

# Unit 12: Ratio and proportion

## Lesson 1: Ratio (1)

→ pages 153–155

1. a) Fruit sorted into 3 groups, each group containing 1 apple and 2 pears.  
b) For every 1 apple there are 2 pears.  
For every 2 pears there is 1 apple.
2. a) For every 3 rulers there are 2 pencils.  
b) For every 2 pencils there are 3 rulers.  
c)  $\frac{9}{15} = \frac{3}{5}$  of the objects are rulers.  
d)  $\frac{6}{15} = \frac{2}{5}$  of the objects are pencils.
3. a) Answers will vary; for example, children could draw 6 triangles and 2 circles.  
b) Answers will vary; for example, children could draw 4 squares and 10 circles.
4. a) Shapes and descriptions matched:  
Left-hand shape → For every 1 grey square there are 2 white squares,  
Middle shape → For every 2 grey squares there is 1 white square,  
Right-hand shape → For every 1 grey square there is 1 white square  
b) 10 squares shaded grey, leaving 2 white.
5.  $\frac{1}{4}$   
Yes, if the ratio of the red to white cubes is kept as ratio 3 : 1 then  $\frac{1}{4}$  of the cubes will be white regardless of the size of the tower.
6. No, the ratio is 2 white marshmallows to 3 pink. This means that in every 5 marshmallows, 2 are white and 3 are pink. So,  $\frac{2}{5}$  of the marshmallows are white and  $\frac{3}{5}$  are pink.

### Reflect

For every 2 apples there is 1 banana.

## Lesson 2: Ratio (2)

→ pages 156–158

1. For every 4 chicks there is 1 hen.  
Or, the ratio of chicks to hens is 4 : 1.
2. The ratio of jars to tins is 1 : 2.  
The ratio of tins to jars is 2 : 1.
3. a) 1 : 3      b) 1 : 3      c) 1 : 4
4. Answers will vary but ensure that there are more than 6 shapes for each answer. For example:  
a) 6 triangles and 2 circles  
(or other multiples of 3 triangles and 1 circle)  
b) 6 triangles and 4 circles  
(or other multiples of 3 triangles and 2 circles)

- c) 2 circles and 6 triangles  
(or other multiples of 1 circle and 3 triangles)
- d) 2 triangles to 8 circles  
(or other multiples of 1 triangle and 4 circles)

5. a) No, the pencil is half the length of the straw.  
b) Yes, the ratio of the length of the pencil to the length of the straw is 1 : 2 so the length of the straw is twice that of the pencil.

6. The ratio of orange juice to lemonade is 1 : 5 (250 : 1,250).

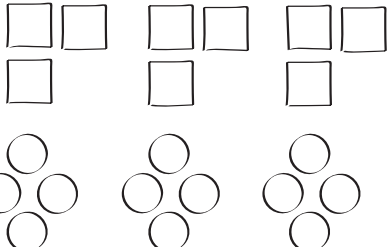
### Reflect

Yes and no. The ratio has the same digits, so describes the same relationship between quantities. However, the order is important as this tells you which quantity is double the other. For example:

In a bag of sweets there are twice as many mints to strawberry sweets. The ratio of mints to strawberry sweets is 2 : 1. This is the same as the ratio 1 : 2 if the order is reversed, i.e. strawberry sweets to mints.

## Lesson 3: Ratio (3)

→ pages 159–161

1. a) 

b) 12

2. 

Strawberry	Lime
2	3
4	6
6	9
8	12
10	15
12	18

There are 12 strawberry sweets in the jar.

3. There are 30 black buttons in the box.
4. There are 28 box fish in the tank.
5. Explanations may vary; for example:  
7 squares would mean that there are 17.5 rectangles which is impossible.
6. There are 16 more cows than sheep in the field.
7. Josh has £2.

## Reflect

Since there are 3 red balloons for every 4 blue balloons, there are more blue balloons in the bag than red balloons.

