

Performance Pillar

P2 – Performance Management

Examiner's Answers

SECTION A

**Answer to Question One**

(a)

	<b>Flexed Budget</b>	<b>Actual</b>	<b>Variance</b>
Output (batches)	50	50	
Direct labour hours	68.91	93.65	24.74 adverse
Direct labour cost (\$)	826.92	1,146	319.08 adverse
Direct labour efficiency (\$)			296.88 adverse
Direct labour rate (\$)			22.20 adverse

**Learning curve workings**

The average time for 30 batches:

$$Y = ax^b$$

$$Y = 10 \times 30^{-0.5146} = 1.737 \text{ hours}$$

$$\text{Total time for 30 batches} = 30 \times 1.737 \text{ hours} = 52.11 \text{ hours}$$

The average time for 29 batches:

$$Y = ax^b$$

$$Y = 10 \times 29^{-0.5146} = 1.768 \text{ hours}$$

$$\text{Total time for 29 batches} = 29 \times 1.768 \text{ hours} = 51.27 \text{ hours}$$

$$\text{Therefore the time for the 30}^{\text{th}} \text{ batch} = 52.11 \text{ hours} - 51.27 \text{ hours} = 0.84 \text{ hours}$$

$$\text{Total time for 50 batches} = 52.11 \text{ hours} + (20 \text{ batches} \times 0.84 \text{ hours}) = 68.91 \text{ hours}$$

(b) There are a number of reasons why this performance report is more useful than that originally prepared:

- The original comparison was invalid because the actual output differed from that budgeted and no adjustment was made to the expected direct labour hours and direct labour cost .
  - The original budget assumptions concerning the learning curve were inappropriate,
  - The revised performance report compares the actual performance with that which should have been expected for the actual output achieved.
  - The revised performance report analyses the total direct labour cost variance between that caused by efficiency (resource utilisation) and that caused by the difference in wage rates, and thus enables the variances to be attributed to those managers responsible.
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## Answer to Question Two

### (i) Selling price changes

It is likely that throughout the growth, maturity & decline phases there will be a gradual reduction in the selling price of the product, but the reasons for the reductions are different for each phase.

In the growth phase, PQ will be aware that their competitors may have purchased the product during its introduction phase and may have reverse engineered it and perhaps produced a competitive product. Therefore PQ will be keen to try and keep the competition from entering the market by making the item less profitable. Secondly, in order for PQ's product to be demanded by a greater number of consumers the price will have to be reduced.

In the maturity phase, the price will be reduced further to encourage further sales while a replacement product is being finalised and introduced to the market so that PQ continues to receive cash inflows to support its continued product development.

In the decline phase, PQ will reduce the price still further as by now its replacement will have been introduced to the market and PQ is therefore attempting to clear its inventory of any remaining units of the old product.

### (ii) Production cost changes

During the growth phase it is likely that there will be reductions in the unit production costs due to economies of scale and the application of the learning and experience curve to the greater volumes until a post learning position is achieved.

In the maturity phase there is unlikely to be significant further reductions in unit production costs.

In the decline phase, PQ will wish to minimise its expenditure so that it can derive as much profit as possible from the final sales of the product, but its production costs may increase due to possible machine breakdowns and inefficiencies.

### (iii) Selling and marketing cost changes

During the growth phase it is likely that there will be significant selling and marketing cost as the product is sold to a more general audience compared to the introduction phase when sales were made to a smaller targeted group of consumers.

In the maturity phase, selling and marketing costs can be reduced as the product is established and is selling itself by word of mouth and reputation.

In the decline phase, selling and marketing costs will be cut since production will cease during this period.

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### Answer to Question Three

(a)

Month	Demand Std hours	Basic Production Std hours	Inc/(Dec) in Inventory Std hours	Closing Inventory Std hours	Average Inventory Std hours	Inventory Cost \$	Overtime Cost \$
1	3,100	3,780	680	680	340	2,040	
2	3,700	3,780	80	760	720	4,320	
3	4,000	3,780	( 220)	540	650	3,900	3,437.55
4	3,300	3,780	480	1,020	780	4,680	
5	3,600	3,780	180	1,200	1,110	6,660	
6	4,980	3,780	(1,200)	0	600	3,600	18,750.00
Total						25,200	22,187.55

