

Performance Pillar

P2 – Performance Management

24 November 2010 - Wednesday Afternoon Session

Instructions to candidates

You are allowed three hours to answer this question paper.

You are allowed 20 minutes reading time **before the examination begins** during which you should read the question paper and, if you wish, make annotations 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.

You are strongly advised to carefully read ALL the question requirements before attempting the question concerned (that is all parts and/or subquestions).

ALL answers must be written in the answer book. Answers written on the question paper will **not** 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 6.

Section B comprises 2 questions and is on pages 8 to 11.

Maths tables and formulae are provided on pages 13 to 16.

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.

Performance Management

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

The following variances have been calculated in respect of a new product:

Direct labour efficiency variance \$14,700 Favourable
Direct labour rate variance \$5,250 Adverse

The variances were calculated using standard cost data which showed that each unit of the product was expected to take 8 hours to produce at a cost of \$15 per hour. Actual output of the product was 560 units and actual time worked in the manufacture of the product totalled 3,500 hours at a cost of \$57,750.

However, the production manager now realises that the standard time of 8 hours per unit was the time taken to produce the first unit and that a learning rate of 90% should have been anticipated for the first 600 units.

Required:

(a) Calculate planning and operating variances following the recognition of the learning curve effect.

(6 marks)

(b) **Explain** the importance of learning curves in the context of Target Costing.

(4 marks)

Note: The learning index for a 90% learning curve is -0.1520

(Total for Question One = 10 marks)

Question Two

CAL manufactures and sells solar panels for garden lights. Components are bought in and assembled into metal frames that are machine manufactured by CAL. There are a number of alternative suppliers of these solar panels. Some of CAL's competitors charge a lower price, but supply lower quality panels; whereas others supply higher quality panels than CAL but for a much higher price.

CAL is preparing its budgets for the coming year and has estimated that the market demand for its type of solar panels will be 100,000 units and that its share will be 20,000 units (i.e. 20% of the available market). The standard cost details of each solar panel are as follows:

		\$ per unit
Selling price		60
Bought - in components (1 set)	15	
Assembly & machining cost	25	
Delivery cost	5	<u>45</u>
Contribution		15

An analysis of CAL's recent performance revealed that 2% of the solar panels supplied to customers were returned for free replacement, because the customer found that they were faulty. Investigation of these returned items shows that the components had been damaged when they had been assembled into the metal frame. These returned panels cannot be repaired and have no scrap value. If the supply of faulty solar panels to customers could be eliminated then, due to improved customer perception, CAL's market share would increase to 25%.

Required:

(a) **Explain**, with reference to CAL, quality conformance costs and quality non-conformance costs and the relationship between them.

(4 marks)

- (b) Assuming that CAL continues with its present systems and that the percentage of quality failings is as stated above:
 - (i) **Calculate**, based on the budgeted figures and sales returns rate, the total relevant costs of quality for the coming year.

(4 marks)

(ii) Calculate the maximum saving that could be made by implementing an inspection process for the solar panels, immediately before the goods are delivered.

(2 marks)

(Total for Question Two = 10 marks)

Section A continues on page 4

Question Three

QW is a company that manufactures machine parts from sheet metal to specific customer order for industrial customers. QW is considering diversification into the production of metal ornaments. The ornaments would be produced at a constant rate throughout the year. It then plans to sell these ornaments from inventory through wholesalers and via direct mail to consumers.

Presently, each of the machine parts is specific to a customer's order. Consequently, the company does not hold an inventory of finished items but it does hold the equivalent of one day's production of sheet metal so as to reduce the risk of being unable to produce goods demanded by customers at short notice. There is a one day lead time for delivery of sheet metal to QW from its main supplier though additional supplies could be obtained at less competitive prices.

Demand for these industrial goods is such that delivery is required almost immediately after the receipt of the customer order. QW is aware that if it is unable to meet an order immediately the industrial customer would seek an alternative supplier, despite QW having a reputation for high quality machine parts.

The management of QW is not aware of the implications of the diversification for its production and inventory policies.

Required

(a) Compare and contrast QW's present production and inventory policy and practices with a traditional production system that uses constant production levels and holds inventory to meet peaks of demand.

(5 marks)

(b) **Discuss** the importance of a Total Quality Management (TQM) system in a just-in-time (JIT) environment. Use QW to illustrate your discussion.

