CIMA

Management Accounting Pillar

Managerial Level Paper

P1 – Management Accounting – Performance Evaluation

22 May 2007 – 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 15 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. 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.

P1 – Performance Evaluation

TURN OVER

SECTION A – 40 MARKS

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

ANSWER *ALL* FIFTEEN SUB-QUESTIONS

Instructions for answering Section A:

The answers to the fifteen 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 1.15** you should show your workings as marks are available for the method you use to answer these sub-questions.

Question One

1.1 Which of the following best describes an investment centre?

A A centre for which managers are accountable only for costs.

B A centre for which managers are accountable only for financial outputs in the form of generating sales revenue.

C A centre for which managers are accountable for profit.

D A centre for which managers are accountable for profit and current and non-current assets.

(2 marks)

1.2 A flexible budget is

A a budget which, by recognising different cost behaviour patterns, is designed to change as volume of activity changes.

B a budget for a twelve month period which includes planned revenues, expenses, assets and liabilities.

C a budget which is prepared for a rolling period which is reviewed monthly, and updated accordingly.

D a budget for semi-variable overhead costs only.

(2 marks)

1.3 The term "budget slack" refers to the

A lead time between the preparation of the master budget and the commencement of the budget period.

B difference between the budgeted output and the actual output achieved.

C additional capacity available which is budgeted for even though it may not be used.

D deliberate overestimation of costs and/or underestimation of revenues in a budget.

(2 marks)

1.4 PP Ltd is preparing the production and material purchases budgets for one of their products, the SUPERX, for the forthcoming year.

The following information is available:

SUPERX	
Sales demand (units)	30,000
Material usage per unit	7 kgs
Estimated opening inventory	3,500 units
Required closing inventory	35% higher than opening inventory

How many units of the SUPERX will need to be produced?

A 28,775

B 30,000

C 31,225

D 38,225

(2 marks)

Section A continues on the next page

The following data are given for sub-questions 1.5 and 1.6 below

X Ltd operates a standard costing system and absorbs fixed overheads on the basis of machine hours. Details of budgeted and actual figures are as follows:

	Budget	*Actual*
Fixed overheads	£2,500,000	£2,010,000
Output	500,000 units	440,000 units
Machine hours	1,000,000 hours	900,000 hours

1.5 The fixed overhead expenditure variance is

A £190,000 favourable

B £250,000 adverse

C £300,000 adverse

D £490,000 favourable

(2 marks)

1.6 The fixed overhead volume variance is

A £190,000 favourable

B £250,000 adverse

C £300,000 adverse

D £490,000 favourable

(2 marks)

1.7 A company operates a standard absorption costing system. The budgeted fixed production overheads for the company for the latest year were £330,000 and budgeted output was 220,000 units. At the end of the company's financial year the total of the fixed production overheads debited to the Fixed Production Overhead Control Account was £260,000 and the actual output achieved was 200,000 units.

The under / over absorption of overheads was

A £40,000 over absorbed

B £40,000 under absorbed

C £70,000 over absorbed

D £70,000 under absorbed

(2 marks)

1.8 A company operates a standard absorption costing system. The following fixed production overhead data are available for the latest period:

Budgeted Output	300,000 units
Budgeted Fixed Production Overhead	£1,500,000
Actual Fixed Production Overhead	£1,950,000
Fixed Production Overhead Total Variance	£150,000 adverse

The actual level of production for the period was nearest to

A 277,000 units

B 324,000 units

C 360,000 units

D 420,000 units

(2 marks)

1.9 Which of the following best describes a basic standard?

A A standard set at an ideal level, which makes no allowance for normal losses, waste and machine downtime.

B A standard which assumes an efficient level of operation, but which includes allowances for factors such as normal loss, waste and machine downtime.

C A standard which is kept unchanged over a period of time.

D A standard which is based on current price levels.

(2 marks)

1.10 XYZ Ltd is preparing the production budget for the next period. The total costs of production are a semi-variable cost. The following cost information has been collected in connection with production:

Volume (units)	*Cost*
4,500	£29,000
6,500	£33,000

The estimated total production costs for a production volume of 5,750 units is nearest to

A £29,200

B £30,000

C £31,500

D £32,500

(2 marks)

Section A continues on the next page

TURN OVER

1.11 S Ltd manufactures three products, A, B and C. The products use a series of different machines but there is a common machine, P, that is a bottleneck.

The selling price and standard cost for each product for the forthcoming year is as follows:

	A	*B*	*C*
	$	*$*	*$*
Selling price	200	150	150
Direct materials	41	20	30
Conversion costs	55	40	66
Machine P - minutes	12	10	7

Calculate the return per hour for each of the products.

