Cost Volume Profit Analysis (CVP)

Q1. Motor Co has recently developed a new environmentally friendly motor home. It has prepared two sets of figures for its forecast for the next year since it is currently undecided on its production level and selling price. The company is trying to decide whether it is more profitable to produce 400 or 500 motor homes, since a clear link between price and demand has been identified. An extract from the coming year's forecast is as follows:

Units produced and sold	**400**	**500**
	$'000	$'000
Revenue	34,000	37,500
Materials	13,600	17,000
Labour	8,400	10,500
Overheads (1)	9,000	10,500

Note

(1) Overheads include both a fixed and a variable element which can be calculated from the above data.

Required:

(a) Calculate the contribution per unit at each sales level. (4 marks)

(b) Calculate the break-even point in units at each sales level. (3 marks)

(c) Calculate the margin of safety as a percentage at each sales level and explain what the margin of safety is. (3 marks)

(d) Calculate the budgeted profit at each sales level. (2 marks)

(e) Using the graph paper provided, draw and label a break-even chart for the motor homes at a sales level of 400 units, showing activity levels between 0 and 400 units.

(f) State four assumptions on which break-even analysis is based. (2 marks)

Q2. A building company constructs a standard unit which sells for £30 000. The company's costs can be readily identifiable between fixed and variable costs.

Budgeted data for the coming six months includes the following:

	Sales (in units)	Profit £
January	18	70 000
February	20	100 000
March	30	250 000
April	22	130 000
May	24	160 000
June	16	40 000

You are told that the fixed costs for the six months have been spread evenly over the period under review to arrive at the monthly profit projections.

Required:

Prepare a graph for total sales, costs and output for the six months under review that shows:

(i) The break-even point in units and revenue.

(ii) Total fixed costs.

(iii) The variable cost line.

(iv) The margin of safety for the total budgeted sales. (14 marks)

HINT: USE HIGH LOW METHOD TO SEPARATE FC AND VC AND FOR THAT, FIRST CALCULATE TOTAL COST

Q3. Taylor Ltd manufactures a single product using a labour intensive production process. Its quality control department tests the final product before it leaves the factory and at present 20% of its pre-inspection output is rejected and scrapped. Scrap units have no value and cannot be reworked. Taylor builds the cost of scrapped units into the cost of good production.
A standard cost card for Taylor's product under its current production method is given below

	£ per unit
Direct material 3 kgs at £5 per kg	15·00
Direct labour (variable)	10·00
Variable overhead	5·00
Cost pre-inspection per unit produced	30·00
Cost of rejects	7·50
Variable cost per good unit	37·50
Selling price per good unit	60·00
Contribution per good unit	£22·50

Total fixed overheads are budgeted at £148,500 per month. Taylor currently sells 9,000 units per month. Negligible stocks are held.
A proposal is being considered to reduce the reject rate:
To automate the process by hiring a machine for £120,000 per month. This would lead to a 50% reduction in labour cost per unit and the quality of the manufacturing process would improve so that reject rates would fall to 5% of pre-inspection output. Variable overhead and material cost per unit (pre-inspection) would be unchanged. Existing fixed overheads would be unchanged.
Required:
(a) Calculate the break even point in good units per month for the current manufacturing process. (2 marks)
(b) Calculate the break even point in good units per month for the automated process under the proposal. (5 marks)
(c) Calculate the output level in good units per month at which proposal 1 and the current manufacturing process would have the same total cost. Comment briefly on your result.
HINT: TOTAL COST OF MONTH 1 (EQUATION) = TOTAL COST OF MONTH 2 (EQUATION)

Hair Co manufactures three types of electrical goods for hair: curlers (C), straightening irons (S) and dryers (D.) The budgeted sales prices and volumes for the next year are as follows:

	C	S	D
Selling price	$110	$160	$120
Units	20,000	22,000	26,000

Each product is made using a different mix of the same materials and labour. Product S also uses new revolutionary technology for which the company obtained a ten-year patent two years ago. The budgeted sales volumes for all the products have been calculated by adding 10% to last year's sales.

The standard cost card for each product is shown below.

	C	S	D
	$	$	$
Material 1	12	28	16
Material 2	8	22	26
Skilled labour	16	34	22
Unskilled labour	14	20	28

Both skilled and unskilled labour costs are variable.

The general fixed overheads are expected to be $640,000 for the next year.

