MANAGERIAL LEVEL

MANAGEMENT ACCOUNTING PILLAR

PAPER P1 – MANAGEMENT ACCOUNTING PERFORMANCE EVALUATION

This is a Pilot Paper and is intended to be an indicative guide for tutors and students of the style and type of questions that are likely to appear in future examinations. It does not seek to cover the full range of the syllabus learning outcomes for this subject.

Management Accounting Performance Evaluation will be a three hour paper with two compulsory sections (50 marks and 30 marks respectively) and one section with a choice of questions for 20 marks.

CONTENTS

P1 – Performance Evaluation

Re-issued May 2004

SECTION A – 50 MARKS

ANSWER *ALL* SUB-QUESTIONS

- Questions 1.1 to 1.10 are worth 2 marks each (20 marks in total)
- Questions 1.11 to 1.19 are worth 30 marks in total

REQUIRED:

On the indicative ANSWER SHEET, enter either your answer in the space provided where the sub-question requires a written response, or place a circle "O" around the letter that gives the correct answer to the sub-question where a list of distractors has been provided.

If you wish to change your mind about an answer to such a sub-question, block out your first answer completely and then circle another letter. You will not receive marks if more than one letter is circled.

Space has been provided on the four-page answer sheet for workings. If you require further space, please use the last page of your answer book and clearly indicate which question(s) these workings refer to.

You must detach the answer sheet from the question paper and attach it to the front cover of your answer book before you hand it to the invigilators at the end of the examination.

Question One

*The following data are given for questions **1.1** and **1.2** below*

Trafalgar Limited budgets to produce 10,000 units of product D12, each requiring 45 minutes of labour. Labour is charged at £20 per hour, and variable overheads at £15 per labour hour. During September 2003, 11,000 units were produced. 8,000 hours of labour were paid at a total cost of £168,000. Variable overheads in September amounted to £132,000.

1.1 What is the correct labour efficiency variance for September 2003?

A £5,000 Adverse

B £5,000 Favourable

C £5,250 Favourable

D £10,000 Adverse

1.2 What is the correct variable overhead expenditure variance for September 2003?

A £3,750 Favourable

B £4,125 Favourable

C £12,000 Adverse

D £12,000 Favourable

Management Accounting Performance Evaluation

INDICATIVE ANSWER SHEET FOR SECTION A

SUB-QUESTIONS 1.1 TO 1.10

Write here your full examination number:			
Centre Code			
Hall Code			
Desk Number			

1.1	**A**	**B**	**C**	**D**
1.2	**A**	**B**	**C**	**D**
1.3	**A**	**B**	**C**	**D**
1.4	**A**	**B**	**C**	**D**
1.5	**A**	**B**	**C**	**D**
1.6	**A**	**B**	**C**	**D**
1.7	**A**	**B**	**C**	**D**
1.8	**A**	**B**	**C**	**D**
1.9	**A**	**B**	**C**	**D**
1.10	**A**	**B**	**C**	**D**

You must detach the answer sheet from the question paper and attach it to the inside front cover of your answer book before you hand it in to the invigilators at the end of the examination.

Space for workings for Section A

Space for workings for Section A

Space for workings for Section A

1.3 Which of the following definitions best describes “Zero-Based Budgeting”?

A A method of budgeting where an attempt is made to make the expenditure under each cost heading as close to zero as possible.

B A method of budgeting whereby all activities are re-evaluated each time a budget is formulated.

C A method of budgeting that recognises the difference between the behaviour of fixed and variable costs with respect to changes in output and the budget is designed to change appropriately with such fluctuations.

D A method of budgeting where the sum of revenues and expenditures in each budget centre must equal zero.

1.4 Copenhagen plc is an insurance company. Recently there has been concern that too many quotations have been sent to clients either late or containing errors. The department concerned has responded that it is understaffed, and a high proportion of current staff has recently joined the firm. The performance of this department is to be carefully monitored.

Which ONE of the following non-financial performance indicators would NOT be an appropriate measure to monitor and improve the department’s performance?

A Percentage of quotations found to contain errors when checked.

B Percentage of quotations not issued within company policy of three working days.

C Percentage of department’s quota of staff actually employed.

D Percentage of budgeted number of quotations actually issued.

1.5 Nile Limited is preparing its sales budget for 2004. The sales manager estimates that sales will be 120,000 units if the Summer is rainy, and 80,000 units if the Summer is dry. The probability of a dry Summer is 0·4.

What is the expected value for sales volume for 2004?

A 96,000 units

B 100,000 units

C 104,000 units

D 120,000 units

1.6 MN plc uses a Just-in-Time (JIT) system and backflush accounting. It does not use a raw material stock control account. During April, 1,000 units were produced and sold. The standard cost per unit is £100: this includes materials of £45. During April, conversion costs of £60,000 were incurred.

