Answers

1 Cement Co

(a) Pay off table

				SUPPLY (no. of bags)		
			Prob.*	**350,000**	**280,000**	**200,000**
	Weather			**$'000**	**$'000**	**$'000**
	Good	$'000	0·25	1,750 (1)	1,400	1,000
DEMAND	Average	$'000	0·45	1,085 (2)	1,400	1,000
	Poor	$'000	0·3	325	640	1,000

* The probability column is only shown so as to help in part (b) (iii)'s calculations.

Profit per bag sold in coming year = $9 – $4 = $5
Loss per bag disposed of = $4 + $0·50 = $4·50

(1) 350,000 x $5 = $1,750,000

(2) [280,000 x $5] – [70,000 x $(4·50)] = $1,085,000 etc

(b) **(i)** **Maximin** – identify the worst outcome for each level of supply and choose the highest of these worst outcomes.

	SUPPLY (no. of bags)		
	350,000	**280,000**	**200,000**
	$'000	**$'000**	**$'000**
Worst	325	640	1000

The highest of these is $1,000,000 therefore choose to supply only 200,000 bags to meet poor conditions.

(ii) **Maximax** – identify the best outcome for each level of supply and choose the highest of these best outcomes.

	SUPPLY (no. of bags)		
	350,000	**280,000**	**200,000**
	$'000	**$'000**	**$'000**
Best	1,750	1,400	1,000

The highest of these is $1,750,000 therefore choose to supply 350,000 bags to meet good conditions.

(iii) **Expected value** – use the probabilities provided in order to calculate the expected value of each of the supply levels.

Good (0·25 x $1,750,000) + (0·45 x $1,085,000) + (0·30 x $325,000) = $1,023,250
Average (0·7 x $1,400,000) + (0·3 x $640,000) = $1,172,000
Poor 1 x $1,000,000 = $1,000,000

The expected value of producing 280,000 bags when conditions are average is the highest at $1,172,000, therefore this supply level should be chosen.

(c) **Maximin and expected value decision rules**

The 'maximin' decision rule looks at the worst possible outcome at each supply level and then selects the highest one of these. It is used when the outcome cannot be assessed with any level of certainty. The decision maker therefore chooses the outcome which is guaranteed to minimise his losses. In the process, he loses out on the opportunity of making big profits. It is often seen as the pessimistic approach to decision-making (assuming that the worst outcome will occur) and is used by decision makers who are risk averse. It can be used for one-off or repeated decisions.

The 'expected value' rule calculates the average return that will be made if a decision is repeated again and again. It does this by weighting each of the possible outcomes with their relative probability of occurring. It is the weighted arithmetic mean of the possible outcomes.

Since the expected value shows the long run average outcome of a decision which is repeated time and time again, it is a useful decision rule for a risk neutral decision maker. This is because a risk neutral person neither seeks risk or avoids it; they are happy to accept an average outcome. The problem often is, however, that this rule is often used for decisions that only occur once. In this situation, the actual outcome is unlikely to be close to the long run average. For example, with Cement Co, the closest actual outcome to the expected value of $1,172,000 is the outcome of $1,085,000. This is not too far away from the expected value but many of the others are really different.

2 **The Energy Buster**

(a) **Profit**

In order to ascertain the optimum price, you must use the formula P = a – bQ

Where P = price; Q = quantity; a = intersection (price at which quantity demanded will be nil); b = gradient of the demand curve.

The approach is as follows:

(i) **Establish the demand function**

b = change in price/change in quantity = $15/1,000 = 0·015.

We know that if price = $735, quantity = 1,000 units.

Establish 'a' by substituting these values for P, Q and b into our demand function:

735 = a – 0·015Q
15 + 735 = a
Therefore a = 750.

Demand function is therefore P = 750 – 0·015Q

(ii) **Establish marginal cost**

The labour cost of the 100th unit needs to be calculated as follows:

Formula = y = ax^b.
a = 1·5

Therefore, if x = 100 and b= –·0740005, then y = 1·5 x $100^{-0\cdot0740005}$ = 1·0668178
Therefore cost per unit = 1·0668178 x $8 = $8·5345
Total cost for 100 units = $853·45.

