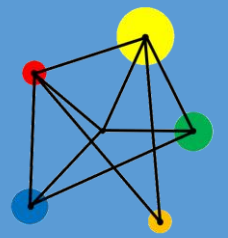
# Ratio



Share quantities in a given ratio

Simplify ratios.

Express a ratio in the form 1 : n and n : 1

# Vocabulary

**Ratio**

A ratio shows the relative sizes of two or more values.

# Warm up

Share £120 equally between:

a) 2 people

b) 3 people

c) 4 people

d) 10 people

e) 15 people

f) 16 people

**Challenge**

Write down all of the factors of 120?

# Solutions

Share £120 equally between:

a) 2 people

**£60**

b) 3 people

**£40**

c) 4 people

**£30**

d) 10 people

**£12**

e) 15 people

**£8**

f) 16 people

**£7.50**

**Challenge**

Write down all of the factors of 120?

**1 , 2 , 3 , 4 , 5 , 6 , 8 , 10 , 12 , 15 , 20 , 24 , 30 , 40 , 60 , 120**

# Key Fact

There are times when we do not want to share a quantity equally.

In these situations, we share the quantity in a **ratio**.

# Example

Alya and Beatrice buy 16 plants for £8

Alya pays £3 and Beatrice pays £5.

How many plants should each of them get?

# Solution

Alya paid $\frac{3}{8}$ of the money.

Beatrice paid $\frac{5}{8}$ of the money.

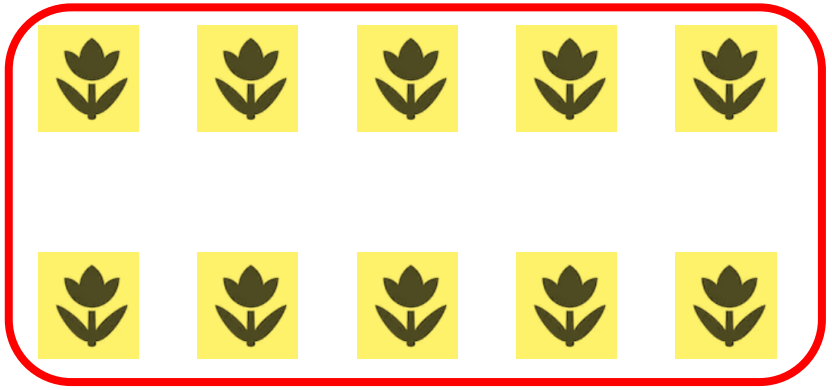
$\frac{1}{8}$ of 16 plants = 16 ÷ 8 = 2 plants

$\frac{3}{8}$ of 16 plants = 2 x 3 = 6 plants

$\frac{5}{8}$ of 16 plants = 2 x 5 = 10 plants

Alya

Beatrice



Alya should get 6 plants.

Beatrice should get 10 plants.

# Example

Share £180 between Ali, Bella and Carl in the ratio  2 : 3 : 4.

# Solution

Share £180 between Ali, Bella and Carl in the ratio 2 : 3 : 4.

Total shares
= 2 + 3 + 4 = 9

180 ÷ 9 = £20

Ali receives £20 x 2 = £40

Bella receives £20 x 3 = £60

Carl receives £20 x 4 = £80

# Exercise

1. Share 12 in the ratio 2 : 1
2. Share 16 in the ratio 1 : 3
3. Share 25 in the ratio 2 : 3
4. Share 72 in the ratio 8 : 1
5. Share 36 in the ratio 2 : 1 : 3
6. Share 80 in the ratio 1 : 2 : 3 : 4

1. Share 32 in the ratio 5 : 2 : 1
2. Share £2 in the ratio 1:7
3. Share 0.6 in the ratio 1 : 3
4. Share 1 in the ratio 5 : 3

1. Share 360 in the ratio 5 : 4 : 3 : 2 : 1
2. Share $\frac{1}{2}$ in the ratio 2 : 1

**Challenge**

When £150 is shared in the ratio a : b , the larger share is £66 greater than the smaller share.

