

**CIMA INTERIM ASSESSMENT**

**Performance Management**

**November 2011**

**Time allowed**

Reading and planning: 20 minutes

Writing: 3 hours

All questions are compulsory and MUST be attempted.

**Do NOT open this paper until instructed by the supervisor.**

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 this reading time.

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**Paper P2**

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## MATHS TABLES AND FORMULAE

### TABLES

#### Present value table

Present value of £1, i.e.  $(1 - r)^{-n}$  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**

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 (n)	Interest rates (r)									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201
19	17.226	15.679	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365
20	18.046	16.351	14.878	13.590	12.462	11.470	10.594	9.818	9.129	8.514

Periods (n)	Interest rates (r)									
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327
12	6.492	6.194	5.918	5.660	5.421	5.197	4.988	4.793	4.611	4.439
13	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14	6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675
16	7.379	6.974	6.604	6.265	5.954	5.668	5.405	5.162	4.938	4.730
17	7.549	7.120	6.729	6.373	6.047	5.749	5.475	5.222	4.990	4.775
18	7.702	7.250	6.840	6.467	6.128	5.818	5.534	5.273	5.033	4.812
19	7.839	7.366	6.938	6.550	6.198	5.877	5.584	5.316	5.070	4.843
20	7.963	7.469	7.025	6.623	6.259	5.929	5.628	5.353	5.101	4.870

**FORMULAE**

**Time series**

Additive model:

$$\text{Series} = \text{Trend} + \text{Seasonal} + \text{Random}$$

Multiplicative model:

$$\text{Series} = \text{Trend} \times \text{Seasonal} \times \text{Random}$$

**Regression analysis**

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

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

where:

$$b = \frac{\text{Co - variance (XY)}}{\text{Variance (X)}} = \frac{n \sum XY - (\sum X)(\sum Y)}{n \sum X^2 - (\sum X)^2}$$

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

or solve:

$$\sum Y = na + b \sum X$$

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

Exponential  $Y = ab^x$

Geometric  $Y = aX^b$

**Learning curve**

$$Y_x = aX^b$$

where:

$Y_x$  = the cumulative average time per unit to produce X units

a = the time required to produce the first unit of output

X = the cumulative number of units

b = the index of learning

The exponent b is defined as the log of the learning curve improvement rate divided by log 2.

## SECTION A

### Answer ALL questions

#### QUESTION 1

- (a) 'The analysis of total cost into its behavioural elements is essential for effective cost and management accounting.'

**Required:**

**Comment on the statement above, illustrating your answer with examples of cost behaviour patterns. (4 marks)**

- (b) 'For decision making, costs can be classified according to whether they are relevant to a particular decision.'

**Required:**

**Explain, using examples, what is meant by a relevant cost, and its significance for decision making. Your answer should include an explanation of the following terms: avoidable cost, opportunity cost and sunk cost. (6 marks)**

**(Total: 10 marks)**

#### QUESTION 2

JR Company manufactures two products – the Exe and the Wye. The company wishes to maximise its total contribution from these two products, but there are several constraints impacting upon the production capabilities. The Production Manager has formulated the situation as follows:

Let  $x$  be the number of units of product Exe produced each period

Let  $y$  be the number of units of product Wye produced each period

*Objective:* To maximise contribution

$$10x + 15y$$

*Subject to:*

Department A machine hours:  $5x + 4.8y \leq 15,000$

Department B machine hours:  $2x + 8y \leq 12,500$

Department C machine hours:  $2x + 4y \leq 8,000$

Minimum of Exe  $x \geq 500$

Minimum of Wye  $y \geq 500$

Production constraint  $x \geq y$

**Required:**

- (a) **Graph the constraints for products Exe and Wye, and then shade the feasible region.**

**(6 marks)**

- (b) **Establish the optimum production plan and the maximum contribution each period.**

**(4 marks)**

**(Total: 10 marks)**

**QUESTION 3**

Get Fitter is a private health spa and gymnasium. Every month the swimming pool has to be closed for routine inspection and maintenance. In January, a new engineer was appointed to do this work, which is being monitored carefully. The time taken, in hours, to carry out this job is shown below:

Month	January	February	March	April
Maintenance time:	16.0	12.8	12.0	11.1

The management accountant believes that the reduction in maintenance time is due to a learning curve experience by the new engineer. The cost of this routine maintenance to the company is £100 per hour.

**Required:**

- (a) Estimate the rate of learning from the maintenance times above. Explain the meaning of this percentage to the director of the swimming pool. (5 marks)
- (b) Forecast the total cost of maintenance for the next four-month period. (5 marks)

**(Total: 10 marks)****QUESTION 4**

LMR plc is a cable television company which operates from a number of sites in Europe. Its headquarters are in London, and its main management accounting operation (employing 40 staff) is based at the headquarters. The management accounting staff prepare regular budgets and financial control reports which are circulated widely throughout the company. The management accounting staff also undertake on-site cost investigations and participate in project evaluations, which involve travel around Europe to visit sites and participate in meetings.