If x = 99, y = 1·5 x $99^{-0\cdot0740005}$ = 1·0676115
Therefore cost per unit = $8·5408
Total cost for 99 = $845·55
Therefore cost of 100th unit = $853·45 – $845·55 = $7·90.

Therefore total marginal cost = $42 + $7·90 = $49·90.
Fixed overheads have been ignored as they are not part of the marginal cost.

(iii) **Find profit**

(1) Establish the marginal revenue function

MR = a – 2bQ
MR = 750 – 0·03Q

(2) Equate MC and MR

49·90 = 750 – 0·03Q
0·03Q = 700·1
Q = 23,337

(3) Find optimum price

P = 750 – (0·015 x 23,337)
= $399·95

(b) (i) **Penetration pricing**

With penetration pricing, a low price would initially be charged for the Energy Buster. The idea behind this is that the price will make the product accessible to a larger number of buyers and therefore the high sales volumes will compensate for the lower prices being charged. A large market share would be gained and possibly, the Energy Buster might become accepted as the only industrial air conditioning unit worth buying.

The circumstances that would favour a penetration pricing policy are:

– highly elastic demand for the Energy Buster i.e. the lower the price, the higher the demand. The preliminary research does suggest that demand is elastic.

– if significant economies of scale could be achieved by Heat Co, then higher sales volumes would result in sizeable reductions in costs. This is not the case here, since learning ceases at 100 units.

– if Heat Co was actively trying to discourage new entrants into the market. In this case, new entrants cannot enter the market anyway, because of the patent.

– if Heat Co wished to shorten the initial period of the Energy Buster's life cycle so as to enter the growth and maturity stages quickly. We have no evidence that this is the case for Heat Co, although it could be.

From the above, it can be seen that this could be a suitable strategy in some respects but it is not necessarily the best one.

(ii) **Market skimming**
With market skimming, high prices would initially be charged for the Energy Buster rather than low prices. This would enable Heat Co to take advantage of the unique nature of the product, thus maximising sales from those customers who like to have the latest technology as early as possible. The most suitable conditions for this strategy are:

– the product is new and different. This is indeed the case with the Energy Buster.

– the product has a short life cycle and high development costs that need to be recovered quickly. The life cycle is fairly short and high development costs have been incurred.

– since high prices attract competitors, there needs to be barriers to entry in order to deter competitors. In Heat Co's case, there is a barrier, since it has obtained a patent for the Energy Buster.

– the strength and sensitivity of demand are unknown. Again, this is not the case here.

Once again, the Energy Buster meets only some of the conditions which would suggest that although this strategy may be suitable the answer is not clear cut. The fact that high development costs have been incurred and the life cycle is fairly short are fairly good reasons to adopt this strategy. Whilst we have demand curve data, we do not really know just how reliable this data really is, in which case a skimming strategy may be a safer option.

3 Noble restaurant

(a) Flexed budget

Number of meals	1,560	
	$	$
Food sales (1)	62,400	
Drink sales (1)	15,600	
Total revenue		78,000
Variable costs:		
Staff wages (2)	(12,672)	
Food costs (3)	(7,800)	
Drink costs (4)	(3,120)	
Energy costs (5)	(4,234)	
		(27,826)
Contribution		50,174
Fixed costs:		
Manager's and chef's pay	(8,600)	
Rent, rates and depreciation	(4,500)	
		(13,100)
Operating profit		37,074

(1) Food revenue
Food revenue = 1,560 x $40 = $62,400
Drinks revenue = 1,560 x ($2·50 x 4) = $15,600.

(2) Staff wages
Average number of orders per day = 1,560/(6 days x 4 weeks) = 65 per day.
Therefore extra orders = 15 per day.
8 staff x 1·5 hours x 6 days x 4 weeks = 288 extra hours.
At $12 per hour = $3,456 extra wages.
Total flexed wages = $9,216 + $3,456 = $12,672.

(3) Food costs
Food costs = 12·5% x $62,400 = $7,800.

