

Marginal Costing and Decision Making

Marginal means extra. Marginal cost is a cost of one unit of product or service which would be avoided if that unit were not produced or provided. It is a cost of producing one extra unit. Marginal revenue is the revenue earned by the sale of one extra unit.

Marginal costing unlike absorption costing, keeps a clear distinction between variable and fixed cost for decision making purpose. In Marginal costing variable costs are charged to units of output and fixed costs are treated as period costs and charged in full to income statement. Semi variable costs are divided into fixed and variable. Marginal costing is also known as direct costing, variable costing or contribution costing.

Advantages of Marginal Costing

- It is simple and easy to understand
- It avoids the complexities of arbitrarily charging fixed overheads to units of output
- Cost control can be exercised in a better way because variable costs can be controlled and fixed uncontrollable up to a certain extent
- No need to find out overhead absorption rates
- No complications of over / under absorbed overheads
- Because fixed costs relate to a particular time period and not based on output therefore only variable costs are considered for product costing
- Inventories carried forward to the next period do not include proportion of current year's fixed overheads
- It facilitates short term decision making and there recommended for internal reporting purpose

Disadvantages of Marginal Costing

- It assumes all expenses can be categorized into fixed or variable. There are however some expenses like employee bonuses etc which do not relate to volume of output or time period
- Dividing a semi-variable costs into fixed and variable components is an estimation and not accurate
- Inventory is undervalued by not including share of fixed overheads thus it is not an acceptable method of inventory valuation under IAS2 and Tax Depts.
- Calculations under marginal costing are misleading in case of fluctuations in production as in seasonal business
- It is based upon the assumption of constant variable cost per unit, selling price, total fixed costs etc which are unrealistic

Uses of Marginal Costing

- Calculating break-even level of output
- Decisions about "Special" or "one-off" orders
- Whether to "Make or Buy" a product
- Choosing between two or more alternatives
- Costing an order to quote minimum possible price
- Devising a pricing strategy
- Deleting a product line
- Deciding an optimal production plan in case of limiting factor
- Preparing budgets, variance analysis and making capital investment decisions

Contribution

Contribution = Sales – All Variable Costs

Contribution towards covering fixed costs and making a profit. It helps the business to judge and compare the profitability of different products or business segments

Breakeven

Break-even point refers to a situation where the business is earning neither a profit nor a loss. It occurs where contribution equals fixed costs.

$$\text{BE Units} = \frac{\text{Fixed Costs}}{\text{Contribution / Unit}}$$

$$\text{BE Revenue} = \text{BE Units} \times \text{Selling Price / Unit}$$

OR

$$\text{BE Revenue} = \frac{\text{Fixed Costs}}{\text{C/S Ratio}}$$

$$\text{C/S Ratio} \quad (\text{Contribution to sales Ratio}) = \frac{\text{Contribution}}{\text{Sales}}$$

How to increase Contribution to Sales Ratio

- Increase the selling prices
- Reduce variable costs
- Making sales mix more profitable by switching production to those products which have higher c/s ratio

Target Profit

After break-even has achieved the business aims for a profit. Once the fixed costs are covered then selling further units will lead to a profit. We can see how many units or revenue is required to achieve the desired level of profits.

$$\text{Target Units} = \frac{\text{Fixed Costs} + \text{Target Profit}}{\text{Contribution / Unit}}$$

$$\text{Target Revenue} = \text{Target Units} \times \text{Selling Price / Unit}$$

$$\text{Target Revenue} = \frac{\text{Fixed Costs} + \text{Target Revenue}}{\text{C/S Ratio}}$$

Margin of Safety

Margin of Safety is the difference between budgeted and breakeven. It determines how far sales can fall before the business will move from profit to loss. It gives an indication of the vulnerability of profit to reduction in demand. MOS is a measure of risk. The greater the safety margins the better for the business. It can be expressed in terms of units, revenue and %age.

