating profit	2,981
Non-current assets	17,850
Inventory	950
Cash at bank	1,750
Short-term borrowings	1,225
Trade receivables	731
Trade payables	813

Calculate the following performance measures:

- (i) Operating profit margin;
- (ii) Return on capital employed;
- (iii) Trade receivable days (debtors days);
- (iv) Current ratio. (4 marks)

The following data are given for sub questions 1.13, 1.14 and 1.15

Premier Cycles has two divisions: the Frame Division and the Assembly Division. The Frame Division produces bike frames. The frames can be sold directly to external customers as “frame only” or the frames can be transferred to the Assembly Division where they are built up into complete bikes by adding other components, such as wheels and handlebars.

Frame Division

Budgeted details for the forthcoming year for the Frame Division are:

Selling price per frame	\$852
Variable cost per frame	\$420
Annual fixed cost	\$4,000,000
Annual capacity	12,000 frames

The Division has orders for 5,000 frames from external customers for the forthcoming year.

Assembly Division

The Manager of the Assembly Division has just signed a contract to supply 8,000 bikes to a sporting goods retailer next year. This will mean that the Division will be operating at full capacity. Budgeted details are as follows:

Selling price per bike	\$1,600
Variable cost of assembly and components	\$500 (excluding frame)
Annual fixed cost	\$2,400,000
Annual capacity	8,000 bikes

Company Policy

It has been announced that Premier Cycles will be introducing a new performance appraisal system. The Divisional Managers’ bonuses will only be payable if they earn a minimum annual contribution of 108% of fixed costs.

1.13 Calculate the minimum number of frames the Frame Division must sell next year in order for the Divisional Manager to earn a bonus if frames are sold for \$852 each. *(2 marks)*

1.14 Calculate the maximum price per frame that the Manager of the Assembly Division could pay and still earn a bonus next year. *(2 marks)*

1.15 Ignoring Premier Cycles’ performance appraisal system, explain how the Manager of the Frame Division should calculate the transfer price of frames it supplies to the Assembly division in order to maximise profits for Premier Cycles.

Note: NO calculations are required. *(2 marks)*

Section A continues on the next page

TURN OVER

1.16 State FOUR aims of a transfer-pricing system.

(2 marks)

1.17 Product GH passes through two consecutive processes: the output from Process 1 is transferred to Process 2. Details of Process 1 for Period 3 were as follows:

There were 5,000 units of opening work-in-progress, which were valued as follows:

Materials	\$77,080
Labour	\$33,480
Production overheads	\$8,825

During the period, 14,000 units were added to the process and the following costs were incurred:

Materials	\$230,000
Labour	\$101,000
Production overheads	\$40,000

At the end of Period 3, there were 6,000 units of closing work-in-progress. The degree of completion for these units was:

Materials	100%
Labour	80%
Production overheads	65%

The expected normal loss is 10% of new units added to the process during the period. These units and any other losses can be sold for \$5 per unit.

11,000 units were transferred to Process 2 and there were losses of 2,000 units.

All losses occur at the end of the process.

Weighted average costing is used.

Calculate the total cost of the 11,000 units that were transferred to Process 2.

(4 marks)

(Total for Section A = 40 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.

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 SIX SUB-QUESTIONS. EACH SUB-QUESTION IS WORTH 5 MARKS

Question Two

- (a) Describe THREE key features that are present in any organisation that is successfully focused on Total Quality Management (TQM). *(5 marks)*
-

- (b) Explain THREE behavioural consequences that may result after the introduction of participative budgeting. *(5 marks)*
-

- (c) Discuss the advantages and disadvantages of rolling budgets. *(5 marks)*
-

The following data relate to sub-questions (d), (e) and (f)

A multi-national company manufactures and sells a wide range of digital equipment. The company is structured into three Divisions: Computers, Audio-visual and Photographic. The Divisions operate as investment centres and the performance of the Divisional Managers is evaluated by using Return on Investment (ROI).

The Manager of the Photographic Division was concerned that the Division was falling behind its competitors in terms of financial returns and market share, and has implemented strategies to improve the situation. An external benchmarking exercise was undertaken to try to establish the position of the Division in relation to its competitors in a number of key areas. It has now been suggested that the Division should also carry out an internal benchmarking exercise.

