

DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO.



Performance Pillar

## P2 – Performance Management

21 May 2014 – Wednesday Afternoon Session

### ***Instructions to candidates***

You are allowed three hours to answer this question paper.
You are allowed 20 minutes reading time <b>before the examination begins</b> during which you should read the question paper and, if you wish, make annotations on the question paper. However, you will <b>not</b> be allowed, <b>under any circumstances</b> , to open the answer book and start writing or use your calculator during this 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).
ALL answers must be written in the answer book. Answers written on the question paper will <b>not</b> be submitted for marking.
You should show all workings as marks are available for the method you use.
ALL QUESTIONS ARE COMPULSORY.
Section A comprises 5 questions and is on pages 2 to 9.
Section B comprises 2 questions and is on pages 10 to 13.
Maths tables and formulae are provided on pages 15 to 18.
The list of verbs as published in the syllabus is given for reference on page 19.
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.

# P2 – Performance Management

TURN OVER

## SECTION A – 50 MARKS

[You are advised to spend no longer than 18 minutes on each question in this section.]

ANSWER ALL FIVE QUESTIONS IN THIS SECTION. EACH QUESTION IS WORTH 10 MARKS. YOU SHOULD SHOW YOUR WORKINGS AS MARKS ARE AVAILABLE FOR THE METHOD YOU USE.

### Question One

A company has produced the following performance report for April. The budget shown in the report was based on an original assumption that the total market size for April would be 40 million units. Since the performance report was produced, more accurate market size information has become available. The actual market size for April was lower than estimated at 37.5 million units.

	Budget	Actual	Variance
Sales and production units	2,000,000	1,650,000	(350,000)
	Budget	Actual	Variance
	\$000	\$000	\$000
Revenue	7,000	5,643.0	(1,357.0)
Variable costs	4,220	3,580.5	639.5
Fixed costs	1,050	1,100.0	(50.0)
Profit	1,730	962.5	(767.5)

*Required:*

(a) **Produce** a statement that reconciles budget profit to actual profit for April in as much detail as possible.

(6 marks)

(b) **Discuss** the advantages and disadvantages of your statement with regard to responsibility accounting.

(4 marks)

(Total for Question One = 10 marks)

*Question two is on the next page*

TURN OVER

## Question Two

SVC is a car manufacturer. SVC is planning the development of a prototype hydrogen powered car, the Model Q. The prototype Model Q car will have a limited production run of 250 cars. To ensure that the Model Q is ready by SVC's stated deadline, production will take place over the course of one month. Details for the development and production of the prototype Model Q are shown below.

Note: a prototype is defined as a preliminary version of a vehicle from which other forms may be developed.

Forecast development cost	\$6,500,000
Forecast design cost	\$1,300,000
<u>Forecast manufacturing costs</u>	
Material cost	\$25,500 per car
Variable production overhead cost	\$780 per car (this is not related to labour hours)
Direct labour	\$60 per hour (see note 2 below)

### Direct labour

SVC plans to hire a team of 12 specialist production staff. The specialist production staff will be paid a premium on their basic hourly rate of pay dependent on the total number of labour hours required to produce all 250 prototype Model Q cars as follows:

Total labour hours	Premium on basic hourly labour rate
0 – 2,000	35%
2,001 – 2,500	30%
2,501 – 3,000	25%
3,001 – 3,500	20%
More than 3,500	0%

The premium on the basic hourly labour rate will be applicable to all labour hours during production.

### Learning curve

It is estimated that the manufacture of the first car will take 13 labour hours. There is expected to be a 95% learning curve that will continue until 128 cars have been produced. Thereafter, each car will take the same time to produce as the 128<sup>th</sup>.

### **Notes:**

1. The learning index for a 95% learning curve = -0.074
2. The hourly direct labour rate stated above under 'Forecast manufacturing cost' is inclusive of a premium on the basic hourly labour rate, which has been calculated assuming that each of the 250 cars takes the same time to produce as the first.

*Required:*

(a) **Calculate** the total labour cost of producing 250 cars.

*(6 marks)*

(b) **Discuss** life cycle costing, using the information given about the Model Q car to illustrate your discussion.

*(4 marks)*

*(Total for Question Two = 10 marks)*

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TURN OVER

### Question Three

NJ assembles and sells racing bicycles.

In an attempt to improve profit, during the latest year NJ reduced the training it provided to its manufacturing staff.