$$\text{MOS Units} = \text{Budgeted Units} - \text{Breakeven Units}$$

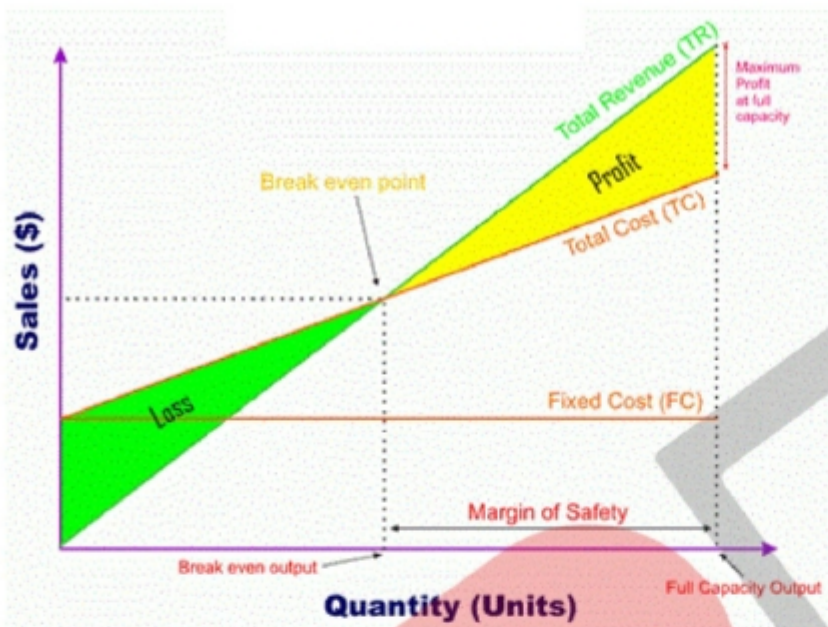
$$\text{MOS Revenue} = \text{Budgeted Revenue} - \text{Breakeven Revenue}$$

$$\text{MOS as a \%age} = \frac{\text{Budgeted Units} - \text{Breakeven Units}}{\text{Budgeted Units}} \times 100$$

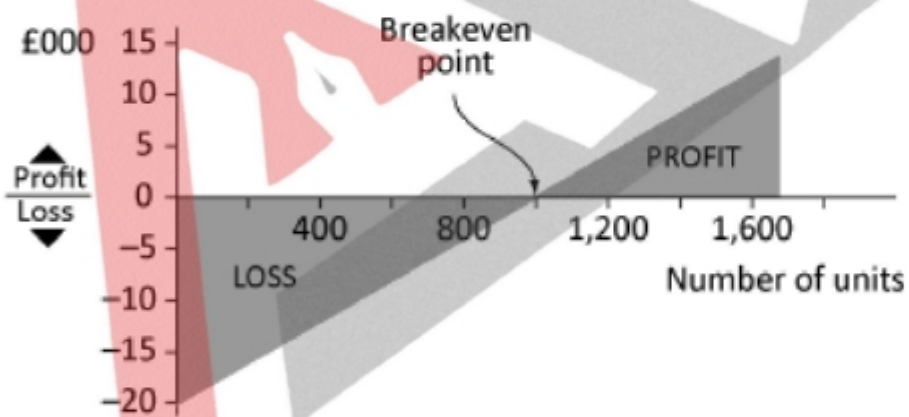
OR

$$\text{MOS as a \%age} = \frac{\text{Budgeted Revenue} - \text{Breakeven Revenue}}{\text{Budgeted Revenue}} \times 100$$

Break-even Chart



Profit Volume Chart



Assumptions and Limitations of Break-even Analysis

Assumptions	Limitations
All costs can be categorized as fixed or variable	The existence of semi-variable costs is ignored, whereas most of the costs are not perfectly fixed or perfectly variable
Total fixed costs remain unchanged for all output levels	Fixed costs may change if output increases or decreases substantially as most fixed costs are step costs
Total variables costs change with the change in activity but variable costs per unit remains same	Variable costs per unit change due to reasons like bulk buying discounts, overtime etc
Selling price per unit remains the same for all output levels	Selling price may have to be reduced to win extra sales or increased to cover extra costs
Costs and revenue behave in a linear fashion within a relevant range	As discussed above selling price and variable costs per unit vary at different output levels
No factor other than sales volume affects the costs and revenue	Various external factors such as inflation, interest rates, state of economy may affect costs and revenues
The Analysis assumes business producing one product only or a constant product mix	This restricts its usefulness because it is unrealistic
The technology, production method and efficiency remains unchanged	They all change in practice
There are no inventories of RM, WIP of FG at start or end of the period or they remain constant	It ignores the possibility of increase or decrease in inventory levels