## Lesson 4: Ratio (4)

→ pages 162–164

- Carrot 

4
---

  
Lemon 

4	4	4	4
---	---	---	---

 } 20  
There are 4 slices of carrot cake and 16 slices of lemon cake.
- There are 18 footballs and 45 tennis balls.
- 27 squares shaded red and 45 squares shaded blue.  
Explanations may vary; for example:  
Work out the number of squares in total (72).  
There are  $3 + 5 = 8$  parts in each group.  
 $72 \div 8 = 9$   
So, there are 9 groups of 3 red squares and 9 groups of 5 blue squares.  
 $9 \times 3 = 27$  and  $9 \times 5 = 45$ , so there are 27 red squares and 45 blue squares.
- a) There are 24 grey socks in the drawer.  
b) 8 pairs of white socks can be made.
- Zac receives £12 more than Jamie.
- 4 parts = 560, so 1 part = 140  
 $3 \text{ parts} + 7 \text{ parts} = 10 \text{ parts altogether}$   
 $10 \times 140 = 1,400$

## Reflect

Explanations may vary; for example:

Add together  $2 + 3$  to get 5. This is the total number of parts.

$$1 \text{ part} = 60 \div 5 = 12$$

So, sharing 60 into the ratio  $2 : 3$  gives  $2 \times 12 : 3 \times 12$ , which is  $24 : 36$ .

Alternatively, children may choose to draw a bar model to show their method.

## Lesson 5: Scale drawings

→ pages 165–167

- a)  

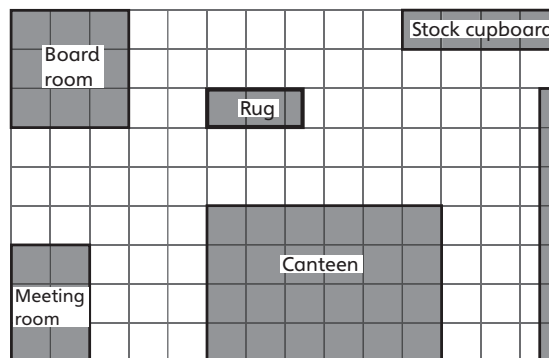
0 m	2 m	4 m	6 m	8 m	10 m	12 m	14 m	16 m	18 m	20 m
-----	-----	-----	-----	-----	------	------	------	------	------	------

0 cm	1 cm	2 cm	3 cm	4 cm	5 cm	6 cm	7 cm	8 cm	9 cm	10 cm
------	------	------	------	------	------	------	------	------	------	-------

  
b) 12  
c) 24

- Rectangle with dimensions  $1 \text{ cm} \times 2.5 \text{ cm}$  drawn on the grid and identified as a rug. For example:



- a) Every 2 cm on the plan represents 1 m in real life.  
b)  

0 m	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------

0 cm	2 cm	4 cm	6 cm	8 cm	10 cm	12 cm	14 cm	16 cm	18 cm	20 cm
------	------	------	------	------	-------	-------	-------	-------	-------	-------

  
c) Width = 8 cm; height = 5 cm  
 $8 + 8 + 5 + 5 = 26 \text{ cm}$   
Ratio =  $2 : 1$ , so  $26 \text{ cm} : 13 \text{ m}$   
The perimeter is 13 m.
- $1 \text{ cm} : 5 \text{ km}$   
 $11 \times 5 = 55$   
Length of route = 55 km
- $12 \times 25,000 = 300,000$   
The actual distance between the two houses is 3 km (or 3,000 m or 300,000 cm).
- $1 : 50$   
Explanations may vary; for example:  
Ratio of perimeter is  $20 \text{ squares} : 8 \text{ squares} = 2.5 : 1$ .  
So, the scale for the shape on the left is 2.5 times smaller than the scale for the shape on the right.  
 $20 \times 2.5 = 50$   
So, the scale on the right is  $1 : 50$ .

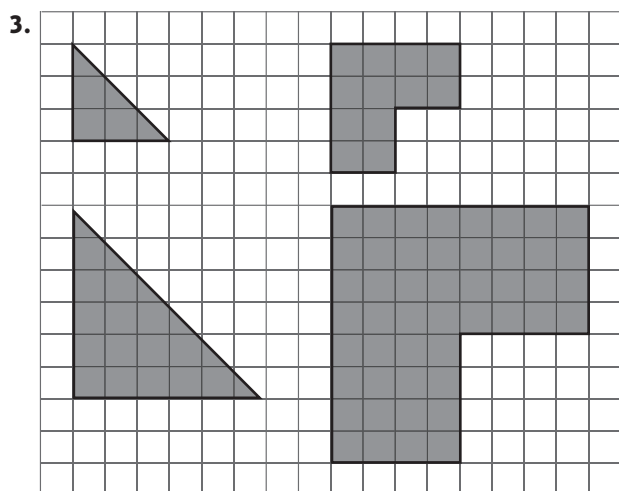
## Reflect

The scales are the same, since  $1 : 200 = 1 \text{ cm} : 200 \text{ cm} = 1 \text{ cm} : 2 \text{ m}$ . However, the scale  $1 : 200$  does not contain any units whereas the scale  $1 \text{ cm} : 2 \text{ m}$  contains units.

