MGT388 Finance and Law for Engineers

Break-even point

Break-even Point

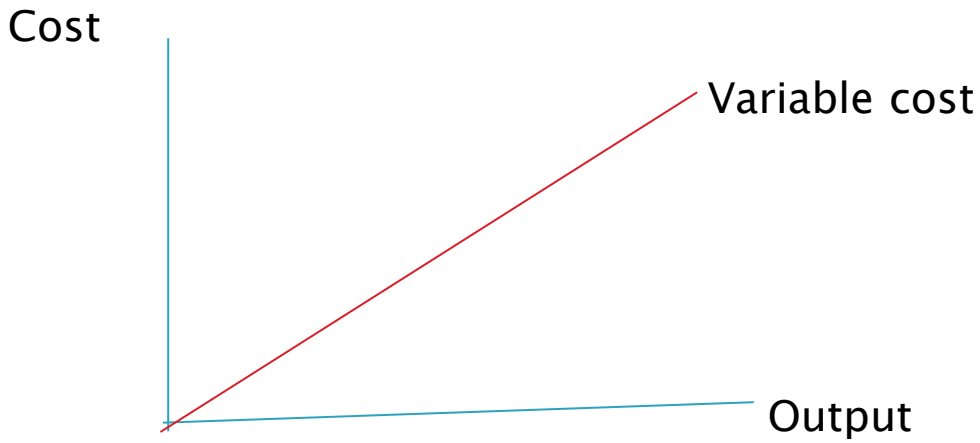
Break even point is the point at which neither a profit nor a loss is made.

It is the point where the total revenue of a business is equal to the total costs.

The total costs of the business are the variable costs and the fixed costs.

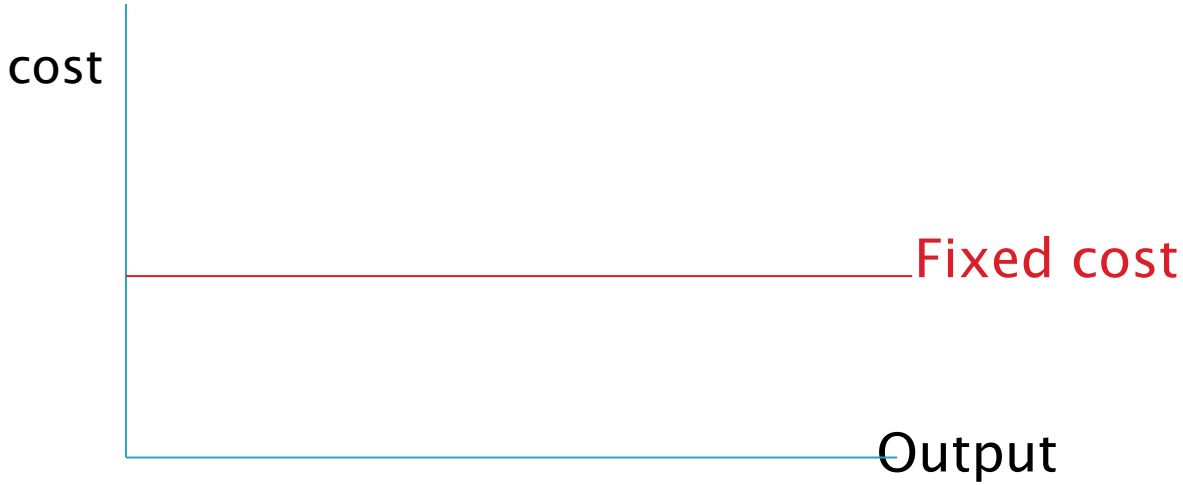
Variable costs and Fixed costs

Variable costs vary in direct proportion with volume of activity.