(4) Drink costs
Drinks costs = $15,600 x 20% = $3,120.

(5) Energy costs
Standard total hours worked = (8 x 6) x 6 days x 4 weeks = 1,152 hours.
Extra hours worked = 288 (working 2).
Total hours = 1,152 + 288 = 1,440.
At $2·94 per hour = $4,234.

(b) The sales mix contribution variance measures the effect on profit of changing the mix of actual sales from the standard mix. The sales quantity contribution variance measures the effect on profit of selling a different total quantity from the budgeted total quantity.

The mix variance is adverse here. Since meal B generates a higher contribution than meal A, the adverse variance shows that more of meal A must have been sold, relative to B, than budgeted. Since the quantity variance is favourable, this means that the total quantity of meals sold (in the standard mix) was higher than expected, as evidenced by the number of meals sold being 1,560 rather than the budgeted 1,200.

(c) Two other variances

Drink sales
As well as the price variance for drinks sales, the sales margin volume variance could be calculated. This will examine the difference between the standard volume of sales that would ordinarily be expected for this number of customers (1,560 x 4 drinks) compared to the actual volume of drinks sold because of the drinks promotion (1,560 x 6 drinks). Since the variance is calculated by applying the increase in volume to the standard margin, this variance will be favourable.

In addition, the total sales margin price variance for drinks sales could be split into an operational and a planning variance. The manager is only responsible for any operational variance and any part of the sales margin variance that relates to a planning error (i.e. the last minute decision by the owner to run the drinks promotion) should be separated out. This way, the manager will not be held accountable for matters outside of his control.

Food sales
By running the half price drinks offer promotion, more customers have been attracted to the restaurant. Drinks have been treated as a 'loss leader' i.e. sold at a low price in order to entice customers. It would therefore be relevant to calculate some variances in relation to food sales in order to show how the drinks promotion has increased food sales. The most obvious one to calculate would be the sales margin volume variance for food sales.

NOTE: Candidates only needed to mention two variances.

4 Brace Co

(a) Balanced scorecard

The balanced scorecard is a strategic management technique for communicating and evaluating the achievement of the strategy and mission of an organisation. It comprises an integrated framework of financial and non-financial performance measures that aim to clarify, communicate and manage strategy implementation. It translates an organisation's strategy into objectives and performance measurements for the following four perspectives:

Financial perspective
The financial perspective considers how the organisation appears to shareholders. How can it create value for its shareholders? Kaplan and Norton, who developed the balanced scorecard, identified three core financial themes that will drive the business strategy: revenue growth and mix, cost reduction and asset utilisation.

Customer perspective
The customer perspective considers how the organisation appears to customers. The organisation should ask itself: 'to achieve our vision, how should we appear to our customers?'.

The customer perspective should identify the customer and market segments in which the business units will compete. There is a strong link between the customer perspective and the revenue objectives in the financial perspective. If customer objectives are achieved, revenue objectives should be too.

Internal perspective
The internal perspective requires the organisation to ask itself the question – 'what must we excel at to achieve our financial and customer objectives?'. It must identify the internal business processes that are critical to the implementation of the organisation's strategy. Kaplan and Norton identify a generic process value chain consisting of three processes: the innovation process, the operations process and the post-sales process.

Learning and growth perspective
The learning and growth perspective requires the organisation to ask itself whether it can continue to improve and create value.

If an organisation is to continue having loyal, satisfied customers and make good use of its resources, it must keep learning and developing. It is critical that an organisation continues to invest in its infrastructure – i.e. people, systems and organisational procedures – in order to provide the capabilities that will help the other three perspectives to be accomplished.

(b) **Divisional performance**

ROI:
Division A
Net profit = \$44·6m x 28% = \$12·488m
ROI = \$12·488m/\$82·8m = 15·08%

Division B
Net profit = \$21·8m x 33% = \$7·194m
ROI = \$7·194m/\$40·6m = \$17·72%

Residual income:
Division A
Divisional profit = \$12·488m
Capital employed = \$82·8m
Imputed interest charge = \$82·8m x 12% = 9·936m
Residual income = \$12·488m – \$9·936m = \$2·552m.