What was the debit balance on the cost of goods sold account for April?

A £90,000

B £95,000

C £105,000

D £110,000

1.7 Division A transfers 100,000 units of a component to Division B each year.

The market price of the component is £25 per unit.

Division A's variable cost is £15 per unit.

Division A's fixed costs are £500,000 each year.

What price per unit would be credited to Division A for each component that it transfers to Division B under marginal cost pricing and under two-part tariff pricing (where the Divisions have agreed that the fixed fee will be £200,000)?

	Marginal cost pricing	*Two-part tariff pricing*
A	£15	£15
B	£25	£15
C	£15	£17
D	£25	£17

1.8 Which of the following statements are true?

(i) A flexible budget can be used to control operational efficiency.

(ii) Incremental budgeting can be defined as a system of budgetary planning and control that measures the additional costs that are incurred when there are unplanned extra units of activity.

(iii) Rolling budgets review and, if necessary, revise the budget for the next quarter to ensure that budgets remain relevant for the remainder of the accounting period.

A (i) and (ii) only

B (ii) and (iii) only

C (iii) only

D (i) only

1.9 Green division is one of many divisions in Colour plc. At its year-end, the fixed assets invested in Green were £30 million, and the net current assets were £5 million. Included in this total was a new item of plant that was delivered three days before the year end. This item cost £4 million and had been paid for by Colour, which had increased the amount of long term debt owed by Green by this amount.

The profit earned in the year by Green was £6 million before the deduction of £1·4 million of interest payable to Colour.

What is the most appropriate measure of ROI for the Green division?

A 13·1%

B 14·8%

C 17·1%

D 19·4%

1.10 Division G has reported annual operating profits of £20·2 million. This was after charging £3 million for the full cost of launching a new product that is expected to last three years. Division G has a risk adjusted cost of capital of 11% and is paying interest on a substantial bank loan at 8%. The historical cost of the assets in Division G, as shown on its balance sheet, is £60 million, and the replacement cost has been estimated at £84 million.

Ignore the effects of taxation.

What would be the EVA for Division G?

A £15·40 million

B £15·48 million

C £16·60 million

D £12·96 million

(Total for sub-questions 1.1 –1.10 = 20 marks)

REQUIRED:

Each of the sub-questions numbered **1.11** to **1.19** below require a brief written response.

This response should be in note form and should not exceed 50 words.

Write your answers to these sub-questions in your answer book.

1.11 The overhead costs of RP Limited have been found to be accurately represented by the formula

$$y = £10{,}000 + £0{\cdot}25x$$

where y is the monthly cost and x represents the activity level measured as the number of orders.

Monthly activity levels of orders may be estimated using a combined regression analysis and time series model:

$$a = 100{,}000 + 30b$$

where a represents the de-seasonalised monthly activity level and b represents the month number.

In month 240, the seasonal index value is 108.

Required:

Calculate the overhead cost for RP Limited for month 240 to the nearest £1,000.

(3 marks)

1.12 The following data have been extracted from the budget working papers of WR Limited:

Activity (machine hours)	*Overhead cost £*
10,000	13,468
12,000	14,162
16,000	15,549
18,000	16,242

In November 2003, the actual activity was 13,780 machine hours and the actual overhead cost incurred was £14,521.

Required:

Calculate the total overhead expenditure variance for November 2003.

(4 marks)

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*The following data are given for questions **1.13** and **1.14** below*

DRP Limited has recently introduced an Activity Based Costing system. It manufactures three products, details of which are set out below:

	Product D	*Product R*	*Product P*
Budgeted annual production (units)	100,000	100,000	50,000
Batch size (units)	100	50	25
Machine set-ups per batch	3	4	6
Purchase orders per batch	2	1	1
Processing time per unit (minutes)	2	3	3

Three cost pools have been identified. Their budgeted costs for the year ending 31 December 2004 are as follows:

Machine set-up costs	£150,000
Purchasing of materials	£70,000
Processing	£80,000

1.13 Calculate the annual budgeted number of:

(a) batches

(b) machine set-ups

(c) purchase orders

(d) processing minutes

(2 marks)

1.14 Calculate the budgeted overhead unit cost for Product R for inclusion in the budget for 2004.

(4 marks)

*The following data are given for questions **1.15** and **1.16** below*

SW plc manufactures a product known as the TRD100 by mixing two materials. The standard material cost per unit of the TRD100 is as follows:

			£
Material X	12 litres	@ £2·50	30
Material Y	18 litres	@ £3·00	54

In October 2003, the actual mix used was 984 litres of X and 1,230 litres of Y. The actual output was 72 units of TRD100.