Work out a and b?

# Solutions

1. Share 12 in the ratio 2 : 1 **8 : 4**
2. Share 16 in the ratio 1 : 3 **4 : 12**
3. Share 25 in the ratio 2 : 3 **10 : 15**
4. Share 72 in the ratio 8 : 1 **64 : 8**
5. Share 36 in the ratio 2 : 1 : 3 **12 : 6 : 18**
6. Share 80 in the ratio 1 : 2 : 3 : 4 **8 : 16 : 24 : 32**

1. Share 32 in the ratio 5 : 2 : 1 **20 : 8 : 4**
2. Share £2 in the ratio 1:7 **25p : £1.75**
3. Share 0.6 in the ratio 1 : 3 **0.15 : 0.45**
4. Share 1 in the ratio 5 : 3 **0.625 : 0.375**

1. Share 360 in the ratio 5 : 4 : 3 : 2 : 1
   **120 : 96 : 72 : 48 : 24**
2. Share $\frac{1}{2}$ in the ratio 2 : 1
   $\frac{1}{3} : \frac{1}{6}$

**Challenge**

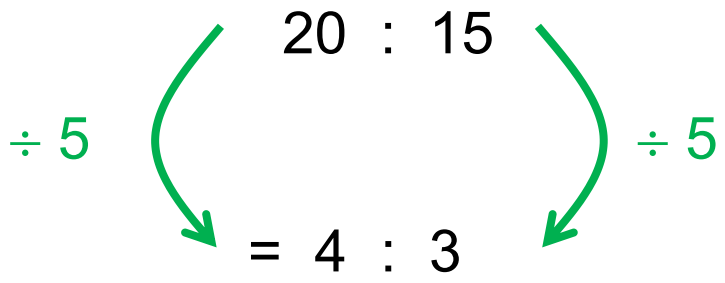
When £150 is shared in the ratio a : b , the larger share is £66 greater than the smaller share.

**18 and 7**

Work out a and b?

# Key Fact

Ratios can be simplified in a similar way to fractions.



# Examples

Simplify the ratios as far as possible

a) 12 : 16

b) 24 : 36 : 84

# Solutions

Simplify the ratios as far as possible

a) 12 : 16

= 6 : 8

= **3 : 4**

b) 24 : 36 : 84

= 12 : 18 : 42

= 6 : 9 : 21

= **2 : 3 : 7**

# Exercise

Simplify each ratio as far as possible.

a) 6 : 10

b) 8 : 10

c) 12 : 18

d) 60 : 45

e) 48 : 60

f) 35 : 63 : 14

Simplify each ratio as far as possible.

a) 84 : 48

b) 132 : 33

c) 65 : 91

d) 243 : 81

e) 256 : 512

f) 34 : 85 : 51

Simplify each ratio as far as possible.

a) 40 320 : 5040

b) $2^{15} : 2^{14}$

# Solutions

Simplify each ratio as far as possible.

a) 6 : 10 **= 3 : 5**

b) 8 : 10 **= 4 : 5**

c) 12 : 18 **= 2 : 3**

d) 60 : 45 **= 4 : 3**

e) 48 : 60 **= 4 : 5**

f) 35 : 63 : 14 **= 5 : 9 : 2**

Simplify each ratio as far as possible.

a) 84 : 48 **= 7 : 4**

b) 132 : 33 **= 11 : 3**

c) 65 : 91 **= 5 : 7**

d) 243 : 81 **= 3 : 1**

e) 256 : 512 **= 1 : 2**

f) 34 : 85 : 51 **= 2 : 5 : 3**

Simplify each ratio as far as possible.

a) 40 320 : 5040 **= 8 : 1**

b) $2^{15} : 2^{14}$ **= 2 : 1**

# Key Fact

A ratio can be written in many different ways.

40 : 30

2 : 5

20 : 15

8 : 6

4 : 3

1 : 2.5

All of the above ratios are equivalent.