-
- (d) The manager of the Photographic Division is considering introducing a Balanced Scorecard to measure the success of the strategies. He has identified two perspectives and two associated goals. They are:

Perspective	Goal
Innovation	Technology Leadership
Customer	Support

- (i) For the "Innovation Perspective" of the Division, recommend a performance measure and briefly explain how the measure will reflect the achievement of the stated goal. *(3 marks)*
- (ii) For the "Customer Perspective" of the Division, state which data should be collected and explain how this could be used to ensure the goal of "support" is met. *(2 marks)*

(Total for (d) = 5 marks)

-
- (e) Explain THREE reasons why internal benchmarking may provide information that is more useful to the Manager of the Photographic Division, in terms of monitoring and improving performance, than that provided by external benchmarking. *(5 marks)*

-
- (f) Explain THREE reasons why ROI may not be a good performance measure. *(5 marks)*

(Total for Question Two = 30 marks)

(Total for Section B = 30 marks)

End of Section B

Section C starts on the next page

TURN OVER

SECTION C – 30 MARKS

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

ANSWER ONE OF THE TWO QUESTIONS

Question Three

The newly-appointed Managing Director of FX has received the variance report for Month 6, which is shown below:

Month 6 Variance Report

Output and Sales for Month 6. Budget: 1,000 units. Actual: 1,200 units.

	£	£	£
Budgeted contribution			90,000
Budgeted fixed costs			<u>70,000</u>
Budgeted profit			20,000
Volume variance			<u>18,000</u>
Expected profit on actual sales			38,000
Sales price variance			12,000
Production variances	Favourable	Adverse	
Materials price		6,300	
Materials usage		6,000	
Labour rate	5,040		
Labour efficiency		2,400	
Variable overhead expenditure	-	-	
Variable overhead efficiency		1,200	
Fixed overhead		<u>4,000</u>	
	<u>5,040</u>	<u>19,900</u>	<u>14,860</u>
Actual profit			11,140

Background information (not seen by the Managing Director)

The report did not include any other information. Details relating to the company and the product that it makes are given below:

FX produces one type of product. It operates a standard marginal costing system.

The standard unit cost and price of the product is as follows:

	£	£
Selling price		250
Direct material (5 kg at £20)	100	
Direct labour (4 hours at £10)	40	
Variable overheads (4 hours at £5)	<u>20</u>	<u>160</u>
Contribution		<u>90</u>

The variable overhead absorption rate is based on direct labour hours.

The company has budgeted fixed overheads of £70,000 per month.

Budgeted sales and production levels are 1,000 units per month.

Month 6

The company has just completed Month 6 of its operations. Extracts from its records show:

1. 1,200 units were produced and sold.
2. The actual direct materials purchased and used was 6,300 kg costing £132,300
3. The actual direct labour hours worked were 5,040 hours.

Required:

- (a) Prepare a report for the Managing Director of FX that explains and interprets the Month 6 variance report. The Managing Director has recently joined the company and has very little previous financial experience.

(17 marks)

The Managing Director was concerned about the Material Price variance and its cause. He discovered that a shortage of materials had caused the market price to rise to £23 per kg.

Required:

- (b) In view of this additional information, calculate for Direct Materials:

- The total variance;
- The planning variance;
- The two operational variances.

(7 marks)

- (c) Discuss the advantages and disadvantages of reporting planning and operational variances. Your answer should refer, where appropriate, to the variances you calculated in (b) above.

(6 marks)

(Total for Question Three = 30 marks)

Section C continues on the next page

TURN OVER

Question Four

Q, a new company, is being established to manufacture and sell an electronic tracking device: the Trackit. The owners are excited about the future profits that the business will generate. They have forecast that sales will grow to 2,600 Trackits per month within five months and will be at that level for the remainder of the first year.

The owners will invest a total of \$250,000 in cash on the first day of operations (that is the first day of Month 1). They will also transfer non-current assets into the company.

Extracts from the company's business plan are shown below.

Sales

The forecast sales for the first five months are:

Month	Trackits (units)
1	1,000
2	1,500
3	2,000
4	2,400
5	2,600

The selling price has been set at \$140 per Trackit.

Sales receipts

Sales will be mainly through large retail outlets. The pattern for the receipt of payment is expected to be as follows:

Time of payment	% of sales value
Immediately	15 *
One month later	25
Two months later	40
Three months later	15

The balance represents anticipated bad debts.

* A 4% discount will be given for immediate payment.

Production

The budget production volumes in units are:

Month 1	Month 2	Month 3	Month 4
1,450	1,650	2,120	2,460

Variable production cost

The budgeted variable production cost is \$90 per unit, comprising:

	\$
Direct materials	60
Direct wages	10
Variable production overheads	<u>20</u>
Total variable cost	<u>90</u>

Direct materials: Payment for purchases will be made in the month following receipt. There will be no opening inventory of materials in Month 1. It will be company policy to hold inventory at the end of each month equal to 20% at of the following month's production requirements. The direct materials cost includes the cost of an essential component that will be bought in from a specialist manufacturer.

Direct wages will be paid in the month in which the production occurs.

Variable production overheads: 65% will be paid in the month in which production occurs and the remainder will be paid one month later.