Use of Break-even Analysis

Despite of its limitations breakeven is a useful technique for managers in the following cases

- To make feasibility before starting a new venture
- To determine the selling price or desired sales mix for earning required profits
- To measure profit or loss at different output levels
- To calculate lowest possible activity level to survive
- To evaluate alternative and special orders as a part of decision making process

ARD Textiles
Income Statement (Marginal Costing) Format

Sales Revenue		XXX
Less: Variable cost of Sales		
Opening Inventory	XXX	
Add: Variable Production Costs	XXX	
Less: Closing Inventory	(XXX)	
Variable Production Cost	XX	
Add: Variable Non-Production Cost (Selling / Admin etc)	XX	
Total Variable Cost of Sales		(XXX)
Contribution		XXX
Less: All Fixed Costs		
Fixed Production Overheads	XX	
Fixed Non Production Overheads (Selling / Admin / Distribution etc)	XX	(XXX)
Net Profit / (loss)		XX/(XX)

ARD Textiles
Income Statement (Absorption Costing) Format

Sales Revenue		XXX
Less: Production Cost of Sales		
Opening Inventory	XXX	
Add: Variable Production Costs	XXX	
Fixed Production Overheads (Actual)	XXX	
Less: Closing Inventory	(XXX)	
Production Cost of Sales		(XX)
Gross Profit		XXX
Less: All Non Production Costs		
Variable Non-Production Cost (Selling / Admin etc)	XX	
Fixed Non Production Overheads (Selling / Admin / Distribution etc)	XX	(XXX)
Net Profit / (loss)		XX/(XX)

STATEMENT OF RECONCILIATION

	Jan	Feb	Mar
Profit under Absorption Costing	XXX	XXX	XXX
Add: Difference in Opening Inventories	XX	XX	XX
Less: Difference in Closing inventories	(XX)	(XX)	(XX)
Profit Under Marginal Costing	XXX	XXX	XXX

Relevant Costs in Decision Making

Relevant Costs	Irrelevant Costs
Future Costs / Opportunity Costs	Past costs / Historical costs / Sunk Costs
Cash Flow	Non Cash Costs e.g. Depreciation, Provisions
Variable / Incremental Costs / Differential Costs	Fixed Costs
Specific Fixed Costs	General fixed Costs
Avoidable Costs	Un-Avoidable Costs
Attributable / Directly Attributable Fixed Costs	Absorbed / Allocated / Apportioned Fixed Costs

Make v Buy Decisions

Sometimes business has to take a decision whether to manufacture a particular product / component or buy it from supplier. The decision is based on financial and non financial factors. In general Purchase price is compared with relevant cost of production and lower option is opted for but non financial factors also need to be considered.

Qualitative / Non Financial factors for Make v Buy decisions

- Quality and reliability of goods bought or made
- Reliability of supplier e.g. timely delivery
- Possibility of ceasing production in near future
- Long term contract with suppliers upon prices and other terms
- Alternative use of resources made available
- Time required restarting production in case supplier fails to provide goods. Retaining or re-hiring of staff
- Costs associated with closing production
- Foreign exchange rates and their effect on the decision
- Import and other govt policies etc
- Reputation / brand image / ethical considerations

Special Order to use up spare capacity

Sometimes business get offers for short term orders from customers. If the business has

enough spare capacity it will definitely consider such opportunities providing the order generates some positive contribution over and above its relevant costs.

