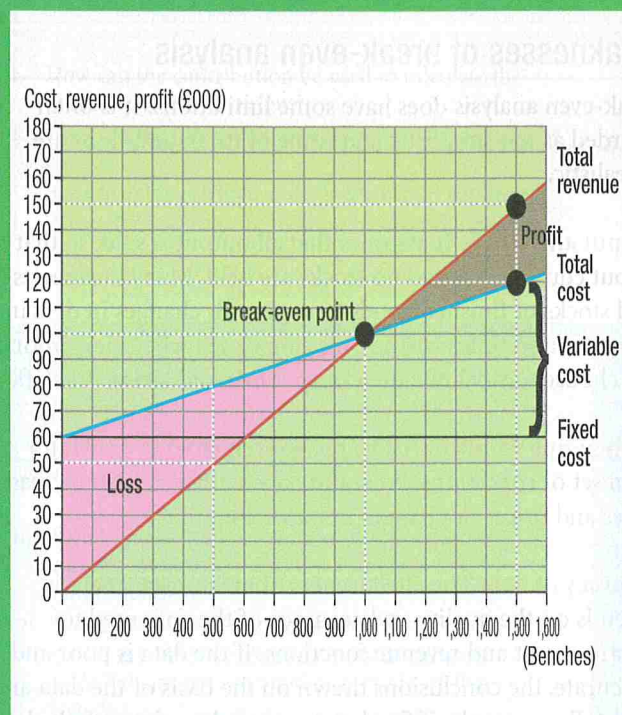


Figure 1: Break-even chart for Jack Cadwallader



## Calculating break-even using break-even charts

The use of graphs is often helpful in break-even analysis. It is possible to identify the break-even point and break-even output by plotting the total cost and total revenue equations on a graph. This graph is called a BREAK-EVEN CHART. Figure 1 shows the break-even chart for Jack Cadwallader's business.

Output is measured on the horizontal axis and revenue, costs and profit are measured on the vertical axis. What does the break-even chart show?

- The value of total cost over a range of output. For example, when Jack produces 1,500 benches total costs are £120,000.
- The value of total revenue over a range of output. For example, when Jack produces 1,500 benches total revenue is £150,000.
- Break-even charts can show the level of fixed costs over a range of output. For example, the fixed costs for Jack's business are £60,000.
- The level of output needed to break-even. The break-even point is where total costs equal total revenue of £100,000. This is when 1,000 benches are produced. So the break-even output is 1,000 benches.
- At levels of output below the break-even output, losses are made. This is because total costs exceed total revenue. At an output of 500 a £30,000 loss is made.
- At levels of output above the break-even output, a profit is made. This profit gets larger as output rises. At an output of 1,500 a profit of £30,000 is made.
- The relationship between fixed costs and variable costs as output rises. At low levels of output fixed costs represent a large proportion of total costs. As output rises, fixed costs become a smaller proportion of total costs.
- The profit at a particular level of output. If Jack produces 1,500 benches, profit is shown by the vertical gap between the total cost and total revenue equations. It is £30,000.

## The margin of safety

What if a business is producing more than the break-even output? It might be useful to know by how much sales could fall before a loss is made. This is called the MARGIN OF SAFETY. It refers to the range of output over which a profit can be made. The margin of safety can be identified on the break-even chart by measuring the distance between the break-even level of output and the current (profitable) level output. For example, Figure 2 shows the break-even chart for Jack Cadwallader. If Jack produces 1,200 benches the margin of safety is 200 benches. This means that output can fall by 200 before a loss is made. If Jack sells 1,200 benches the chart shows that total revenue is £120,000, total cost is £108,000 and profit is £12,000.

Businesses prefer to operate with a large margin of safety. This means that if sales drop they still might make some profit. With a small margin of safety there is a risk that the business is more likely to make losses if sales fall.



### Question 1.

Jun Shan produces Chinese rugs using traditional techniques and sells them online. The rugs are high in quality and made from natural materials. The rugs sell for £105 and variable costs are £65 per rug. Jun Shan's fixed costs are £2,000 pa.

- Calculate how many rugs Jun Shan needs to produce and sell to break-even.
- How much profit will Jun Shan make if 500 rugs are sold during a year?
- How many rugs will Jun Shan need to sell to break-even if the price is increased to £115?