PONTEFRACT
ACADEMIES TRUST

Out of lesson work

Year 8

Term 1

Set X3-4 & Y3-4

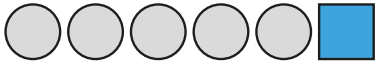
Understand the meaning and representation of ratio

1 Complete the sentences.

a)

For every ☐ squares there are ☐ triangles.

b)

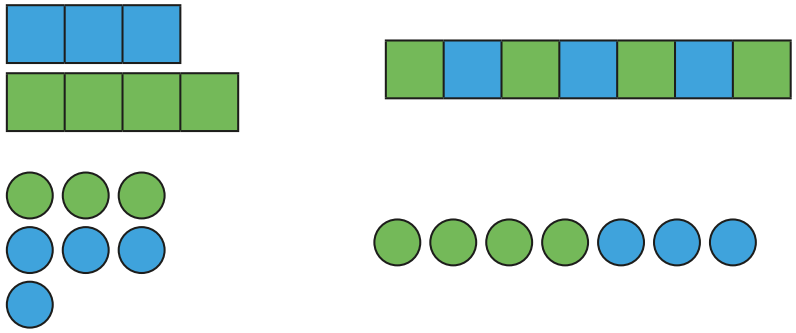


For every ☐ circles there is ☐ square.

For every ☐ square there are ☐ circles.

2 For every 3 blue there are 4 green.

Tick the correct representations.

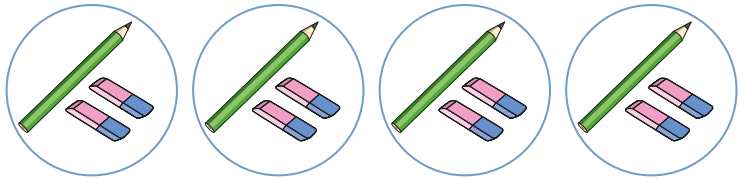


3 For every 1 red there are 2 yellow.

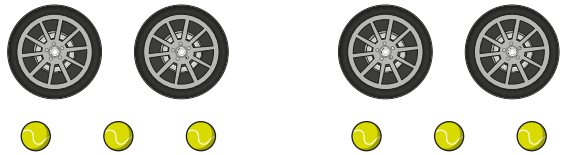
Draw three different diagrams to show this.

4 Write a sentence to describe each image. Begin with the phrase 'For every . . . '

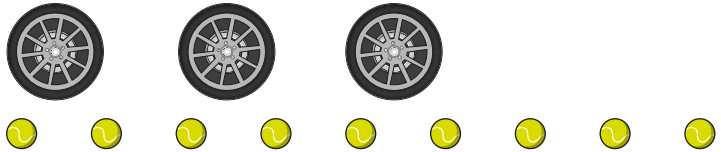
a)



b)



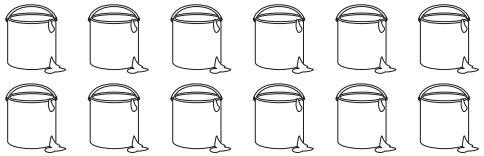
c) Describe this image in two different ways. Begin with the phrase 'For every . . .'



5 **a)** Scott has some tins of paint.

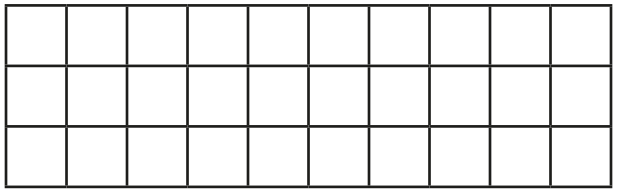
For every 1 tin of red paint he has 3 tins of blue paint.

Colour the paint tins.



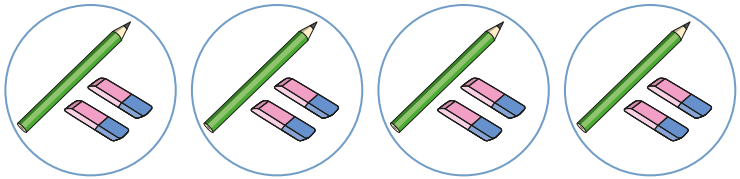
b) For every 2 green squares in this grid there are 3 red squares.

Colour the grid.

