



# Proportion

This page introduces direct proportion and inverse proportion.

Direct proportion is covered in more detail (up to grade A) on page 43.

Inverse proportion is covered in more detail (up to grade A) on page 44.

Two quantities are in **DIRECT PROPORTION** when both quantities increase at the same rate.

Two quantities are in **INVERSE PROPORTION** when one quantity increases at the same rate as the other quantity decreases.

Number of theatre tickets bought      Total cost



Average speed      Time taken



## Worked example

grade D

Rujuta buys 2 cupcakes for a total cost of £3.30  
Work out the cost of 7 of these cupcakes.

$$\text{Cost of 1 cupcake} = \frac{\pounds 3.30}{2} = \pounds 1.65$$

$$\text{Cost of 7 cupcakes} = \pounds 1.65 \times 7 = \pounds 11.55$$

Calculate the cost of 1 cupcake first. Then multiply the cost of 1 cupcake by 7 to work out the cost of 7 cupcakes. Remember to write down the correct units. When working with money, you must give your answer to 2 decimal places.

## Divide or multiply?

6 people can build a wall in 4 days.

How long would it take 8 people to build the same wall?

*Inverse proportion problems often involve time. The more people working on a task, the quicker it will be finished.*

You can solve this problem by working out how long it would take 1 person to build the wall. Use common sense to decide whether to divide or multiply.

$6 \times 4 = 24$  so 1 person could build the wall in 24 days.

*You multiply because it would take 1 person more time to build the wall.*

$24 \div 8 = 3$  so 8 people could build the wall in 3 days.

*You divide because it would take 8 people less time to build the wall.*

## Now try this

If the speed is less, the mass will be bigger.

edexcel

grade D

1. Amy bought 17 footballs for a total cost of £50.83

James bought 11 footballs.

The cost of each football bought by Amy and James was the same.

Work out how much James paid for his 11 footballs. (2 marks)

2. A machine can project balls to help with coaching. The velocity,  $v$  km/h, at which the ball is projected is inversely proportional to the mass,  $m$  grams, of the ball. A ball with a mass of 150 g is projected at a speed of 48 km/h. Work out the mass of a ball projected at 24 km/h. (3 marks)

grade C