

CIMA FINAL ASSESSMENT

Performance Operations

November 2011

Time allowed

Reading and planning: 20 minutes

Writing: 3 hours

ALL questions are compulsory and **MUST** be attempted.

Maths tables and formulae are on pages 3 – 7

Do NOT open this paper until instructed by the supervisor.

During reading and planning time only the question paper may be annotated. You must NOT write in your answer booklet until instructed by the supervisor.

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Paper P1

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MATHS TABLES AND FORMULAE

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

FORMULAE

Probability

$A \cup B$ = A or B

$A \cap B$ = A and B (overlap)

$P(B/A)$ = probability of B, given A

Rules of addition

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

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

Rules of multiplication

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

If A and B are not independent: $P(A \cap B) = P(A) \times P(B/A)$

$E(x)$ = \sum (probability \times 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

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

Standard deviation

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

Index numbers

$$\text{Price relative} = 100 \times P_1/P_0$$

$$\text{Quantity relative} = 100 \times Q_1/Q_0$$

$$\text{Price: } \frac{\sum w \times \left(\frac{P_1}{P_0} \right)}{\sum w} \times 100$$

$$\text{Quantity: } \frac{\sum w \times \left(\frac{Q_1}{Q_0} \right)}{\sum w} \times 100$$

Time series

Additive model

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

Multiplicative model

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

Linear regression and correlation

The linear regression equation of y on x is given by:

$$y = a + bx \text{ or } y - \bar{y} = b(x - \bar{x})$$

where

$$b = \frac{\text{Covariance}(xy)}{\text{Variance}(x)} = \frac{n \sum xy - (\sum x)(\sum y)}{n \sum x^2 - (\sum x)^2}$$

and

$$a = \bar{y} - b\bar{x}$$

or solve

$$\sum y = na + b \sum x$$

$$\sum xy = a \sum x + b \sum x^2$$

Coefficient of correlation

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

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

Financial mathematics

Compound interest (values and sums)

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

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

Annuity

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

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

Perpetuity

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

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

SECTION A

Answer ALL 10 sub-questions in this section

QUESTION 1

The following data are given for sub-questions 1.1 and 1.2 below.

BA Ltd uses a standard costing system, with its material stock account being maintained at standard cost. The following details have been extracted from the standard cost card in respect of direct materials:

6 kg @ £2//kg = £12 per unit

Budgeted production in October was 1,100 units.

The following details relate to actual materials purchased and issued to production during October when actual production was 1,130 units:

Materials purchased 7,200 kg costing £14,090

Materials issued to production 6,700 kg

1.1 The material price variance for October was:

- A £160 F
- B £310 F
- C £530 A
- D £690 A

(2 marks)

1.2 The material usage variance for October was:

- A £160 F
- B £310 F
- C £530 A
- D £690 A

(2 marks)

The following data are given for sub-questions 1.3 and 1.4 below.

BB Ltd manufactures a single product by mixing two materials. The standard cost per unit is as follows:

Material A 8 kg @ £3/kg = £24

Material B 12 kg @ £7/kg = £84

In October, the actual mix used was 7,380 kg of Material A and 9,020 kg of Material B. Actual output was 810 units.

1.3 The total mix variance reported was nearest to:

- A £1,080 F
 - B £3,280 F
 - C £3,280 A
 - D £1,080 A
- (2 marks)**

1.4 The total yield variance reported was nearest to:

- A £1,080 F
 - B £3,280 F
 - C £3,280 A
 - D £1,080 A
- (2 marks)**

1.5 Definition A: 'A technique where the primary goal is to maximise throughput while simultaneously maintaining or decreasing inventory and operating costs.'

Definition B: 'A system whose objective is to produce or procure products or components as they are required by a customer or for use, rather than inventory.'

Which of the following pairs of terms correctly matches the definitions A and B above?

