

WALT - Use ratios in a real-life situation

Success Criteria: I know that

- the ratio is the comparison of like quantities.
- Order is important in ratios
- Each part of the ratio can be expressed as the fraction of the whole
- Terms must be expressed in the same unit

1 Express each of the following as a ratio.

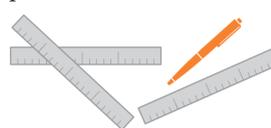
a circles to triangles



b stars to moons



c pens to rulers



2 David has \$4 and Carla has \$7. Find these ratios.

- a David's money to Carla's money
b Carla's money to David's money

3 'My pocket money is three times your pocket money', says Gerard to Alison. What is the ratio of:

- a i Gerard's pocket money to Alison's?
ii Alison's pocket money to Gerard's?
b Do we know how much pocket money each person receives?

4 Peter can cycle twice as fast as Amy. Find these ratios.

- a i Amy's cycling speed to Peter's speed
ii Peter's cycling speed to Amy's speed
b Do we know the cycling speed of each person?



- 5 a Are the ratios 1 : 8 and 8 : 1 equal? Give a reason for your answer.
b If $a : b = b : a$, what can be said about a and b ?

EXAMPLE 1

A recipe for children's playdough lists 4 cups of flour, 2 cups of water and 1 cup of salt.

- a What is the ratio of flour to water?
b What is the ratio of water to the total number of cups required?
c What fraction of the dough mixture is salt?

Flour : water : salt
4 cups : 2 cups : 1 cup
Total is $4 + 2 + 1 = 7$ cups

- a Ratio of flour to water is $4 : 2 = 2 : 1$.
b Ratio of water to total cups is $2 : 7$.
c Fraction of salt is 1 cup out of 7 cups or $\frac{1}{7}$.



It's a good idea to summarise the given information. !

- 6 The ratio of sand to cement in a mortar mix is 5 : 2.
- What fraction of the mortar mix is sand?
 - What fraction of the mortar mix is cement?
- 7 Feather blue is a pale blue paint made by mixing 1 part blue to 8 parts of white paint.
- What is the ratio of blue to white paint?
 - What is the ratio of white to blue paint?
 - What fraction of feather blue is blue paint?
 - What fraction of feather blue is white paint?
 - Alf mixed the blue and white paints in the ratio 8 : 1. Describe the result.
- 8 In a class of 30 students, $\frac{3}{5}$ of the students are boys.
- What fraction of the class is girls?
 - What is the ratio of boys to girls?
 - What is the ratio of girls to boys?
 - Do we know how many students are boys? If so, how many?
 - Do we know how many students are girls? If so, how many?

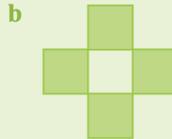


- 9 A box of jellybeans contains 4 blue, 5 orange, 6 red, 3 purple and 2 green jellybeans.
- What fraction of the jellybeans are blue?
 - Which colour is the least common?
 - Which colour is the most common?
 - What fraction of the jellybeans are purple?
 - What is the ratio of orange jellybeans to the total number of jellybeans in the box?

EXAMPLE 2

For each of the following diagrams find the:

- ratio of shaded area to unshaded area
- ratio of shaded area to the total area
- fraction of the total area that is shaded.



a i shaded : unshaded = 1 : 3

ii shaded : total = 1 : 4

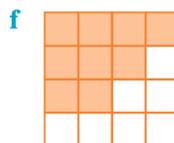
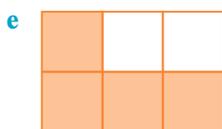
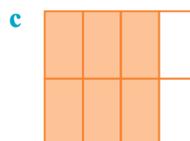
iii Fraction of total area shaded is $\frac{1}{4}$.

b i shaded : unshaded = 4 : 1

ii shaded : total = 4 : 5

iii Fraction of total area shaded is $\frac{4}{5}$.

- 10** For each of the following diagrams find the:
- ratio of shaded area to unshaded area
 - ratio of shaded area to the total area
 - fraction of the total area that is shaded.



