

Ratio

Starter

1. **(Review of last lesson)** During a Grand Prix car race, the tyres on a car are reduced in weight by 3%. If they weigh 388 kg at the end of the race, how much did they weight at the start?

Working: $x \xrightarrow[\times 0.97]{-3\%} 388 \Rightarrow x \times 0.97 = 388$

$$x = \frac{388}{0.97} = 400$$

The tyres weighed 400 kg at the start.

2. **(Review of last lesson)** When an iron bar is heated it expands by 0.2%. If the increase in length is 1 cm, what was the original length of the bar?

Working: Let x be the original length of the bar.

$x \xrightarrow[\times 1.002]{+0.2\%} x + 1 \Rightarrow x \times 1.002 = x + 1$

$$0.002x = 1$$

$$x = \frac{1}{0.002} = 500$$

The original length of the bar is 500 cm or 5 m.

Alternatively: 0.2% represents 1 cm i.e. $0.2\% \equiv 1$
 $1\% \equiv \frac{1}{0.2}$
 $100\% \equiv \frac{1}{0.2} \times 100$
 $100\% \equiv 500$

The original length of the bar is 500 cm or 5 m.

3. **(Review of previous material)**
 Simplify these ratios: (a) 16 : 24 : 80 (b) 20 mm : 4 cm

Working: (a) 16 : 24 : 80
Divide each number by 8: 2 : 3 : 10

(b) 20 mm : 4 cm
Convert the values to the same units.
Either both to mm: 20 : 40
...or both cm: 2 : 4
Divide each number by 20 or 2: 1 : 2

4. **(Review of previous material)** Write the ratio 3 : 5 in the form 1 : n .

Working: *Divide each component off the ratio by 3:* $\frac{3}{3} : \frac{5}{3} \Rightarrow 1 : \frac{5}{3}$

E.g. 1 If $\frac{5}{8}$ of the students in a school are girls, what is the ratio of girls to boys? Give your answer in terms of integers.

Working: Fraction of boys = $1 - \frac{5}{8} = \frac{3}{8}$
 Ratio of girls to boys is $\frac{5}{8} : \frac{3}{8}$
Multiply by 8: $5 : 3$
 The ratio of girls to boys is $5 : 3$

E.g. 2 A farmer has sheep and cows. The proportion that are sheep is $\frac{4}{7}$. What is the ratio of sheep to cows?

Working: Fraction of cows = $1 - \frac{4}{7} = \frac{3}{7}$
 Ratio of sheep to cows is $\frac{4}{7} : \frac{3}{7}$
Multiply by 7: $4 : 3$
 The ratio of sheep to cows is $4 : 3$

E.g. 3 A wood has oak and beech trees in the ratio $2 : 9$. If there are 42 oak trees, how many of the trees are beech?

Working: $\frac{2}{11}$ of the trees are oak and $\frac{9}{11}$ are beech.
 Since there are 42 oak trees: $\frac{2}{11} \equiv 42$
Divide by 2: $\frac{11}{1} \equiv \frac{42}{2}$
 $\frac{9}{11}$ are beech so multiply by 9: $\frac{11}{9} \equiv \frac{42}{2} \times 9$
 $\frac{11}{9} \equiv 189$
 There are 189 beech trees.

E.g. 4 Max and Sid split their savings in the ratio $7 : 6$. Sid gets £51. How much do they have in total?

Working: Max has $\frac{7}{13}$ and Sid has $\frac{6}{13}$
 Since Sid has £51: $\frac{6}{13} \equiv 51$
Divide by 6: $\frac{13}{1} \equiv \frac{51}{6}$
 Max has $\frac{7}{13}$ so multiply by 7: $\frac{13}{7} \equiv \frac{51}{6} \times 7$
 $\frac{13}{7} \equiv 59.50$
 In total they have $\pounds 59.50 + \pounds 51 = \pounds 110.50$.

E.g. 5 I share some sultanas between Alice and Barbara in the ratio 3 : 5. Alice gets 28 g fewer sultanas than Barbara. How many grams of sultanas does Barbara get?

Working: The ratio is 3 : 5 so Alice could get $3x$ and Barbara could get $5x$.
Since Barbara has 28 g more than Alice: $5x - 3x = 28$
 $2x = 28$
 $x = 14$

Barbara gets $5x = 5 \times 14 = 70$ g of sultanas

Alternatively:

Alice gets 3 parts and Barbara gets 5 parts

So Barbara gets 2 parts more than Alice i.e. 2 parts \equiv 28 g

1 part \equiv 14 g

Barbara gets 5 parts $= 5 \times 14 = 70$ g of sultanas

E.g. 6 If $x : 3$ and $12 : x$ are equivalent ratios, calculate the positive value of x .

Working: $x : 3 \equiv 12 : x \quad \Rightarrow \quad \frac{x}{12} = \frac{3}{x}$
Cross-multiply: $x^2 = 3 \times 12$
 $x^2 = 36$
 $x = \sqrt{36} = 6$

Video: [GCSE Ratio](#)

[Solutions to Starter and E.g.s](#)

Exercise

9-1 class textbook: p37 M2.5 Qu 1ace..., 3, 4, 6, 9, 10, 12, 15-17
A*-G class textbook: p37 M2.5 Qu 1-5, 9-13
9-1 homework book: p11 M2.5 Qu 1, 3, 5-8
A*-G homework book: p8 M2.5 Qu 1-3ab, 6, 8