(5 marks)

(Total for Question Three = 10 marks)

Question Four

DW, a transport company, operates three depots. Each depot has a manager who reports directly to the Operations Director.

For many years the depot managers have been asked by the Operations Director to prepare a budget for their depot as part of the company's annual budgeting process. A new depot manager has been appointed to the Southern region and he has concerns about the validity of these annual budgets. He argues that they soon become out of date as operational circumstances change. At a recent manager's meeting he said, "They are restrictive. They do not permit the depot managers to make decisions in response to operational changes, or change working practices for next year until that year's budget has been approved."

Required:

(a) **Explain** the differences between the above annual budgeting system and a rolling budget system.

(4 marks)

(b) **Discuss** how the Southern region depot manager could use a rolling budget system to address his concerns.

(6 marks)

(Total for Question Four = 10 marks)

Section A continues on page 6

Question Five

XY provides accountancy services and has three different categories of client: limited companies, self employed individuals, and employed individuals requiring taxation advice. XY currently charges its clients a fee by adding a 20% mark-up to total costs. Currently the costs are attributed to each client based on the hours spent on preparing accounts and providing advice.

XY is considering changing to an activity based costing system. The annual costs and the causes of these costs have been analysed as follows:

	\$
Accounts preparation and advice	580,000
Requesting missing information	30,000
Issuing fee payment reminders	15,000
Holding client meetings	60,000
Travelling to clients	40,000

The following details relate to three of XY's clients and to XY as a whole:

		XY		
	Α	В	С	
Hours spent on preparing accounts and				
providing advice	1,000	250	340	18,000
Requests for missing information	4	10	6	250
Payment reminders sent	2	8	10	400
Client meetings held	4	1	2	250
Miles travelled to meet clients	150	600	0	10,000

Required:

Prepare calculations to show the effect on fees charged to each of these three clients of changing to the new costing system.

(10 marks)

(Total for Question Five = 10 marks)

(Total for Section A = 50 marks)

End of Section A

Section B starts on page 8

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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.

Question Six

LM produces two products from different quantities of the same resources using a just-in-time (JIT) production system. The selling price and resource requirements of each of these two products are as follows:

Product Unit selling price (\$)	<i>L</i> 70	<i>M</i> 90
Variable costs per unit: Direct labour (\$7 per hour) Direct material (\$5 per kg) Machine hours (\$10 per hour)	28 10 10	14 45 20
Fixed overheads absorbed	12	6
Profit per unit	10	5

Fixed overheads are absorbed at the rate of \$3 per direct labour hour.

Market research shows that the maximum demand for products L and M during December 2010 will be 400 units and 700 units respectively.

At a recent meeting of the purchasing and production managers to discuss the company's production plans for December 2010, the following resource availability for December 2010 was identified:

Direct labour	3,500 hours
Direct material	6,000 kg
Machine hours	2.000 hours

Required:

(a) **Prepare** calculations to show, from a financial perspective, the optimum production plan for December 2010 and the contribution that would result from adopting your plan.

(6 marks)

- (b) You have now presented your optimum plan to the purchasing and production managers of LM. During the presentation, the following additional information became available:
 - (i) The company has agreed to an order for 250 units of product M for a selling price of \$90 per unit from a new overseas customer. This order is in addition to the maximum demand that was previously predicted and **must** be produced and delivered in December 2010;
 - (ii) The originally predicted resource restrictions were optimistic. The managers now agree that the availability of all resources will be 20% lower than their original predictions.

Required:

Construct the revised resource constraints and the objective function to be used to identify, given the additional information above, the revised optimum production plan for December 2010.

(6 marks)

(C) The resource constraints and objective function requested in part (b) above have now been processed in a simplex linear programming model and the following solution has been printed:

Product L	400	Product L other value	0
Product M	194	Product M other value	506
Direct labour	312		
Direct material (\$)	1.22		
Machine hours	312		
Contribution (\$)	10,934.00		

Required:

Analyse the meaning of each of the above eight values in the solution to the problem. Your answer should include a proof of the five individual values highlighted in **bold**.

(13 marks)

(Total for Question Six = 25 marks)

Section B continues on page 10

Question Seven

SWZ is a manufacturing company that has many trading divisions. Return on Investment (ROI) is the main measure of each division's performance. Each divisional manager's salary is linked only to their division's ROI.