EXAMPLE 3

For each ratio, express the first part as a fraction of the whole.

a 4 : 5

b 1 : 9

c 7 : 2

a The ratio 4 : 5 has 9 parts in total. The fraction is $\frac{4}{9}$.

b The ratio 1 : 9 has 10 parts in total. The fraction is $\frac{1}{10}$.

c The ratio 7 : 2 has 9 parts in total. The fraction is $\frac{7}{9}$.

When converting a ratio to a fraction, first find the total number of parts by adding the numbers in the ratio, then put the part you want as a fraction over the total.



- 11** Each ratio shows the number of cats to dogs in a pet shop. For each ratio, express the number of cats as a fraction of the total number of animals.

a 2 : 3

b 4 : 3

c 5 : 4

d 6 : 1

e 8 : 5

f 5 : 7

g 11 : 3

h 2 : 5

EXAMPLE 4

Each fraction shows the first part of a ratio as a fraction of the whole. Find the ratio.

a $\frac{2}{3}$

b $\frac{1}{4}$

c $\frac{3}{8}$

a For $\frac{2}{3}$, the first part of the ratio is 2.
The second part of the ratio is $3 - 2 = 1$.
The ratio is 2 : 1.

b For $\frac{1}{4}$, the first part of the ratio is 1.
This leaves 3 parts out of a total of 4 parts. The ratio is 1 : 3.

c For $\frac{3}{8}$, the first part of the ratio is 3.
This leaves 5 parts out of the total of 8 parts. The ratio is 3 : 5.

The denominator of a fraction is the total number of parts. When converting to a ratio, the numerator of the fraction is the first number and the remaining parts are the second number.



- 12** Each fraction shows the first part of a ratio as a fraction of the whole. Find the ratio.

a $\frac{3}{4}$

b $\frac{1}{5}$

c $\frac{3}{5}$

d $\frac{5}{7}$

e $\frac{4}{5}$

f $\frac{2}{9}$

g $\frac{6}{7}$

h $\frac{5}{9}$

- 13** Flour, water and salt is mixed in the ratio of 4 : 2 : 1 to form playdough.

a What fraction of the playdough is water?

b What fraction of the playdough is salt?

EXAMPLE 5

Express each of the following as a ratio.

- a** 7 cm to 3 m **b** 73 mL to 2 L **c** 3 h to 17 min

- a** Convert 3 m to 300 cm. The ratio is 7 cm to 300 cm or 7 : 300.
b Convert 2 L to 2000 mL. The ratio is 73 mL to 2000 mL or 73 : 2000.
c Convert 3 h to 180 min. The ratio is 180 min to 17 min or 180 : 17.

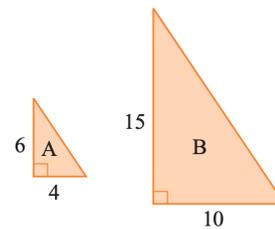
14 Express each of the following as a ratio.

- a** 1 m to 1 cm **b** 7 mL to 1 L **c** 11 s to 1 min
d 3 km to 173 m **e** 2 h to 13 min **f** 67 m to 1 km
g 3 L to 87 mL **h** 1 km to 27 m **i** 13 cm to 3 mm

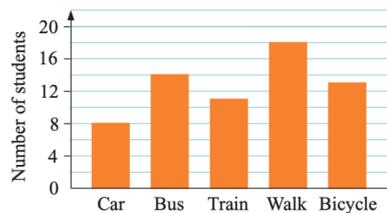
15 In this diagram, what is the ratio of the:

- a** base of triangle A to the base of triangle B?
b height of triangle A to the height of triangle B?
c area of triangle A to the area of triangle B?

Hint: Area of a triangle = $\frac{1}{2}b \times h$ or $\frac{b \times h}{2}$.