Division B
Divisional profit = \$7·194m
Capital employed = \$40·6m
Imputed interest charge = \$40·6m x 12% = \$4·872m
Residual income = \$7·194 – \$4·872 = \$2·322m.

Comments
If a decision about whether to proceed with the investments is made based on ROI, it is possible that the manager of Division A will reject the proposal whereas the manager of Division B will accept the proposal. This is because each division currently has a ROI of 16% and since the Division A investment only has a ROI of 15·08%, it would bring the division's overall ROI down to less than it's current level. On the other hand, since the Division B investment is higher than its current 16%, the investment would bring the division's overall ROI up.

When you consider what would actually be best for the company as a whole, you come to the conclusion that, since both investments have a healthy return, they should both be accepted. Hence, the fact that ROI had been used as a decision-making tool has led to a lack of goal congruence between Division A and the company as whole. This backs up what the new manager of Division A is saying. If they used residual income in order to aid the decision-making process, both proposals would be accepted by the divisions since both have a healthy RI. In this case, RI helps the divisions to make decisions that are in line with the best interests of the company. Once again, this backs up the new manager's viewpoint.

It is important to note, however, that each of the methods has numerous advantages and disadvantages that have not been considered here.

5 **(a)** **Throughput accounting ratio (TAR)**

TAR is traditionally defined as: return per factory hour/cost per factory hour. In this context, we are dealing with a hospital, so it will be: return per hospital hour/cost per hospital hour.

Since, in throughput accounting, all costs except material costs are treated as fixed costs, total hospital costs will be all the salaries plus the general overheads:

\$45,000 + \$38,000 + \$75,000 + \$90,000 + \$50,000 + \$250,000 = \$548,000.

Total hours of bottleneck resource, the surgeon's time, = 40hrs x 47 weeks = 1,880 hours.

Therefore cost per hospital hour = \$548,000/1,880 = \$291·49.

Return per hospital hour now needs to be calculated.

	\$
Selling price per unit	4,250
Materials cost:	
– injection	(1,000)
– anaesthetic	(45)
– dressings	(5·6)
Throughput per unit	3,199·40
Time on BNR in hours	1·25
Return per hour (\$)	2,559·52
TAR	\$2,559·52/\$291·49 = 8·78

(b) Optimum production plan

Limiting factor analysis can be used to determine the optimum production plan. Each procedure first needs to be ranked according to its TAR, then as many of each procedure should be performed as possible, starting with the most profitable procedure first.

	A	B	C
	$	$	$
TAR	8·96	9·11	8·78
Ranking	2	1	3

Name	Number	Hrs each	Total hours	T/P per hour	Total T/P
B	800	1	800	2,654·40	2,123,520
A	600	0·75	450	2,612·53	1,175,638·5
C	504	1·25	630	2,559·52	1,612,497·6
			1,880		4,911,656·1

The optimum production plan is therefore to perform the maximum number of procedures A and B (600 and 800 respectively) and perform only 504 of procedure C.

Total profit will be:

	$
Throughput	4,911,656·1
Less total costs	(548,000)
Profit	4,363,656·1

(c) Profitability increase

At present, if the company adheres to the optimum production plan above, it will be satisfying customer demand for procedures A and B but not for procedure C. The most obvious way to try and increase profit would be to try and exploit demand for procedure C. There are two main factors that would need to be overcome in order for this demand to be exploited. Firstly, another surgeon would need to be employed. Most other members of staff clearly have excess time available, because the surgeon's required time is at least double their required time. The recovery specialist, however, is currently used for 1,292·96 hours [(600 x 0·6) + (800 x 0·7) + (504 x 0·74)]. This staff member therefore has 587·04 spare hours available (1,880 – 1,292·96). This is enough to carry out the additional 696 procedures of C, gvien that each one uses 0·74 hours of the recovery specialist's time (0·74 x 696 = 515·04).

If another surgeon was employed he would be able to meet all of the excess demand for procedure C, which would be 696 procedures (1,200 – 504).