Required:

(a) Calculate the weighted average contribution to sales ratio for Hair Co.

Note: round all workings to 2 decimal places. (6 marks)

(b) Calculate the total break-even sales revenue for the next year for Hair Co.

Note: round all workings to 2 decimal places. (2 marks)

(c) Using the graph paper provided, draw a multi-product profit-volume (PV) chart showing clearly the profit/loss lines assuming:

(i) you are able to sell the products in order of the ones with the highest ranking contribution to sales ratios first; and

(ii) you sell the products in a constant mix.

Note: only one graph is required. (9 marks)

(d) Briefly comment on your findings in (c). (3 marks)

(20 marks)

CHALLENGING QUESTION

Q5. Company YZ manufactures products L, M and N. These products are always sold in the ratio 9L:6M:5N. The budgeted sales volume for December is a total of 14,000 units. The budgeted sales volumes, selling price per unit and variable cost per unit for each of the products are shown below:

	L	M	N
Sales budget (units)	6,300	4,200	3,500
	$	$	$
Selling price per unit	300	600	230
Variable cost per unit	100	300	50

The budgeted fixed costs of the company for December are $2.7 million.

Required:

(c) **Calculate** the number of units of each product that must be sold for Company YZ to break even in December given the current sales mix ratio. ***(4 marks)***

(d) The Sales Manager has now said that to be able to sell 6,300 units of product L in December it will be necessary to reduce the selling price of product L.

Calculate the sensitivity of Company YZ's total budgeted profit for December to a change in the selling price per unit of product L. ***(5 marks)***

(Total for Question Six = 25 marks)

Nov 2012

Q6. ABC Limited deals in a single product called HGV. It had prepared a budget for the year ending December 31, 2009 which was based on the following key assumptions:

Sales	504,000 units @ Rs. 430
Total Variable cost	Rs. 300 per unit
Fixed cost for the year	Rs. 25,000,000

Variable costs include direct material, labour and overheads.

However, the position as shown by the management accounts prepared up to May 31, 2009 is not very encouraging and depicts the following actual results:

- 105,000 units were sold @ Rs. 350 per unit.
- Average cost of raw material used increased by Rs. 5 per unit of finished product.
- Other variable costs were as per the budget.

The marketing department advised the management that the failure to achieve targeted sale is because a competitor has introduced another product which has been very popular in the low income areas.

After due deliberations, the management has prepared a revised plan for the remaining period of the financial year. The plan involves launching of a low grade version of the existing product named LGV, to capture the low income market. Salient features of the plan are as under:

(i) Sales mix of HGV and LGV is expected to be in the ratio of 1:2. Sale price of HGV would be increased to Rs. 385, whereas sale price of LGV would be Rs. 270.

(ii) A new machine will have to be purchased for Rs. 1.2 million.

(iii) For LGV two different types of raw materials i.e. A and B will be used in the ratio of 5:3. However, the variable cost of LGV is expected to be Rs. 220 per unit.

(iv) Variable cost of HGV will continue to be Rs. 305 per unit after increase in material cost

(v) Additional marketing cost would be Rs. 3 million.

Required:

Compute the sales amount and quantities for the remaining period, to achieve a break even in 2009. **[10 marks]**

HINT: FOR THE CALCULATION OF REMAINING BE POINT, CONSIDER THE UNRECOVERED FC OF 2009

A company is developing a new product. During its expected life it is forecast that 6,400 units of the product will be sold for $70 per unit.
The direct material and other non-labour related costs are expected to be $45 per unit throughout the life of the product.
Production is expected to be in batches of 100 units throughout the life of the product. The direct labour cost is expected to reduce due to the effects of learning throughout the life of the product.
The total direct labour cost of the first batch of 100 units is expected to be $6,000 and an 80% learning effect is expected to occur.
Fixed costs specific to this product are expected to be $60,000 in total for the life of the product.
Note: The value of the learning index for an 80% learning curve is -0.3219

Required:

(a) **Calculate** the total direct labour cost of the first:

(i) 800 units
(ii) 1,600 units
(iii) 3,200 units
(iv) 6,400 units ***(4 marks)***

(b) **Apply** the results from part (a) to **advise** the company management of the approximate break-even level of sales of the product. ***(3 marks)***

(c) **Explain** the effect on the break-even level of sales if the rate of learning was 90%. (No calculations are required) ***(3 marks)***

(Total for Question One = 10 marks)