16 The bar graph represents the results of a survey to determine the method by which students travel to school.



- a** Find the total number of students surveyed.
b Write as a ratio:
i students travelling by car : students who walk
ii students travelling by bus : total number of students surveyed.
c What fraction of the students surveyed travel to school by train?
d To 1 decimal place, what percentage of these student travels by:
i train? **ii** bus? **iii** car?



Investigation 1 Gears on a bike

A bicycle has a chain that joins a cog on the front chainwheel to a cog on the back wheel. The gears on a bicycle can be varied by changing the position of the chain on the front chainwheel and on the rear cog.

If the front cog has 25 teeth and the rear cog has 18 teeth, then the gear ratio is 25 : 18 or $\frac{25}{18} : 1 = 1.39 : 1$.

A bicycle has two cogs on the front chainwheel with 25 teeth and 45 teeth respectively. The back wheel has three cogs with 28, 25 and 16 teeth respectively. If the chain can be used in any position on the two front cogs and on the three back cogs, find each ratio for the number of teeth on one of the front cogs to the number of teeth on one of the rear cogs in the form $n : 1$.



Exercise 2A

- 1 a** 2 : 5 **b** 3 : 2 **c** 1 : 3
2 a 4 : 7 **b** 7 : 4
3 a i 3 : 1 **ii** 1 : 3 **b** No
4 a i 1 : 2 **ii** 2 : 1 **b** No
5 a No as $\frac{1}{8} \neq \frac{8}{1}$ **b** $a = b$
6 a $\frac{5}{7}$ **b** $\frac{2}{7}$
7 a 1 : 8 **b** 8 : 1 **c** $\frac{1}{9}$ **d** $\frac{8}{9}$
e The paint would be mostly blue, $\frac{8}{9}$ blue and $\frac{1}{9}$ white, and so much darker than feather blue.
8 a $\frac{2}{5}$ **b** 3 : 2 **c** 2 : 3
d Yes, 18 **e** Yes, 12
9 a $\frac{1}{5}$ **b** Green **c** Red **d** $\frac{3}{20}$ **e** 1 : 4
10 a i 2 : 2 = 1 : 1 **ii** 2 : 4 = 1 : 2 **iii** $\frac{2}{4} = \frac{1}{2}$
b i 3 : 3 = 1 : 1 **ii** 3 : 6 = 1 : 2 **iii** $\frac{3}{6} = \frac{1}{2}$
c i 6 : 2 = 3 : 1 **ii** 6 : 8 = 3 : 4 **iii** $\frac{6}{8} = \frac{3}{4}$
d i 3 : 6 = 1 : 2 **ii** 3 : 9 = 1 : 3 **iii** $\frac{3}{9} = \frac{1}{3}$
e i 4 : 2 = 2 : 1 **ii** 4 : 6 = 2 : 3 **iii** $\frac{4}{6} = \frac{2}{3}$
f i 9 : 7 **ii** 9 : 16 **iii** $\frac{9}{16}$
11 a $\frac{2}{5}$ **b** $\frac{4}{7}$ **c** $\frac{5}{9}$ **d** $\frac{6}{7}$
e $\frac{8}{13}$ **f** $\frac{5}{12}$ **g** $\frac{11}{14}$ **h** $\frac{2}{7}$
12 a 3 : 1 **b** 1 : 4 **c** 3 : 2 **d** 5 : 2
e 4 : 1 **f** 2 : 7 **g** 6 : 1 **h** 5 : 4

13 a $\frac{2}{7}$ **b** $\frac{1}{7}$

14 a 100 : 1 **b** 7 : 1000 **c** 11 : 60
d 3000 : 173 **e** 120 : 13 **f** 67 : 1000
g 3000 : 87 **h** 1000 : 27 **i** 130 : 3

15 a 4 : 10 = 2 : 5 **b** 6 : 15 = 2 : 5 **c** 4 : 25

16 a 64

b i 4 : 9 **ii** 7 : 32 **c** $\frac{11}{64}$

d i 17.2% **ii** 21.9% **iii** 12.5%