Mix and Yield Variance

Q1. Simply Soup Limited manufactures and sells soups in a JIT environment. Soup is made in a manufacturing process by mixing liquidised vegetables, melted butter and stock (stock in this context is a liquid used in making soups). They operate a standard costing and variances system to control its manufacturing processes. At the beginning of the current financial year they employed a new production manager to oversee the manufacturing process and to work alongside the purchasing manager. The production manager will be rewarded by a salary and a bonus based on the directly attributable variances involved in the manufacturing process

After three months of work there is doubt about the performance of the new production manager. On the one hand, the cost variances look on the whole favourable, but the sales director has indicated that sales are significantly down and the overall profitability is decreasing.

The table below shows the variance analysis results for the first three months of the manager's work.

Table 1

	Month 1	**Month 2**	**Month 3**
Material Price Variance	$300 (F)	$900 (A)	$2,200 (A)
Material Mix Variance	$1,800 (F)	$2,253 (F)	$2,800 (F)
Material Yield Variance	$2,126 (F)	$5,844 (F)	$9,752 (F)
Total Variance	$4,226 (F)	$7,197 (F)	$10,352 (F)

The actual level of activity was broadly the same in each month and the standard monthly material total cost was approximately $145,000.

The standard cost card is as follows for the period under review

	$
0.90 litres of liquidised vegetables at $0.80 per litre	0.72
0.05 litres of melted butter at $4 per litre	0.20
1.10 litres of stock at $0.50 per litre	0.55
Total cost to produce 1 litre of soup	1.47

Required:

(a) Using the information in table 1:

(i) Explain the meaning of each type of variances above (price, mix and yield but excluding the total variance) and briefly discuss to what extent each type of variance is controllable by the production manager. (6 marks)

(ii) Evaluate the performance of the production manager considering both the cost variance results above and the sales director's comments. (6 marks)

(b) The board has asked that the variances be calculated for Month 4. In Month 4 the production department data is as follows:

Actual results for Month 4

Liquidised vegetables:	Bought 82,000 litres costing	$69,700
Melted butter:	Bought 4,900 litres costing	$21,070
Stock:	Bought 122,000 litres costing	$58,560

Actual production was 112,000 litres of soup

Required:

Calculate the material price, mix and yield variances for Month 4. You are not required to comment on the performance that the calculations imply. Round variances to the nearest $.

Q2. Crumbly Cakes make cakes, which are sold directly to the public. The new production manager (a celebrity chef) has argued that the business should use only organic ingredients in its cake production. Organic ingredients are more expensive but should produce a product with an improved flavour and give health benefits for the customers. It was hoped that this would stimulate demand and enable an immediate price increase for the cakes.

Crumbly Cakes operates a responsibility based standard costing system which allocates variances to specific individuals. The individual managers are paid a bonus only when net favourable variances are allocated to them.

The new organic cake production approach was adopted at the start of March 2009, following a decision by the new production manager. No change was made at that time to the standard costs card. The variance reports for February and March are shown below (Fav = Favourable and Adv = Adverse)

Manager responsible	Allocated variances	February Variance $	March Variance $
Production manager			
	Material price (total for all ingredients)	25 Fav	2,100 Adv
	Material mix	0	600 Adv
	Material yield	20 Fav	400 Fav
Sales manager			
	Sales price	40 Adv	7,000 Fav
	Sales contribution volume	35 Adv	3,000 Fav

The production manager is upset that he seems to have lost all hope of a bonus under the new system. The sales manager thinks the new organic cakes are excellent and is very pleased with the progress made.

Crumbly Cakes operate a JIT stock system and holds virtually no inventory.

Required:

(a) Assess the performance of the production manager and the sales manager and indicate whether the current bonus scheme is fair to those concerned. (7 marks)

In April 2009 the following data applied:

Standard cost card for one cake (not adjusted for the organic ingredient change)

Ingredients	Kg	$
Flour	0·10	0·12 per kg
Eggs	0·10	0·70 per kg
Butter	0·10	1·70 per kg
Sugar	0·10	0·50 per kg
Total input	0·40	
Normal loss (10%)	(0·04)	
Standard weight of a cake	0·36	
Standard sales price of a cake		0·85
Standard contribution per cake after all variable costs		0·35

The budget for production and sales in April was 50,000 cakes. Actual production and sales was 60,000 cakes in the month, during which the following occurred:

Ingredients used	Kg	$
Flour	5,700	$741
Eggs	6,600	$5,610
Butter	6,600	$11,880
Sugar	4,578	$2,747
Total input	23,478	$20,978
Actual loss	(1,878)	
Actual output of cake mixture	21,600	
Actual sales price of a cake		$0·99

Required: Calculate the material price, mix and yield variances and the sales price and sales contribution volume variances for April. (13 marks)

Q3. Montreal Ltd. manufactures firelighters under contract for a major supermarket chain. Under the contract Montreal receives a price of €1.70 per kilogram. The company normally produces 30,000 kilograms of firelighters for the supermarket chain each month, but it occasionally varies this quantity slightly if asked to do so.

