Answers

Section B

1 (a)

Batches	Units	Price per unit	Total revenue	Variable cost per unit	Total variable costs	Fixed costs	Total cost	Profit
		$	$	$	$	$	$	$
1	1,000	20	20,000	10·00	10,000	10,000	20,000	0
2	2,000	18	36,000	8·80	17,600	10,000	27,600	8,400
3	3,000	16	48,000	7·80	23,400	12,000	35,400	12,600
4	4,000	13	52,000	6·40	25,600	12,000	37,600	14,400
5	5,000	12	60,000	6·40	32,000	14,000	46,000	14,000

Therefore Jewel Co should import and sell four batches (4,000 units) of headphones since at this point it will make the greatest profit: $14,400 for the month.

(b) The algebraic model requires several assumptions to be true. First, there must be a consistent relationship between price (P) and demand (Q), so that a demand equation can be established, usually in the form P = a – bQ. Here, although there is a clear relationship between the two, it is not a perfectly linear relationship and so more complicated techniques are required to calculate the demand equation. It also cannot be assumed that a linear relationship will hold for all values of P and Q other than the five given.

Similarly, there must be a clear relationship between demand and marginal cost, usually satisfied by constant variable cost per unit and constant fixed costs. The changing variable costs per unit again complicate the issue, but it is the changes in fixed costs which make the algebraic method less useful in Jewel's case.

The algebraic model is only suitable for companies operating in a monopoly and it is not clear here whether this is the case, but it seems unlikely, so any 'optimum' price might become irrelevant if Jewel's competitors charge significantly lower prices.

Other more general factors not considered by the algebraic model are political factors which might affect imports, social factors which may affect customer tastes and economic factors which may affect exchange rates or customer spending power. The reliability of the estimates themselves – for sales prices, variable costs and fixed costs – could also be called into question.

2 (a) The breakeven sales revenue for Swim Co is $90,000. The company's profit, to the nearest $10,000, if 500 athletes attend the course is $20,000 ($140,000 – $120,000). (From the graph, it is clear that the precise amount will be nearer $17,000, i.e. $140,000 – approximately $123,000.)

(b) Cost structure

From the chart, it is clear that Line C represents fixed costs, Line B represents total costs and Line A represents total revenue.

In terms of line A, from 0–400 athletes the line is straight with a constant gradient, indicating an unchanged selling price. This can be calculated as $300 per athlete (120,000/400). Beyond this point, the slope of the line becomes shallower, indicating that the sales price is reduced for further sales above 400. The reduced selling price can be calculated using the high-low method – an increase of 100 athletes leads to an increase of $20,000 in revenue, so the reduced price of $200 per athlete. This may be to encourage more sales.

Line C is the fixed costs line – if no sales are made, then the cost will be $20,000. This remains constant until 100 courses are sold, at which point the fixed costs increase gradually between 100 and 200 athletes by $20,000 up to $40,000. They then remain constant at $40,000 for 200+ athletes.

The behaviour between 100 and 200 athletes is that of a semi-variable cost. The reasons for this behaviour are unclear and more information would be required. It could be, for example, that freelance trainers or nutritionists are used when the number of athletes falls between 100 and 200 and they may charge by the hour for each hour of their time which they provide. Then, once 200 athletes is reached, new staff are recruited. Alternatively, the accountant could simply have made a mistake.

Line B is a combination of the fixed cost line (C) and the variable costs. As variable costs are zero when no courses are sold, this line starts in the same place as line B. Between 0 and 100 athletes, the gradient of the line is constant, indicating a constant variable cost/unit. This can be calculated as $200 per athlete, again using the high-low method.

The gradient of the line becomes steeper between 100 and 200 units. This indicates an increase in variable cost per unit. However, some of this will be due to the behaviour of line C, as previously discussed. The fixed costs have increased by $20,000 in this range and if this had not happened, then the total costs at 200 athletes would be $60,000, which is what would be expected if the variable costs had remained at $200 per athlete. Therefore the increase in gradient between 100 and 200 athletes is entirely down to the increase in fixed costs.

Between 200 and 300 athletes the gradient of the line reduces again. As the fixed costs are now unchanged, this must be due to a reduction in variable cost per athlete. An increase of 100 athletes gives an increase of $10,000, i.e. $100 per athlete which is a 50% reduction. This may be due to economies of scale such as cheaper materials or labour cost.