Relevant Benefit / Incremental Revenue **XXX**

Less: Relevant Costs / Outflows

Variable costs	XX	
Relevant Fixed Costs	XX	
Opportunity costs (if any)	XX	(XX)

Net Benefit /(Loss) from special order **XX / (XX)**

Acceptance of order with net loss / negative contribution

- To retain a highly skilled and trained workforce
- To keep plant in gear as idle plant become in-efficient and lose its value more quickly
- To get more full price orders in future
- For charitable or sympathetic reasons

General Non financial factors

- To maintain production and keep employees busy
- To avoid loss of future orders (in competitive industries)
- To use spare production capacity
- To dispose of accumulated obsolete or perishable inventory
- To improve the sale of more profitable products
- To promote a product / service (dealtoday.pk)

Consequences of Acceptance of order below normal price

- Regular customers also demand price reduction
- Prices cannot be increased in future
- Special order may lock up capacity which could be used for future full price orders
- Price wars damage the industry profitability

Closure of Product Line / Department

Some times a particular product or department incurs a loss. Management may be concerned and decides to close that product or department. Again there are some financial and non financial considerations that need to be made in this case. Financial rule is that if a department is making some positive contribution over and above its relevant costs it should be continued and not closed but if the product is generating negative contribution after its relevant costs then it shall be considered for closure after taking non financial factors into account.

Factors to be considered before closure of a department / product

- Decision should be based upon contribution and not profit / loss
- Methods used to apportion expenses should be fair
- The possibility of improving the performance of the least profitable or loss making dept
- Effect upon other profitable departments / products need to be considered
- Non monetary factors such as reputation, image, relationship with suppliers and customers
- Loss of staff morale due to redundancies etc
- It must be borne in mind that not all overheads will disappear after closure of a dept.
- Alternative use of resources becoming available

Limiting Factor

Limiting factor is any factor that limits organizational activity. Every commercial business aims for profit maximization but its aim is restricted by some factors such as **availability of raw material for production, availability of labor hours, availability of machine hours, shortage of factory space, finance** etc. In Limiting factor analysis we need to identify that limiting factor and make an optimal production plan. Optimal plan is a production plan that maximizes overall company profitability.

Contribution = Sales – All Variable Costs

Contribution towards covering fixed costs and making profit

Product	A		B		C	
Selling price / unit		XXX		XXX		XXX
Less: Variable Cost / Unit						
Direct Material	X		X		X	
Direct Labor	X		X		X	
Direct Exp	X		X		X	
Variable OH	X	(XX)	X	(XX)	X	(XX)
Contribution / Unit		XX		XX		XX
Divide by						
Kgs / Hrs per unit		X		X		X
Contribution per unit of kg / hr		XX		XX		XX
Ranking		3		1		2

Optimal Production Plan and profit statement (in class)

Reducing the affect of limiting factors in long term

1. Shortage of Raw Material

- (a) Search for new source of raw material
- (b) Reduce the dependency on particular material or component by re-designing / re-engineering

2. Shortage of Skilled Labour

- (a) Attract more skilled labour by advertising and incentives such as increased pay, paying for moving costs etc

3. Shortage of production capacity e.g. machinery, machine hours

- (a) purchase of additional production machinery
- (b) sub-contract some work to outside companies

4. Shortage of factory space

- (a) increase factory space by building an extension
- (b) purchasing / Hiring an additional factory
- (c) sub-contract some work to outside companies

5. Lack of Demand for a particular product

- (a) increase sales levels by changing prices
- (b) advertising campaigns or giving sales incentives to staff / customers

6. Shortage of finance

- (a) Additional investment by owners / share holders
- (b) loans from bank or other sources

Make v Buy Decision

Q1 KRS Ltd is considering whether to administer its own purchase ledger or to use an external accounting service. It has obtained the following cost estimates for each option:

Internal service department

	Cost	Volume
Purchase hardware/software	\$320 pa	
Hardware/software maintenance	\$750 pa	
Accounting stationery	\$500 pa	
Part-time account clerk	\$6,000 pa	

External services

Processing of invoices/credit notes	\$0.50 per document	5,000 pa
Processing of cheque payments	\$0.50 per cheque	4,000 pa
Reconciling supplier accounts	\$2.00 per supplier per month	150 suppliers

Determine the cost effectiveness of outsourcing the accounting activities and identify the qualitative factors involved.