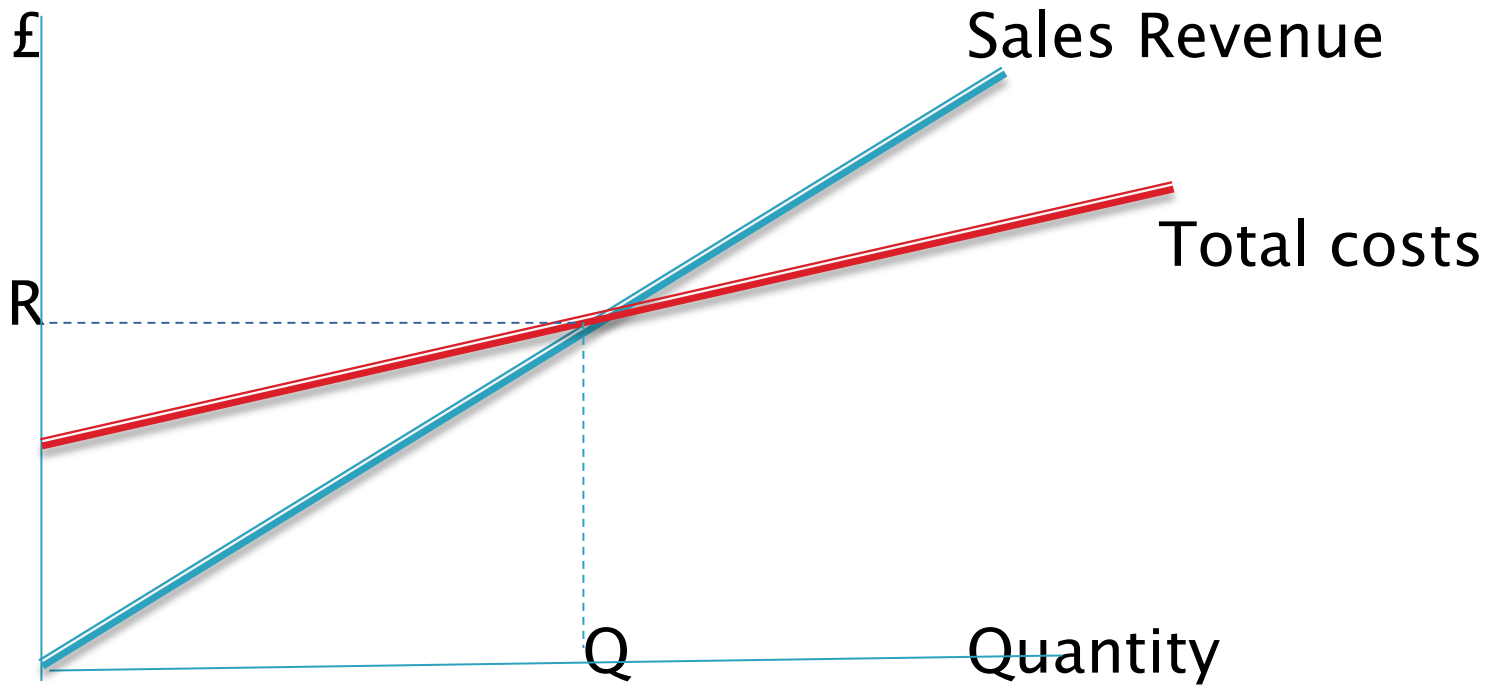
Variable and Fixed Costs

These costs remain constant over wide ranges of activity.

