Answers

1 Chaff Co

(a) When assessing variances it is important to consider the whole picture and the interrelationships that exist. In Chaff there appears to be doubt about the wisdom of some of the decisions that have been made. Favourable variances have been applauded and adverse variances criticised and the managers in charge dispute the challenge to their actions.

Purchasing manager. The purchasing manager has clearly bought a cheaper product, saving $48,000. The cause of this is not specified and it could be due to good buying or negotiation, reductions in quality or changes in overall market conditions. We are told the market for buying seeds is stable, so there is more likely to be an internal reason for the problem. The material usage variance is significantly adverse, indicating much more waste than is normal has occurred in month 1. This suggests that the quality of the seed bought was poor and as a result a $52,000 excess loss has occurred. It is possible that the waste was caused by the labour force working poorly or too quickly and this has to be considered.

The sales price achieved is also well down on standard with the sales price variance showing an $85,000 loss of revenue and (therefore) profit. We are told that the market for sales of brown rice is stable and so it is reasonable to presume that the fall in sales price achieved is as a result of internal quality issues rather than general price falls. The purchasing manager of the only ingredient may well be responsible for this fall in quality. This may have also led to a fall in the volume of sales, another $21,000 of adverse variance.

In conclusion the purchasing manager appears mainly responsible for a loss of $110,000* taking the four variances above together.

* ($85,000 + $52,000 + $21,000 – $48,000)

Production director. The production director has increased wage rates and this has cost an extra $15,000 in month 1. However one could argue that this wage increase has had a motivational effect on the labour force. The labour efficiency variance is $18,000 favourable; and so it is possible that a wage rise has encouraged the labour force to work harder. Academic evidence suggests that this effect might only be temporary as workers get used to the new level of wages.

Equally the amount of idle time has reduced considerably, with a favourable variance of $12,000 resulting. Again it is possible that the better motivated labour force has been more willing to work than before. Idle time can have many causes, including, material shortages or machine breakdowns. However, we are told the machines are running well and the buyer has bought enough rice seeds.

In conclusion the increase in the wage rate did cost more money but it may have improved morale and enhanced productivity. The total of the three variances above is $15,000* Fav. *($18,000 + $12,000 – $15,000)

Maintenance manager. The maintenance manager has decided to delay the annual maintenance of the machines and this has saved $8,000. This will increase profits in the short term but could have disastrous consequences later. In this case only time will tell. If the machines breakdown before the next maintenance then lost production and sales could result.

The maintenance manager has only *delayed* the spend and not prevented it altogether. A saving of $8,000 as suggested by the variance has not been made. It is also possible that the adverse variable overhead expenditure variance has been at least partly caused by poor machine maintenance.

The variance calculated is not the saving made as it represents a timing difference only. The calculation also ignores the risks involved.

(b) The standard contribution is given, but could be calculated as follows (not required by the question but shown as a proof):

	$	$
Sales price		240
Less:		
Rice seed (1·4 Tonnes x $60/tonne)	84	
Labour (2 hours x $20/hr)	40	
Variable overhead (2 hours x $30/hr)	60	
Marginal costs of production		184
Standard contribution		56

The standard labour charge needs to be adjusted to reflect the cost to the business of the idle time. It is possible to adjust the time spent per unit or the rate per hour. In both cases the adjustment would be to multiply by 10/9 – a 10% adjustment. In the case above the rate per hour has been adjusted to $18 x 10/9 = $20/hr. (Both approaches would gain full marks.)

In order to reconcile the budget profit to the actual profit, both these profits need to be calculated and an operating statement prepared.

Budget profit statement for month 2

	$	$
Sales (8400u x $240/u)		2,016,000
Less:		
Rice seed (1·4 tonnes x $60/tonne x 8,400 tonnes)	705,600	
Labour (2 hours x $20/hr x 8,400 tonnes)	336,000	
Variable overhead (2 hours x $30/hr x 8,400 tonnes)	504,000	
Marginal costs of production		1,545,600
Contribution		470,400
Less Fixed costs		210,000
Budget profit		260,400

Actual profit for month 2.