(4 marks)

1.12 The following data have been extracted from a company's year-end accounts:

	£
Turnover	7,055,016
Gross profit	4,938,511
Operating profit	3,629,156
Non-current assets	4,582,000
Cash at bank	4,619,582
Short term borrowings	949,339
Trade receivables	442,443
Trade payables	464,692

Calculate the following four performance measures:

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

(4 marks)

1.13 PQR Ltd operates a standard absorption costing system. Details of budgeted and actual figures are as follows:

	Budget	*Actual*
Sales volume (units)	100,000	110,000
Selling price per unit	£10	£9·50
Variable cost per unit	£5	£5·25
Total cost per unit	£8	£8·30

(i) Calculate the sales price variance.

(2 marks)

(ii) Calculate the sales volume profit variance.

(2 marks)

1.14 WX has two divisions, Y and Z. The following budgeted information is available.

Division Y manufactures motors and budgets to transfer 60,000 motors to Division Z and to sell 40,000 motors to external customers.

Division Z assembles food mixers and uses one motor for each food mixer produced.

The standard cost information per motor for Division Y is as follows:

	£
Direct materials	70
Direct labour	20
Variable production overhead	10
Fixed production overhead	40
Fixed selling and administration overhead	10
Total standard cost	150

In order to set the external selling price the company uses a 33·33% mark up on total standard cost.

(i) Calculate the budgeted profit/(loss) for Division Y if the transfer price is set at marginal cost.

(ii) Calculate the budgeted profit/(loss) for Division Y if the transfer price is set at the total production cost.

(4 marks)

Section A continues on the next page

1.15 RF Ltd is about to launch a new product in June 2007. The company has commissioned some market research to assist in sales forecasting. The resulting research and analysis established the following equation:

$Y = Ax^{0.6}$
Where Y is the cumulative sales units, A is the sales units in month 1, x is the month number.
June 2007 is Month 1.
Sales in June 2007 will be 1,500 units.

Calculate the forecast sales volume for each of the months June, July and August 2007 and for that three month period in total.

(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.

End of Section A

Section B starts on page 10

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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) A company uses variance analysis to monitor the performance of the team of workers which assembles Product M. Details of the budgeted and actual performance of the team for last period were as follows:

	Budget	*Actual*
Output of product M	600 units	680 units
Wage rate	£30 per hour	£32 per hour
Labour hours	900 hours	1,070 hours

It has now been established that the standard wage rate should have been £31·20 per hour.

(i) Calculate the labour rate planning variance and calculate the operational labour efficiency variance.

(ii) Explain the major benefit of analysing variances into planning and operational components.

(5 Marks)

(b) Briefly explain three limitations of standard costing in the modern business environment.

(5 Marks)

(c) Briefly explain three factors that should be considered before deciding to investigate a variance.

(5 Marks)

(d) G Group consists of several autonomous divisions. Two of the divisions supply components and services to other divisions within the group as well as to external clients. The management of G Group is considering the introduction of a bonus scheme for managers that will be based on the profit generated by each division.

Briefly explain the factors that should be considered by the management of G Group when designing the bonus scheme for divisional managers.

(5 Marks)

(e) Briefly explain the role of a Manufacturing Resource Planning System in supporting a standard costing system.

(5 Marks)

(f) Briefly explain the main differences between the traditional manufacturing environment and a just-in-time manufacturing environment.

(5 marks)

(Total for Question Two = 30 marks)

(Total for Section B = 30 marks)

End of Section B

Section C starts on page 12

TURN OVER

SECTION C – 30 MARKS

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

ANSWER *ONE* OF THE TWO QUESTIONS

Question Three

RJ produces and sells two high performance motor cars: Car X and Car Y. The company operates a standard absorption costing system. The company's budgeted operating statement for the year ending 30 June 2008 and supporting information is given below:

Operating statement year ending 30 June 2008

	Car X	*Car Y*	*Total*
	$000	*$000*	*$000*
Sales	52,500	105,000	157,500
Production cost of sales	40,000	82,250	122,250
Gross profit	12,500	22,750	35,250
Administration costs			
Variable	6,300	12,600	18,900
Fixed	7,000	9,000	16,000
Profit/(loss)	(800)	1,150	350

The production cost of sales for each car was calculated using the following values:

	Car X		*Car Y*	
	Units	*$000*	*Units*	*$000*
Opening inventory	200	8,000	250	11,750
Production	1,100	44,000	1,600	75,200
Closing inventory	300	12,000	100	4,700
Cost of sales	1,000	40,000	1,750	82,250

Production costs
The production costs are made up of direct materials, direct labour, and fixed production overhead. The fixed production overhead is general production overhead (it is not product specific). The total budgeted fixed production overhead is $35,000,000 and is absorbed using a machine hour rate. It takes 200 machine hours to produce one Car X and 300 machine hours to produce one Car Y.