1.15 Calculate the total material mix variance for October 2003.

(3 marks)

1.16 Calculate the total material yield variance for October 2003.

(2 marks)

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*The following data are given for questions **1.17** and **1.18***

A company produces three products using three different machines. No other products are made on these particular machines. The following data is available for December 2003.

Product	*A*	*B*	*C*
Contribution per unit	£36	£28	£18
Machine hours required per unit			
Machine 1	5	2	1.5
Machine 2	5	5.5	1·5
Machine 3	2.5	1	0·5
Estimated sales demand (units)	50	50	60

Maximum machine capacity in December will be 400 hours per machine.

1.17

(a) Calculate the machine utilisation rates for each machine for December 2003.

(2 marks)

(b) Identify which of the machines is the bottleneck machine.

(2 marks)

1.18

(a) State the recommended procedure given by Goldratt in his "Theory of Constraints" for dealing with a bottleneck activity.

(2 marks)

(b) Calculate the optimum allocation of the bottleneck machine hours to the three products.

(3 marks)

1.19 Explain three circumstances where the First in, First out (FIFO) valuation method of process costing will give very similar results to the Weighted Average valuation method.

(3 marks)

(Total for sub-questions 1.11 – 1.19 = 30 marks)

(Total for Section A = 50 marks)

End of Section A

SECTION B – 30 MARKS

ANSWER ALL PARTS OF THIS QUESTION – ALL PARTS CARRY EQUAL MARKS

Question Two

(a) Briefly outline the main features of "feedback control", and the "feedback loop" and explain how, in practice, the procedures of feedback control can be transformed into "feed-forward control".

(b) Give FOUR reasons why the adoption of Total Quality Management (TQM) is particularly important within a Just-in-Time (JIT) production environment.

(c) Briefly outline the advantages and disadvantages of allowing profit centre managers to participate actively in the setting of the budget for their units.

(d) Explain and discuss the similarities and differences between Residual Income and Economic Value Added as methods for assessing the performance of divisions.

(e) Define the "controllability principle" and give arguments for and against its implementation in determining performance measures.

(f) Discuss the problems that arise specifically when determining transfer prices where divisions are located in different countries.

(Total = 30 marks)

End of Section B

Question Three

Marshall Limited operates a business that sells advanced photocopying machines and offers on-site servicing. There is a separate department that provides servicing. The standard cost for one service is shown below along with the operating statements for the Service Department for the six months to 30 September 2003. Each service is very similar and involves the replacement of two sets of materials and parts.

Marshall Limited's budgets for 5,000 services per month.

Standard cost for one service

	£
Materials – 2 sets @ £20 per set	40
Labour – 3 hours @ £11 per hour	33
Variable overheads – 3 hours @ £5 per hour	15
Fixed overheads – 3 hours @ £8 per hour	24
Total standard cost	112

Operating Statements for six months ending 30 September 2003

Months	*1*	*2*	*3*	*4*	*5*	*6*	*Total*
Number of services per month	5,000	5,200	5,400	4,800	4,700	4,500	29,600
	£	£	£	£	£	£	£
Flexible budget costs	560,000	582,400	604,800	537,600	526,400	504,000	3,315,200
Less: Variances:							
Materials							
Price	5,150F	3,090F	1,100F	-2,040A	-5,700A	-2,700A	-1,100A
Usage	-6,000A	2,000F	-4,000A	-12,000A	-2,000A	0	-22,000A
Labour							
Rate	26,100F	25,725F	27,331F	18,600F	17,400F	15,515F	130,671F
Efficiency	5,500F	9,900F	12,100F	-12,100A	-4,400A	-11,000A	0
Variable overheads:							
Spending	-3,500A	-3,500A	-2,500A	-4,500A	500F	2,500F	-11,000A
Efficiency	2,500F	4,500F	5,500F	-5,500A	-2,000A	-5,000A	0
Fixed overheads:							
Expenditure	-3,000A	-5,000A	-5,000A	-15,000A	5,000F	5,000F	-18,000A
Volume	0	4,800F	9,600F	- 4,800A	-7,200A	-12,000A	-9,600A
Actual costs	533,250	540,885	560,669	574,940	524,800	511,685	3,246,229

Note: "A" = adverse variance; "F" = favourable variance

Required:

(a) Prepare a summary financial statement showing the overall performance of the Service Department for the six months to 30 September 2003.

(4 marks)

(b) Write a report to the Operations Director of Marshall Limited commenting on the performance of the Service Department for the six months to 30 September 2003.

Suggest possible causes for the features you have included in your report and state the further information that would be helpful in assessing the performance of the department.

(16 marks)

(Total = 20 marks)

Question Four

PQR plc is a chemical processing company. The company produces a range of solvents by passing materials through a series of processes. The company uses the First In First Out (FIFO) valuation method.

