Answers

1 (a)

	Incremental revenue	Less VC	Net profit/(loss)	Further process?
L	(1,200 x 0·95 x $6·70) – (1,200 x $5·60) = $918	(1,200 x $0·5) x 0.95 =$(570)	$348	Yes
M	(1,400 x 0·95 x $7·90) – (1,400 x $6·50) = $1,407	(1,400 x $0·70) x 0.95 = $(931)	$476	Yes
S	(1,800 x 0·95 x $6·80) – (1,800 x $6·10) = $648	(1,800 x $0·80) x 0.95 =$(1,368)	$(720)	No

Process Co should further process L and M, since incremental revenue from further processing will exceed incremental costs. However, it should not further process S as incremental costs exceed incremental revenue in S's case.

Note: *The above calculations could be done on a unit basis if preferred, still earning full marks.*

(b) The suggested transfer price being used is actual marginal cost. This means that whilst Division A would recover its variable costs of producing products L and M, there is no profit margin built in and, therefore, unless Head Office intervenes and forces Division A to transfer L and M to Division B, Division A will not want to transfer these products. Also, Division A will not have the opportunity to recover any apportioned fixed costs since marginal cost does not include these. Not only would Division A not make any profit or recovery of apportioned fixed costs from the transfers using the suggested system, it would actually lower its overall profits if it were forced to transfer L and M for further processing rather than being allowed to sell them externally after the split-off point. Division A's manager would feel extremely demotivated if he/she were to be made to transfer L and M for further processing, as it would make performance look poorer for the Division.

All of the profit from both producing L and M and further processing them into LX and MX would be gained by Division B under the suggested system. If the criteria of return on investment (ROI) or residual income (RI) were then to be used to assess performance, as is usual for divisional performance assessment, Division B's ROI/RI would be seen to have increased as a result of the further processing. Division B would then effectively be taking the credit for a large part of the work carried out by Division A. The manager of Division B would be unlikely to complain about this as it works in favour of his Division.

Another point worth mentioning is that because actual cost would be used rather than standard cost, Division A would have little incentive to keep its variable costs down because it would pass all of its costs on to Division B. However, given that the suggested transfer price incorporates no profit for Division A, this point would hardly be arguable by Division B.

If Division A were told to make the transfers to Division B, their autonomy would be taken away from them. This would be likely to have a detrimental effect on the motivation of managers since one of the primary purposes of creating a divisional structure is to grant autonomy.

Note: *Other points could be made too. A candidate would not be expected to make all of the above points in order to earn full marks.*

(c) Environmental management accounting

Input/outflow analysis
This technique records material inflows and balances this with outflows on the basis that what comes in, must go out. So, if 100 kg of materials have been bought and only 80 kg of materials have been produced, for example, then the 20 kg difference must be accounted for in some way. It may be, for example, that 10% of it has been sold as scrap and 10% of it is waste. By accounting for outputs in this way, both in terms of physical quantities and, at the end of the process, in monetary terms too, businesses are forced to focus on environmental costs.

Flow cost accounting
This technique uses not only material flows but also the organisational structure. It makes material flows transparent by looking at the physical quantities involved, their costs and their value. It divides the material flows into three categories: material, system and delivery, and disposal. The values and costs of each of these three flows are then calculated. The aim of flow cost accounting is to reduce the quantity of materials which, as well as having a positive effect on the environment, should have a positive effect on a business's total costs in the long run.

Activity-based costing
ABC allocates internal costs to cost centres and cost drivers on the basis of the activities which give rise to the costs. In an environmental accounting context, it distinguishes between environment-related costs, which can be attributed to joint cost centres, and environment-driven costs, which tend to be hidden in general overheads.

Life cycle costing
Within the context of environmental accounting, life cycle costing is a technique which requires the full environmental consequences, and therefore costs, arising from production of a product to be taken account of across its whole life cycle, 'from cradle to grave'.

Note: *Only two techniques were required.*

2 (a) Throughput accounting ratio = throughput return per factory hour/cost per factory hour.