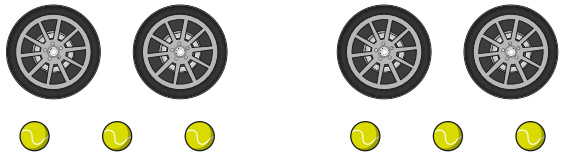


4 Write a sentence to describe each image. Begin with the phrase 'For every . . . '

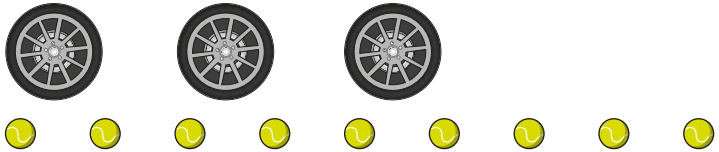
a)



b)



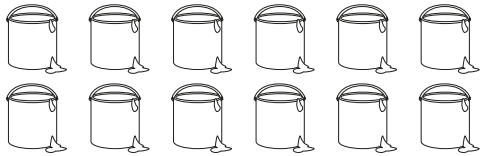
c) Describe this image in two different ways. Begin with the phrase 'For every . . .'



5 **a)** Scott has some tins of paint.

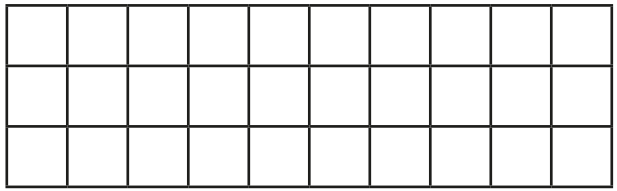
For every 1 tin of red paint he has 3 tins of blue paint.

Colour the paint tins.



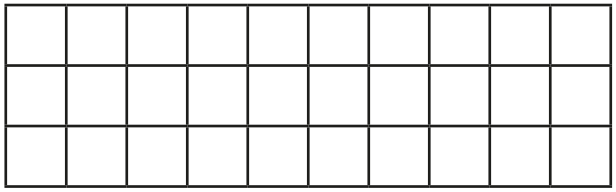
b) For every 2 green squares in this grid there are 3 red squares.

Colour the grid.



c) Two in every three squares are shaded.

Show this on the grid.



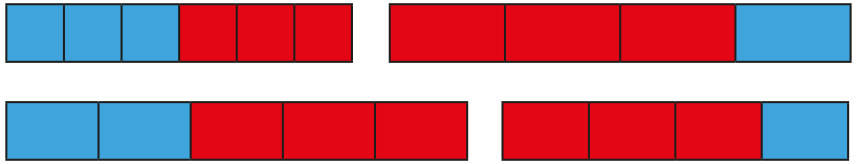
6 For every £1 Eva has, Dexter has 50p.

Draw 3 sets of coins that Eva and Dexter could have.

What is the smallest amount less than £20 that they could have?

7 The more blue paint in the mixture, the darker the purple will be.

Tick the representation that will make the darkest purple.



Explain your answer.

Draw a representation that will make a darker purple.

8 Show that all of these scenarios have similar ratio representations.

2 in every 5 people wear glasses.	For every £1 Whitney has, Mo has £1.50	For every 225 g of flour there are 150 g of sugar.

Understand and use ratio notation

1 **a)** For every 3 boys in a class, there are 4 girls.

What is the ratio of boys to girls?

What is the ratio of girls to boys?

b) For every 1 red counter in a bag, there are 5 blue counters.

Draw a diagram to represent this statement.

What is the ratio of red to blue?

What is the ratio of blue to red?

c) The ratio of adults to children in a room is 2 : 5. Complete the sentences

For every ☐ adults, there are ☐ children.

For every ☐ children, there are ☐ adults.

For every 4 adults, there are ☐ children.

d)

What is the ratio of blue to orange?

What is the ratio of blue to orange?

Complete the sentences.

For every ☐ blue, there are ☐ orange.

For every ☐ orange, there are ☐ blue.

e)

For every ☐ triangles, there is ☐ square.

For every ☐ square, there are ☐ triangles.

What is the ratio of squares to triangles?

What is the ratio of triangles to squares?

What is the ratio of green shapes to yellow shapes?

2 For every 1 car, there are 4 tyres.

How many ways can you represent this?

3 A chocolate cookie has white chocolate, milk chocolate and dark chocolate chips.

The ratio of white to milk to dark chocolate chips is 3 : 5 : 2

a) Write the ratio of milk chocolate to white chocolate chips.

b) Write the ratio of dark chocolate to white chocolate chips.

c) Write the ratio of dark chocolate to milk chocolate chips.

d) Teddy really likes dark chocolate.

Suggest a ratio he could use that would have more dark chocolate chips.

4 Write the ratio of $x : y$ when:

a) $x = 3, y = 2$ **c)** $x = 2, y = 2$

b) $x = 2, y = 3$ **d)** $x = y$

Draw diagrams to represent each ratio.

What would happen to the ratio if you added 1 to both x and y?

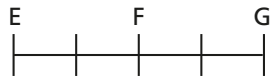
What would happen to the ratio if you doubled both x and y?

Discuss with a partner.

5 E, F and G are points on a line.

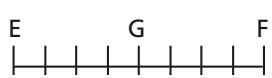
a) In each case, write the ratio of the distance EF : FG.

b) In each case, write the ratio of the distance EF : EG.