In Process 2, the output from Process 1 (XP1) is blended with two other materials (P2A and P2B) to form XP2. It is expected that 10% of any new input to Process 2 (that is, transfers from Process 1 plus Process 2 materials added) will be immediately lost and that this loss will have no resale value. It is also expected that in addition to the loss, 5% of any new input will form a by-product, Z, which can be sold without additional processing for £2·00 per litre.

Data from Process 2 for November 2003 was as follows:

Opening work in process
Process 2 had 1,200 litres of opening work in process. The value and degree of completion of this was as follows:

	£	*% degree of completion*
XP1	1,560	100
P2A	1,540	100
P2B	750	100
Conversion costs	3,790	40
	7,640	

Input
During November, the inputs to Process 2 were:

	£
XP1 5,000 litres	15,679
P2A 1,200 litres	6,000
P2B 3,000 litres	4,500
Conversion costs	22,800

Closing work in process
At the end of November, the work in process was 1,450 litres. This was fully complete in respect of all materials, but only 30% complete for conversion costs.

Output
The output from Process 2 during November was:

Z	460 litres
XP2	7,850 litres

Required:

Prepare the Process 2 account for November 2003.

(17 marks)

Note: 3 marks will be awarded for presentation.

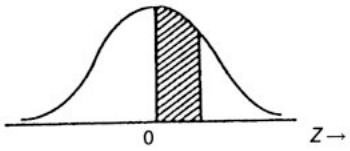
(Total = 20 marks)

End of question paper
Maths Tables and Formulae follow on pages 17-20

INDICATIVE MATHS TABLES AND FORMULAE

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 ie $(1 + r)^{-n}$ 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%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	.990	.980	.971	.962	.952	.943	.935	.926	.917	.909	.901	.893	.885	.877	.870	.862	.855	.847	.840	.833
2	.980	.961	.943	.925	.907	.890	.873	.857	.842	.826	.812	.797	.783	.769	.756	.743	.731	.718	.706	.694
3	.971	.942	.915	.889	.864	.840	.816	.794	.772	.751	.731	.712	.693	.675	.658	.641	.624	.609	.593	.579
4	.961	.924	.888	.855	.823	.792	.763	.735	.708	.683	.659	.636	.613	.592	.572	.552	.534	.516	.499	.482
5	.951	.906	.863	.822	.784	.747	.713	.681	.650	.621	.593	.567	.543	.519	.497	.476	.456	.437	.419	.402
6	.942	.888	.837	.790	.746	.705	.666	.630	.596	.564	.535	.507	.480	.456	.432	.410	.390	.370	.352	.335
7	.933	.871	.813	.760	.711	.665	.623	.583	.547	.513	.482	.452	.425	.400	.376	.354	.333	.314	.296	.279
8	.923	.853	.789	.731	.677	.627	.582	.540	.502	.467	.434	.404	.376	.351	.327	.305	.285	.266	.249	.233
9	.914	.837	.766	.703	.645	.592	.544	.500	.460	.424	.391	.361	.333	.308	.284	.263	.243	.225	.209	.194
10	.905	.820	.744	.676	.614	.558	.508	.463	.422	.386	.352	.322	.295	.270	.247	.227	.208	.191	.176	.162
11	.896	.804	.722	.650	.585	.527	.475	.429	.388	.350	.317	.287	.261	.237	.215	.195	.178	.162	.148	.135
12	.887	.788	.701	.625	.557	.497	.444	.397	.356	.319	.286	.257	.231	.208	.187	.168	.152	.137	.124	.112
13	.879	.773	.681	.601	.530	.469	.415	.368	.326	.290	.258	.229	.204	.182	.163	.145	.130	.116	.104	.093
14	.870	.758	.661	.577	.505	.442	.388	.340	.299	.263	.232	.205	.181	.160	.141	.125	.111	.099	.088	.078
15	.861	.743	.642	.555	.481	.417	.362	.315	.275	.239	.209	.183	.160	.140	.123	.108	.095	.084	.074	.065
16	.853	.728	.623	.534	.458	.394	.339	.292	.252	.218	.188	.163	.141	.123	.107	.093	.081	.071	.062	.054
17	.844	.714	.605	.513	.436	.371	.317	.270	.231	.198	.170	.146	.125	.108	.093	.080	.069	.060	.052	.045
18	.836	.700	.587	.494	.416	.350	.296	.250	.212	.180	.153	.130	.111	.095	.081	.069	.059	.051	.044	.038
19	.828	.686	.570	.475	.396	.331	.277	.232	.194	.164	.138	.116	.098	.083	.070	.060	.051	.043	.037	.031
20	.820	.673	.554	.456	.377	.312	.258	.215	.178	.149	.124	.104	.087	.073	.061	.051	.043	.037	.031	.026