Cost per factory hour
Total factory costs/total available hours on bottleneck resource
= $12,000,000/2,700 hours (12 x 5 x 50 x 90% hours)
= $4,444·44

Throughput return	**Large panels**	**Small panels**
	$	**$**
Selling price	12,600	3,800
Materials	(4,300)	(1,160)
Throughput per unit	8,300	2,640
Hours per unit required on Machine M	1·4	0·6
Throughput return per hour	**$5,928·57**	**$4,400**

Throughput accounting ratio

Throughput return per factory hour/cost per factory hour:	5,928·57/4,444·44	4,400/4,444·44
	= **1·33**	= **0·99**

In any organisation, one would expect the throughput accounting ratio to be greater than 1. This means that the rate at which the organisation is generating cash from sales of this product is greater than the rate at which it is incurring costs. It follows on, then, that if the ratio is less than 1, changes need to be made quickly. Whilst the ratio for large panels is more than 1, it is just under 1 for small panels. However, if changes are made as suggested in (c) below, this could soon be rectified.

(b) Optimum production plan

Product	**No. of units**	**Hours per unit**	**Total hours**	**T/P per hour**	**Total T/P**
Small panels (under contract)	1,000	0.6	600	$4,400	$2,640,000
Large panels	1,500 (W.1)	1.4	2,100	$5,928·57	$12,449,997
Total			2,700		$15,089,997
Less total factory costs					($12,000,000)
Profit					$3,089,997

W.1
(2,700-600)/1.4

(c) Increasing throughput

Generally speaking, throughput can be increased by increasing sales volumes or prices on the one hand, or by cutting costs on the other hand. In the case of S Co, it is not possible to increase sales prices as the company has guaranteed not to increase them for three years. From our answer to (b) above, we can see that S Co has unsatisfied demand for both small panels and large panels. There are customers out there who the company is unable to supply because of its restricted machine capacity. Therefore, it would be worthwhile for S Co to focus on increasing production volumes and thus sales volumes.

In order to increase production volumes without making any additional capital expenditure, the company needs to focus on how it could increase the productivity of Machine M. We are told that there is plenty of spare capacity on Machines C and A. Some suggestions to increase Machine M's capacity are as follows:

- Machine M is currently only fully functional 90% of the time. This means that 300 hours of time are lost whilst the machine is being maintained or workers are not available to man it. If the maintenance work could be carried out outside the usual working day (i.e. either before 7 am or after 8 pm), some additional time could be freed up. This should be possible given that we are told that the maintenance contractors work around the clock.
- Workers could be trained to use more than one of the machines. This would then mean that, if some workers were absent, one of the other workers could step in and work on another machine in order to keep it running. Again, this would help to keep the lost 300 hours productive.
- The most obvious machine time which is being lost is the one hour per day at lunchtime. This amounts to 250 lost production hours per year. These additional 250 hours could be used to produce an extra 178 large panels (250/1·4 hours.) Large panels should be made first in preference to small panels since they generate a higher throughput per machine hour. If workers were trained to use all three machines then, if their lunchtimes were staggered, it may be possible to keep machine M running for the whole working day. However, even after doing this, there would still be 590 additional hours of time required on Machine M if the full market demand is going to be satisfied. Therefore, more time needs to be made available.
- Finally then, in order to increase productive hours on M, the working hours of the factory would need to be increased. Either the working day could be made longer, given that workers must already be working shifts, or maybe the factory could open for one extra day per week.

3 (a) Monthly costs

Month	Cumulative number of batches	Cumulative average hours per batch	Cumulative total hours	Incremental number of batches	Incremental total hours	Actual labour cost per month $
July	1	200	200	1	200	2,400
August (w.1)	2	176	352	1	152	1,824
September	4	154·88	619·52	2	267·52	3,210·24
October	8	136·294	1,090·352	4	470·832	5,649·60
November (w.2)	16	124·4	1,990·36	8	900·008	10,800·096

Working 1: Calculations for August
Cumulative average hours per batch: 200 x 0·88 = 176 hours.
Cumulative total hours = 2 x 176 = 352 hours.
Incremental number of batches = cumulative no. of 2 batches for August less cumulative number of 1 batch for July = 1 batch.
Incremental total hours = cumulative total hours of 352 for August – 200 for July = 152 hours.
Actual labour cost = incremental total hours of 152 x $12 per hour = $1,824.