- | | <i>Definition A</i> | <i>Definition B</i> | |
|---|---------------------------------|--------------------------------|------------------|
| A | Manufacturing resource planning | Just-in-time | |
| B | Enterprise resource planning | Materials requirement planning | |
| C | Optimised production technology | Enterprise resource planning | |
| D | Optimised production technology | Just-in-time | (2 marks) |

1.6 In the context of budget preparation the term 'goal congruence; is:

- A The alignment of budgets with objectives using feed-forward control.
 - B The setting of a budget which does not include budget bias.
 - C The alignment of corporate objectives with the personal objectives of a manager.
 - D The use of aspiration levels to set efficiency targets.
- (2 marks)**

The following information is to be used for sub-questions 1.7 and 1.8.

A company is considering investing in a project with a life of five years, for which the following information is provided. The capital has been depreciated using the straight-line method, and the asset is expected to have a nil residual value.

	£
Initial capital expenditure	75,000
Profits/(losses):	
Year: 1	30,000
2	30,000
3	20,000
4	(10,000)
5	(10,000)

The cost of capital is 15%.

1.7 The payback period is:

- A 1.67 years
- B 1.83 years
- C 2.00 years
- D 2.75 years (2 marks)

1.8 The accounting rate of return, based on average investment, is (to the nearest whole %):

- A 16%
- B 22%
- C 25%
- D 32% (2 marks)

1.9 Brian has trade receivables at 01/09/X7 of \$20,000. Brian's income statement showed credit sales of \$255,100 during the year ended 31/08/X8.

Brian's trade receivables at 31/08/X8 were 50 days.

Assume sales accrue evenly throughout the year and that all sales are on credit. There were no bad debts or discounts given during the year.

How much cash did Brian receive from its customers during the year ended 31/08/X8?

- A \$34,945
- B \$275,100
- C \$240,155
- D \$34,549 (2 marks)

1.10 Florence uses the Economic Order Quantity (EOQ) model. Demand for Florence's product is 120,000 units per annum. Demand is evenly distributed throughout the year. The cost of placing an order is \$15 and the cost of holding a unit of inventory for a year is \$2.

How many orders should Florence make in a year? (2 marks)

(Total for Section A: 20 marks)

SECTION B

Answer ALL six parts of this question. Each sub-question is worth 5 marks

QUESTION 2

The following information applies to parts (a), (b) and (c).

Olympic specialises in the manufacture of sportswear. Sales revenue in the current year has been \$5.2 million, all on credit. The terms of sale are 2% discount 14 days, net 28 days. One half of Olympic's customers take advantage of the cash discount. The current level of receivables (debtors) is \$500,000, and 1% of credit sales become irrecoverable (bad) debts. The net operating margin (excluding irrecoverable debts and discounts) for Olympic is 25% of sales revenue. The company is considering a change in its credit policy to 4% discount 14 days, net 28 days. It anticipates the following effects of this change:

- Sales to increase by 10% pa.
 - 75% of customers to take advantage of the discount.
 - The period of time before payment for customers not taking the discount to increase by one week.
 - Irrecoverable debts to fall to 0.5% of sales. Olympic's current cost of finance is 12%.
-

Required:

- (a) Calculate the average period of time it currently takes those debtors who do not take the discount, to pay. (5 marks)
- (b) Calculate the cost of the current receivables policy, including the cost of discount and cost of irrecoverable debts. (5 marks)
- (c) Calculate the financial implications of the change in credit policy, and advise whether Olympic should undertake this change. (5 marks)
- (d) A new product will require a new machine. The purchasing company have two choices available:

Machine One

This machine will cost \$238,850 and last for five years, at the end of which time it will have zero scrap value. Maintenance costs will be \$10,000 in the first year of operation, increasing by \$3,000 per year for each year of operation.

Machine Two

This machine will cost \$215,000 and last for four years, at the end of which time it will have zero scrap value. Maintenance costs will be \$10,000 in the first year of operation, increasing by \$5,000 per year for each year of operation.

The company uses a nominal (money) cost of capital of 11% in investment appraisal.

Determine which machine should be purchased. (5 marks)

- (e) The AA company is expected to generate the following sales over the forthcoming six months:

	Sales
	\$
January	20,000
February	42,000
March	88,000
April	98,000
May	72,000
June	37,500

The company expects receipt of payment in the following manner, 40% will be paid in the month of sale to take advantage of the 5% cash discount offered for early payment, 30% will be paid in the following month, 20% is paid in the third month and 10% is paid in the fourth month.