The following information summarises the financial performance of the S division of SWZ over the last three years:

Year ending 31 October	2008 \$000	2009 \$000	2010 \$000
Turnover	400	400	400
Cost of sales	240	240	240
Gross profit	160	160	160
Other operating costs	120	104	98
Pre-tax operating profit	40	56	62
Capital invested as at the end of the year	400	320	256

Other operating costs include asset depreciation calculated at the rate of 20% per annum on a reducing balance basis.

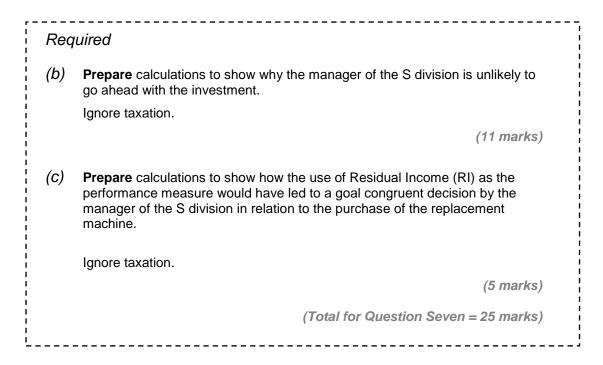
The figures shown in the above table for the capital invested as at the end of the year is the net book value of the division's fixed assets.

All of the above values have been adjusted to remove the effects of inflation. There have been no additions or disposals of fixed assets within the S division during this period.

Required (a) Discuss the performance of the S division over the three year period. (9 marks)

The manager of the S division is now considering investing in a replacement machine. The machine that would be replaced would be sold for its net book value which was \$40,000 at 31 October 2010 and the new machine would cost \$100,000. The new machine would have an expected life of five years and would be depreciated using the same depreciation rates as the existing machinery. The new machine would reduce the division's cost of sales by 10%. At the end of five years it would be sold for its net book value.

The divisional cost of capital is 8% per annum. The company has evaluated the investment and correctly determined that it has a positive Net Present Value (NPV) of \$24,536.



(Total for Section B = 50 marks)

End of question paper

Maths tables and formulae are on pages 13 to 16

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					Interes	rates (r)				
(<i>n</i>)	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180
19	0.828	0.686	0.570	0.475	0.396	0.331	0.277	0.232	0.194	0.164
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149

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

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

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

Periods					Interes	t rates (r)				
(n)	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327
12	6.492	6.194	5.918	5.660	5.421	5.197	4.988	7.793	4.611	4.439
13	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14	6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675
16	7.379	6.974	6.604	6.265	5.954	5.668	5.405	5.162	4.938	4.730
17	7.549	7.120	6.729	6.373	6.047	5.749	5.475	5.222	4.990	4.775
18	7.702	7.250	6.840	6.467	6.128	5.818	5.534	5.273	5.033	4.812
19	7.839	7.366	6.938	6.550	6.198	5.877	5.584	5.316	5.070	4.843
20	7.963	7.469	7.025	6.623	6.259	5.929	5.628	5.353	5.101	4.870

FORMULAE

PROBABILITY

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

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

 $P(A \cap B) = P(A) * P(B)$ $P(A \cap B) = P(A) * P(B \mid A)$ If A and B are independent. If A and B are **not** independent.

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

DESCRIPTIVE STATISTICS

Arithmetic Mean

$$\overline{x} = \frac{\sum x}{n}$$
 $\overline{x} = \frac{\sum fx}{\sum f}$ (frequency distribution)

Standard Deviation

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

INDEX NUMBERS

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

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

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

TIME SERIES

Additive Model

Series = Trend + Seasonal + Random

Multiplicative Model

Series = Trend * Seasonal * 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:

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

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

$$Y_x = aX^b$$

 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

$$EOQ = \sqrt{\frac{2C_oD}{C_h}}$$

where:

cost of placing an order
 cost of holding one unit in inventory for one year
 annual demand

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LIST OF VERBS USED IN THE QUESTION REQUIREMENTS

A list of the learning objectives and verbs that appear in the syllabus and in the question requirements for each question in this paper.

It is important that you answer the question according to the definition of the verb.

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

Performance Pillar

Management Level Paper

P2 – Performance Management

November 2010

Wednesday Afternoon Session