	$	$
Sales		1,800,000
Less:		
Rice seed	660,000	
Labour	303,360	
Variable overhead	480,000	
Marginal costs of production		1,443,360
Contribution		356,640
Less Fixed costs		200,000
Actual profit		156,640

Operating statement for month 2

	$	$	$
Budget contribution			470,400
Variances:	Adverse	Favourable	
Sales price	120,000		
Sales volume	22,400		
			142,400
			328,000
Material price		60,000	
Material usage	48,000		
Labour rate	18,960		
Labour efficiency		20,000	
Idle time		15,600	
Variable overhead efficiency		30,000	
Variable overhead expenditure	30,000		
	96,960	125,600	28,640
Actual contribution			356,640
Budget fixed cost		210,000	
Less: Fixed cost expenditure variance		10,000	
Actual fixed cost			200,000
Actual profit			156,640

Workings for the variances in month 2

1. Sales price: (225 – 240)8,000 = 120,000 *Adv*
2. Sales volume: (8,000 – 8,400)56 = 22,400 *Adv*
3. Material price: $\left(\frac{660,000}{12,000} - 60\right)12,000 = 60,000$ *Fav*
4. Material usage: (12,000 – 11,200*)60 = 48,000 *Adv*
   *(8,000 x 1·4 = 11,200)
5. Labour rate: (19·20 – 18)15,800 = 18,960 *Adv*
6. Labour efficiency: (15,000 – 16,000)20 = 20,000 *Fav*
7. Idle time: (800 – 1,580*)20 = 15,600 *Fav*
   *10% of 15,800

8. Variable overhead expenditure: $\left(\frac{480,000}{15,000} - 30\right)15,000 = 30,000$ *Adv*

9. Variable overhead efficiency variance: (15,000 – 16,000)30 = 30,000 *Fav*

Alternative calculations if standard **hours** adjusted for expected idle time and not the rate.

Standard cost (2 hours x 10/9) x $18 = $40 per tonne
Or 2·222 hours x $18 = $40 per tonne

Rate variance as above = 18,960 *Adv*

Idle time: (800 – 1,580)18 = 14,040 *Fav*

Efficiency variance: (15,000 – 16,197·77777*)18 = 21,560 *Fav*
* (standard time allowed less standard idle time)
Standard time is 8,000 tonnes x 2·222 hours = 17,777·777 hours
Standard idle time is 10% of 15,800 = 1,580 hours
Therefore expected working hours is 17,777·777 – 1,580 = 16,197·777 hours
(Note – there are many alternative methods of dealing with this issue, any reasonable attempt was accepted.)

2 Higgins Co

(a) Contribution per cue

	Pool cue	Snooker cue
	$	$
Selling price	41·00	69·00
Material cost at $40/kg	(10·80)	(10·80)
Craftsmen cost at $18/hr	(9·00)	(13·50)
Other Variable cost	(1·20)	(4·70)
Contribution per cue	20·00	40·00

(b) Formulation of the linear programming problem

Variables

Let P and S be the number of pool and snooker cues made and sold in any three month period.

Let C represent the contribution earned in any three month period

Constraints:

Craftsmen:	$0{\cdot}5P + 0{\cdot}75S \leq 12,000$
Ash:	$0{\cdot}27P + 0{\cdot}27S \leq 5,400$
Demand levels – Pool cues	$P \leq 15,000$
– Snooker cues	$S \leq 12,000$
Non negativity:	$P, S \geq 0$

Objective: Higgins seeks to maximise contribution in a three month period, subject to:

$$20P + 40S = C$$

See diagram on next page

The feasible region is identified as the area inside OABCDE.

The contribution line is identified as the dotted line. Pushing the contribution line outward increases the contribution gained (theory of iso-contribution). The contribution line last leaves the feasible region at point D which is the intersect of the skilled labour line and the maximum demand line for S.