Beyond 300 athletes the line gets steeper which indicates an increase in variable cost per athlete. It is hard to read exactly from the graph but, assuming that the total cost for 400 athletes is $107,000, then the variable cost per athlete beyond 300 has increased to $170. The reasons for this are unclear. It may be extra labour time is required to deal with so many athletes and this outweighs the economies of scale enjoyed between 200 and 300 athletes.

As the selling price is $200 beyond 400 athletes, then each extra course booked makes contribution of about $30, increasing the profits of Swim Co.

3 Total sales revenue = (280,000 x $55) + (420,000 x $45) = $15·4m + 18·9m = $34·3m.

	$'000
Less costs:	
Development and design costs	5,600
Patent application costs (including $20k)	500
Patent renewal costs – 2 years	400
Opportunity cost – ignore	–
Total material costs [(280,000 x $16) + (420,000 x $14)]	10,360
Total labour costs [(280,000 x $8) + (420,000 x $7)]	5,180
Fixed production overheads	3,800
Marketing costs (working 1)	4,680
Selling and distribution costs	1,500
Environmental costs	250
Total life cycle costs	32,270

Expected profit = $2·03m

Note

The expected profit has been calculated using life cycle costing not relevant costing. Hence, the $20,000 salary cost included in patent costs should be included in the life cycle cost. Similarly, the opportunity cost of $800,000 is not included using life cycle costing whereas if relevant costing was being used to decide on a particular course of action, the opportunity cost would be included.

Working 1

Expected marketing cost in year 1: (0·2 x $2·2m) + (0·5 x $2·6m) + (0·3 x $2·9m) = $2·61m
Expected marketing cost year 2: (0·3 x $1·8m) + (0·4 x $2·1m) + (0·3 x $2·3m) = $2·07m
Total expected marketing cost = $4·68m

4 (a) Maximising group profit

Division L has enough capacity to supply both Division M and its external customers with component L.

Therefore, incremental cost of Division M buying externally is as follows:

Cost per unit of component L when bought from external supplier: $37
Cost per unit for Division L of making component L: $20.

Therefore incremental cost to group of each unit of component L being bought in by Division M rather than transferred internally: $17 ($37 – 20).

From the group's point of view, the most profitable course of action is therefore that all 120,000 units of component L should be transferred internally.

(b) Calculating total group profit

Total group profits will be as follows:

Division L:
Contribution earned per transferred component = $40 – $20 = $20
Profit earned per component sold externally = $40 – $24 = $16

	$
120,000 x $20	2,400,000
160,000 x $16	2,560,000
	4,960,000
Less fixed costs	(500,000)
Profit	4,460,000

Division M:
Profit earned per component sold externally = \$27 – \$1 = \$26

	\$
120,000 x \$26	3,120,000
Less fixed costs	(200,000)
Profit	2,920,000
Total profit	7,380,000

(c) Problems with current transfer price and suggested alternative

The problem is that the current transfer price of \$40 per unit is now too high. Whilst this has not been a problem before since external suppliers were charging \$42 per unit, it is a problem now that Division M has been offered component L for \$37 per unit. If Division M now acts in its own interests rather than the interests of the group as a whole, it will buy component L from the external supplier rather than from Division L. This will mean that the profits of the group will fall substantially and Division L will have significant unused capacity.

Consequently, Division L needs to reduce its price. The current price does not reflect the fact that there are no selling and distribution costs associated with transferring internally, i.e. the cost of selling internally is \$4 less for Division L than selling externally. So, it could reduce the price to \$36 and still make the same profit on these sales as on its external sales. This would therefore be the suggested transfer price so that Division M is still saving \$1 per unit compared to the external price. A transfer price of \$37 would also presumably be acceptable to Division M since this is the same as the external supplier is offering.

5 (a) Basic variances

Labour rate variance
Standard cost of labour per hour = \$42/3 = \$14 per hour.

Labour rate variance = (actual hours paid x actual rate) – (actual hours paid x std rate)

Actual hours paid x actual rate = \$531,930.
Actual hours paid x std rate = 37,000 x \$14 = \$518,000.