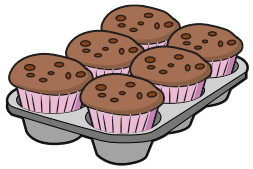
c) What do you notice about your answers to part a) and b)?

d) If EF : FG is 4 : 1, how many ways can you arrange E, F and G on a line to show this?



Solve problems involving ratios of the form 1 : n (or n : 1)

1 A cake tray holds 6 muffins.



a) For every 1 tray, there are ☐ muffins.

b) The ratio of trays to muffins is ☐ : ☐

c) For every ☐ muffins, there is ☐ tray.

d) The ratio of muffins to trays is ☐ : ☐

e) How many muffins would 2 trays hold?

f) How many muffins would 3 trays hold?

g) How many trays would be needed for 30 muffins?

2 A cake mixture has 1 part flour to 1 part sugar.

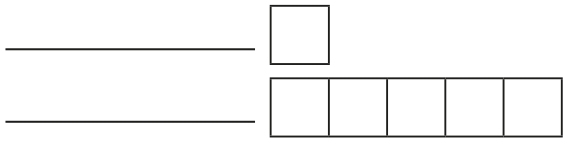
a) If 200 g of flour is used, how much sugar is needed?

b) If 100 g of sugar is used, how much flour is needed?

c) What do you notice about your answers?

3 Juice is made using cordial and water in a ratio of 1 : 5

a) Label the bar model.



Explain your answer to a partner.

b) Use the bar model to work out how much juice can be made using 20 ml of cordial.

c) Use a bar model to work out how much juice can be made using 20 ml of water.

d) What is the same and what is different about parts b) and c)?

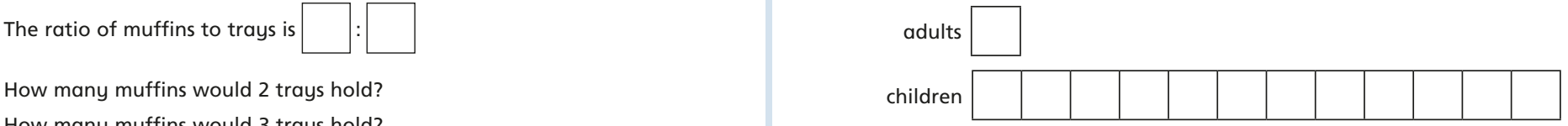
4 The ratio of adults to children in a school is 1 : 12

There are 156 children in the school.

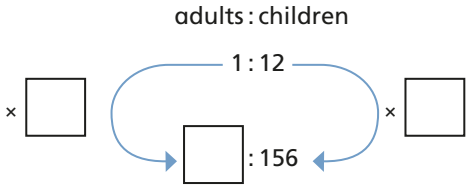
How many adults are there?

a) Use each method to show how many adults there are.

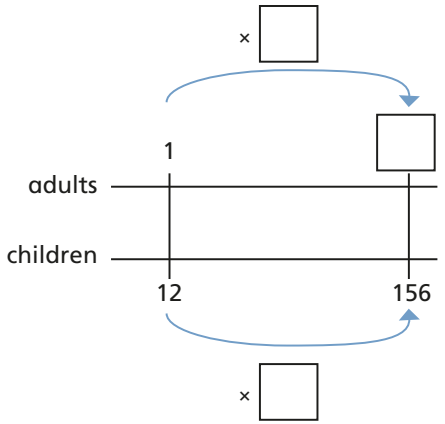
Method 1



Method 2



Method 3



There are ☐ adults in the school.

b) Which method do you prefer to use? Why? Discuss it with a partner.

Solve problems involving ratios of the form 1 : n (or n : 1)

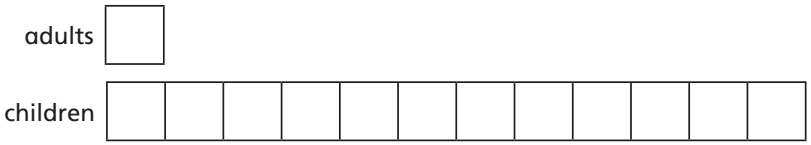
4 The ratio of adults to children in a school is 1 : 12

There are 156 children in the school.

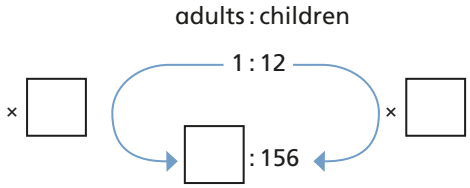
How many adults are there?

a) Use each method to show how many adults there are.

