Ratio and Proportion

After completing this unit, you will be able to:

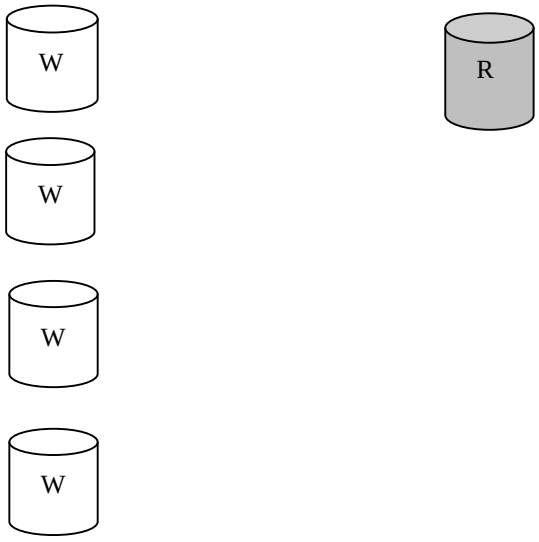
- **Write proportions as a ratio.**
- **Write ratios in their simplest form**
- **Write ratios in common units.**
- **Divide amounts in given ratios.**

Writing proportions as a ratio

When we want to compare the sizes of two numbers we can show them as a ratio. To do this we write the two numbers alongside each other with a colon between.

For example:-

To make Wild Pink paint, 4 tins of White paint are mixed with one tin of Red.



This is written as being in the ratio **4 : 1**

Working out equivalent ratios

To make double this amount of pink paint you would need 8 white tins to 2 red tins.

This would give a ratio of **8 : 2**

These two ratios are called **equivalent ratios**.

You can multiply or divide both parts of a ratio by any number to give an equivalent ratio. Both 8 and 2 can be divided by 2 , so 8:2 is the same as 4:1

Simplifying ratios

e.g. Natasha and Rachel share a flat but because Natasha has a larger room they agree to share the rent in the ratio **60 : 40**. This can be simplified as follows:-

Divide both sides by 10 to get **6 : 4**

Divide both sides by 2 to get **3 : 2**

There are no further common factors of the two sides so this is the simplest form of the ratio.

Self Assessment One - Writing ratios in their simplest form

Write each ratio in its simplest form

1)	6 : 2	7)	75 : 25
2)	18 : 24	8)	42 : 63
3)	80 : 20	9)	4 : 8 : 6
4)	12 : 48	10)	30 : 90 : 120
5)	12 : 25	11)	14 : 28 : 35
6)	14 : 63	12)	21 : 63 : 105

13) The label for a bottle of floor cleaning liquid says that one unit of fluid needs to be mixed with 20 units of water.

a) How much water is mixed with 5 units of cleaning fluid ?

b) How much cleaning liquid is mixed with 180 units of water ?

Converting to similar units

It is important to remember that when amounts are given in different units they must first be converted into a common unit before they can be expressed as a ratio.

They can then be put into the simplest form.

E.G Two TV programmes last 45 minutes and 2 hours.
Express the times of the two programmes as a ratio.

The times are	45 minutes	:	2 Hours
Convert both times into minutes	45 minutes	:	120 minutes
This is now a ratio of	45	:	120
Divide both by 15	**3**	**:**	**8**

This is the ratio in its simplest form.

Self Assessment Two - Writing ratios in common units

Write each ratio in a common unit and then put it into its simplest form.

1) 20 minutes : 3 hours

2) 20mm : 3cm

3) 3kg : 850g

4) £3 : 60p

5) 250 ml : 1.75 litres

6) 2500m : 5km

7) An Orange drink is mixed in the ratio of 25 ml of orange cordial to 1 litre of water.

   a) How much of this cordial would you mix with 4 litres of water?

   b) What is the correct mixing ratio of cordial to water? Write this ratio in its simplest form.

Dividing amounts in given ratios

e.g. Natasha and Rachel share a flat and agree to share the rent in the ratio 3:2
If the cost of the rent is £80 per week, how much does each pay?