Solving at point D:

Maximum demand	$S = 12,000$	(1)
Craftsmen	$0{\cdot}5P + 0{\cdot}75S = 12,000$	(2)

Substituting $S = 12,000$ in equation (2)

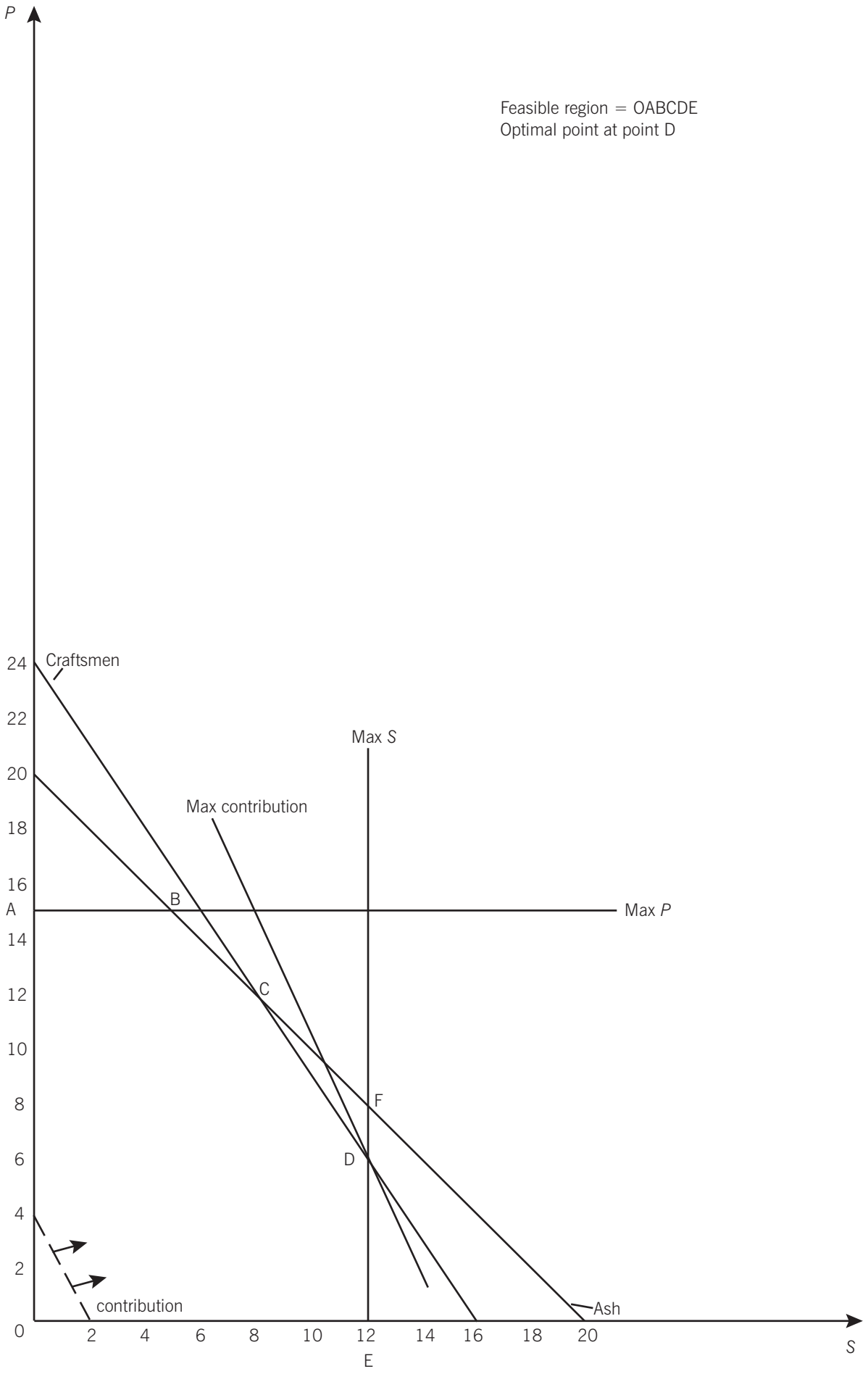
$$0{\cdot}5P + (0{\cdot}75 \times 12,000) = 12,000$$
$$0{\cdot}5P + 9,000 = 12,000$$
$$0{\cdot}5P = 12,000 - 9,000$$
$$0{\cdot}5P = 3,000$$
$$P = 6,000$$

Therefore the maximum contribution is earned when 6,000 pool cues and 12,000 snooker cues are made and sold in a three month period.