CUMULATIVE PRESENT VALUE OF £1

This table shows the 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%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	.990	.980	.971	.962	.952	.943	.935	.926	.917	.909	.901	.893	.885	.877	.870	.862	.855	.847	.840	.833
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814	6.492	6.194	5.918	5.660	5.421	5.197	4.988	4.793	4.611	4.439
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367	6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824	7.379	6.974	6.604	6.265	5.954	5.668	5.405	5.162	4.938	4.730
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022	7.549	7.120	6.729	6.373	6.047	5.749	5.475	5.222	4.990	4.775
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201	7.702	7.250	6.840	6.467	6.128	5.818	5.534	5.273	5.033	4.812
19	17.226	15.679	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365	7.839	7.366	6.938	6.550	6.198	5.877	5.584	5.316	5.070	4.843
20	18.046	16.351	14.878	13.590	12.462	11.470	10.594	9.818	9.129	8.514	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

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

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

Price: $$\frac{\sum w * \left(\frac{p_1}{P_o}\right)}{\sum w} \text{ x } 100$$

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:

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

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

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

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

FINANCIAL MATHEMATICS

Compound Interest (Values and Sums)

Future Value of 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:

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

SOLUTIONS TO PILOT PAPER

Note:
In some cases, these solutions are more substantial and wide ranging than would be expected of candidates under exam conditions. They provide background on theorists, frameworks and approaches to guide students and lecturers in their studies, preparation and revision.

SECTION A

Question One

1.1 [(11,000 x 0·75) - 8,000] x £20 = £5,000 Favourable

Therefore the answer is B

1.2 [8,000 x £15] - £132,000 = £12,000 Adverse

Therefore the answer is C

1.3 The answer is B

1.4 The answer is D

1.5 104,000 units = [80,000 x 0·4] + [120,000 x 0·6]

Therefore the answer is C

1.6

	£
Cost of goods sold	100,000
Less material cost £45 x 1,000	45,000
Conversion cost allocated	55,000
Conversion cost incurred	60,000
Excess charged to cost of goods sold account	5,000
Total debit on cost of goods sold account £100,000 + £5,000 =	105,000

Therefore the answer is C

1.7 Marginal cost will be same as Variable cost, that is £15

The two-part tariff transfer price per unit is the marginal cost £15. This is because the £200,000 will be transferred as a total fixed fee and not, therefore, as part of the *unit* transfer price.

Therefore the answer is A

1.8 The answer is D

1.9 The most appropriate measure of ROI will include only assets available to earn profit during the year and will not include interest payable.

Thus ROI will be £6 million/(£35 million - £4 million) = 19·4%

Therefore the answer is D

1.10 Adjustment needed for launch costs – spread over 3 years, and need to use replacement cost of net assets so EVA = (£20·2 million + £2million) – (£84 million x 11%) = £12·96 million.

Therefore the answer is D

1.11 Orders = [100,000 + (30 x 240)] x 1·08 = 115,776

Overhead cost = £10,000 + (£0·25 x 115,776) = £38,944

Answer is £39,000

1.12 Use high/low method to separate fixed and variable budgeted overhead cost:

	Hours	*£*
High	18,000	16,242
Low	10,000	13,468
Difference	8,000	2,774

Variable cost per machine hour

$= \frac{£2,774}{8,000} = £0 \cdot 34675$

By substitution fixed cost
= £13,468 - (10,000 x £0·34675) = £10,000

Budget cost allowance	*£*
= £10,000 + (13,780 x £0·34675) =	14,778
Actual cost =	14,521
	257 (F)

1.13

Budgeted number of batches:

Product D (100,000/100)	=	1,000
Product R (100,000/50)	=	2,000
Product P (50,000/25)	=	2,000
		5,000

Budgeted machine set-ups:

Product D (1,000 x 3)	=	3,000
Product R (2,000 x 4)	=	8,000
Product P (2,000 x 6)	=	12,000
		23,000

Budgeted number of purchase orders:

Product D (1,000 x 2)	=	2,000
Product R (2,000 x 1)	=	2,000
Product P (2,000 x 1)	=	2,000
		6,000

Budgeted processing minutes:

Product D (100,000 x 2)	=	200,000
Product R (100,000 x 3)	=	300,000
Product P (50,000 x 3)	=	150,000
		650,000
		minutes

1.14 *Budgeted cost/set-up:*

$= \frac{£150,000}{23,000} = £6 \cdot 52$ Budgeted unit cost of R: $= \frac{£6 \cdot 52 \text{ x } 4}{50} = £0 \cdot 52$

Budgeted cost/purchase orders

$= \frac{£70,000}{6,000} = £11 \cdot 67$ Budgeted unit cost of R: $= \frac{£11 \cdot 67 \text{ x } 1}{50} = £0 \cdot 23$