Make v Buy Decision with a limiting factor

Q2 A company manufactures four components (L, M, N and P) which are incorporated into different products. All the components are manufactured using the same general purpose machinery. The following production cost and machine hour data are available, together with the purchase prices from an outside supplier.

	L	M	N	P
Production cost:				
Direct material	\$ 12	\$ 18	\$ 15	\$ 8
Direct labour	25	15	10	8
Variable overhead	8	7	5	4
Fixed overhead	10	6	4	3
Total	55	46	34	23
Purchase price from outside supplier	\$57	\$55	\$54	\$50
Machine hours per unit	3	5	4	6

Manufacturing requirements show a need for 1,500 units of each component per week. The maximum number of general purpose machinery hours available per week is 24,000.

What number of units should be purchased from the outside supplier?

Shutdown Decision

Q3 The management of Fiona Co is considering the closure of one of its operations, department 3, and the financial accountant has submitted the following report.

Department	1	2	3	Total
Sales (units)	5,000	6,000	2,000	13,000
Sales (\$)	150,000	240,000	24,000	414,000
Cost of sales (\$)				
Direct material	75,000	150,000	10,000	235,000
Direct labour	25,000	30,000	8,000	63,000
Production overhead	5,769	6,923	2,308	15,000
Gross profit (\$)	44,231	53,077	3,692	101,000
Expenses (\$)	15,384	18,461	6,155	40,000
Net profit (\$)	28,847	34,616	(2,463)	61,000

Additional information:

- production overheads of \$15,000 have been apportioned to the three departments on the basis of unit sales volume
- expenses are head office overheads, again apportioned to departments on sales volume.

As management accountant, you further ascertain that, on a cost driver basis:

- 50% of the production overheads can be directly traced to departments and so could be allocated on the basis 2:2:1.
- Similarly 60% of the expenses can be allocated 3:3:2, with the remainder not being possible to allocate.
- 80% of the so-called direct labour is fixed and cannot be readily allocated. The remaining 20% is variable and can be better allocated on the basis of sales volume.

Required:

- (a) Restate the financial position in terms of the contribution made by each department and, based on these figures, make a clear recommendation.
- (b) Discuss any other factors that should be considered before a final decision is made.

Q4 Harolds fashion store comprises three departments – Men's Wear, Ladies' Wear and Unisex. The store budget is as follows:

	Men's	Ladies'	Unisex	Total
	\$	\$	\$	\$
Sales	40,000	60,000	20,000	120,000
Direct cost of sales	20,000	36,000	15,000	71,000
Department costs	5,000	10,000	3,000	18,000
Apportioned store costs	5,000	5,000	5,000	15,000
Profit/(loss)	10,000	9,000	(3,000)	16,000

It is suggested that Unisex be closed to increase the size of Men's and Ladies' Wear.

Required:

Determine what information is relevant or required.

Marginal Costing and Breakeven

- Q1.** Mary Smith's sales and costing information for the year ended 31 December 2010 included the following:

Sales (units)	25 000
Selling price per unit	\$35
Total costs for the year	\$
Direct materials	200 000
Direct labour	250 000
Variable overheads	50 000
Fixed costs	180 000

REQUIRED

- (a) Calculate the following for the year ended 31 December 2010.
- Contribution per unit
 - Break even output level in units
 - The margin of safety expressed both in units **and** as a percentage of sales.
- (b) State **three** fixed costs a business typically incurs.
- (c) Explain what is meant by the term 'stepped costs'.

During 2011 sales (in units) were expected to remain at the 2010 level of 25 000 units.

Mary Smith is in the process of compiling her 2012 budget. Research has indicated a potential increase in sales (in units) of 60% compared with the 2010 level. The company is assuming that selling price **and** all variable costs per unit in 2012 will remain at the 2010 level.

The current production level is 32 000 units per annum.

To increase production further would require:

capital investment of \$3 000 000;

an increase in fixed costs of \$195 000 per annum.

REQUIRED

- (d) Prepare **and** label a break-even chart for 2012, taking into account all of the potential amendments.
- (e) Increasing production will allow the firm to potentially earn more profit. However, it could pose significant risks to the business.