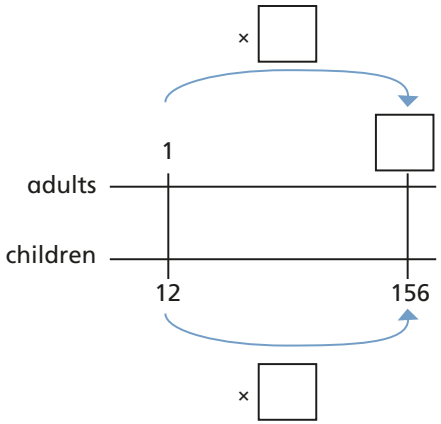
Method 1



Method 2



Method 3



There are ☐ adults in the school.

b) Which method do you prefer to use? Why? Discuss it with a partner.

5 Use your preferred method to answer the question.

The ratio of children to adults in a supermarket is 1 : 5

There are 15 children in the supermarket.

How many adults are in the supermarket?

6 For every 3 monkeys in a zoo, there is 1 tiger.

a) If there are 150 tigers, how many monkeys are there?

b) If there are 150 monkeys, how many tigers are there?

c) If there are 300 monkeys, how many tigers are there?

7 A model of a house is made using a scale of 1 : 32

a) Which part represents the model of the house?

How do you know?

b) If the house is 8 m tall, how tall will the model of the house be in centimetres?

Solve problems involving ratios of the form m : n

1 For every 2 apples, there are 3 oranges.

a) What is the ratio of apples to oranges?

b) What is the ratio of oranges to apples?

c) If there are 6 oranges, how many apples will there be?

d) If there are 6 apples, how many oranges will there be?

2 The ratio of men to women at a football match is 5 : 2

Are these statements true or false?

There are more men than women.

There are 7 people at the football match.

For every 2 women, there are 5 men.

If one more woman arrives, the ratio will change to 5 : 3

3 For every 7 boys in a class, there are 9 girls.

There are 14 boys in the class.

a) How many girls are there in the class?

b) How many children are there in the class in total?

c) How many more girls than boys are there in the class?

d) There are 3 adults in the classroom.

What is the ratio of adults to children?

4 A teacher orders pencils and rulers in the ratio 3 : 5

a) One week, the teacher orders 240 pencils.

How many rulers does she order?

b) The week after, the teacher orders 240 rulers.

How many pencils does she order?

5 A farm has sheep and horses in the ratio 7 : 5

a) If there are 70 horses on the farm, how many sheep are there?

b) If there are 140 horses on the farm, how many sheep are there?

c) If there are 35 horses on the farm, how many sheep are there?

d) What do you notice about your answers?

e) If there are 280 horses on the farm, how many sheep are there?

6 For every 30 minutes that Huan spends watching TV, Whitney spends 2 hours.

If Huan watches TV for 4 hours, how long does Whitney watch TV for?

7 For every £1 Annie has, Tommy has 50p.

a) Which of these ratios represents the situation?

1 : 1	1 : 50	100 : 50
2 : 1	1 : 2	

For any incorrect ratios, discuss the mistake that has been made.

b) If Annie has £3, how much money does Tommy have?

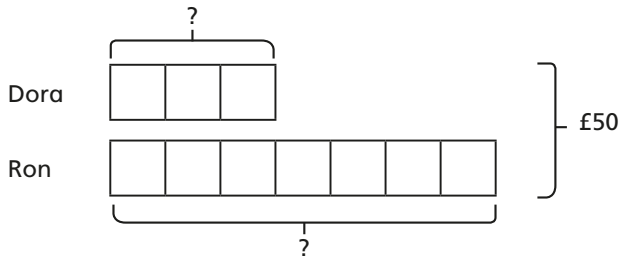
c) If Tommy has £2.50, how much money does Annie have?

d) If Annie has £4.00, how much money do they have altogether?

e) If Tommy has £7.50, how much more money does Annie have than Tommy?

Divide in a given ratio

1 Dora and Ron share £50 in the ratio 3 : 7



a) Discuss with a partner how this bar model represents the question.

b) How much money do they each receive?

2 Eva gets £42 a month for her allowance.

Out of this, for every £5 she spends, she saves £1

a) Draw a bar model to represent this.

b) How much money does Eva save in a month?

c) How much money does Eva spend in a month?

d) The next month, Eva changes the ratio of the amount she saves to the amount she spends to 2 : 5

Will Eva save more or less? How much more or less will she save?

3 Purple paint is made by mixing red and blue paint in the ratio 5 : 4

How much more red paint than blue paint is in 450 ml of the mixture?

4 Mo, Aisha and Jack share £400 in the ratio 3 : 1 : 4

How much money do they each receive? Show your workings.

5 **a)** Share 150 in the ratio 6 : 4

Share 150 in the ratio 3 : 2

b) Share 75 in the ratio 3 : 2

Share 75 in the ratio 2 : 3

c) Share 25 in the ratio 2 : 3

Share 100 in the ratio 2 : 3

d) What do you notice about these instructions and answers?