The contribution earned is

C = (20 x 6,000) + (40 x 12,000)
C = 120,000 + 480,000
C = $600,000

Production schedule



(c) Shadow prices

A shadow price is the value assigned to changes in the quantity of a scarce resource available, normally measured in terms of contribution. If more critical scarce resource becomes available then the feasible region would tend to expand and this means that the optimal point would tend to move outward away from the origin thus earning more contribution. It is this increase in the contribution that is the shadow price measured on a per unit of scarce resource basis.

Management can use the shadow price as a measure of how much they would be willing to pay to gain more of a scarce resource. It represents the maximum they should be willing to pay for more scarce resource over and above the normal price subject to any non-financial issues that may be present.

If the availability of a non-critical scarce resource increased then the feasible region would not tend to expand and therefore no more contribution could be earned. In this case extra non-critical scarce resource has no value and a nil shadow price.

Calculation of shadow prices:

Ash: This is a non-critical scarce resource and as such it has a shadow price of nil. Put simply we have slack (spare material) of ash and therefore have no desire to pay more to get more of it.

Craftsmen: This is a critical scarce resource and if more became available then the feasible region would expand and the optimal point would move outward thus earning more contribution. Assuming that just one more hour becomes available it is necessary to find the new optimal point and measure the increase in contribution earned.

At point D, we re-solve based on the available craftsmen hours being one more than previously.

$$S = 12{,}000 \text{ (3)}$$
$$0{\cdot}5P + 0{\cdot}75S = 12{,}001 \text{ (4)}$$

Substituting $S = 12{,}000$ in equation (4)

$$0{\cdot}5P + 0{\cdot}75(12{,}000) = 12{,}001$$
$$0{\cdot}5P + 9{,}000 = 12{,}001$$
$$0{\cdot}5P = 3{,}001$$
$$P = 6{,}002$$

The new optimal solution would be where 12,000 snooker cues and 6,002 pool cues are made. This would earn an extra \$40 (2 x \$20) in contribution.

The shadow price is therefore \$40 per extra hour of craftsmen time.

(d) Acceptability of the craftmens' offer.

Rate of pay

The rate of pay requested (double time) is on the face of it less than the shadow price and is therefore affordable by Higgins Co. The business would be better off by accepting the offer.

However, it is common for overtime to be paid at time and a half (\$27 per hour) and Higgins would be well advised to negotiate on this point. Higgins takes the commercial risks in this business and would therefore be justified in keeping the majority of the rewards that come with it. Equally it is a dangerous precedent to accept the first offer and pay such a high rate for overtime, Higgins would have to ask itself what would happen next time an overtime situation arose. It is also possible that double time, being so generous, encourages slow working in normal time so as to gain the offer of overtime.

How many hours to buy?

The problem here is that as Higgins buys more craftsmen time, the craftsmen constraint line will move outward, changing the shape of the feasible region. Once the craftsmen line reaches point F (see diagram) then there would be little point buying any more hours since Higgins would then not have the materials (ash) to make more cues.

We need therefore to calculate the number of hours needed at point F.

At F

Maximum demand for S $\quad S = 12{,}000$ (5)
Ash $\quad 0{\cdot}27P + 0{\cdot}27S = 5{,}400$ (6)

Substituting $S = 12{,}000$ in equation (6)

$$0{\cdot}27P + 0{\cdot}27(12{,}000) = 5{,}400$$
$$0{\cdot}27P + 3{,}240 = 5{,}400$$
$$0{\cdot}27P = 2{,}160$$
$$P = 8{,}000$$

Point F falls where $S = 12{,}000$ and $P = 8{,}000$

The craftsmen hours needed at this point would be given by putting the above P and S values in the craftsmen constraint formula.

Craftsmen hours = (0·5 x 8,000) + (0·75 x 12,000)
Craftsmen hours =13,000 hours

Therefore Higgins should only buy 1,000 hours (13,000 – 12,000).

In general terms Higgins need only buy the number of hours that the business can use to make and sell more product. If more ash can also be bought then more labour hours may be desirable.

Quality of work

Higgins should consider the quality of work. Overtime hours can force tiredness on craftsmen that have already worked a full day. Tired people often produce sub-standard work. If quality is important then this could damage the reputation of the business.

Any other feasible points would be accepted

3 Bridgewater Co

(a) The divisions of Bridgewater Co have been given very specific targets to meet it is reasonable to assume that performance will be assessed relative to them.