Montreal operates a standard absorption costing system. Fixed production overheads are budgeted at €9,600 per month. The standards for the direct materials required to produce a kilogram of firelighters are as follows:

Direct Material Type "A"	0.6 kg.@ €0.25 per kilogram
Direct Material Type "B"	0.45 kg @ €0.40 per kilogram
Direct Material Type "C"	0.15 kg. @ €0.80 per kilogram
Total direct materials of input per kilogram of output	1.2 kg.

The only other cost is a cardboard packaging box, which Montreal purchases from a subcontractor at an agreed price of €0.05 per kilogram of firelighters sold.
During January 2007 actual activity was as follows:

- Montreal Ltd. produced 31,000 kilograms of firelighters and supplied them to the supermarket chain at the agreed price of €1.70 per kilogram.
- Fixed overheads amounted to €11,520.
- Direct materials purchased and used in production were:
  - Direct Material Type "A": 16,700 kg @ €0.25 per kilogram
  - Direct Material Type "B": 11,900 kg @ €0.42 per kilogram
  - Direct Material Type "C": 3,800 kg @ €0.80 per kilogram
- Cardboard packaging boxes were purchased at standard cost.

REQUIRED:
(a) Calculate the standard profit per kilogram of firelighters, and the company's total budget and actual profits for January 2007.
(b) Calculate direct materials price, mix and yield variances.

Q4. The Organic Bread Company (OBC) makes a range of breads for sale direct to the public. The production process begins with workers weighing out ingredients on electronic scales and then placing them in a machine for mixing. A worker then manually removes the mix from the machine and shapes it into loaves by hand, after which the bread is then placed into the oven for baking.
All baked loaves are then inspected by OBC's quality inspector before they are packaged up and made ready for sale.
Any loaves which fail the inspection are donated to a local food bank.
The standard cost card for OBC's 'Mixed Bloomer', one of its most popular loaves, is as follows:

		$
White flour	450 grams at $1·80 per kg	0·81
Wholegrain flour	150 grams at $2·20 per kg	0·33
Yeast	10 grams at $20 per kg	0·20
Total	610 grams	1·34

Budgeted production of Mixed Bloomers was 1,000 units for the quarter, although actual production was only 950 units. The total actual quantities used and their actual costs were:

	Kg	$ per kg
White flour	408·5	1·90
Wholegrain flour	152·0	2·10
Yeast	10·0	20·00

(a) Calculate the material mix variance and the material yield variance for OBC for the last quarter.
(b) Using the information in the question, suggest THREE possible reasons why an ADVERSE MATERIAL YIELD variance could arise at OBC.

Q5. The Safe Soap Co makes environmentally-friendly soap using three basic ingredients. The standard cost card for one batch of soap for the month of September was as follows:

Material	Kilograms	Price per kilogram ($)
Lye	0·25	10
Coconut oil	0·6	4
Shea butter	0·5	3

The budget for production and sales in September was 120,000 batches. Actual production and sales were 136,000 batches. The actual ingredients used were as follows:

Material	Kilograms
Lye	34,080
Coconut oil	83,232
Shea butter	64,200

Required:

(a) Calculate the total material mix variance and the total material yield variance for September. (8 marks)

(b) In **October** the materials mix and yield variances were as follows:

Mix:	$6,000 adverse
Yield:	$10,000 favourable

The production manager is pleased with the results overall, stating:

'At the beginning of September I made some changes to the mix of ingredients used for the soaps. As I expected, the mix variance is adverse in both months because we haven't yet updated our standard cost card but, in both months, the favourable yield variance more than makes up for this. Overall, I think we can be satisfied that the changes made to the product mix are producing good results and now we are able to produce more batches and meet the growing demand for our product.'

The sales manager, however, holds a different view and says:

'I'm not happy with this change in the ingredients mix. I've had to explain to the board why the sales volume variance for October was $22,000 adverse. I've tried to explain that the quality of the soap has declined slightly and some of my customers have realised this and simply aren't happy but no-one seems to be listening. Some customers are even demanding that the price of the soap be reduced and threatening to go elsewhere if the problem isn't sorted out.'