The net saving for the six month period is \$3,012.45

Calculation of overtime cost:

Month 3 = 220 std hours / 0.96 = 229.17 labour hours x \$15 =	3,437.55
Month 6 = 1,200 std hours / 0.96 = 1,250.00 labour hours x \$15 =	<u>18,750.00</u>
	<u>22,187.55</u>

(b) There are a number of other factors that need to be considered, these include:

- The need for a commitment to quality to ensure that all of the items that are produced are of the appropriate standard since there is no longer any inventory that can be used as a safety net from which sales can be made while defective items are re-worked or replaced.
- Staff members need to be flexible in terms of the hours that they work and the tasks they perform in order for the items to be made on time. They also need to take responsibility for their own quality.

#### Answer to Question Four

- (a) The senior partner seems to want to involve the divisional partners in the budgeting process by inviting them to prepare cost budgets for their respective divisions. However, since they are then amended without any consultation it is clear that the divisional partners do not have any real involvement as they are not able to influence their final cost budgets.

From a motivational point of view this approach is probably worse than not involving the divisional partners at all. They will feel that they have wasted their time in preparing a budget which is then effectively ignored.

The benefit of involvement leading to ownership of the budget and thus feeling personally responsible for achieving the target costs is therefore lost. Divisional partners will not be motivated to achieve the budgeted cost. Indeed they may be motivated to deliberately fail to achieve the budgeted costs in order to prove that their own budget was correct and that the changes imposed by the senior partner were wrong.

- (b) A number of non-financial performance indicators could be used by the firm. These include:
- Number of training days for staff and partners – which is used to measure the investment by the firm in its people and the firm's commitment to providing up to date and current information to its clients.
  - Response time between the enquiry and the first meeting with a client – which is used to measure the efficiency and flexibility of the firm to meet client demand.
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## Answer to Question Five

- (a) Any performance measurement system should be fair to all parties if it is to be used as a basis of improving future performance. In order for it to be fair the costs, revenues and investment that are monitored should be within the control of the divisional director. Clearly there are issues in this company that divisional directors are being held responsible for elements of performance that are outside of their control.

Three specific items can be identified:

- There are problems with Head office costs. The costs are apportioned from Head Office on an arbitrary basis without proper regard for the reasons for the costs to be incurred. Also the divisions have no control over the level of Head Office expenditure or its efficiency of resources usage.
- The transfer prices between divisions are imposed by Head Office so the divisional directors have no control over the prices being charged. It is not clear whether such internal trading is enforced by Head Office or whether the managers have the power to refuse to trade with each other if the transfer price is unacceptable. Neither is there any information about the impact of the level of internal trading on each division's results.
- The divisional directors have limited control over their investments. This may not be significant as there is no indication of the size of the divisions and the extent to which the \$100,000 threshold is a barrier to any of the directors in their divisional decision making.

All of these factors mean that the divisional directors are not in full control of their own results and it therefore seems unfair to measure their performance in this way.

- (b) An activity based approach to analysing the Head Office costs should identify the cause of the costs being incurred. It may be that some of the Head Office costs are facility sustaining and are no longer caused by current actions. However, a number of other costs might occur as a result of actions being taken at divisional level. ABC may provide a fairer basis of charging these costs to the divisions that cause them to be incurred because the divisional directors can influence the costs being incurred by changing their actions.

As a consequence of understanding what drives these costs, LMN's profitability may improve because these costs may be reduced by acting in a different way both in the divisions and at Head Office.

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## SECTION B

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### Answer to Question Six

- (a) The optimum production plan is determined by reference to the product contributions earned per unit of the scarce resource. The resource requirements to meet the maximum product demand levels are as follows:

	<i>R</i>	<i>T</i>	<i>Total</i>
Total demand	750	1,150	
Direct labour (hours)	2,250	5,750	8,000
Material A (kgs)	3,750	4,600	8,350
Material B (kgs)	1,500	1,150	2,650
Machine hours	2,250	4,600	6,850

By comparing the resources required with those available we can determine that the only resource that is restrictive is direct labour hours.