Sales Growth

The northwest division suffers from a slow start to the year, with falls in sales from quarter 1 to quarter 2. Overall sales growth looks better with an average growth of 14% achieved. We don't have quarterly budget sales to compare to but the low growth in budget profit suggests that much slower sales growth than that actually achieved was expected. Overall the sales budget has been exceeded, with big increases in sales in the last two quarters

The manager's promotion could be damaged by the slow start. The 'good news' of better sales growth comes after the promotion decision is taken.

Cost control – trainer costs

The division spends slightly more (as a % of sales) than budgeted on trainers. It is spending 20% as opposed to 18% on trainers. Given the manager's attitude towards quality it appears he is trying to employ better trainers in the hope of more satisfied customers. This should, logically, build customer loyalty and improve local and brand reputation. This could possibly explain the better growth in the later quarters.

Again the problem for the promotion seeking manager, investing in the future in this way damages short term performance measures, in this case cost targets.

Cost control – room hire costs

The divisional manager is also spending more on room hire. He is spending 10% as opposed to the budgeted 9% of sales. He could be buying poorly, hence wasting money. Alternatively he could be hiring better quality rooms to improve the learning environment and enhance the training experience.

Again his focus on quality may be undermining his short term promotional prospects.

Profit

Annually, the divisional manager is beating the targets laid down for profit. His problem as far as his promotion is concerned is the profit targets laid down for the first two quarters are not met.

The promotion decision comes too early for his employers to see the benefit of a quality focus made earlier in the year.

Overall, promotional prospects do not look good. The manager has not met any of his targets in the first two quarters. His only hope is that his bosses look at future forecasts and take them in to consideration when making the decision.

(b) **Revised forecasts**

	Q1 $'000	Q2 $'000	Q3 $'000	Q4 $'000	Total $'000
Sales	42·5	38·5	62·5	74·5	218·0
less:					
Trainers	8·0	7·2	12·0	14·4	41·6
Room hire	4·0	3·6	6·0	7·2	20·8
Staff training	1·5	1·5	1·0	1·0	5·0
Other costs	3·0	1·7	6·0	7·0	17·7
Software	1·8				1·8
Forecast Net profit	24·2	24·5	37·5	44·9	131·1
Original Budget profit	25·0	26·0	27·0	28·0	106·0

Incremental effects (as a working)

	Q1 $'000	Q2 $'000	Q3 $'000	Q4 $'000	Total $'000
Extra sales					
Voucher sales	2·5	2·5	2·5	2·5	10·0
Software sales			10·0	12·0	22·0
Extra costs					
Trainers			2·0	2·4	4·4
Room hire			1·0	1·2	2·2
Staff training	0·5	0·5			1·0
Software	1·8				1·8
Change in forecast Net profit	+0·2	+2·0	+9·5	+10·9	+22·6

(c) Voucher scheme

At first glance of it the voucher scheme looks a good one. The manager is confident of a reasonable volume of sales and given that all the attendees will go on existing courses there will be no additional costs. The scheme seems to generate $10,000 of extra sales revenue in the year. One should question the assumption that no extra costs are incurred.

One potential concern would be that existing customers may object to the price reduction, particularly if they have already paid a higher price for a future course. However, most customers will probably not be aware of the price difference or will not bother complaining, those that do complain can be dealt with individually. It is common with promotions that the offer clearly states the terms and conditions that apply. In this way the manager can protect existing sales by excluding existing sales from the new offer.

From a promotion point of view the extra revenue and profit helps a little. If the revenue is spread evenly (as suggested) there will be $2,500 of extra revenue and profit in each of quarter 1 and 2. Unfortunately, in both cases the manager will still fall short of the target profit and the growth between quarter 1 and 2 will still be negative. He would need the take up rate of the sessions to be quicker to help his promotion prospects. Manipulation of the accounting figures should be resisted

Software upgrade

A software training company must stay in touch with modern software developments. From that point of view you could argue that this development is essential. Financially the proposal looks sound. The extra courses will generate a profit of $12,600 in this year alone, with, presumably, more courses to follow. A slower than expected take-up rate for the new course would reduce this year's effect.