# Examples

Express these ratios in the form 1 : n

a) 2 : 5

b) 9 : 4

# Solutions

Express these ratios in the form 1 : n

a) $2 : 5$

$\div 2$ $\quad$ $\div 2$

$1 : 2.5$

b) $9 : 4$

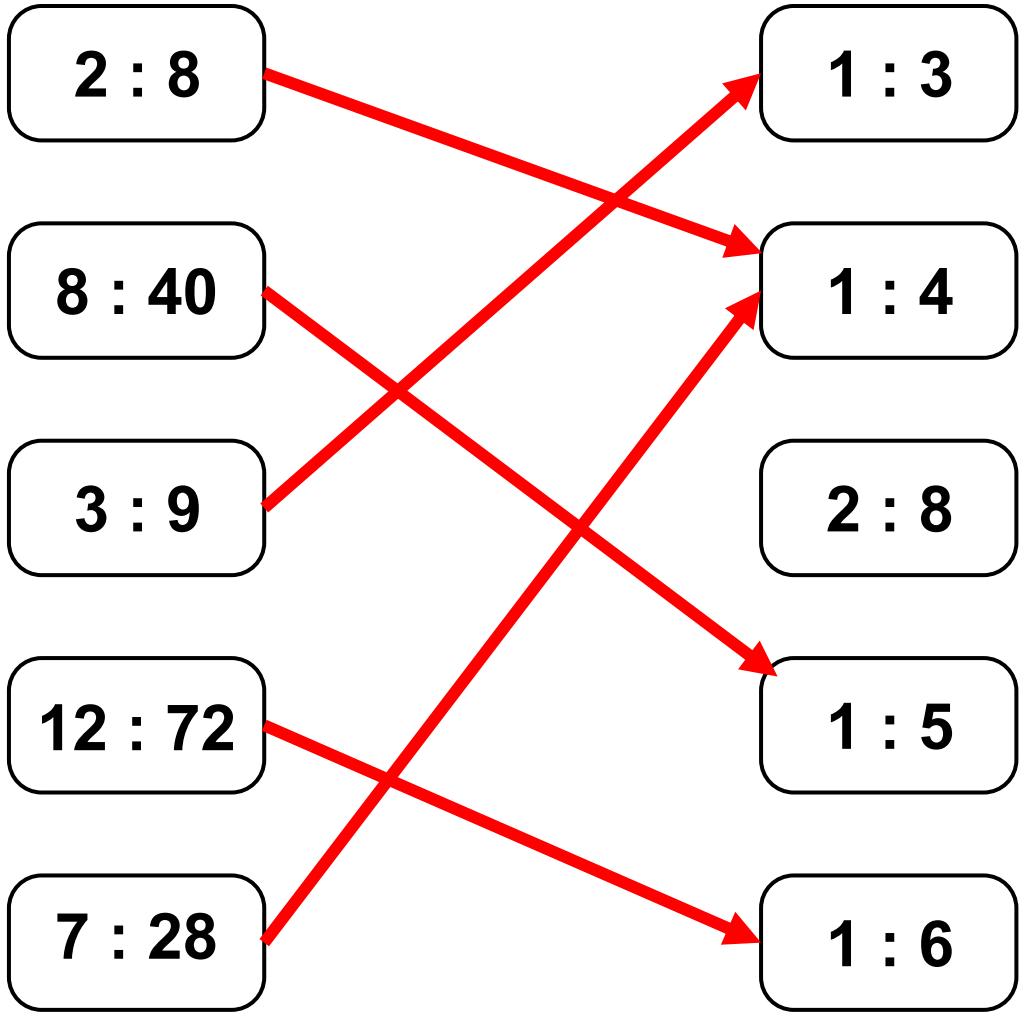
$\div 9$ $\quad$ $\div 9$

$1 : \frac{4}{9}$

Express each ratio on the left with an equivalent ratio in the form 1 : n

| | |
|---|---|
| **2 : 8** | **1 : 3** |
| **8 : 40** | **1 : 4** |
| **3 : 9** | **2 : 8** |
| **12 : 72** | **1 : 5** |
| **7 : 28** | **1 : 6** |