<i>Product</i>	<i>R</i> \$/unit	<i>T</i> \$/unit	
Selling price	130	160	
Direct labour	24	40	
Material A	15	12	
Material B	14	7	
Machine time	<u>30</u>	<u>40</u>	
	<u>83</u>	<u>99</u>	
Contribution	47	61	
Contribution per labour hour	15.67	12.20	
Rank	1	2	
<b>Labour hours</b>	<i>R</i> units	<i>T</i> units	<i>Total</i>
Contract demand uses	750	1,750	2,500
Balance of hours	1,500	3,500	5,000
<b>Production</b>			
Contract	250	350	
Market	500	700	

This yields a contribution of:

Product R	Contract	250 x \$17	\$ 4,250	
	Market	500 x \$47	<u>\$23,500</u>	\$27,750
Product T	Contract	350 x \$36	\$12,600	
	Market	700 x \$61	<u>\$42,700</u>	<u>\$55,300</u>
				<u>\$83,050</u>

- (b) This mix leaves market demand for 100 units of T unsatisfied, which is equivalent to a lost contribution of \$6,100. As this is less than the financial penalty for non-delivery of any part of the contract then the contract should be produced in full as stated above.

Further analysis shows that if the additional units of T were to be produced for the external market, then the resources would be taken from the production of product R for the contract because this yields a lower contribution per hour than the contract production of product T.

Detailed calculations show that the reduction in contract production of product R would be 167 units which would reduce contribution by \$2,833; this is added to the penalty of \$10,000 which totals \$12,833 compared to the extra contribution of \$6100 from the external market sales of 100 units of T. If the contract were not delivered in full the company's total contribution would be lower by \$6,733.

*Note: This answer is more detailed than was required from candidates and is provided for the benefit of future students.*

- (b) Resources available:

Resource	Per question	Less 10%	Contract requires	Resources available
Direct labour	7,500	6,750	2,500	4,250
Material A	8,500	7,650	2,650	5,000
Material B	3,000	2,700	850	1,850
Machine hours	7,500	6,750	2,150	4,600

Constraints:

Direct labour	$3R + 5T$ less than or equal to 4,250
Material A	$5R + 4T$ less than or equal to 5,000
Material B	$2R + 1T$ less than or equal to 1,850
Machine hours	$3R + 4T$ less than or equal to 4,600
Iso-contribution function	$47R + 61T$

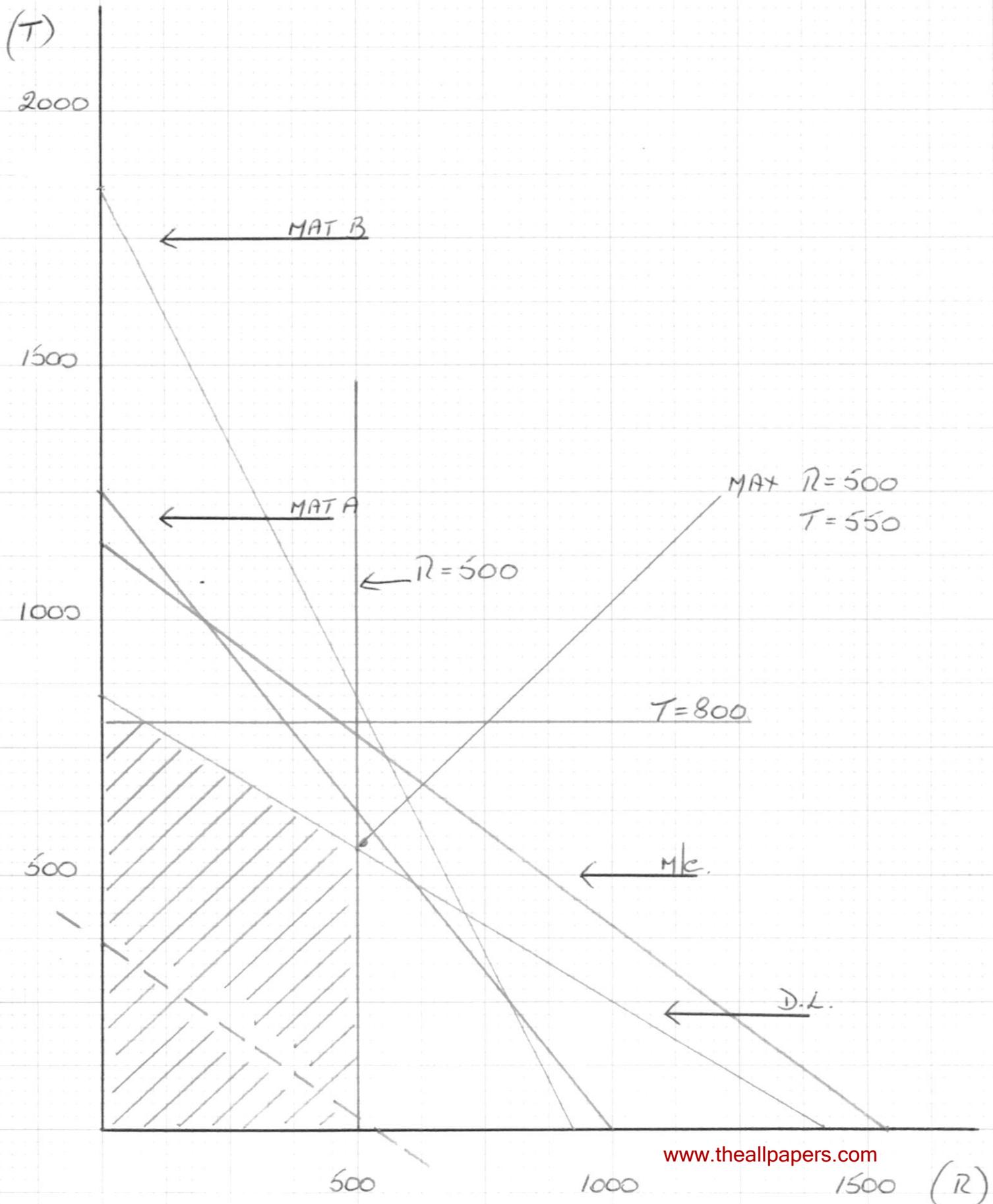
See graph on page 9.