The promotional aspects are not as good. The extra costs occur in quarter 1 and 2 but the revenue does not come in until after the promotion decision is made. Integrity is an issue here. Personal promotional prospects must come second to sound business decisions. The manager should show the revised forecasts to his bosses and hope this sways the decision.

Delayed payment to trainers

This is a poor idea. This will not affect profit, costs or any of the performance measures in question. It will affect cash flow in a positive manner. However, to delay payment without agreement can damage the relationships with the trainers, upon which he depends on for the quality of their presentations.

Overall the three proposals do improve the performance of the division. However most of the benefits accrue after quarter 2 and might therefore come too late for the promotion decision.

(d) To encourage a longer term view more emphasis should be placed on non-financial measures of performance.

This business is dependent amongst other things on the quality of its course provision. As a result an improvement could be to set targets for the quality of presentations given. Attendees could be asked to grade all trainers (or facilities) at the end of sessions. This would prevent cheap but weak presenters (and poor quality rooms) being employed by managers.

Equally, the senior managers have to take account of longer periods when assessing performance. Viewing a single quarter is too narrow and looking at the whole year is advisable. Wider issues should also be taken into consideration when making promotional decisions. Repurchase rates could be measured for client companies for example.

4 Jola Publishing

(a) The first thing to point out is that the overhead allocations to the two products have not changed by that much. For example the CB has absorbed only $0·05 more overhead. The reason for such a small change is that the overheads are dominated by property costs (75% of total overhead) and the 'driver' for these remains machine hours once the switch to ABC is made. Thus no difference will result from the switch to ABC in this regard.

The major effect on the cost will be for quality control. It is a major overhead (23% of total) and there is a big difference between the relative number of machine hours for each product and the number of inspections made (the ABC driver). The CB takes less time to produce than the TJ, due to the shortness of the book. It will therefore carry a smaller amount of overhead in this regard. However, given the high degree of government regulation, the CB is subject to 'frequent' inspections whereas the TJ is inspected only rarely. This will mean that under ABC the CB will carry a high proportion of the quality control cost and hence change the relative cost allocations.

The production set up costs are only a small proportion of total cost and would be, therefore, unlikely to cause much of a difference in the cost allocations between the two products. However this hides the very big difference in treatment. The CB is produced in four long production runs, whereas the TJ is produced monthly in 12 production runs. The relative proportions of overhead allocated under the two overhead treatments will be very different. In this case the TJ would carry much more overhead under ABC than under a machine hours basis of overhead absorption.

(b) There are many problems with ABC, which, despite its academic superiority, cause issues on its introduction.

- Lack of understanding. ABC is not fully understood by many managers and therefore is not fully accepted as a means of cost control.
- Difficulty in identifying cost drivers. In a practical context, there are frequently difficulties in identifying the appropriate drivers. For example, property costs are often significant and yet a single driver is difficult to find.
- Lack of appropriate accounting records. ABC needs a new set of accounting records, this is often not immediately available and therefore resistance to change is common. The setting up of new cost pools is needed which is time consuming.

(c) Cost per unit calculation using machine hours for overhead absorption

	$CB		$TJ
Paper (400g at $2/kg)	0·80	(100g at $1/kg)	0·10
Printing (50ml at $30/ltr)	1·50	(150ml at $30/ltr)	4·50
Machine cost (6 mins at $12/hr)	1·20	(10 mins at $12/hr)	2·00
Overheads (6 mins at $24/hr) (W1)	2·40	(10 mins at $24/hr)	4·00
Total cost	5·90		10·60
Sales price	9·30		14·00
Margin	3·40		3·40

(W1) Workings for overheads:

Total overhead	$2,880,000
Total machine hours (1,000,000 x 6 mins) + (120,000 x 10 mins) = Which is	 7,200,000 mins 120,000 hours

$$\text{Cost per hour} = \frac{\$2{,}880{,}000}{120{,}000 \text{ hrs}} = \$24/\text{hr}$$

Cost per unit calculations under ABC

	CB $		TJ $
Paper (400g at $2/kg)	0·80	(100g at $1/kg)	0·10
Printing (50ml at $30/ltr)	1·50	(150ml at $30/ltr)	4·50
Machine cost (6 mins at $12/hr)	1·20	(10 mins at $12/hr)	2·00
Overheads (W2)	2·41	(W2)	3·88
Total cost	5·91		10·48
Sales price	9·30		14·00
Margin	3·39		3·52