LMR plc's Chief Executive has recently reviewed the management accounting operation, and has instructed you (in your capacity as LMR plc's Management Services Officer) as follows:

*'The management accounting operation has an annual cost of around £30 million per year, which includes salaries of £7 million, office costs of £7 million, and transport/accommodation costs of £0.5 million. I am unsure whether the company is obtaining adequate value from this. Please investigate the management accounting operation, identify the value added by the various activities it undertakes, and suggest options that are available for cost reduction. I am particularly interested in the elimination of non-value-adding activity, and cost reductions in the use of staff.'*

**Required:****Explain:**

- how the value added by a particular task or activity might be determined;
- how you would conduct a value analysis of activities undertaken by LMR plc's management accounting operation;
- how non-value-adding activities in the operation might be eliminated.

**(10 marks)**

### QUESTION 5

HJ is a printing company that specialises in producing high quality cards and calendars for sale as promotional gifts. Much of the work produced by HJ uses similar techniques and for a number of years HJ has successfully used a standard costing system to control its costs. HJ is now planning to diversify into other promotional gifts such as plastic moulded items including key fobs, card holders and similar items. There is already a well established market place for these items but HJ is confident that with its existing business contacts it can be successful if it controls its costs. Initially HJ will need to invest in machinery to mould the plastic, and it is likely that this machinery will have a life of five years. An initial appraisal of the proposed diversification based on low initial sales volumes and marginal cost based product pricing for year 1, followed by increases in both volumes and selling prices in subsequent years, shows that the investment has a payback period of four years.

**Required :**

- (a) Explain the relationship between target costs and standard costs and how HJ can derive target costs from target prices (5 marks)**
- (b) Discuss the conflict that will be faced by HJ when making pricing decisions based on marginal cost in the short term and the need for full recovery of all costs in the long term. (5 marks)**

**(Total for Question Five = 10 marks)**



## SECTION B

### Answer BOTH questions

#### QUESTION 6

WY Ltd makes three products A, B and C which all use the same types of material and same grade of labour. The following information is available from last year's results for total sales and costs.

	A	B	C
Units sold	1,200	1,500	2,000
	\$	\$	\$
Total sales revenue	48,000	75,000	120,000
Material M1 (£5 p/kg)	12,000	15,000	30,000
Material M2 (£4 p/kg)	14,400	24,000	32,000
Labour (£8 p/hr)	4,800	9,000	8,000

**Required:**

- (a) Calculate the C/S ratio for each product and weighted average C/S ratio from last year's results. (2 marks)

The following figures are available for the next 12 months:

#### Revised sales prices and costs

Product A	£45.00 per unit
Product B	£52.50 per unit
Product C	£62.00 per unit
Material M1	£5.50 per kg
Material M2	£4.25 per kg
Labour	£9.00 per hour

#### Maximum demand

Product A	1400 units
Product B	1600 units
Product C	2200 units

The Management Accountant is trying to prepare a production plan for the next year that will maximise the total contribution for the business. However, there are limits to the amount of each type of materials and labour hours that are available.

It is predicted that they will only be able to find the following **additional** kilograms and hours, compared to the amounts used last year.

Material M1	1000kg
Material M2	2000kg
Labour Hours	300 hours

The amount of labour hours and kilograms of each material per unit is not expected to change.

**Required:**

- (b) Calculate the optimal production plan for the next 12 months. (18 marks)**

The management accountant has also looked into what it would cost to subcontract out production of some of the products to a third party.

The following quotes have been given for the cost per unit to buy each of the products from a third party.

Product A	£30 per unit
Product B	£35 per unit
Product C	£40 per unit

The prices that we could sell each product for would not be affected by this decision

**Required:**

- (c) Calculate a revised optimal production plan and any units of each product which should be outsourced to the third party. (5 marks)**

**(Total: 25 marks)**

**QUESTION 7**

MOC makes and sells an executive game for two distinct markets in which it currently has a monopoly. The fixed costs of production per month are £20,000, and variable costs per unit produced, and sold, are £40. The monthly sales can be thought of as X, where  $X = X_1 + X_2$ , with  $X_1$  and  $X_2$  denoting monthly sales in their respective markets. Detailed market research has revealed the demand functions in the markets to be as follows, with prices shown as  $P_1$  and  $P_2$ :

$$\text{Market 1: } P_1 = 55 - 0.05X_1$$

$$\text{Market 2: } P_2 = 200 - 0.2X_2$$

The management accountant believes there should be price discrimination; the price is currently £50 per game in either market.

**Required:**

**Analyse the information for the executive game AND, given the management accountant's belief:**

- (a) Calculate the price to charge in EACH market, and the quantity to produce (and sell) each month, to maximise profit. (8 marks)**
- (b) Calculate the Total Monthly Contribution for EACH market at the price and quantities calculated in part (a) and the maximum monthly profit in TOTAL. (3 marks)**
- (c) Explain any reservations you may have about the above calculations (4 marks)**
- (d) Write a report to the management accountant to explain how this pricing strategy would change if new competitors entered the market and suggest other pricing strategies which the business may have to consider, as well as pricing strategies that a new competitor may use. (10 marks)**

**(Total: 25 marks)**