Secondly, the other theatre would need to be equipped with the necessary equipment so that the second surgeon could operate in it. A quick calculation will show that this cost will be more than covered even in the first year (and the theatre cost is capital anyway, and will be benefitted from over many years).

	$
T/P from additional 696 procedures (696 x 1·25 x $2,559·52) =	2,226,782
Cost of equipment	(750,000)
Surgeon's fee	(90,000)
	1,386,782

Without even taking into account future years, on the basis of one year's throughput alone, it is worth equipping the second theatre provided that a suitably qualified second surgeon can be found.

				Marks
1	**(a)**	Pay off table		
		Calculation of profit		1
		Calculation of loss		1
		'Demand' label		0·5
		'Supply' label		0·5
		Weather column		0·5
		Supply column – 350,000		1·5
		Supply column – 280,000		1·5
		Supply column – 200,000		1·5
				8
	(b)	Decision criterion		
		(i)	Maximin	
			Selecting highest of the low	1
		(ii)	Maximax	
			Selecting highest of the high	1
		(iii)	Expected value	
			Calculating EV when good	1
			Calculating EV average	1
			Calculating EV when poor	1
			Selecting highest	1
				4
	(c)	Maximin and EV		
		Describe maximin		1
		Used when outcome cannot be assessed with any certainty		1
		Risk averse/pessimistic		1
		One-off/repeated decisions		1
		Describe EV		2
		Risk neutral		1
		Repeated decisions		1
		Maximum marks		6
		Total marks		**20**

				Marks
2	**(a)**	Profit using demand-based approach		
		(i)	Establish demand function:	
			Find b	1
			Find a	1
			Write out demand function	1
				3
		(ii)	Find MC:	
			Average cost of 100	1
			Total cost of 100	1
			Average cost of 99	1
			Total cost of 99	1
			Difference	1
			Correct total MC excluding fixed cost	1
				6
		(iii)	Establish MR function	1
			Equate MC and MR to find Q	1
			Find optimum price	1
				3
	(b)	Market based strategies		
		Penetration pricing		
		Each valid point		1
		Max		4
		Market skimming		
		Each valid point		1
		Max		4
		Total marks		**20**

			Marks
3	(a)	Flexed budget	
		Food sales	1
		Drink sales	1
		Total revenue	1
		Staff wages	1·5
		Food costs	1
		Drinks costs	1
		Energy costs	1·5
		Variable costs total	1
		Contribution	1
		Manager's and chef's pay	0·5
		Rent & Rates	0·5
		Operating profit	1
			12
	(b)	Explanation of variances	2
		Suggestions of reason for variances	2
			4
	(c)	Variance discussions	
		Each variance	2
		Maximum	4
		Total marks	**20**
4	(a)	Balanced scorecard approach	
		Stating what it is	2
		Financial perspective	2
		Customer perspective	2
		Internal perspective	2
		Learning and growth perspective	2
		Maximum	10
	(b)	ROI/RI	
		ROI for A	1
		ROI for B	1
		RI for A	2
		RI for B	2
		Maximum for ROI/RI	6
		Comments	
		A rejects, B accepts under ROI	1
		Both accept under RI	1
		ROI produces wrong decision for company	1
		RI produces right decision	1
		Manager right	1
		Other factors to consider	1
		Maximum for comments	6
			10
		Total marks	**20**

			Marks
5	(a)	TAR	
		Cost per hour	3
		Return per hour – C	2
		Ratio – C	1
			6
	(b)	Optimum production plan	
		Ranking	1
		Optimum number of A	1·5
		Optimum number of B	1·5
		Optimum number of C	1·5
		Total throughput	0·5
		Less cost	0·5
		Profit	0·5
			7
	(c)	Discussion	
		Demand satisfied for A & B	1
		Unsatisfied demand for C	1
		Calculation re recovery specialist	2
		Would need another surgeon	1
		Other staff have lots of idle time	1
		Need extra theatre time	1
		Profit calculation	1
		Financially feasible	1
		Each other valid point	1
		Conclusion	1
		Maximum	7
		Total marks	**20**