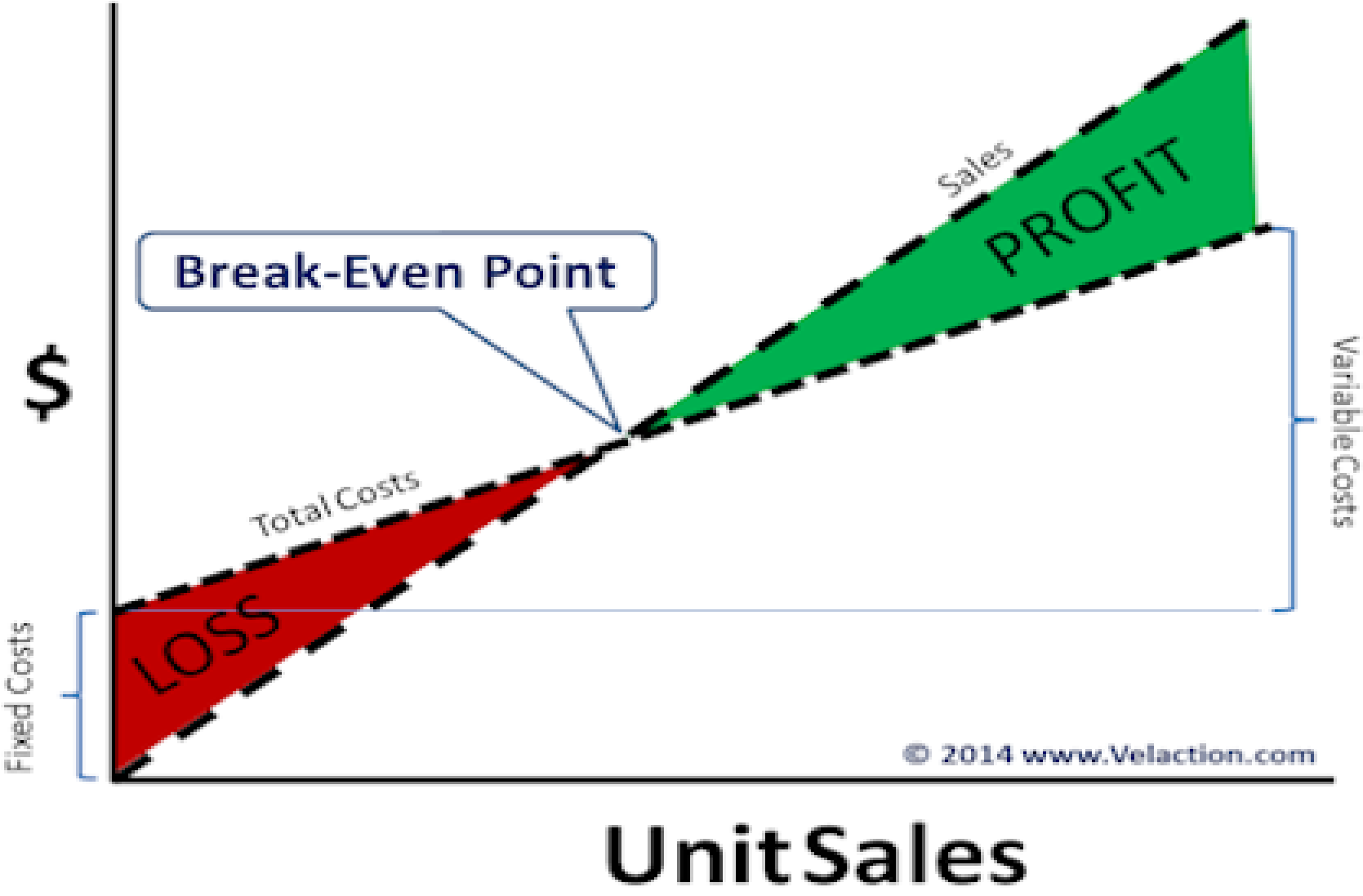


Break-Even Point

Break-even point can be seen on a break-even chart or a cost-volume-profit chart (CVP)



Break-even point



Break-even Point

Sales revenue – variable cost –fixed costs =0

SP x Quantity – VC x Quantity – fixed cost = 0

Quantity (SP –VC) – Fixed cost = 0

Break even point (quantity) = $\frac{\text{Fixed costs}}{\text{Contribution}}$

Break even point

Using the formula the number of units that need to be produced and sold to break-even can be calculated.

Example

A company manufactures and sells digital radios. The selling price is £75, the variable costs are £45 and fixed costs are £60,000

Calculate the break-even point

Break-even Point

$$\text{Break-even point} = \frac{\text{Fixed costs}}{\text{Selling price} - \text{variable cost}}$$

$$\text{Break-even point} = \frac{60{,}000}{£75 - £45}$$

Break-even point= 2,000 radios

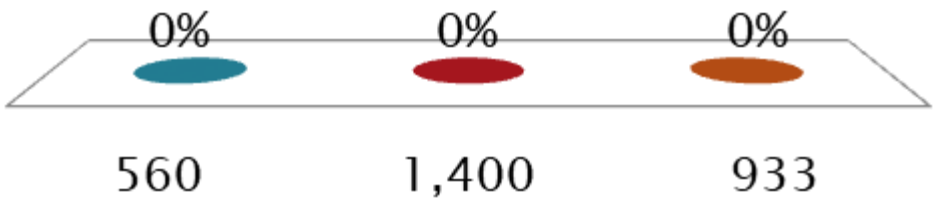
Check

2,000 X £75 – 2,000x £45 – £60,000 = 0

150,000 – 90,000 – 60,000 =0

Calculate the BEP for digital radios if fixed costs could be reduced to £42,000. Sales price £75 and variable cost £45