The optimal plan is to produce 500 units of Product R and 550 units of Product T in addition to the contract.

- (d) The graph shows clearly that the most binding constraints are the maximum demand for product R and the availability of direct labour hours.

If the availability of resources were less restricted, then each of the resource constraints would move to the right, parallel to their present constraint line.

It can be seen that if the direct labour constraint were to move to the right, then the optimal production values would change until the material A constraint became binding, if there were no change to the direct labour constraint any movement of the other resource constraints would have no effect on the production plan.



## Answer to Question Seven

(a) (i)

	<i>Profit &amp; Loss</i> (\$)	<i>Capital Value</i>	<i>Month ROI</i>	<i>Annualised ROI</i>
Process B	18,800	$\$800,000 \times 0.8^5 = \$262,144$	7%	84%
Process C	(15,550)	$\$500,000 \times 0.8^2 = \$320,000$	(5%)	(60%)
Process D	(5,000)	$\$300,000 \times 0.8^{10} = \$ 32,212$	(15%)	(180%)

(a) (ii)

The profit or loss shown for each of the processes is (at least in part) dependent on the transfer price being charged between the processes. Since transfer prices are based on the budgets of the supplier plus a percentage mark-up, the customer's performance will be affected by the budgeted efficiency of the supplier. This is unfair as the customer has no control over the supplier's budget.

All of the processes are allocated Head Office costs that are outside the control of the Process Division Manager. To this extent it is unfair to measure their performance based on the resulting profits.

The managers of processes C and D incur fixed process costs regardless of the output from Process B (which determines their input volumes). As a result the managers of processes C and D cannot control their own activity levels and obviously the operational gearing of their cost structures means that their profitability is dependent on their activity level.

All of the managers are operating with equipment that was bought at different times. Consequently the value of the equipment used in their respective ROI calculations is inconsistent from the perspective of cross divisional comparisons. By using equipment bought at different times the effect is two-fold. Firstly the price of the equipment would have been affected by inflation. Secondly the number of years' depreciation has reduced the capital value.