Therefore rate variance = \$531,930 – \$518,000 = \$13,930 A

Labour efficiency variance
Labour efficiency variance = (actual production in std hours – actual hours worked) x std rate
[(12,600 x 3) – 37,000] x \$14 = \$11,200 F

(b) Planning and operational variances

Labour rate planning variance
(Revised rate – std rate) x actual hours paid = [\$14·00 – (\$14·00 x 1·02)] x 37,000 = \$10,360 A.

Labour rate operational variance
Revised rate x actual hours paid = \$14·28 x 37,000 = \$528,360.
Actual cost = \$531,930.
Variance = \$3,570 A.

Labour efficiency planning variance
(Standard hours for actual production – revised hours for actual production) x std rate
Revised hours for each pair of gloves = 3·25 hours.
[37,800 – (12,600 x 3·25)] x \$14 = \$44,100 A.

Labour efficiency operational variance
(Revised hours for actual production – actual hours for actual production) x std rate
(40,950 – 37,000) x \$14 = \$55,300 F.

(c) Analysis of performance

At a first glance, performance looks mixed because the total labour rate variance is adverse and the total labour efficiency variance is favourable. However, the operational and planning variances provide a lot more detail on how these variances have occurred.

The production manager should only be held accountable for variances which he can control. This means that he should only be held accountable for the operational variances. When these operational variances are looked at it can be seen that the labour rate operational variance is \$3,570 A. This means that the production manager did have to pay for some overtime in order to meet demand but the majority of the total labour rate variance is driven by the failure to update the standard for the pay rise that was applied at the start of the last quarter. The overtime rate would also have been impacted by that pay increase.

Then, when the labour efficiency operational variance is looked at, it is actually $55,300 F. This shows that the production manager has managed his department well with workers completing production more quickly than would have been expected when the new design change is taken into account. The total operating variances are therefore $51,730 F and so overall performance is good.

The adverse planning variances of $10,360 and $44,100 do not reflect on the performance of the production manager and can therefore be ignored here.

Section B

			Marks
1	**(a)**	Calculations	
		Figures for batch 1	1
		Figures for batch 2	1
		Figures for batch 3	1
		Figures for batch 4	1
		Figures for batch 5	1
		Recommendation	1
			6
	(b)	Explanation	
		Per point – maximum marks	2
			4
		Total marks	**10**
2	**(a)**	BEP and profit	
		B/E revenue	1
		Profit	1
			2
	(b)	Discussion	
		Identifying lines	1
		Cost structure:	
		Stepped fixed costs	1
		Variable cost at 100 units	1
		Variable cost at 200 units	1
		Variable cost at 300 units	1
		Variable cost at 400/500 units	1
		Explanation of steepness of lines	2
		Revenue structure:	
		Constant price to 400 athletes of $300	1
		Decrease price to $280	1
		Maximum marks	8
		Total marks	**10**
3	Total revenue		0·5
	Design and development costs		1·5
	Inclusion of full $500k patent application		1
	Annual patent renewal costs		0·5
	Exclusion of opportunity cost		1·5
	Materials		0·5
	Labour		0·5
	Fixed production		0·5
	Marketing		2
	Selling and distribution		0·5
	Environmental		0·5
	Expected profit		0·5
	Total marks		**10**

			Marks
4	(a)	**Maximising group profits**	
		Calculating incremental cost per unit	2
		Recommendation	1
			3
	(b)	**Profit**	
		Profit of L	3
		Profit of M	2
		Total profit	1
			6
	(c)	**Discussion**	
		Transfer price is too high	2
		Division M will not buy	1
		Profits for group will fall	1
		S/D costs should mean lower TP anyway	2
		Suggested transfer price	1
		Maximum marks	6
		Total marks	**15**
5	(a)	**Basic variances**	
		Each variance	1
			2
	(b)	**Operational and planning variance**	
		Labour rate planning	1·5
		Labour rate operational	1·5
		Labour efficiency planning	1·5
		Labour efficiency operational	1·5
			6
	(c)	**Performance**	
		Only operational variances	1
		Adverse op. variance	2
		Failure to update the standard	1
		Overtime rate impacted	1
		Favourable efficiency variance	2
		Good overall	1
		Maximum	7
		Total marks	**15**