Budgeted processing cost per minute:

$= \frac{£80,000}{650,000} = £0 \cdot 12$ Budgeted unit cost of R= £0.12 x 3 = £0.36

Total budgeted unit cost of R is:

		£
Set-up costs	=	0·52
Purchasing costs	=	0·23
Processing costs	=	0·36
Total cost	=	1.11 per unit

1.15

	Actual mix	*Standard mix*	*Difference*	*Price*	*Variance*
	litres	*litres*	*litres*	*£*	*£*
X	984	885·6	98·4 (A)	2·50	246·0 (A)
Y	1,230	1,328·4	98·4 (F)	3·00	295·2 (F)
Totals	2,214	2,214·0	nil		49·2 (F)

1.16

Expected output = $\frac{2{,}214}{30}$ = 73·8 units

Actual output = 72·0 units

Shortfall = 1·8 units

1·8 units x £84/unit = £151·2 (A)

An alternative would be only 73 complete units of output were expected, thus the shortfall would be 1 unit. The variance would be 1·0 x £84 per unit = £84 adverse.

1.17

(a) Machine utilisation rates

	Product			
Required machine hours	*A*	*B*	*C*	*Total*
Machine 1	250	100	90	440
Machine 2	250	275	90	615
Machine 3	125	50	30	205

Utilisation rates:

Machine 1 (440/400) = 110%

Machine 2 (615/400) = 154%

Machine 3 (205/400) = 51%

(b) Machine 2 is the bottleneck – it has the highest utilisation and this is greater than 100%.

1.18

(a) The Goldratt procedure is:

- Identify the system's bottleneck
- Decide how to exploit or relieve the bottleneck
- Sub-ordinate everything else to relieving the bottleneck
- Elevate the system's bottlenecks
- When one bottleneck is no longer a constraint, start procedure again (there will always be a new bottleneck).

(b) Optimal allocation would be on the basis of contribution from the bottleneck resource.

Ranking of contribution per product from machine 2 is:

Product	*A*	*B*	*C*
Contribution per unit	£36	£28	£18
Machine 2 hours	5	5.5	1·5
Contribution per machine hour	£7·20	£5·09	£12·00
Ranking	2	3	1

Thus allocation on this ranking

Product C	60 units	Using	90 hours
Product B	50 units	Using	250 hours

This uses 340 hours, leaving an available balance of 60 hours.
This will make 60/5.5 = 10.9 units of Product B or 10 whole units.

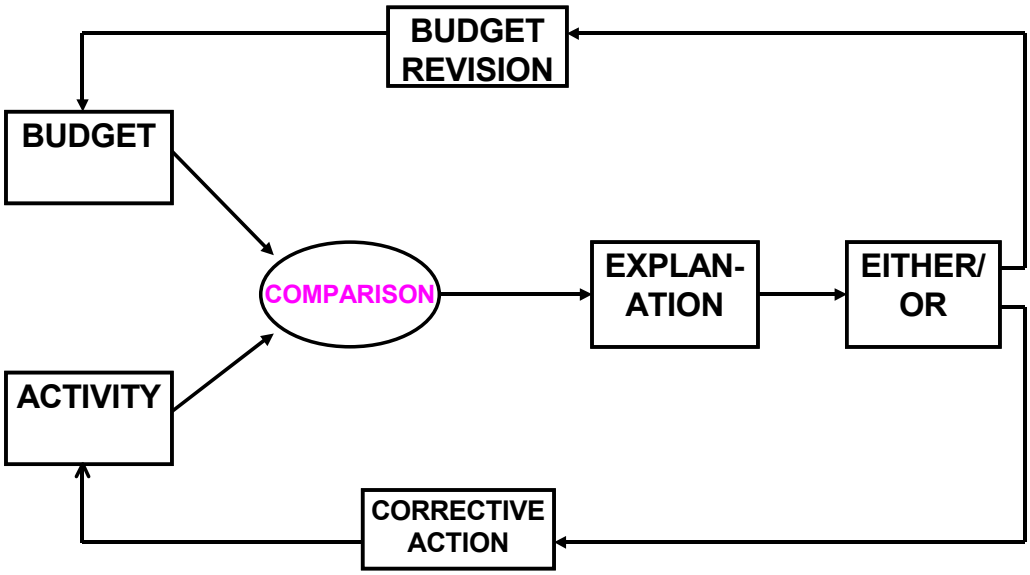
1.19 FIFO and weighted average methods give very similar results under various circumstances including the following:

- Where the conversion percentage is virtually constant between accounting periods.
- Where the conversion costs in work-in-process at the end of the month are very small in relation to the total conversion costs during the month. This is likely to occur where the process time is short and the process is repeated many times in the month.
- In general, where unit cost fluctuations are minimal between the months.