Evaluate the above statement using your answers to parts (a) and (d).

Q2. Ventana Ltd produce three different types of slatted wooden blinds, Pine, Teak and Oak. The company's forecast figures for the year ended 30 April 2012 were:

	Pine \$	Teak \$	Oak \$
Selling price (per unit)	61	158	170
Costs (per unit)			
Direct material	30	60	80
Direct labour	15	46	24
Variable overhead	6	12	16

Fixed overhead is absorbed on the basis of 50% of direct material cost.

Annual production and sales are forecast to be:

Pine	2000 units
Teak	1600 units
Oak	1000 units

REQUIRED

(a) For the year ended 30 April 2012:

- (i) Prepare a statement to show the contribution per unit for **each** product.
 - (ii) Calculate the total forecast fixed cost for the year.
 - (iii) Prepare a statement to show the break-even point for **each** type of blind in units and dollars.
- (b) Prepare a statement, using the contribution per unit, to show the total profit or loss made by **each** type of blind for the year.

One of the directors wishes to stop production of the pine blinds.

This would increase the total forecast fixed costs by 25%. However, the director estimates that sales of the teak and the oak blinds would increase by 50%.

REQUIRED

- (c) Prepare a detailed marginal cost statement, using the contribution per unit, to show the effect on total profit of stopping production of the pine blinds.

Q3. Paul owns two car wash businesses, called City Centre Car Wash and Suburban Car Wash.

City Centre Car Wash has the following monthly costs:

Per car	\$
Detergent	1.00
Electricity	0.50
Water costs	0.05
Wage costs	1.25
Per month	\$
Insurance of site	800
Lease of equipment	2040
Manager's salary	1000

Additional information:

Both car wash businesses are open for 400 hours every month.

The cars are washed one at a time.

The average time taken to wash each car is 10 minutes.

City Centre Car Wash is currently operating at 80% capacity and Suburban Car Wash at 70% capacity.

REQUIRED

- (a) For City Centre Car Wash, calculate the following correct to **two** decimal places:
- (i) the total number of cars washed per month
 - (ii) the total variable operating cost per month
 - (iii) the total operating cost per month
 - (iv) the average cost per car wash
 - (v) the price to be charged per car to give a profit margin of 20%
 - (vi) the total profit per month.
- (b) Using the price calculated in (a)–(v) above, calculate the following for City Centre Car Wash, correct to **two** decimal places:
- (i) the contribution per car (per unit)
 - (ii) the break-even point in units
 - (iii) the margin of safety, in dollars, when operating at 80% capacity
 - (iv) the margin of safety, in dollars, if operating efficiency falls to 60% capacity
 - (v) the contribution/sales (C/S) ratio when operating at 80% capacity.

Suburban Car Wash charges the same price as City Centre Car Wash.

At that price Suburban Car Wash shows a contribution to sales (C/S) ratio of 40%. Fixed costs are \$3240.

REQUIRED

- (c) Calculate, for Suburban Car Wash
 - (i) the break-even point in units **and** in dollars
 - (ii) the total monthly profit when operating at 70% capacity.

Q4. Singh Ltd manufactures three products - Athol, Brose and Crowdie – selling at \$3, \$7 and \$4 respectively. The manufacturing process is the same for all products but each requires a different quality of raw material.

Expected trading results for the six months ending 31 May 2010 are as follows:

	Athol \$	Brose \$	Crowdie \$	Total \$
Sales	<u>120 000</u>	<u>91 000</u>	<u>88 000</u>	<u>299 000</u>
Variable costs				
Direct materials	48 000	52 000	27 500	127 500
Direct labour (paid at \$4 per hour)	20 000	13 000	22 000	55 000
Variable overheads	<u>40 000</u>	<u>39 000</u>	<u>11 000</u>	<u>90 000</u>
	<u>108 000</u>	<u>104 000</u>	<u>60 500</u>	<u>272 500</u>
Fixed costs				<u>20 000</u>
				<u>292 500</u>
Estimated profit				<u>6 500</u>

REQUIRED

- (a) Calculate the estimated number of direct labour hours needed to manufacture **each** product, and in total.
- (b) Calculate the estimated contribution **per direct labour hour** for products Athol and Crowdie.
- (c) Calculate the number of units of **each** of the **three** products produced per direct labour hour.