The following actual selling price and cost information is available for the latest year:

	\$ per bicycle
Selling price	1350
Frame cost	820
Other material cost	85
Assembly cost	100
Delivery cost	<u>15</u>
Contribution	<u>330</u>

#### Annual quality cost information for the latest year

Inspection costs (manufacturing)	\$2,300,000
Staff training costs	\$780,000
Total cost of dismantling and reassembling per bike (this includes the collection cost of the faulty bicycle at \$20)	\$200
Estimated market size (number of bicycles)	2,500,000

#### Additional information for the latest year

- 3,000 completed bicycles were found to have a faulty frame before delivery to the customer. Each faulty frame had to be replaced and the bicycle had to be reassembled. NJ is unable to recover the cost of faulty frames from the supplier as the supplier has gone into liquidation.
- NJ had to replace 1,500 bicycles that had already been delivered to customers due to a failure of the frame.
- The management team at NJ estimated that its market share fell to 8% from a forecast 8.5% due to adverse consumer reaction as a result of criticism in the bicycle racing press.

*Required:*

- (a) **Prepare** a cost of quality report for NJ for the latest year under appropriate headings.

(6 marks)

- (b) **Discuss**, using the above information, the relationship between conformance costs and non-conformance costs.

(4 marks)

(Total for Question Three = 10 marks)

#### Question Four

AST is a grocery and general merchandise retail group. AST has supermarkets located in most towns and cities in its home country. Over the last few years, profits have fallen and AST has recognised that it has paid insufficient attention to customer care.

AST has now realised the importance of the customer experience at its supermarkets. In an attempt to earn the loyalty of its customers, AST has introduced a loyalty card scheme that rewards customers with discount vouchers based on their spend and buying patterns at supermarkets.

The management of AST is considering the introduction of a balanced scorecard approach to manage the performance of its stores.

*Required:*

**Recommend** an objective and a suitable performance measure for each of three non-financial perspectives of a balanced scorecard that AST could use to support its new strategy of improving the customer experience.

Note: in your answer you should state three perspectives and then recommend with reasons an objective and a performance measure for each one of your three perspectives.

*(Total for Question Four = 10 marks)*

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*Section A continues on the next page*

TURN OVER

### Question Five

PTP produces two products from different combinations of the same resources. Details of the selling price and costs per unit for each product are shown below:

	Product E	Product M
	\$	\$
Selling price	175	125
Material A (\$12 per kg)	60	24
Material B (\$5 per kg)	10	15
Labour (\$20 per hour)	40	20
Variable overhead (\$7 per machine hour)	14	28

The fixed costs of the company are \$50,000 per month.

PTP aims to maximise profits from production and sales. The production plan for June is currently under consideration.

The following resources are available in June:

Material A	4,800kg
Material B	3,900kg
Labour	2,500 hours
Machine hours	5,000 hours

*Required:*

(a)

- (i) **Identify** the objective function and the constraints to be used in a linear programming model to determine the optimum production plan for June.

*(3 marks)*

The solution to the linear programming model shows that the only binding constraints in June are those for Material A and Material B.

- (ii) **Produce**, using simultaneous equations, the optimum production plan and resulting profit for June. (You are NOT required to draw or sketch a graph.)

*(5 marks)*

Based on the optimal production plan for June, the management accountant at PTP has determined that the shadow price for Material A is \$7 per kg.

- (b) **Explain** the meaning of the shadow price for Material A.

*(2 marks)*

*(Total for Question Five = 10 marks)*

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*(Total for Section A = 50 marks)*

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*End of Section A*

*Section B starts on page 10*

TURN OVER

## SECTION B – 50 MARKS

[You are advised to spend no longer than 45 minutes on each question in this section.]

ANSWER *BOTH* QUESTIONS IN THIS SECTION. EACH QUESTION IS WORTH 25 MARKS. YOU SHOULD SHOW YOUR WORKINGS AS MARKS ARE AVAILABLE FOR THE METHOD YOU USE.

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### Question Six

BON Group is a magazine publishing company. It comprises a number of different divisions, each publishing magazines in a different sector. Many of its magazines are the most popular titles in their specialist interest group. BON Group is a profitable company and is one of the largest publishing companies in its country based on staff numbers and magazine circulation.

BON Group is now considering entering into the home decoration print magazine market with its new title 'Y Magazine'. The home decoration print magazine market is very competitive with a number of well established titles already being published by BON Group's competitors.

Y Magazine would be published monthly. The management of BON Group is initially considering the following market research-derived information to determine the selling price of Y Magazine.