What is the same? What is different?

6 The angles in a triangle are in the ratio 1 : 1 : 4

a) What type of triangle is it? How do you know?

b) What is the size of the largest angle in the triangle?

7 The mean of four numbers is 16

The numbers are in the ratio 1 : 7 : 3 : 5

Work out the range of the numbers. Show your workings.

8 $x : y = 4 : 9$

$x + y = 52$

a) Work out the value of x.

b) Work out the value of y.

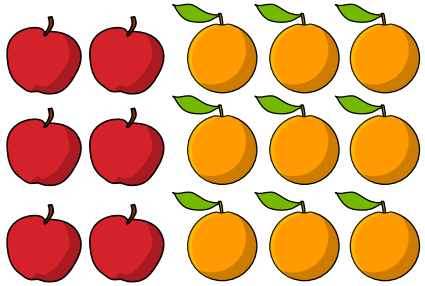
Use your answers to parts a) and b) to work out these values.

c) $y - x$ **e)** $x^2 + 3y$

d) $x - y$ **f)** $5x - 3y$

Express ratios in their simplest integer form

1 For every two apples, there are three oranges.

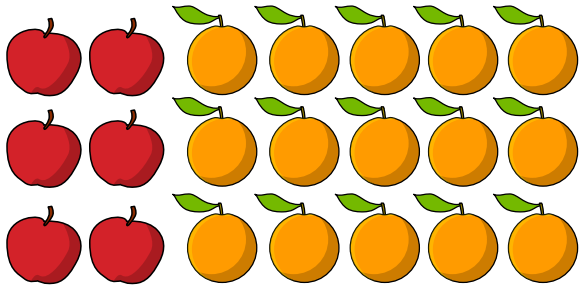


a) Write the ratio of apples to oranges in three different ways.

b) Compare answers with a partner.
Can you see all of your answers in the picture?

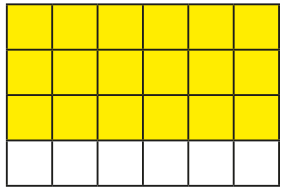
c) Which ratio is in its simplest form? How do you know?

2



Write the ratio of apples to oranges in its simplest form.

3 A pattern is made from yellow and white squares.



a) Complete the sentences.

For every 18 yellow squares, there are ☐ white squares.

For every 9 yellow squares there are ☐ white squares.

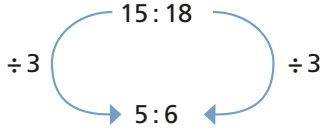
For every 6 yellow squares there are ☐ white squares.

For every 3 yellow squares, there are ☐ white squares.

b) Which ratio is in its simplest form?

c) In its simplest form, what is the ratio of yellow to white squares?

4 Explain how each representation shows that the ratio 15 : 18 can be simplified to 5 : 6



15 : 18

3 × 5 : 3 × 6

5 : 6

5 Write each ratio in its simplest form.

a) 15 : 5

b) 9 : 6

c) 25 : 100

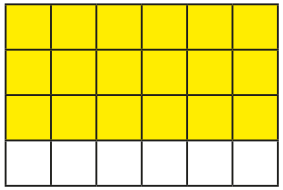
d) 42 : 49

e) 32 : 16

f) 27 : 45 : 18

Express ratios in their simplest integer form

3 A pattern is made from yellow and white squares.



a) Complete the sentences.

For every 18 yellow squares, there are ☐ white squares.

For every 9 yellow squares there are ☐ white squares.

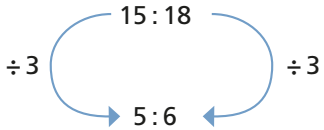
For every 6 yellow squares there are ☐ white squares.

For every 3 yellow squares, there are ☐ white squares.

b) Which ratio is in its simplest form?

c) In its simplest form, what is the ratio of yellow to white squares?

4 Explain how each representation shows that the ratio 15 : 18 can be simplified to 5 : 6



15 : 18

3 × 5 : 3 × 6

5 : 6

5 Write each ratio in its simplest form.

a) 15 : 5

b) 9 : 6

c) 25 : 100

d) 42 : 49

e) 32 : 16

f) 27 : 45 : 18

6 There are 16 girls and 14 boys in Class 8B.

Write the ratio of boys to girls in its simplest form.

Write the ratio of girls to boys in its simplest form.

7 Mo is sorting number cards with ratios.

All of these ratios are equivalent to 3 : 5

13 : 15	30 : 50	7 : 9	$3x : 5x$	5 : 3

Circle the ratios that are not equivalent.

Explain the mistakes that Mo has made.