Express each ratio on the left with an equivalent ratio in the form 1 : n



# Exercise

Write each ratio in the form 1 : n.

a) 2 : 10

b) 4 : 12

c) 11 : 22

d) 4 : 40

e) 9 : 81

f) 9 : 63

Write each ratio in the form 1 : n.

a) 24 : 72

b) 26 : 104

c) 2 : 3

d) 4 : 5

e) 5 : 2

f) 9 : 1

Write this ratio in the form 1 : n.

x : y

# Solutions

Write each ratio in the form 1 : n.

a) 2 : 10 = **1 : 5**

b) 4 : 12 = **1 : 3**

c) 11 : 22 = **1 : 2**

d) 4 : 40 = **1 : 10**

e) 9 : 81 = **1 : 9**

f) 9 : 63 = **1 : 7**

Write each ratio in the form 1 : n.

a) 24 : 72 = **1 : 3**

b) 26 : 104 = **1 : 4**

c) 2 : 3 = **1 : 1.5**

d) 4 : 5 = **1 : 1.25**

e) 5 : 2 = **1 : 0.4**

f) 9 : 1 = **1 : $\frac{1}{9}$**

Write this ratio in the form 1 : n.

x : y = **1 : $\frac{y}{x}$**

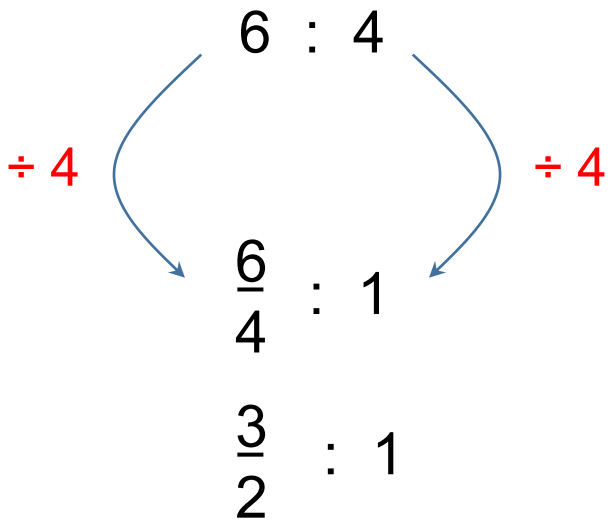
# Examples

Write this ratio in the form n : 1

6 : 4

# Examples

Write this ratio in the form n : 1



# Exercise

Write each ratio in the form n : 1.

a) 6 : 3

b) 20 : 5

c) 36 : 12

d) 7 : 2

e) 5 : 2

f) 11 : 4

Write each ratio in the form n : 1.

a) 1 : 2

b) 2 : 3

c) 13 : 17

d) $\frac{1}{2} : \frac{1}{4}$

e) $\frac{2}{3} : \frac{3}{5}$

Write this ratio in the form n : 1.

$x : x^2$

# Solutions

Write each ratio in the form n : 1.

a) $6 : 3 = 2 : 1$

b) $20 : 5 = 4 : 1$

c) $36 : 12 = 3 : 1$

d) $7 : 2 = \frac{7}{2} : 1$

e) $5 : 2 = \frac{5}{2} : 1$

f) $11 : 4 = \frac{11}{4} : 1$

Write each ratio in the form n : 1.

a) $1 : 2 = \frac{1}{2} : 1$

b) $2 : 3 = \frac{2}{3} : 1$

c) $13 : 17 = \frac{13}{17} : 1$

d) $\frac{1}{2} : \frac{1}{4} = 2 : 1$

e) $\frac{2}{3} : \frac{3}{5} = \frac{10}{9} : 1$

Write this ratio in the form n : 1.

$x : x^2$

$= \frac{1}{x} : 1$

# Word Questions

Isabella mixes blue paint and yellow paint in the ratio  2 : 3.

She uses six tins of blue paint.