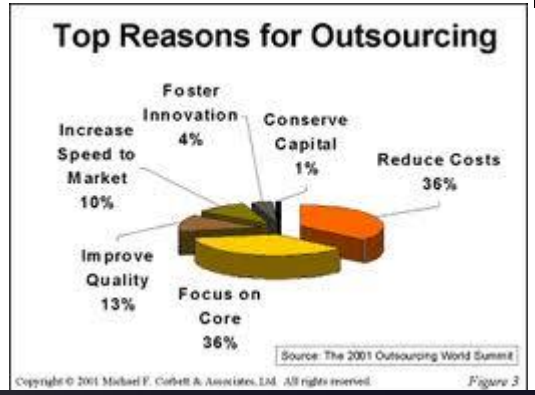
A. 560
B. 1,400
C. 933



Answer

$$\text{BEP} = \frac{42{,}000}{£75 - £45} = 1{,}400 \text{ units}$$

Business Can Reduce Fixed Costs



What If fixed costs are high?

Business with high research and development or initial set up costs will have high fixed costs. To bring down the cost per unit a high sales volume is needed.

Computer games, such as Call of Duty, can cost £35m to produce, the only way to recoup this is to have a high sales volume.

Eurotunnel reached cash break-even in 2003 having opened in 1994 the Chief Executive stating the problem being the tunnel is an "under utilised piece of kit".

Airbus: July 16

Airbus aims to cut production in A380s from 27 in July 2015 to just 12.

The company broke-even when delivering 27 planes and is aiming to break-even at 20 planes by targeting additional cost reduction initiatives.

Target profit

Where a business wishes to make a certain level of profit the break-even formula should be used. The target profit added to the fixed costs figure.

For the company making digital radios calculate the number of units that must be produced if a profit of £48,000 is required.

Sales price £75, Variable costs £45, Fixed costs £60,000.

Break-even Point

Units to achieve target profit

$$\frac{\text{Fixed costs + target profit}}{\text{Sales price – variable cost}}$$

$$\frac{£60{,}000 + £48{,}000}{£75-£45} = \frac{£108{,}000}{£30}$$

3,600 radios

Check

3,600 X £75 -3,600X£45 -£60,000 = £48,000

270,000 – 162,000 -60,000 =48,000

Margin of Safety

The margin of safety is the excess of planned or actual sales above break-even point.

This can be expressed as a percentage of the sales estimate.

Break-even point

Margin of safety

Planned sales	3,600 @£75	£270,000
Break-even point	2,000 @£75	£150,000
Margin of safety	1,600	£120,000

Expressed as a percentage $\frac{1,600}{3,600} = 40\%$

Break-even point

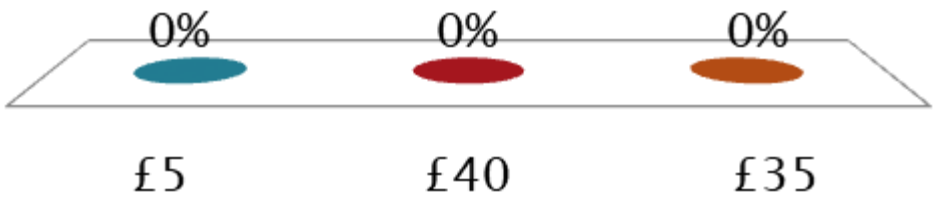
The management are considering buying a new piece of machinery which will reduce variable costs but cause fixed costs to increase by £18,000.

To maintain the current profit of £48,000 what will variable costs have to go down to?

Fixed costs were £60,000, variable costs £45 and sales price £75, sales quantity 3,600 radios.

New variable costs need to be

A. £5
B. £40
C. £35



Answer

Fixed costs 60,000 + 18,000 = £78,000

Fixed cost + desired profit = 78,000+48,000 =126,000

$$3{,}600 \text{ units} = \frac{126{,}000}{75 - x}$$

270,000–3,600x = 126,000
X = £40

Uses of Break-even

Initial Price setting

On starting a business-high level of fixed costs
You may not be able to achieve a high sales volume so do you set price high to start or just at level to cover re-occurring fixed costs.

Business plan

Know the expected sales targets and margin of safety then an indication of business risk

Uses of break-even

Marketing

Can add the cost of marketing to fixed costs to see extra sales quantity need to achieve.

Where looking to offer a discount can look at extra quantity to maintain profits

Limitations of break-even

- Unrealistic assumptions – semi-variable cost
- All units produced are not always sold
- Variable costs change with output (bulk discount)
- Many businesses make more than one product