## Lesson 6: Scale factors

→ pages 168–170

- a)  $9 \text{ cm} \times 2$   
Mo's line is 2 times longer than Zac's.  
So, the scale factor of enlargement is 2.  
b)  $9 \times 5 = 45$   
Olivia's line is 5 times as long as Zac's.  
So, the scale factor of enlargement is 5.
- Each side of the new shape is twice the length of each side of the old shape.



4.

Rectangle	Original length	Scale factor of enlargement	New length
A	6 cm	4	24 cm
B	12 cm	5	60 cm
C	18 cm	$\frac{1}{2}$	9 cm
D	18 cm	$1\frac{1}{2}$	27 cm
E	5 cm	100	5 m

5. a) The sale factor is  $2\frac{1}{2}$ .  
b) The sale factor is  $\frac{1}{4}$ .

### Reflect

When a shape is enlarged by a scale factor of  $\frac{1}{2}$ , each length on the shape is halved (multiplied by  $\frac{1}{2}$ ), so each new side is half the length of the old side.

## Lesson 7: Similar shapes

→ pages 171–173

- a) Yes, they are similar as they have a scale factor of 2. The side of 3 squares has been enlarged to 6 squares ( $= 2 \times 3$ ) and the side of 4 squares has been enlarged to 8 squares ( $= 2 \times 4$ ).  
b) No, they are not similar. The lengths have been enlarged but the widths are the same.
- Answers will vary. Check one triangle is an enlargement of the other.
- a) The scale factor is 3.  
The length of side  $a$  is 15 cm.  
b) The scale factor is 5.  
The length of side  $b$  is 8 cm.
- $x = 2.5$  cm       $y = 25$  cm
- a) 1 : 2  
b) Children should have drawn a similar parallelogram on the grid with base length of 12 and perpendicular height of 9. The bottom left vertex of shape should sit three squares to the left of the top left vertex.  
c) 18 cm

### Reflect

Answers may vary; for example:

All sides in the shapes will be in the ratio 1 : 4 since the shapes are similar. One shape will have lengths 4 times longer than the other shape.

## Lesson 8: Problem solving – ratio and proportion (I)

→ pages 174–176

- $60 \div 5 = 12$   
 $7 \times 12 = 84$   
7 pencils cost 84p.
- The perimeter of the patio is 5.4 m.
- a) 300 g flour  
6 eggs  
900 ml milk  
3 tbsp oil  
b) Toshi needs 250 g of flour.  
c) 675 ml  
d) Toshi can make 12 pancakes.
- £15.60
- 550 g

### Reflect

Methods may vary; for example:

Method 1: Use a scale factor: since 9 is  $6 + 3$  ( $= 6 +$  half of 6), the scale factor is  $1\frac{1}{2}$ . The weight will also be scaled up by a factor of  $1\frac{1}{2}$ , so 9 chocolates will weight  $120 \text{ g} \times 1\frac{1}{2} = 180 \text{ g}$ .

Method 2: Divide by 6 to find the weight of 1 chocolate and multiply by 9 to find the weight of 9 chocolates.  
 $120 \div 6 = 20$ ,  $20 \times 9 = 180 \text{ g}$ .

## Lesson 9: Problem solving – ratio and proportion (2)

→ pages 177–179

- There are 12 lilies.
- a) There are 4 times more mint sweets than strawberry sweets. This is because the ratio is 4 : 1 so, for every strawberry sweet there are 4 mints.  
b) 8
- 40
- 105 g
- 35
- 20
- They have caught 39 fish.

**Reflect**

Answers will vary: look for children recognising that bar models are a useful way of representing the numbers given and their relationship to the whole or parts.

**End of unit check****→ pages 180–181****My journal**

1. a) Andy is incorrect. Some of the sides in shape B are double the length of the sides in shape A but some are the same.  
b) 1 : 2  
The sides in the second shape have been enlarged by a scale factor of 2.

**Power play**

- a) The ratio is 1 : 5,000, so 1 cm represents 5,000 cm.  
 $5,000 \text{ cm} = 50 \text{ m}$   
So, 1 cm represents 50 m in real life.
- b) This is 3 squares on the map, which is 2.1 cm.  
The scale is 1 : 5,000.  
 $2.1 \times 5,000 = 10,500 \text{ cm} = 105 \text{ m}$   
105 m is the shortest distance between Holly's house and the bus stop.
- c)  $350 \div 50 = 7$ , so any point 7 cm from Holly's house.