If the selling price of Y Magazine is \$3.99, the monthly demand for the magazine is expected to be 60,000 copies. For every \$0.50 increase in the selling price, this demand would reduce by 10,000 copies. For every \$0.50 decrease in the selling price, this demand would increase by 10,000 copies.

Forecast variable cost per copy of Y Magazine:

	\$
Paper	0.83
Ink	See note 1
Machine cost	0.22
Other variable cost	0.15

Note 1: Each Y Magazine needs 0.2 litres of ink. However 10% of the ink input to the printing process is wasted. Ink costs \$5.40 per litre.

*Required:*

(a) **Calculate** the total monthly contribution that would be earned by Y Magazine.

Note: assume that BON Group will set the selling price so that profits would be maximised.

If  $P = a - bx$  then  $MR = a - 2bx$

*(7 marks)*

BON Group has commissioned an advertising campaign to launch Y Magazine. This will invalidate the previous price and demand relationship. The price of Y Magazine has been set at full cost plus a mark-up of 20%. In month 1, BON Group now expects to sell 50,000 copies of the magazine to new customers at this price.

The management of BON Group wishes to calculate the total profit for first three months of Y Magazine. The following information is available:

- After their first month of purchase, BON Group expects 90% of all new customers to purchase Y Magazine for a second consecutive month. After the second month of purchase, BON Group expects to retain 85% of these remaining customers in subsequent months.
- As the magazine circulation area increases, sales to additional new customers in months 2 and 3 will be 20% and 30% of the month 1 sales figure respectively.
- Fixed overhead costs are apportioned by BON Group to magazines based on sales volume. Total budgeted annual fixed overhead is \$18,000,000 and total budgeted annual magazine sales, including Y Magazine, is 12,000,000 copies.
- The sales price of Y Magazine will remain unchanged throughout the first three months.

*Required:*

(b) **Produce** a statement that shows the total profit for the first three months of Y Magazine. *(6 marks)*

(c) **Calculate** the percentage of new customers that need to purchase Y Magazine for a second consecutive month in order to achieve a three-month profit of \$100,000. *(4 marks)*

(d) **Discuss** the suitability of market skimming and penetration pricing as alternative pricing strategies for the introduction of Y Magazine. *(8 marks)*

*(Total for Question Six = 25 marks)*

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*Section B continues on the next page*

TURN OVER

## Question Seven

BLR provides vehicle maintenance services through its chain of garages. Each garage operates as an investment centre.

Garage managers are targeted on Return on Capital Employed (ROCE) and receive a bonus if their garage generates an annual ROCE of 15% or more.

At the start of this year, garage managers were informed that each garage would now receive an apportionment of the BLR head office fixed overhead costs. Head office costs are calculated as 7% of sales revenue and are included in Other operating costs. BLR head office stated that target ROCE would remain at 15% for each of its garages.

The following is a summary performance report for Garage A and Garage B:

	<u>Garage A</u>		<u>Garage B</u>	
	This year	Last year	This year	Last year
	\$000	\$000	\$000	\$000
Sales revenue	1,300.0	1,200.0	550.0	500.0
Material costs	190.0	180.0	80.0	75.0
Staff costs	355.0	350.0	150.0	150.0
Other operating costs	<u>531.0</u>	<u>460.0</u>	<u>258.5</u>	<u>180.0</u>
Profit	224.0	210.0	61.5	95.0
Capital employed	1,600	1,500	400	600

The capital employed figures in the above table are the net book value of the non-current assets of each garage at the end of the year.

*Required:*

(a) **Explain** ONE advantage and ONE disadvantage of each BLR garage being charged an apportionment of BLR head office costs.

*(4 marks)*

(b) **Discuss**, using the information in the scenario, the advantages and disadvantages of using ROCE to determine manager bonuses.

*(9 marks)*

Now using Residual Income (RI) to assess the performance of garage managers:

(c) **Discuss** the advantages and disadvantages of using RI instead of ROCE to determine garage managers' bonuses.

Note: BLR has a cost of capital of 8%.

*(8 marks)*

BLR has a Total Quality Management (TQM) culture and, to support this culture, Head Office proposes to measure garage performance against a competitor instead of against a pre-determined internal standard. The management of BLR has chosen to benchmark performance against NKR. NKR is a successful private company that operates a network of similar sized garages to BLR.

*Required:*

(d) **Discuss** the suitability and the feasibility of benchmarking the performance of BLR against that of NKR.