Working 2
Time for 7th batch:
$Y = ax^b = 200 \times 7^{-0·1844245}$
= 139·693 hours.

Total time for 7 batches = 139·693 x 7 = 977·851 hours.

Total time for 8 batches = 1,090·352 hours.

Therefore 8th batch took 112·501 hours (1,090·352 – 977·851)

Time for batches 9–16 = 112·501 x 8 = 900·008 hours.

Therefore cumulative average time for batches 1–16 = 1,090·352 + 900·008 = 1,990·36 hours.
Cumulative average time for 16 batches = 1,990·36/16 = 124·4 hours per batch.

Note: *The labour costs for November could be arrived at quickly simply by taking the 112·501 hours for the 8th batch, multiplying it by 8 batches and applying this number to the $12 per hour labour cost. This quick calculation is totally sufficient to earn full marks.*

(b) Implications of end of learning period

The learning period ended at the end of October. This means that from November onwards the time taken to produce each batch of microphones is constant. Therefore, in future, when Mic Co makes decisions about allocating its resources and costing the microphones, it should base these decisions on the time taken to produce the 8th batch. The resource allocations and cost data prepared for the last six months will have been inaccurate since they were based on a standard time per batch of 200 hours.

Mic Co could try to improve its production process so that the learning period could be extended. It may be able to do this by increasing the level of staff training provided. Alternatively, it could try and motivate staff to work harder through payment of bonuses, although the quality of production needs to be maintained.

(c) Involving senior staff at Mic Co in the budget setting process

Advantages
- Since they are based on information from staff who are most familiar with the department, they are more likely to improve the accuracy of the budget. In Mic Co's case, the selling price could have been set more accurately and sales may have been higher if the production manager had been consulted.
- Staff are more likely to be motivated to achieve any targets as it is 'their' budget and they therefore have a sense of ownership and commitment. The production manager at Mic Co seems resigned to the fact that he is not consulted on budgetary matters.
- Morale amongst staff is likely to improve as they feel that their experience and opinions are valued.
- Knowledge from a spread of several levels of management is pooled.
- Co-ordination is improved due to the number of departments involved in the budget setting process.

Disadvantages
- The whole budgeting process is more time consuming and therefore costly.
- The budgeting process may have to be started earlier than a non-participative budget would need to start because of the length of time it takes to complete the process.

- Managers may try to introduce budgetary slack, i.e. making the budget easy to achieve so that they receive any budget-based incentives.
- Disagreements may occur between the staff involved, which may cause delays and dissatisfaction. In Mic Co's case, however, the fact that the production manager was not consulted has led to disagreement after the event.
- Can support 'empire building' by subordinates.

4 Ratio analysis

	Division S Year on year	Division C Year on year
Increase in revenue	44%	9%
Increase in material costs	36%	25%
Increase in payroll costs	70%	15%
Increase in property costs	78%	6%
GPM in 2013	56%	65%
GPM in 2012	61%	67%
Increase in D & M costs	38%	18%
Increase in admin costs	6%	0%
NPM in 2013	11%	21%
NPM in 2012	9%	22%
Revenue per employee in 2013	$102,224	$104,917
Revenue per employee in 2012	$111,772	$104,828
Payroll cost per employee in 2013	$27,000	$21,000
Payroll cost per employee in 2012	$25,020	$20,000
Total market size ($ revenue) in 2013 (w.1)	$129·48m	$80·12m
Total market size ($ revenue) in 2012 (w.1)	$107·75m	$77·61m

Working 1 for market size

Division S 2013: $38,845m/30% = $129·48m
Division S 2012: $26,937/25% = $107·75m
Division C 2013: $44,065m/55% = $80·12m
Division C 2012: $40,359m/52% = $77·61m

Note: *Percentages have been calculated to the nearest 1%.*

Commentary

General overview

Overall, Division S has performed well in 2013, although it has not managed to meet its objective of becoming market leader despite its $2m advertising campaign. Since it has 30% of the market in 2013 and there are only two competitors holding 70% of the market between them, at least one of those competitors must hold 35% or more of the market.