Administration costs
The fixed administration costs include the costs of specific marketing campaigns: $2,000,000 for Car X and $4,000,000 for Car Y.

Required:

(a) Produce the budgeted operating statement in a marginal costing format.

(7 marks)

(b) Reconcile the total budgeted absorption costing profit with the total budgeted marginal costing profit as shown in the statement you produced in part *(a).*

(5 marks)

The company is considering changing to an activity based costing system. The company has analysed the budgeted fixed production overheads and found that the costs for various activities are as follows:

	$000
Machining costs	7,000
Set up costs	12,000
Quality inspections	7,020
Stores receiving	3,480
Stores issues	5,500
	35,000

The analysis also revealed the following information:

	Car X	*Car Y*
Budgeted production (number of cars)	1,100	1,600
Cars per production run	10	40
Inspections per production run	20	80
Number of component deliveries during the year	492	900
Number of issues from stores	4,000	7,000

Required:

(c) Calculate the budgeted production cost of one Car X and one Car Y using the activity based costing information provided above.

(10 marks)

(d) Prepare a report to the Production Director of RJ which explains the potential benefits of using activity based budgeting for performance evaluation.

(8 marks)
(Total for Question Three = 30 marks)

Section C continues on the next page

Question Four

RF Ltd is a new company which plans to manufacture a specialist electrical component. The company founders will invest £16,250 on the first day of operations, that is, Month 1. They will also transfer fixed capital assets to the company.

The following information is available:

Sales
The forecast sales for the first four months are as follows:

Month	*Number of components*
1	1,500
2	1,750
3	2,000
4	2,100

The selling price has been set at £10 per component in the first four months.

Sales receipts

Time of payment	*% of customers*
Month of sale	20*
One month later	45
Two months later	25
Three months later	5

The balance represents anticipated bad debts.

*A 2% discount is given to customers for payment received in the month of sale.

Production
There will be no opening inventory of finished goods in Month 1 but after that it will be policy for the closing inventory to be equal to 20% of the following month's forecast sales.

Variable production cost
The variable production cost is expected to be £6·40 per component.

	£
Direct materials	1·90
Direct wages	3·30
Variable production overheads	1·20
Total variable cost	6·40

Notes:
Direct materials: 100% of the materials required for production will be purchased in the month of production. No inventory of materials will be held. Direct materials will be paid for in the month following purchase.

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

Variable production overheads: 60% will be paid in the month in which production occurs and the remainder will be paid one month later.

Fixed overhead costs
Fixed overhead costs are estimated at £75,000 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 30% in the following month. The balance represents depreciation of fixed assets.

Calculations are to be made to the nearest £1.

Ignore VAT and Tax.

Required:

(a) Prepare a cash budget for each of the first three months and in total.

(15 marks)

(b) There is some uncertainty about the direct material cost. It is thought that the direct material cost per component could range between £1·50 and £2·20. Calculate the budgeted total net cash flow for the three month period if the cost of the direct material is:

(i) £1.50 per component; or
(ii) £2.20 per component.

(6 marks)

(c) Using your answers to part *(a)* and *(b)* above, prepare a report to the management of RF Ltd that discusses the benefits or otherwise of performing 'what if' analysis when preparing cash budgets.

(9 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

TURN OVER

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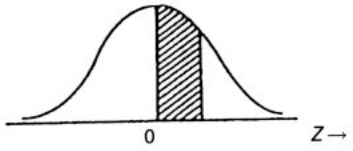
AREA UNDER THE NORMAL CURVE

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	Interest rates (r)									
(n)	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	0705	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	Interest rates (r)									
(n)	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	Interest rates (*r*)									
(*n*)	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	Interest rates (*r)*									
(*n*)	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	7.793	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

$A \cup B$ = ***A* or *B***. $A \cap B$ = ***A* and *B*** (overlap).

$P(B \mid A)$ = 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*: $P(A \cap B) = P(A) * P(B \mid A)$

$E(X) = \sum$(probability * 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

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

Standard Deviation

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

INDEX NUMBERS

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

Price: $$\frac{\sum \text{w} * \left(\frac{\text{P}_1}{\text{P}_\text{o}}\right)}{\sum \text{w}} \text{x}\, 100$$

Quantity: $$\frac{\sum w * \left(\frac{Q_1}{Q_o}\right)}{\sum w} \text{x}\, 100$$

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:

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

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

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

or solve

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

Coefficient of correlation

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

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

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:

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

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

Management Accounting Pillar

Managerial Level

P1 – Management Accounting – Performance Evaluation

May 2007

Tuesday Morning Session