*(4 marks)*

*(Total for Question Seven = 25 marks)*

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*(Total for Section B = 50 marks)*

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*End of question paper*

*Maths tables and formulae are on pages 15 to 17*

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## PRESENT VALUE TABLE

Present value of 1 unit of currency, that is  $(1+r)^{-n}$  where  $r$  = interest rate;  $n$  = number of periods until payment or receipt.

Periods ( $n$ )	Interest rates ( $r$ )									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180
19	0.828	0.686	0.570	0.475	0.396	0.331	0.277	0.232	0.194	0.164
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149

Periods ( $n$ )	Interest rates ( $r$ )									
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694
3	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579
4	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482
5	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402
6	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335
7	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279
8	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233
9	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.225	0.209	0.194
10	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162
11	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135
12	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112
13	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093
14	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078
15	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.079	0.065
16	0.188	0.163	0.141	0.123	0.107	0.093	0.081	0.071	0.062	0.054
17	0.170	0.146	0.125	0.108	0.093	0.080	0.069	0.060	0.052	0.045
18	0.153	0.130	0.111	0.095	0.081	0.069	0.059	0.051	0.044	0.038
19	0.138	0.116	0.098	0.083	0.070	0.060	0.051	0.043	0.037	0.031
20	0.124	0.104	0.087	0.073	0.061	0.051	0.043	0.037	0.031	0.026

## CUMULATIVE PRESENT VALUE TABLE

Cumulative present value of 1 unit of currency per annum, Receivable or Payable at the end of each year for  $n$  years  $\frac{1-(1+r)^{-n}}{r}$

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

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

# FORMULAE

## PROBABILITY

$A \cup B = A \text{ or } B$ .       $A \cap B = A \text{ and } B$  (overlap).  
 $P(B | A)$  = probability of  $B$ , given  $A$ .

### Rules of Addition

If  $A$  and  $B$  are mutually exclusive:

$$P(A \cup B) = P(A) + P(B)$$

If  $A$  and  $B$  are not mutually exclusive:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

### Rules of Multiplication

If  $A$  and  $B$  are *independent*:

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

If  $A$  and  $B$  are **not independent**:

$$P(A \cap B) = P(A) * P(B | A)$$

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

## DESCRIPTIVE STATISTICS

Arithmetic Mean

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

Standard Deviation

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

## INDEX NUMBERS

Price relative =  $100 * P_1/P_0$

Quantity relative =  $100 * Q_1/Q_0$

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

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

## TIME SERIES

Additive Model

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

Multiplicative Model

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

## 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:

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

## 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.

## INVENTORY MANAGEMENT

Economic Order Quantity

$$EOQ = \sqrt{\frac{2C_o D}{C_h}}$$

where:  $C_o$  = cost of placing an order  
 $C_h$  = cost of holding one unit in inventory for one year  
 $D$  = annual demand

## 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
<b>Level 1 - KNOWLEDGE</b> What you are expected to know.	List State Define	Make a list of Express, fully or clearly, the details/facts of Give the exact meaning of
<b>Level 2 - COMPREHENSION</b> What you are expected to understand.	Describe Distinguish Explain  Identify  Illustrate	Communicate the key features Highlight the differences between Make clear or intelligible/State the meaning or purpose of Recognise, establish or select after consideration Use an example to describe or explain something
<b>Level 3 - APPLICATION</b> How you are expected to apply your knowledge.	Apply Calculate Demonstrate  Prepare Reconcile Solve Tabulate	Put to practical use Ascertain or reckon mathematically Prove with certainty or to exhibit by practical means Make or get ready for use Make or prove consistent/compatible Find an answer to Arrange in a table
<b>Level 4 - ANALYSIS</b> How are you expected to analyse the detail of what you have learned.	Analyse Categorise Compare and contrast  Construct Discuss Interpret Prioritise Produce	Examine in detail the structure of Place into a defined class or division Show the similarities and/or differences between Build up or compile Examine in detail by argument Translate into intelligible or familiar terms Place in order of priority or sequence for action Create or bring into existence
<b>Level 5 - EVALUATION</b> How are you expected to use your learning to evaluate, make decisions or recommendations.	Advise Evaluate Recommend	Counsel, inform or notify Appraise or assess the value of Advise on a course of action

*Performance Pillar*

*Management Level Paper*

*P2 – Performance Management*

*May 2014*

*Wednesday Afternoon Session*