(W2) Working for ABC overheads alternative:

	Total $	CB $	TJ $	No of drivers	Cost/driver	CB	TJ
Property costs	2,160,000	1,800,000	360,000	120,000	18/hr	1·80	3·00
Quality control	668,000	601,200	66,800	200	3340	0·6012	0·56
Production set up	52,000	13,000	39,000	16	3250	0·013	0·325
Total	2,880,000	2,414,200	465,800	Cost per unit		2·41	3·88
Production level		1,000,000	120,000				
Cost per unit		2·41	3·88				

The above overheads have been split on the basis of the following activity levels

	Driver	CB	TJ
Property costs	Machine hours	100,000	20,000
Quality control	Inspections	180	20
Production set up	Set ups	4	12

A cost per driver approach is also acceptable.

			Marks
1	**(a)**	Assessment of each person Buyer (poor quality, usage, sales issue) Production director (motivation, efficiency and idle time issue) Administration manager (short-termism, timing only) Allow flexibility here in interpetation	3
			9
	(b)	Budget profit calculation	
		Labour	1
		Sales	1/2
		Rice seed	1/2
		Variable overhead	1/2
		Fixed cost	1/2
		Sales price variance	1
		Sales volume variance	1
		Material price variance	1
		Material usage variance	1
		Labour rate variance	1
		Labour efficiency variance	2
		Idle time variance	2
		Variable overhead expenditure variance	1
		Variable overhead efficiency variance	1
		Fixed overhead expenditure variance	1
		Format	1
			16
			25

			Marks
2	**(a)**	Selling prices	$^1/_2$
		Ash costs	$^1/_2$
		Craftsmen costs	$^1/_2$
		Contribution identified	$^1/_2$
			2
	(b)	Assigning letters for variables	$^1/_2$
		Defining ash constraint	1
		Defining craftsmen constraint	1
		Demand constraint – pool	$^1/_2$
		Demand constraint – snooker	$^1/_2$
		Non-negativity constraint	$^1/_2$
		Correctly drawn diagram	
		Labels	$^1/_2$
		Title	$^1/_2$
		Ash constraint line	$^1/_2$
		Craftsmen constraint line	$^1/_2$
		Pool demand line	$^1/_2$
		Snooker demand line	$^1/_2$
		Identified feasible region	$^1/_2$
		Contribution line	1
		Identified optimal point	$^1/_2$
		Solve at optimal	2
		Calculation of contribution	1
			12
	(c)	Explanation of a shadow price	2
		Ash shadow price	1
		Craftsmen shadow price	2
			5
	(d)	Rate of pay discussion	2
		Quantity of hours discussion	1
		Quantity of hours calculation	1
		Quality (or other)	2
			6
			25

			Marks
3	**(a)**	Per target discussed	2
			8
	(b)	Revised forecasts	
		Voucher sales affect	1
		Vista sales affect	2
		Extra trainer cost	1
		Extra room hire cost	1
		Staff training increase	$^1/_2$
		Software cost	$^1/_2$
		Overall revised profit calculation	1
			7
	(c)	Per idea commented on	2
			6
	(d)	For each suggestion	2
			4
			25
4	**(a)**	Comment on rent and rates	2
		Comment on quality control	2
		Comment on production set up cost	2
		Comment on overall effect	2
			8
	(b)	For each explanation	2
			4
	(c)	Paper cost CB	$^1/_2$
		Paper cost TJ	$^1/_2$
		Printing ink cost CB	$^1/_2$
		Printing ink cost TJ	$^1/_2$
		Machine cost CB	$^1/_2$
		Machine cost TJ	$^1/_2$
		Overhead OAR	1
		Overhead cost CB	$^1/_2$
		Overhead cost TJ	$^1/_2$
		Margins	1
			6 max 5
	(d)	Split of rent and rates	$1^1/_2$
		Split of quality control	$1^1/_2$
		Split of production set up cost	$1^1/_2$
		Overhead cost per unit CB	$1^1/_2$
		Overhead cost per unit TJ	$1^1/_2$
		Direct cost as above	1
		Maximum	**8**
			25