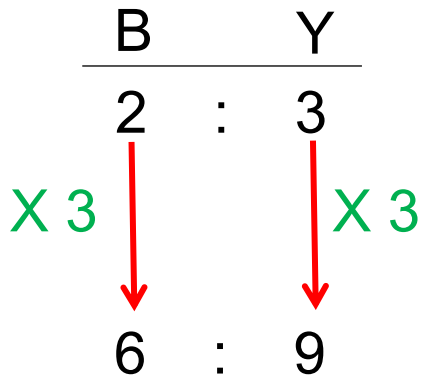
Work out the total number of tins of paint Isabella uses.

# Solution

Isabella mixes blue paint and yellow paint in the ratio 2 : 3.

She uses six tins of blue paint.

Work out the total number of tins of paint Isabella uses.




Isabella uses 15 tins of paint.

# Exercise

1. Felix and Sienna share £50 in the ratio 2 : 3.
   How much more money does Felix get?

   _____

2. Lois and Freya share some money in the ratio 5 : 7.
   Freya gets £24 more than Lois.
   Work out how much money each of them get.

   _____

3. Harry is making concrete by mixing 3 parts sand with 1 part cement.
   He wants to make 20kg of concrete.
   He has 13kg of sand and 2kg of cement.
   How much more sand and cement will he need?

4. Aiden and Rhys share some money in the ratio 3 : 1.
   Aiden then gives £1 to Rhys.
   The ratio of Aiden's money to Rhys' money is now 5 : 2.
   How much do they each now have?

   _____

5. The ratio of width to length in a rectangle is 3 : 4
   The perimeter of the triangle is 84cm.
   Find the area of the rectangle.

   _____

6. Abi has £10 and Beth has no money.
   Each week from now, Abi saves £4 and Beth saves £5.
   In how many weeks will Abi and Beth have savings in the ratio 6 : 5 ?

# Solutions

1. Felix and Sienna share £50 in the ratio 2 : 3.
   How much more money does Felix get?

   **£10 more**

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2. Lois and Freya share some money in the ratio 5 : 7.
   Freya gets £24 more than Lois.
   Work out how much money each of them get.

   **£60 and £84**

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3. Harry is making concrete by mixing 3 parts sand with 1 part cement.
   He wants to make 20kg of concrete.
   He has 13kg of sand and 2kg of cement.
   How much more sand and cement will he need?

   **2kg sand and**
   **3kg concrete.**

4. Aiden and Rhys share some money in the ratio 3 : 1.
   Aiden then gives £1 to Rhys.
   The ratio of Aiden's money to Rhys' money is now 5 : 2.
   How much do they each now have? **£20 & £8**

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5. The ratio of width to length in a rectangle is 3 : 4
   The perimeter of the triangle is 84cm.
   Find the area of the rectangle. **$432cm^2$**

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6. Abi has £10 and Beth has no money.
   Each week from now, Abi saves £4 and Beth saves £5.
   In how many weeks will Abi and Beth have savings in the ratio 6 : 5 ?

   **5 weeks**

# Extension

In a group of children, the ratio of boys to girls is 4 : 3.

If 14 girls join the group, then the ratio of boys to girls will be 3 : 4.

How many children were in the group at the start?.

# Solution

In a group of children, the ratio of boys to girls is 4 : 3.

If 14 girls join the group, then the ratio of boys to girls will be 3 : 4.

How many children were in the group at the start?.

**42 children**

# Exam Style Question

Red paint costs £4.40 per litre.

White paint costs £3.60 per litre.

Red paint and white paint are mixed in the ratio 5 : 3.

Work out the cost of 20 litres of the mixture.

# Solution

Red paint costs £4.40 per litre.

White paint costs £3.60 per litre.

Red paint and white paint are mixed in the ratio 5 : 3.

Work out the cost of 20 litres of the mixture.

*5 litres of red paint costs £22*

*3 litres of white paint costs £10.80*

*8 litres of the mixture costs £32.80*

*1 litre of the mixture costs £4.10*

*20 litres of the mixture costs £82*