(b)(i)

If Process Division C invests in the new equipment, then the abnormal loss would be avoided and hence its output would increase by 1,500 litres  $\times$  \$20 = \$30,000. The scrap sales of the abnormal loss units would be forgone, and there would be a change to the depreciation charge, but this would result in a profit of \$2,367. This would give a ROI of:

$$\$2,367 / \$1,000,000 = 0.24\% - \text{Annualised ROI} = 2.88\%$$

If the investment does not go ahead, the 2011 monthly loss would be \$14,484 (due to a lower depreciation charge) and the ROI would be:

$$(\$14,484) / \$256,000 = (5.66\%) - \text{Annualised ROI} = (67.89\%)$$

**Workings:**

Monthly depreciation charge on old equipment (included in Overhead cost shown in the Process C account):

Original cost in January 2008 was \$500,000

	<i>Annual depreciation</i>	<i>Net Book Value c/fwd</i>
2008	\$100,000	\$400,000
2009	\$80,000	\$320,000
2010	\$64,000	\$256,000
2011	\$51,200	

2010 Monthly depreciation charge = \$64,000 / 12 =	\$5,333
2011 Monthly depreciation charge = \$51,200 / 12 =	\$4,267
2011 Monthly depreciation charge on new equipment: \$1,000,000 x 20% / 12 months =	\$16,666

**If investment does go ahead:**

Loss as shown for 2010	\$15,550
Additional sales: 1500 litres x (\$20 - \$0.50)	<u>\$29,250</u>
	\$13,700
Increase in monthly depreciation charge (\$16,666 - \$5,333)	<u>\$11,333</u>
Profit expected for 2011	<u>\$2,367</u>

**If investment does not go ahead:**

Loss as shown for 2010	\$15,550
Reduction in monthly depreciation charge (\$5,333 - \$4,267)	<u>\$1,066</u>
Loss expected for 2011	<u>\$14,484</u>

**(b) (ii)**

The impact on profits might be one to be encouraged depending on whether it is an adequate return on the investment. However the manager of Process C may be discouraged by the low ROI that can be expected. The decision should be based on an NPV appraisal of the investment using the company's cost of capital as the basis of the calculations. If the investment yields a positive NPV then the investment should proceed, so ideally the effect on the manager's performance measure should yield an answer that is consistent with the NPV solution.

**(c)**

The transfer price from Process B is based on budgeted cost plus a mark-up of 15%. This means that the managers of Processes C and D are protected against inefficiencies of process B and the manager of Process B is rewarded for any efficiencies that are achieved. This is of course subject to the budgeted costs being a fair cost of producing outputs C and D. There is however room for argument between the managers as to the basis of apportionment of the joint costs.

With regard to Process Division D being able to buy the equivalent material externally at \$7.50 per litre, rather than pay \$9.20 per litre to Process Division B, there is an obvious conflict here between buying internally and buying externally.

Since Process B produces two joint products, it is not possible to produce the output for C without also producing the output for D. Therefore if D were to purchase its requirements externally, the output of D from Process B would have to be scrapped. There would be no change to the costs of Process B and external costs would increase.

There is clearly a case here for changing the transfer price so that Process Division D is at least no worse off than it would be if it bought the material externally. This may be achieved by changing the basis of the joint cost apportionment; or using \$7.50 as the transfer price; or some combination of these. In either event, the profitability of Division D (and possibly Division B) would be changed and consequently their ROI would also change.

An alternative is to use a dual system of transfer pricing whereby different transfer values are used by each of Divisions B and D in respect of the same transfer. This would allow Division B to retain the same accounting methods as at present, but the performance of Division D would be calculated using the cost value that it would have paid had it purchased from the external market.

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*The Senior Examiner for P2 Performance Management offers to future candidates and to tutors using this booklet for study purposes, the following background and guidance on the questions included in this examination paper.*

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**Section A – Compulsory**

**Question One** examines candidates' understanding of learning curves and their interaction with budgets and variance analysis.

**Question Two** examines candidates' understanding of the changes in costs and selling prices during the life cycle of a product.

**Question Three** examines candidates' knowledge of alternative production systems and their costs.

**Question Four** examines candidates' understanding of budgeting systems and performance indicators in a service environment.

**Question Five** examines candidates' knowledge of performance measurement in organisation structures where costs are apportioned and managers do not have full control over decisions.

**Section B – Compulsory**

**Question Six** examines candidates' understanding of limiting factor decision making and how those decisions would be affected if the resource restrictions were to change.

**Question Seven** examines candidates' understanding of process accounting and ability to identify the data relevant to measure divisional performance. It then tests candidates' knowledge of return on investment and how it is affected by investment decisions and transfer pricing within a divisionalised structure.

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