Management has decided to cease production of Brose with effect from 1 June 2010.

REQUIRED

- (d) State why management has decided to take this action.

The demand for the remaining products is expected to be:

Athol 60 000 units;
Crowdie 32 000 units.

Management has undertaken to continue production as follows:

- (i) switch the labour force from Brose to Athol and Crowdie: additional labour may also be required;
- (ii) the rate per hour for direct labour will be increased to \$4.10 per hour;
- (iii) selling prices per unit of Athol and Crowdie will be unchanged;
- (iv) direct material costs per unit will be unchanged;
- (v) the ratio of variable overheads to selling price for each product will be unchanged;
- (vi) fixed costs will increase by 10%.

REQUIRED

- (e) Use the information above to prepare an estimated profit statement for the six months ending 30 November 2010. **Follow the layout used at the beginning of the question.**

- Q5.** Aloysius Dixon of Dixon's Tableworks anticipates that in 2009 he will be able to sell 10 000 tables at \$1100 each. However, his works manager has already produced the following figures for 2009 based on the factory's current production of 8000 tables per annum.

Sales (8000 x \$1100)	\$	\$
		8 800 000
Direct materials	1 024 000	
Direct wages	5 000 000	
Production overhead	640 000	
Sales overhead	<u>480 000</u>	<u>7 144 000</u>
Profit		<u>1 656 000</u>

All overheads are 50 % fixed, 50 % variable.

250 000 labour hours are worked.

There are 3 options under consideration which allow sales to increase to 10 000 tables.

Option 1

Purchase 2000 tables from another manufacturer at \$920 each.

Option 2

Lease new and improved machinery at a cost of \$260 000 for the year. This would allow production of 10 000 tables per annum with no change in unit variable costs. This was previously under consideration and \$40 000 had been spent on a feasibility study.

Option 3

Using the existing machinery, introduce an evening shift thus providing an additional 62 500 labour hours. Wage rates for this shift would have to increase by 15 % to take into account unsocial hours to be worked. Also the additional staff needed would have to be trained at a cost of \$50 000 - this cost to be absorbed in 2009.

REQUIRED

- Calculate the original unit contribution.
- Prepare financial statements showing in detail the calculations for the **additional** profits or losses arising from **each** of the **three** options.
- State which option should be accepted, giving **one** advantage and **one** disadvantage, of that option.

Q6. Bould Limited manufactures two products, Wye and Zed. The forecast data for the year ending 30 June 2016 is as follows.

	Wye \$	Zed \$
Revenue from Wye – 70 000 units at \$12	840 000	
Revenue from Zed – 90 000 units at \$8		720 000
Materials	(259 000)	(180 000)
Labour	(233 000)	(372 000)
Overheads	(190 000)	(207 000)
Profit / (Loss)	<u>158 000</u>	<u>(39 000)</u>
Labour includes fixed costs	65 000	48 000
Overheads include fixed costs	36 000	45 000

REQUIRED

- (a) Calculate the contribution per unit of Wye.
- (b) Calculate the contribution per unit of Zed.
- (c) Calculate the break-even point in units of Zed.
- (d) Calculate the break-even point in revenue of Zed.
- (e) Calculate the margin of safety in revenue for Zed.

Additional information

The directors are concerned about the forecast loss of manufacturing Zed and are considering two proposals.

Proposal 1

Increase the selling price of Zed by \$1.20 per unit.
The sales volume is expected to fall by 5% as a result.

Proposal 2

Stop manufacturing Zed.
This will incur redundancy costs of \$20 000.
There would be an increased additional budget facility for advertising Wye, which would increase sales volume of Wye by 40%.

REQUIRED

- (f) Calculate the revised forecast profit of Bould Limited for the year ended 30 June 2016 if proposal 1 is adopted.
- (g) Calculate the revised forecast profit if proposal 2 is adopted.
- (h) Advise, with reasons, which proposal the directors should adopt.