8 There are 72 red cars and 96 blue cars in a car park.

Jack wants to take a sample of the cars and keep the ratio of red to blue cars the same.

He only wants 18 red cars.

How many blue cars will Jack need?

9 Simplify the ratios.

a) £1 : 20p

b) 1 m : 45 cm

c) 2 kg : 3,600 g

d) $6x : 12x$

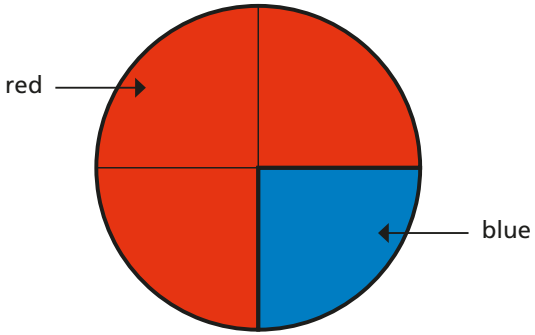
e) 1 hour : 18 minutes

f) 2 m : 130 cm : 10 mm

g) 0.3 : 0.5

Compare ratios and fractions

1



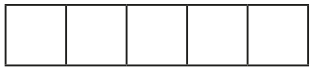
a) What fraction of the pie chart is shaded red?

b) Write the ratio of red : blue.

c) What fraction of the pie chart is shaded blue?

d) Write the ratio of blue : red.

2

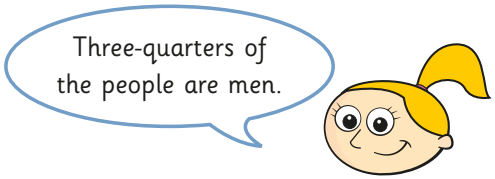


$\frac{1}{5}$ of the bar is red.

The rest is blue.

What is the ratio of red : blue?

3 The ratio of men to women in a library is 3 : 4



Use the bar model to show that Eva is wrong.

What fraction of the people in the library are men?

4 For every 2 horses in a field, there are 3 sheep.

a) Draw a bar model to represent this statement.

b) What fraction of the animals are horses?

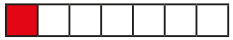
c) What fraction of the animals are sheep?

5 The ratio of circles to squares is 4 : 7

a) What fraction of the shapes are circles?

b) What fraction of the shapes are squares?

6 Complete the table.

Bar model	Ratio red : white	Ratio white : red	Fraction that are white	Fraction that are red
				
	2 : 5			
		3 : 1		
			$\frac{1}{2}$	
				$\frac{2}{5}$

7 Four-fifths of a bag of sweets are red.

What is the ratio of red sweets to non-red sweets?

Compare ratios and fractions

4 For every 2 horses in a field, there are 3 sheep.

a) Draw a bar model to represent this statement.

b) What fraction of the animals are horses?

c) What fraction of the animals are sheep?

5 The ratio of circles to squares is 4 : 7

a) What fraction of the shapes are circles?

b) What fraction of the shapes are squares?

6 Complete the table.

Bar model	Ratio red : white	Ratio white : red	Fraction that are white	Fraction that are red
				
	2 : 5			
		3 : 1		
			$\frac{1}{2}$	
				$\frac{2}{5}$

7 Four-fifths of a bag of sweets are red.

What is the ratio of red sweets to non-red sweets?

8 $\frac{4}{9}$ of a group of people prefer tea to coffee.

What is the ratio of people who prefer tea to people who prefer coffee?

9 Class 8A voted for their favourite sport.

$\frac{17}{30}$ of the class voted for football.

$\frac{1}{5}$ of the class voted for netball.

The rest voted for other.

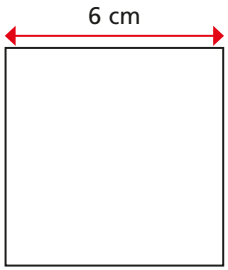
a) What fraction of the class voted for other?

b) Write the ratio of football : netball : other.

c) Write the ratio of netball : other in its simplest form.

Understand π as a ratio

1



a) What is the length of the square?

b) What is the perimeter of the square?

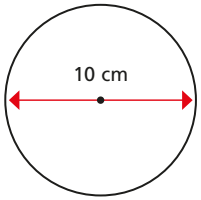
c) What is the ratio of length : perimeter of the square?

d) Will this ratio always be the same?
Talk about it with a partner.

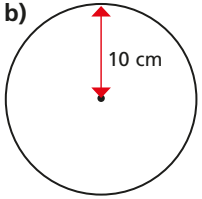
e) Will the ratio be the same for any other shapes? Why?