First decide how many parts the cost must be split into:-

Natasha pays	**3**	parts
Rachel pays	**2**	parts
Total	= **5**	parts

Natasha *Rachel*

Then divide the total cost into this many units and work out the value of each equal unit:-

Split the total cost into 5 parts = $\frac{£40}{5}$ = £8

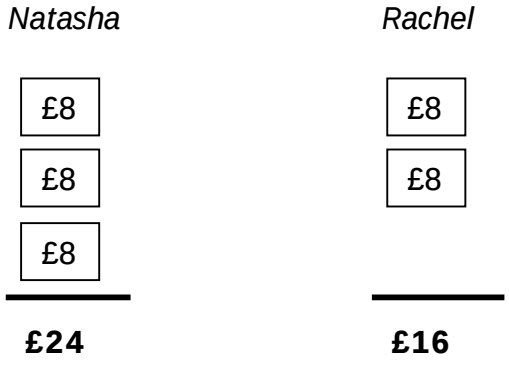
ie Each part is worth £8

Natasha *Rachel*

Then work out how much each person pays:-

Natasha pays for 3 parts, so she pays 3 x £8 = £24
Rachel pays for 2 parts, so she pays 2 x £8 = £16

Finally check by adding the two amounts together. The total cost = £24 + £16 = £40



So, finally, Natasha pays £24 and Rachel pays £16.

Self Assessment Three - Dividing amounts in given ratios

1) Share £400 in the ratio 3 : 2

2) Share £490 in the ratio 2 : 5

3) Share £84 in the ratio 7 : 3 : 2

4) Share £4500 in the ratio 4 : 5

5) Share £2880 in the ratio 2 : 2 ; 4

6) Share £2124 in the ratio 3 : 4 : 2

Self Assessment Four - Dividing amounts in given ratios. Harder questions

1) Peter and Marie share a flat.

   a) The rent is £84 per week and they pay it in the ratio 4 : 3
   How much does each of them pay?

   b) The phone bill is £86.20 and they pay it in the ratio 2 : 3
   How much does each of them pay?

2) Mortar for laying bricks is made with sand and cement in the ratio 7 : 3

   a) How much mortar can be made with 210 kg of sand?

   b) How many grams of each material are needed to make 2½ kg of cement?

3) Carlos and Saima start a business. Each month Carlos and Saima share profits in the ratio 5 :7

   a) In May the profit is £480.
   How much does each get?

   b) In June Carlos gets £255.
   Work out the total profit.

   c) In July Carlos gets £84 less than Saima.How much does each receive?

4) On a packet of weedkiller the instructions tell you to mix 50 grams of powder with 3.5 litres of water. (1 litre of water weighs 1000 g (1 kg))

   What is the ratio of the weights of powder and water to make a correct mixture ?

   a) 50 : 35

   b) 5 : 35

   c) 1 : 70

   d) 1 : 7

Answers

Self Assessment One - Writing ratios in their simplest form

1)	3 : 1	7)	3 : 1
2)	3 : 4	8)	2 : 3
3)	4 : 1	9)	2 : 4 : 3
4)	1 : 4	10)	1 : 3 : 4
5)	12 : 25	11)	2 : 4 : 5
6)	2 : 9	12)	1 : 3 : 5

13) a) 100 units 9 units

Self Assessment Two - Writing ratios in common units

1)	1 : 9	4)	5 : 1
2)	2 : 3	5)	1 : 7
3)	60 : 17	6)	1 : 2

7) a) 100 ml b) 1 : 40

Self Assessment Three - Dividing amounts in given ratios

1)	£240 : £160	4)	£2000 : £2500
2)	£140 : £350	5)	£720 : £720 : £1440
3)	£49 : £21 : £14	6)	£708 : £944 : £472

Self Assessment Four - Dividing amounts in given ratios. Harder questions

1. a) Peter £48. Marie £36.
   b) Peter £34.48 Marie £51.72

2. a) 300 kg
   b) 1750 g of Sand. 750 g of Cement.

3. a) Carlos £200 Saima £280
   b) £612
   c) Carlos £210 Saima £294

4. c) 1 : 70