End of Section A

Answer to Question Two

Requirement (a)



The classic control loop, shown above for a budgeting context, controls by setting an *ex ante* target (budget), measuring *ex post* performance (activity), making a comparison, seeking explanation for any significant variation and then taking one or both of two possible actions. Either action is taken to ensure that activity in future periods is in line with target, or in exceptional circumstances, the target is changed to conform with changes that have occurred since the target was set.

A major criticism of this approach is that it is reactive and backward looking. In other words, action is triggered by a report of variations from the set target or budget. One counter to this argument is the notion of "feed-forward" control. The same procedures take place as in feedback control outlined above. However, it is argued that the fact that a comparison and explanation will take place in the future affects behaviour and thus managers act to ensure that when the comparison takes place, the actual performance will be in line with the set target. This results in control being forward looking and proactive.

Requirement (b)

The aim of TQM (Total Quality Management) is that all goods and services produced can be relied upon to meet their specifications at all times. These specifications will include technical features and timing. The importance of TQM in a JIT environment includes the following:

- JIT requires very precise planning that is only possible when goods can be relied upon.

- JIT requires very low, or no, stocks to be held; thus there must be total reliability that goods will perform to specification, as there will be no alternative stock if goods or services fail.

- Where JIT is operated with a Kanban system for stock replacement, the stock re-order point is decided on the basis that all stock is usable and that replacement stock will be delivered in the specified and very short time period.

- The consequences of poor quality are magnified in a JIT system and could cause considerable hold-ups in a process.

Requirement (c)

Some of the main advantages of participation in the setting of budgets include:

- Acceptance and commitment – where managers have taken part in the setting of the budget they are more likely to accept the resulting targets as relevant;

- Us v Them attitudes can be reduced when targets and budgets are set with participation, not simply imposed. If managers are involved in the budget setting process more knowledge is made available since the managers have considerable detailed knowledge of day to day operations;

- Better communication is achieved through participation, in particular communication is both upwards and downwards within the organisation;

- It is also generally accepted from research findings that participation will lead to:
    - increased job satisfaction;
    - decreased job-related tension;
    - improved job attitudes.

However, there are potential disadvantages to participation, including:

- Under some circumstances, participation may lead to setting less difficult targets – the creation of “budget slack”;
- Some personality types have been shown to react much better to an imposed budget, for example, “externals under a locus of control” personality indicator;
- Increased need for training for non-financial managers – though this could also be argued as an advantage;
- The whole process may be more time-consuming.

Requirement (d)

There are significant similarities between Residual Income (RI) and Economic Value Added (EVA). In both, the basic measure is the profit for the division less an interest charge based on the net assets that have been invested in the division. This results in an absolute value, whereas Return on Investment yields a percentage or relative measure. There are considerable theoretical advantages for the absolute measure.

The major differences between the two are that EVA has a number of complications or developments from the simple RI. RI was developed in the early years of the last century, whereas EVA became popular in the early 1990s.

EVA adjusts the operating profit to bring "accounting profit" in line with a measure of "economic profit". Thus, major long-term expenditure, such as R&D or marketing costs for a new product, can be capitalised over the expected useful life of the expenditure. More complex forms of depreciation are used, and taxation is treated in a more complex manner.

EVA also calculates the interest charge in a more complex manner than was traditionally the case for RI.

Requirement (e)

Controllability is defined by Horngren, Bhimani *et al* as "the degree of influence that a specific manager has over costs, revenues or other items in question". Controllability refers to a specific manager – a superior may be able to control a cost, and for a period of time – all costs are controllable in the long run. The controllability principle is that managers should only be held responsible for costs that they have direct control over. So, for example, a divisional manager would not be held responsible for the allocation of central costs to her department if she has no control over the incurrence or magnitude of these costs. Under this principle, it would be held that dysfunctional consequences would arise if managers were held accountable for costs over which they have no control.

An alternative view argues that there are considerable advantages to be gained in holding managers responsible for costs even when they do not have any direct control over them. For example, it stops managers treating some costs as "free goods" and thus stops them over-using these goods and services. Further, holding managers responsible for items outside their control may encourage them to become more involved with such issues and, as a result, the total cost may be reduced or the goods or services may be provided more efficiently.

There is no clear evidence as to which of these views will produce the best performance from a division or a division manager.

Requirement (f)

The basic analysis of transfer pricing assumes that one of the key objectives in setting such prices is that relevant divisions can be evaluated effectively, that is, that the transfer price will not distort the divisional performance evaluation. In practice, however, the existence of divisions in different countries, and particularly different systems of taxation, can add another objective. It may be valuable to the company to set transfer prices to minimise overall group tax liabilities and maximise overall group profits.