Revenue and market share

This has increased by a huge 44% in the last year. This compares to an increase of only 9% in Division C. However, part of the reason that this has been achieved is because the changes in fire safety laws introduced by the government at the end of 2012 have caused the market for fire products and services to increase from $107·75m to $129·48m. Part of Division S's success is therefore down to increased opportunity. However, Division S has also increased its market share by a further 5 percentage points compared to 2012. Division C has only managed a 3 percentage point increase in its market share, so this is a good result by Division S. One can assume that this is at least partly as a result of the advertising campaign carried out by Division S. However, this did cost a large amount, $2m, and it did not quite enable the Division to achieve its aim of becoming market leader.

Materials costs

The increase in materials costs is 36%, compared to an increase in revenue of 44%. It is difficult to say whether this is good or bad since the increase in revenue includes revenue from services, for which no materials costs would be expected to arise. **Further information is needed on the split of revenue between products and services.**

Payroll costs, revenue per employee and cost per employee

Payroll costs have increased by a massive 70% and far more than Division C's 15% increase. This is largely due to the fact that Division S's employee numbers increased from 241 in 2012 to 380 in 2013. This is a really big increase in employee numbers and has been accompanied by a fall in revenue per employee from $111,772 in 2012 to $102,224 in 2013. It is possible that Division S over-recruited as it hoped to secure a greater level of business than it did through its advertising campaign. Division S's payroll cost per employee also increased from $25,020 in 2012 to $27,000 in 2013. Presumably, this is because of the fact that there is high demand for staff skilled in this area and Division S has probably had to increase pay in order to attract the calibre of staff which it needs.

Increase in property costs

In percentage terms, the biggest increase in costs which Division S has suffered is in relation to its property costs. They have increased by 78%, compared to Division C's 6% increase. It would appear that this increase is due to the increased rent charged by Division S's landlords on its business premises, which in turn has risen because of the increased tax charges. **However, it is not possible to quantify this precisely without further information on rent increases.**

Gross profit margin
This has actually fallen from 61% to 56%. Division C has also seen a fall in its GPM, but only a 2 percentage point fall as opposed to Division S's 5 percentage point fall. The reasons for Division S's lower GPM are the higher material, payroll and property costs. Also, Division S did not try to pass on any of its increased costs to its customers in the form of higher prices.

Distribution and marketing costs
These have increased by 38% compared to Division C's 18%. However, when you take out the advertising costs in both years' figures and work out the cost increase without them ($8·522m – $7·102m/$7·102m), it leaves an increase of only 20%. This increase would be expected given the 20% increase in world fuel prices which occurred. Division S has to deliver to a wider geographical spread of customers than Division C, so it would be expected to feel the full brunt of fuel price increases.

Administrative costs
These have increased by 6% compared to Division C's less than 1% increase (0% when rounded down to the nearest percent). **Further information is needed about the items included in these cost figures to explain why this increase has arisen.**

Net profit margin
Despite challenging cost increases in all categories, Division S has still managed to increase its NPM from 9% to 11%. However, this is substantially lower than the NPM in Division C, which has fallen slightly but is still 21%, almost twice that in Division S. As we have seen, Division S's GPM is lower than Division C's anyway and, on top of that, Division C has not suffered a big increase in advertising costs like Division S; nor have administrative costs risen inexplicably.

Head Office
There is no information given about Head Office. If the Calana Division is also the Head Office, there could be Head Office costs included in Calana's figures, which would affect the comparisons being made. **Further information is required here.**

5 (a) Planning and operational variances

(i)	Material Price Planning Variance (MPPV)	(Standard price – revised price) x actual quantity
	Sheets	($5 – $6) x 248,000 = $248,000 adverse
	Pillow cases	($5 – $6) x 95,000 = $95,000 adverse
	Total	$343,000 adverse
(ii)	Material Price Operational Variance (MPOV)	(Revised price – actual price) x actual quantity
	Sheets	($6 – $5·80) x 248,000 = $49,600 favourable
	Pillow cases	($6 – $5·80) x 95,000 = $19,000 favourable
	Total	$68,600 favourable
(iii)	Material Usage Planning Variance (MUPV)	(Standard quantity for actual production – revised quantity for actual production) x standard price
	RQ for each pillow case = 0·5 m x 1·1 = 0·55 m	
	Sheets	(240,000 – 240,000) x $5 = 0
	Pillow cases	(90,000 – 99,000) x $5 = $45,000 adverse
	Total	$45,000 adverse
(iv)	Material Usage Operational Variance (MUOV)	(Actual quantity – revised quantity for actual production) x standard price
	Sheets	(248,000 – 240,000) x $5 = $40,000 adverse
	Pillow cases	(95,000 – 99,000) x $5 = $20,000 favourable
	Total	$20,000 adverse