Required:

(i) Briefly explain what the adverse materials mix and favourable materials yield variances indicate about production at Safe Soap Co in October. (4 marks)

Note: You are NOT required to discuss revision of standards or operational and planning variances.

(ii) Discuss whether the sales manager could be justified in claiming that the change in the materials mix has caused an adverse sales volume variance in October. (3 marks)

(15 marks)

Q6. Kappa Co produces Omega, an animal feed made by mixing and heating three ingredients: Alpha, Beta and Gamma.

The company uses a standard costing system to monitor its costs.

The standard material cost for 100 kg of Omega is as follows:

Input	Kg	Cost per kg ($)	Cost per 100 kg of Omega ($)
Alpha	40	2·00	80·00
Beta	60	5·00	300·00
Gamma	20	1·00	20·00
Total	120		400·00

Notes

(1) The mixing and heating process is subject to a standard evaporation loss.

(2) Alpha, Beta and Gamma are agricultural products and their quality and price varies significantly from year to year.

Standard prices are set at the average market price over the last five years. Kappa Co has a purchasing manager who is responsible for pricing and supplier contracts.

(3) The standard mix is set by the finance department. The last time this was done was at the product launch which was five years ago. It has not changed since.

Last month 4,600 kg of Omega was produced, using the following inputs:

Input	Kg	Cost per kg ($)	Total cost ($)
Alpha	2,200	1·80	3,960
Beta	2,500	6·00	15,000
Gamma	920	1·00	920
Total	5,620		19,880

At the end of each month, the production manager receives a standard cost operating statement from Kappa Co's performance manager. The statement contains material price and usage variances, labour rate and efficiency variances, and overhead expenditure and efficiency variances for the previous month. No commentary on the variances is given and the production manager receives no other feedback on the efficiency of the Omega process.

Required:

(a) Calculate the following variances for the last month:

(i) the material usage variance for each ingredient and in total; (4 marks)

(ii) the total material mix variance; (4 marks)

(iii) the total material yield variance. (3 marks)

(b) Discuss the problems with the current system of calculating and reporting variances for assessing the performance of the production manager. (9 marks)

(20 marks)

Sales mix and quantity variance

Q6. BRK Co operates an absorption costing system and sells three products, B, R and K which are substitutes for each other. The following standard selling price and cost data relate to these three products:

Product	Selling price per unit	Direct material per unit	Direct labour per unit
B	£14·00	3·00 kg at £1·80 per kg	0·5 hrs at £6·50 per hour
R	£15·00	1·25 kg at £3·28 per kg	0·8 hrs at £6·50 per hour
K	£18·00	1·94 kg at £2·50 per kg	0·7 hrs at £6·50 per hour

Budgeted fixed production overhead for the last period was £81,000. This was absorbed on a machine hour basis.

The standard machine hours for each product and the budgeted levels of production and sales for each product for the last period are as follows:

Product	B	R	K
Standard machine hours per unit	0·3 hrs	0·6 hrs	0·8 hrs
Budgeted production and sales (units)	10,000	13,000	9,000

Actual volumes and selling prices for the three products in the last period were as follows:

Product	B	R	K
Actual selling price per unit	£14·50	£15·50	£19·00
Actual production and sales (units)	9,500	13,500	8,500

Required:

(a) Calculate the following variances for overall sales for the last period:

(i) sales price variance; **(ii) sales volume profit variance;**

(iii) sales mix profit variance; **(iv) sales quantity profit variance**

and reconcile budgeted profit for the period to actual sales less standard cost. (13 marks)

Q7. Hobart Ltd. manufactures soft drinks. The following data was used in compiling the budget for last month:

Product	Direct material per batch	Direct labour per batch	Selling price per batch	Sales quantity
Lemonade	6 litres @ €1.75 per litre	1 hour @ €10 per hour	€30	5,000 batches
Cola	2.5 litres @ €4 per litre	1.5 hours @ €10 per hour	€33	8,000 batches
Ginger ale	4 litres @ €3.75 per litre	1.25 hours @ €10 per hour	€40	7,000 batches

The actual outcome for the month was in accordance with the budgetary assumptions, with the following exceptions:

- The actual wage rate paid was €12 per hour.
- Actual selling prices per batch were €0.50 higher than budgeted.
- Actual sales quantities were 3,000 batches of lemonade, 7,400 batches of cola and 6,600 batches of ginger ale

REQUIRED:

(a) Calculate the following variances, and present a reconciliation of the company's total budgeted and actual contribution for last month:

- Sales mix variance.
- Sales quantity variance.
- Sales volume variance.
- Sales price variance. (12 marks)

(b) Explain the significance of the sales mix, sales quantity and sales volume variances. (5 marks)
(c) Explain what is meant by market share and market size variances, and explain the potential usefulness to the management of Hobart Ltd. of calculating these two variances. (Calculations are not required in answering this part). (3 marks)
[Total: 20 marks]

Q8. Block Cooperates an absorption costing system and sells three types of product – Commodity 1, Commodity 2 and Commodity 3. Like other competitors operating in the same market, Block Co is struggling to maintain revenues and profits in face of the economic recession which has engulfed the country over the last two years. Sales prices fluctuate in the market in which Block Co operates. Consequently, at the beginning of each quarter, a market specialist, who works on a consultancy basis for Block Co, sets a budgeted sales price for each product for the quarter, based on his expectations of the market. This then becomes the 'standard selling price' for the quarter. The sales department itself is run by the company's sales manager, who negotiates the actual sales prices with customers. The following budgeted figures are available for the quarter ended 31 May 2013.

Product	Budgeted production and sales units	Standard selling price per unit	Standard variable production costs per unit
Commodity 1	30,000	$30	$18
Commodity 2	28,000	$35	$28·40
Commodity 3	26,000	$41·60	$26·40

Block Co uses absorption costing. Fixed production overheads are absorbed on the basis of direct machine hours and the budgeted cost of these for the quarter ended 31 May 2013 was $174,400. Commodity 1, 2 and 3 use 0·2 hours, 0·6 hours and 0·8 hours of machine time respectively.
The following data shows the actual sales prices and volumes achieved for each product by Block Co for the quarter ended 31 May 2013 and the average market prices per unit.

Product	Actual production and sales units	Actual selling price per unit	Average market price per unit
Commodity 1	29,800	$31	$32·20
Commodity 2	30,400	$34	$33·15
Commodity 3	25,600	$40·40	$39·10

The following variances have already been correctly calculated for Commodities 1 and 2:
Sales price operational variances
Commodity 1: $35,760 Adverse
Commodity 2: $25,840 Favourable
Sales price planning variances
Commodity 1: $65,560 Favourable
Commodity 2: $56,240 Adverse
Required:
(a) Calculate, for Commodity 3 only, the sales price operational variance and the sales price planning variance. (4 marks)
(b) Using the data provided for Commodities 1, 2 and 3, calculate the total sales mix variance and the total sales quantity variance. (11 marks)
(c) Briefly discuss the performance of the business and, in particular, that of the sales manager for the quarter ended 31 May 2013. (5 marks)
(20 marks)

Q9. Valet Co is a car valeting (cleaning) company. It operates in the country of Strappia, which has been badly affected by the global financial crisis. Petrol and food prices have increased substantially in the last year and the average disposable household income has decreased by 30%. Recent studies have shown that the average car owner keeps their car for five years before replacing it, rather than three years as was previously the case. Figures over recent years also show that car sales in Strappia are declining whilst business for car repairs is on the increase. Valet Co offers two types of valet – a full valet and a mini valet. A full valet is an extensive clean of the vehicle, inside and out; a mini valet is a more basic clean of the vehicle. Until recently, four similar businesses operated in Valet Co's local area, but one of these closed down three months ago after a serious fire on its premises. Valet Co charges customers $50 for each full valet and $30 for each mini valet and this price never changes. Their budget and actual figures for the last year were as follows:

	Budget		Actual	
Number of valets:				
Full valets	3,600		4,000	
Mini valets	2,000		3,980	
	$	$	$	$
Revenue		240,000		319,400
Variable costs:				
Staff wages	(114,000)		(122,000)	
Cleaning materials	(6,200)		(12,400)	
Energy costs	(6,520)		(9,200)	
		(126,720)		(143,600)
Contribution		113,280		175,800
Fixed costs:				
Rent, rates and depreciation		(36,800)		(36,800)
Operating profit		76,480		139,000

The budgeted contribution to sales ratios for the two types of valet are 44·6% for full valets and 55% for mini valets.

Required:

(a) Using the data provided for full valets and mini valets, calculate:

(i) The total sales mix contribution variance; (4 marks)

(ii) The total sales quantity contribution variance. (4 marks)

(b) Briefly describe the sales mix contribution variance and the sales quantity contribution variance. (2 marks)

(c) Discuss the SALES performance of the business for the period, taking into account your calculations from part (a) AND the information provided in the scenario. (10 marks)

(20 marks)