For example, profits could be reduced in a country with high taxation and increased in a country with low taxation, thus reducing the overall tax liability and increasing overall profits. If customs duties were based on the value of the goods, there would be an incentive to transfer the goods at a low transfer price to minimise customs duties. Some countries levy "withholding taxes" on dividends paid outside the country. Here it would be possible to set transfer prices for goods in or out of the country in such a manner that minimise the profits, and thus the dividends.

Most countries have tax legislation that limits the extent to which these practices can be used, but there is still considerable scope for using transfer prices to influence the incidence of profit and, through differing tax regimes, the overall amount of group profit. Where this occurs, the effectiveness of measuring divisional performance may have been substantially reduced.

Answer to Question Three

Summary Statement for six months to 30 September 2003

	Cumulative actual to date	*Cumulative budget to date*	*Total variance*	*Price/spending variance*	*Efficiency/ volume variance*
	£	£	£	£	£
Production	29,600	30,000	400		
Costs	£	£	£	£	£
Materials	1,207,100	1,184,000	(23,100)	(1,100)	(22,000)
Labour	846,129	976,800	130,671	130,671	0
Variable overheads	455,000	444,000	(11,000)	(11,000)	0
Fixed overheads	738,000	710,400	(27,600)	(18,000)	(9,600)
Total costs	3,246,229	3,315,200	68,971	100,571	(31,600)

() = Adverse variance

Note: Alternative statements that summarise the performance of the Service Department would be acceptable.

Requirement (b)

Report to the Operations Director of Marshall Limited

Re: Performance of the Service Department for six months to 30 September 2003

A summary performance statement is attached to this report. The main features are set out below, along with issues that require further explanation or information.

- There has been a rise, then fall in volumes. Is this seasonal variation, such as fewer services required during the summer, or the result of other factors, such as action from competitors in months 4 to 6. If the trend in the last three months continues, this could be a serious problem that needs to be addressed promptly.
- A favourable material usage variance, as occurred in month 2 must mean that some parts were not replaced during the service. Is this acceptable? There seems to be a general inefficiency in material usage. Is this caused by a lack of care by service engineers, or by poor quality sets? The price variance – see below – does not indicate cheap parts are being purchased.
- Material prices are on a general upward path. Is there a general drift in material prices; is there a material shortage? Are there other suppliers offering a better price?
- Labour price is massively out of line with budget yielding large favourable variances. Is this caused by a mistake in the budget or an unexpected change in the price, for example, using different grades/mix of labour. This variance is more than 13% of budgeted cost and thus must be investigated quickly and thoroughly.

- Labour efficiency gets seriously worse after month 4. Has something unusual happened to labour during this month, perhaps a dispute? Is this significantly worse labour efficiency linked to the fall in output over the same months?
- Month 4 is significantly out of line with other months. What happened? Was production disrupted; was there a labour dispute or supplier problems or did another factor affect the result? It is important to find satisfactory explanations for the results in this month and attempt to ensure this performance is not repeated.
- Only total variable overhead variance has meaning and reveals a worsening position after the disaster in month 4, giving further evidence for some unusual circumstances.
- Fixed overhead spending seems to come under control from month 5, but what caused the problems in the early months? Has management acted to remedy matters?
- The fixed overhead volume variance is purely technical and represents differences between planned and actual production.
- Overall costs are 2% below budget, but this apparently satisfactory position masks considerable variation. Nevertheless, the general performance of the Service Department has been close to budget.

Answer to Question Four

Process 2 Account

	litres	*£*		*litres*	*£*
Opening work in process	1,200	7,640	Normal waste	920	nil
XP1	5,000	15,679	By-product Z	460	920
P2A	1,200	6,000	XP2	7,850	51,450
P2B	3,000	4,500			
Conversion cost		22,800			
			Closing work in		
Abnormal gain	280	1,753	process	1,450	6,002
	10,680	58,372		10,680	58,372

Solution workings:

Equivalent Units Table	*Process 1 and materials added*	*Conversion*
Output:		
Started & finished this period	6,650	6,650
Completion of opening work in process	nil	720
Abnormal gain	(280)	(280)
Closing work in process	1,450	435
	7,820	7,525
	£	£
Period costs	26,179	22,800
By-product value	(920)	
	25,259	22,800
Cost per equivalent unit	£3·23	£3·03

Requirement (b)

Valuation Statement

Finished output:			£
Started and finished	6,650 litres x (£3·23 + £3·03)	=	41,629
Opening work in process:			
	cost brought forward	=	7,640
	cost of completion 720 litres x £3·03	=	2,181
			51,450
Abnormal gain			
280 litres x (£3·23 + £3·03)		=	£1,753
Closing work in process:			
1,450 litres x £3·23		=	£4,684
435 litres x £3·03		=	£1,318
			£6,002