

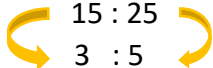
Ratios and Rates Summary

Types of questions

Simplify

Method: Do the same to both sides

Example 1. Simplify the following ratios:

(a) $\div 5$  $\div 5$ Divide both sides by 5

(b) $4500 : 150$ Divide both sides by 10
 $= 450 : 15$ Divide both sides by 15
 $= 30 : 1$

(c) $7\text{m} : 140\text{cm}$ Convert to the same units $1\text{m} = 100\text{cm}$
 $= 700\text{cm} : 140\text{cm}$ The units are the same so drop them. Divide by 10 both.
 $= 70 : 14$ Divide both sides by 7
 $= 10 : 2$ Divide both sides by 2
 $= 5 : 1$

(d) $2.4 : 4.8$ Multiply both sides by 10 (Can't mix decimals and ratios)
 $= 24 : 48$ Divide both sides by 24
 $= 1 : 2$

Find the missing number

(You know the ratio and you know one side, find the other side.)

Example 2. There are red apples and green apples in a bag. The ratio of red to green is $2 : 3$. If there are 12 red apples how many green apples are there?

R : G

2 : 3

On the left side 2 parts = 12, so 1 part = 6 .

12 : ?

Now on the right we want 3 parts = $3 \times 6 = 18$.

12 : 18

So there are 18 green apples.



Alternative method

$$2 : 3 = 12 : x$$

Inners = outers

$$3 \times 12 = 2 \times x$$

$$36 = 2 \times x$$

$$x = 36 \div 2 = 18$$

So there are 18 green apples.

Split an amount in the following ratio

Example 3. Split the \$600 Lotto winning between Fred and Harry in the ratio 5:3

$5 + 3 = 8$ You need to split the money into 8 parts.

8 parts = \$600

1 part = $600 \div 8 = \$75$

5 parts = $5 \times 75 = \$375$ (Fred's share)

3 parts = $3 \times 75 = \$225$ (Harry's share)

OR

Fred : Harry

5 : 3

$5+3 = 8$ and $600 \div 8 = 75$

$5 \times 75 : 3 \times 75$

$\$375 : \225

Fred gets \$375 and Harry gets \$225.

Rates

Rates are like ratios except that they include units as they are different on each side.

E.g. 40km/hr, or 250mg/5mL or \$25/kg.

Simplify (make the right hand side equal to 1)

Example 4. $250\text{mg}/5\text{mL}$ Just divide 250 by 5 $250 \div 5 = 50$
 $= 50\text{mg}/\text{mL}$



Converting units

Example 5. Convert 90km/hr to m/sec.

$$\begin{array}{ll} 90\text{km} / 1 \text{ hr} & \text{Make the 1 visible on the right hand side.} \\ 90 \times 1000 \text{ m} / 1 \text{ hour} & \text{Convert km to metres (1000m = 1km)} \\ 90000\text{m} / 3600\text{sec} & \text{Convert hr to sec (60 x 60 = 3600)} \\ \frac{90000}{3600} = 25 \text{ m/sec} & \text{Divide by 3600} \end{array}$$

When changing to smaller units, change the units first, then make the right hand side equal to one.

Example 6. Convert 30m/sec to km/hr

$$\begin{array}{ll} 30\text{m} / 1\text{sec} & \times 60 \text{ both sides to see how far you go in 60sec (= 1 min)} \\ 30\text{m} \times 60 / 60 \text{ sec} & \\ 1800\text{m} / 60\text{sec (=1min)} & \times 60 \text{ both sides to see how far you go in 60 min (= 1 hr)} \\ 1800\text{m} \times 60 / 3600\text{sec (= 60 min)} & \\ 108000\text{m} / 1 \text{ hr} & \text{Now divide left hand side by 1000 to change m to km} \\ 108\text{km/hr} & \end{array}$$

When changing to larger units multiply both sides to get up the correct amount on the right hand side, then change units.

Legal moves for ratios and rates

- Multiply both sides by the same number
- Divide both sides by the same number
- Change units on one side