Prepare a cash budget for the months of March, April, May and June for the receipts from sales. (5 marks)

- (f) Baltimore Ltd, a fitness organisation has prepared a cash flow forecast for the next six months and has calculated that it will need an additional \$1 million to be able to replace some of its equipment in its gyms if it is to remain competitive.

They have an annual gross revenue of \$100 million and achieves a gross margin of 50%. It currently has the following outstanding working capital balances:

- \$10 million trade payables
- \$12 million trade receivables
- \$2 million bank overdraft

Baltimore predicts that they will be able to repay the \$1 million back within the next twelve months.

Explain to Baltimore some possible sources of finance which will raise the \$1m, clearly showing any relevant workings. (5 marks)

(Total for Section B: 30 marks)

SECTION C

Answer ALL questions

QUESTION 3

TP Limited operates a standard absorption costing system in respect of its only product. Stocks are valued at standard cost. The standard cost card for the product for the year ended 30 September 20X5 is:

		£
Direct materials	8 kgs @ £1.20	9.60
Direct labour	4 hours @ £5.20	20.80
Variable overhead	4 hours @ £1.30	5.20
Fixed overhead	4 hours @ £2.60	10.40
		46.00
Standard profit		14.00
		60.00
Standard selling price		

Budgeted fixed overhead costs for the year ended 30 September 20X5 were £31,200 with costs and activity expected to occur at a constant rate throughout the year. There was no budgeted change in stocks for the year.

During September 20X5, the following actual results occurred:

- (i) Actual sales were 228 units for £14,010.
- (ii) Actual production was 240 units.
- (iii) Direct materials purchased were 2,100 kgs for £2,463.
- (iv) Direct materials issued to production were 1,952 kgs.
- (v) Direct labour hours worked and paid were 991.
- (vi) Direct labour cost was £4,955.
- (vii) Variable overhead cost was £1,240.
- (viii) Fixed overhead cost was £2,780.

Required:

- (a) Calculate the budgeted and actual profit for the month of September 20X5 (5 marks)**
- (b) Prepare a statement which reconciles the budgeted profit and actual profit for September 20X5, showing variances in as much detail as possible. (20 marks)**

(Total: 25 marks)

QUESTION 4

The Managing Director of ABC plc has devolved some decision making to the operating divisions of the firm. He is anxious to extend this process, but first wishes to be assured that decisions are being taken properly in accordance with Group policy.

As a check on existing practice, he has asked for an investigation into a recent decision to increase the price of the sole product of C division to £14.50 per unit due to rising costs.

The following information and estimates were available for the management of C division:

- (1) Last year, 75,000 units were sold at £12 each with a total unit cost of £9, of which £6 were variable costs.
- (2) For the year ahead, the following cost and demand estimates have been made:

Unit variable costs:

Pessimistic	Probability	0.15	£7.00 per unit
Most likely	Probability	0.65	£6.50 per unit
Optimistic	Probability	0.20	£6.20 per unit

Total fixed costs:

Pessimistic	Probability	0.3	Increase by 50%
Most likely	Probability	0.5	Increase by 25%
Optimistic	Probability	0.2	Increase by 10%

Demand estimates at various prices (units):

			<i>Price per unit</i>	
			<i>£13.50</i>	<i>£14.50</i>
Pessimistic	Probability	0.3	45,000	35,000
Most likely	Probability	0.5	60,000	55,000
Optimistic	Probability	0.2	70,000	68,000

(Unit variable costs, fixed costs and demand estimates are statistically independent.)

For this type of decision, the Group has decided to choose the option which has the highest expected outcome with at least an 80% chance of breaking even.

Required:

- (a) **Assess whether the decision was made in accordance with Group guidelines.** (15 marks)
 - (b) **Comment on the estimates for the decision, and describe what other factors might have been considered.** (6 marks)
 - (c) **Explain what is the Group attitude to risk as evidenced by the guidelines.** (4 marks)
- (Total: 25 marks)**

(Total for Section C: 50 marks)

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CIMA P1 PERFORMANCE OPERATIONS

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