Note: *The MPPV could be calculated using the revised quantity rather than the actual quantity. Similarly, the MUOV could be calculated using the revised price rather than the standard price. Marks will be given where this alternative method is used instead. However, it should be used for both the MPPV and the MUOV, otherwise the figures cannot be reconciled back to the difference between actual spend and the budget for spend as flexed for actual production levels ($339,400 adverse).*

(b) Performance of the production manager

In total, there has been an overspend of $339,400, which looks poor. However, when the reasons for this are examined, together with the variances calculated in (a), it is apparent that the production manager cannot be held solely responsible for the overspend. In fact, he has had little control over the situation.

Increase in cotton price
Since cotton is used to make bed sheets and the price of this rose in the world market by 20%, the production manager's performance has to be looked at in light of this. Because of the increased market price, the adverse material price planning variance is very high, since the budgeted cost of $5 per m^2 was far below the actual market price of $6 per m^2. The production manager cannot be held responsible for this since he does not set the standard costs. He can only be held responsible for any difference in price between the $6 market price and the $5·80 actual price paid. Since the $5·80 paid per m^2 is less than the market price of $6 per m^2, the manager performed well, as shown by the favourable material price operating variance of $68,600.

Increase in amount of cotton used

Since more cotton was used for actual production than budgeted, a total adverse material usage variance of $65,000 ($45,000 + $20,000) arose. However, of this, $45,000 (material usage planning variance) arose because of the request for a change in the design of the pillowcases by Bedco's customer. This was not within the control of the production manager and his performance should not therefore be assessed on it. However, an adverse material usage operational variance of $20,000 also arose; the performance of the production manager is weak here. Most of the adverse operational variance actually related to the production of bed sheets rather than pillowcases. It is not clear why this arose but it is definitely poor.

Bedco was also unable to produce all the pillowcases ordered by its customer in November as the order fell short by 10,000 units. If this was genuinely because of the late design change, however, it seems unfair to judge the production manager on this.

			Marks
1	**(a)**	**Further processing**	
		L	3
		M	3
		S	3
		Conclusion	1
			10
	(b)	**Issues**	
		Per valid point – maximum	2
		Maximum	5
	(c)	**Environmental accounting**	
		Each description – maximum	3
		Maximum	5
		Total marks	**20**
2	**(a)**	**Throughput accounting ratios**	
		Cost per factory hour	2
		Throughput per unit for large panels	1
		Throughput per unit for small panels	1
		Throughput per hour for large panels	1
		Throughput per hour for small panels	1
		TAR for large panels	0·5
		TAR for small panels	0·5
		Discussion of TAR	2
			9
	(b)	**Optimum production plan**	
		Optimum number of large panels	1
		Optimum number of small panels	1
		Total throughput	1
		Less total factory costs	1
		Profit	1
			5
	(c)	**Increasing productivity**	
		Each suggestion	2
		Maximum	6
		Total marks	**20**

			Marks
3	**(a)**	**Monthly costs**	
		Per monthly cost: July–October	1·5
		November	3
			9
	(b)	**End of learning period**	
		Each point discussed – maximum	2
		Maximum	4
	(c)	**Advantages and disadvantages**	
		Each advantage	1
		Each disadvantage	1
		Maximum	7
		Total marks	**20**
4		0·5 marks per calculation	7
		Per valid piece of further information – max 2	0·5
		Per comment – maximum	2
		Total marks	**20**
5	**(a)**	**Variance calculations**	
		MPPV	3
		MPOV	3
		MUPV	3
		MUOV	3
			12
	(b)	**Discussion**	
		Each valid point	2
		Maximum	8
		Total marks	**20**