2 What is the diameter of each of these circles?

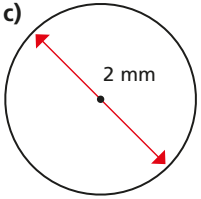
a)



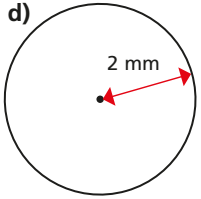
b)



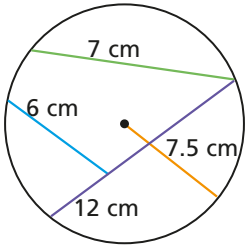
c)



d)



3

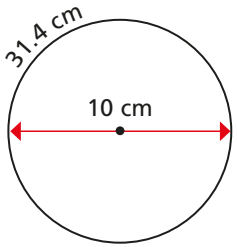


What is the diameter of the circle?

How do you know? Talk about it with a partner.

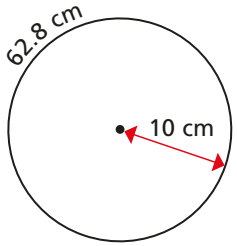
4 Write the ratio of diameter : circumference for each circle in the form 1 : n

a)



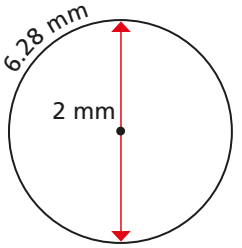
10 cm : 31.4 cm = 1 : ☐

b)

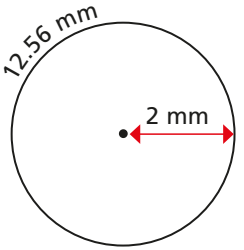


20 cm : 62.8 cm = ☐ : ☐

c)



d)



e) What do you notice about your answers?

f) Complete the sentence.

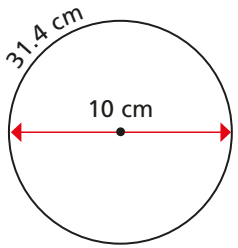
For any circle, the ratio of diameter : circumference can be written as

1 : ☐, or more accurately 1 : ___

Understand π as a ratio

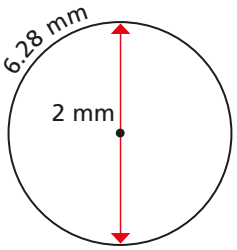
4 Write the ratio of diameter : circumference for each circle in the form 1 : n

a)

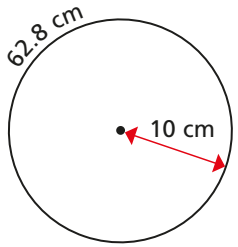


10 cm : 31.4 cm = 1 : ☐

c)

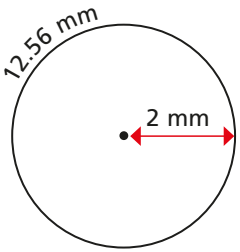


b)



20 cm : 62.8 cm = ☐ : ☐

d)



e) What do you notice about your answers?

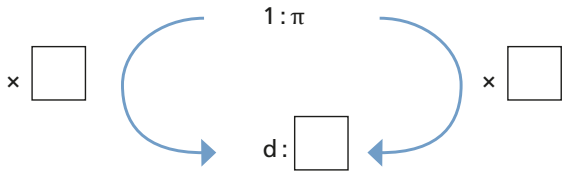
f) Complete the sentence.

For any circle, the ratio of diameter : circumference can be written as

1 : ☐, or more accurately 1 : ___

5 Complete this representation.

diameter : circumference

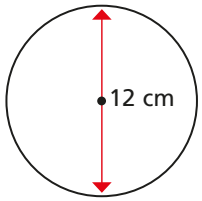


The circumference of a circle is equal to _____

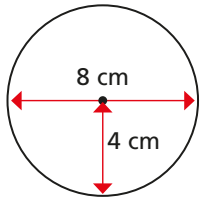
C = ☐

6 Calculate the circumference of the circles.

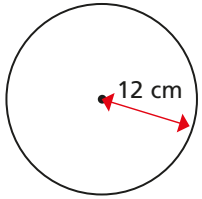
a)



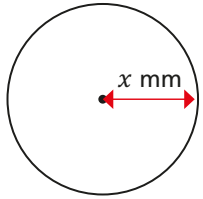
c)



b)



d)



Solve problems involving direct proportion

1 A shop sells school supplies.

a) Pens are sold in boxes. Each box contains 12 pens.

How many pens are there in 5 boxes?

How many pens are there in 50 boxes?

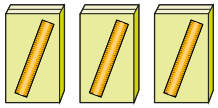
How many pens are there in 200 boxes?

b) Pencils are sold in boxes. Each box contains 40 pencils.

How many pencils are there in 4 boxes?

How many pencils are there in 40 boxes?

How many boxes do you need to buy to have 3,200 pencils?



c) Three boxes of rulers contain 150 rulers altogether.

How many rulers are there in 9 boxes?