Fixed overhead costs

Fixed overheads are estimated at \$840,000 per annum and are expected to be incurred in equal amounts each month. 60% of the fixed overhead costs will be paid in the month in which they are incurred and 15% in the following month. The balance represents depreciation of non-current assets.

Ignore VAT and Tax

Required

- (a) Prepare a cash budget for each of the first three months and for that three-month period in total. *(14 marks)*

- (b) There is some uncertainty about the cost of the specialist component (this is included in the direct material cost). It is thought that the cost of the component could range between \$32 and \$50 per Trackit. It is currently included in the cost estimates at \$40 per Trackit.

Calculate the budgeted total net cash flow for the three-month period in total if the cost of the component was

(i) \$32

(ii) \$50

(6 marks)

- (c) Prepare a report for the owners of Q that offers advice about the profitability of their business and the situation revealed by the extracts from the business plan and your answers to (a) and (b) above. *(10 marks)*

Total for Question Four = 30 marks

(Total for Section C = 30 marks)

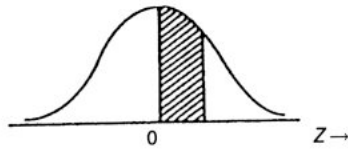
End of question paper

Maths Tables and Formulae are on pages 17 to 21

[This page is blank]

AREA UNDER THE NORMAL CURVE

This table gives the area under the normal curve between the mean and a point Z standard deviations above the mean. The corresponding area for deviations below the mean can be found by symmetry.



$Z = \frac{(x - \mu)}{\sigma}$	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	.0000	.0040	.0080	.0120	.0159	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4430	.4441
1.6	.4452	.4463	.4474	.4485	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4762	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4865	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4980	.4980	.4981
2.9	.4981	.4982	.4983	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.49865	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.49903	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.49931	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.49952	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.49966	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.49977									

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

PROBABILITY

$A \cup B = \mathbf{A \text{ or } B}$. $A \cap B = \mathbf{A \text{ and } B}$ (overlap).

$P(B | A)$ = probability of B , **given** A .

Rules of Addition

If A and B are mutually exclusive: $P(A \cup B) = P(A) + P(B)$

If A and B are **not** mutually exclusive: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Rules of Multiplication

If A and B are *independent*: $P(A \cap B) = P(A) * P(B)$

If A and B are **not independent**: $P(A \cap B) = P(A) * P(B | A)$

$E(X) = \Sigma (\text{probability} * \text{payoff})$

Quadratic Equations

If $aX^2 + bX + c = 0$ is the general quadratic equation, the two solutions (roots) are given by:

$$X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

DESCRIPTIVE STATISTICS

Arithmetic Mean

$$\bar{x} = \frac{\Sigma x}{n} \quad \bar{x} = \frac{\Sigma fx}{\Sigma f} \quad (\text{frequency distribution})$$

Standard Deviation

$$SD = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n}} \quad SD = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \bar{x}^2} \quad (\text{frequency distribution})$$

INDEX NUMBERS

Price relative = $100 * P_1/P_0$ Quantity relative = $100 * Q_1/Q_0$

Price:
$$\frac{\Sigma w * \left(\frac{P_1}{P_0}\right)}{\Sigma w} * 100$$

Quantity:
$$\frac{\Sigma w * \left(\frac{Q_1}{Q_0}\right)}{\Sigma w} * 100$$

TIME SERIES

Additive Model

Series = Trend + Seasonal + Random

Multiplicative Model

Series = Trend * Seasonal * Random

LINEAR REGRESSION AND CORRELATION

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

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

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

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

or solve

$$\begin{aligned} \sum Y &= na + b \sum X \\ \sum XY &= a \sum X + b \sum X^2 \end{aligned}$$

Coefficient of correlation

$$r = \frac{\text{Covariance}(XY)}{\sqrt{\text{Var}(X) \cdot \text{Var}(Y)}} = \frac{n \sum XY - (\sum X)(\sum Y)}{\sqrt{\{n \sum X^2 - (\sum X)^2\} \{n \sum Y^2 - (\sum Y)^2\}}}$$

$$R(\text{rank}) = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}$$

FINANCIAL MATHEMATICS

Compound Interest (Values and Sums)

Future Value S , of a sum of X , invested for n periods, compounded at $r\%$ interest

$$S = X[1 + r]^n$$

Annuity

Present value of an annuity of £1 per annum receivable or payable for n years, commencing in one year, discounted at $r\%$ per annum:

$$PV = \frac{1}{r} \left[1 - \frac{1}{[1 + r]^n} \right]$$

Perpetuity

Present value of £1 per annum, payable or receivable in perpetuity, commencing in one year, discounted at $r\%$ per annum:

$$PV = \frac{1}{r}$$

[This page is blank]

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

P1 – Management Accounting – Performance Evaluation

May 2008

Tuesday Morning Session