How many rulers are there in 27 boxes?

How many boxes do you need to buy to have 1,500 rulers?

How did you work out your answers? Talk about it with a partner.

2 Here is a recipe for 8 cupcakes.

Cupcakes (makes 8)	
100 g butter	1 tsp vanilla extract
100 g sugar	120 g flour
2 eggs	4 tbsp milk

a) Complete these recipe cards.

Cupcakes (makes 4)

☐ butter	☐ eggs	☐ flour
☐ sugar	☐ vanilla extract	☐ milk

Cupcakes (makes 24)

☐ butter	☐ eggs	☐ flour
☐ sugar	☐ vanilla extract	☐ milk

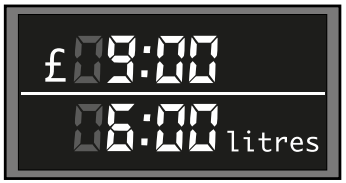
Cupcakes (makes ☐)

☐ butter	☐ vanilla extract
☐ sugar	960 g flour
16 eggs	☐ milk

b) Mo has half a kilogram of butter.

What is the greatest number of cupcakes he can make using this recipe?

3 At a service station, 6 litres of petrol costs £9



a) How much does 60 litres of petrol cost?

b) How much does 24 litres of petrol cost?

c) How much does 2 litres of petrol cost?

d) How many litres of petrol can you buy for £45?

e) How many litres of petrol can you buy for £4.50?

4 The weight of a piece of rope is in direct proportion to its length.

Complete the table.

Length of rope	Weight of rope
80 m	5 kg
	30 kg
20 m	
2 m	

5 Are these statements true or false? Explain your answers.

a) 5 gallons of water weigh 8 lbs, so 25 gallons of water weigh 40 lbs.

b) 8 chocolate bars cost £5, so 2 chocolate bars cost £1.50

c) Henry the 8th had 6 wives, so Henry the 4th had 3 wives.

d) The length of 12 identical toy cars is 132 cm, so the length of 240 of the same toy cars is 26.4 m.

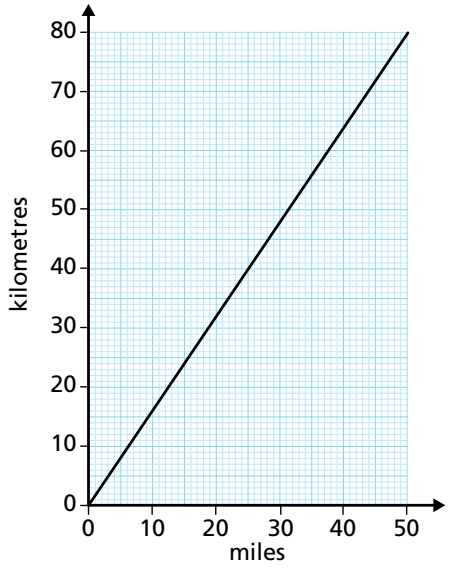
6 40 g of ginger are needed to make 16 gingerbread men.

Annie wants to make 60 gingerbread men.

She has 140 g of ginger. Is this enough? Explain your answer.

Explore conversion graphs

1 This is a conversion graph between miles and kilometres.



a) Use the graph to make approximate conversions.

10 miles = ☐ km

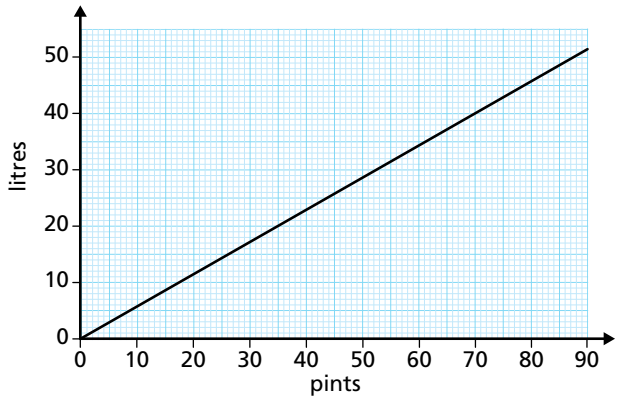
40 km = ☐ miles

40 miles = ☐ km

80 km = ☐ miles

b) Use your last answer to make an approximate conversion of 800 kilometres to miles.

2 This is a conversion graph between pints and litres.



a) Use the graph to make approximate conversions.

40 pints = ☐ litres

20 litres = ☐ pints

40 litres = ☐ pints

35 pints = ☐ litres

b) Jack and Dora want to convert 100 pints to litres. Complete their methods.

Jack's method

100 pints = 70 pints + 30 pints

70 pints = ☐ litres

30 pints = ☐ litres

So 100 pints = ☐ litres

Dora's method

100 pints = 2 × 50 pints

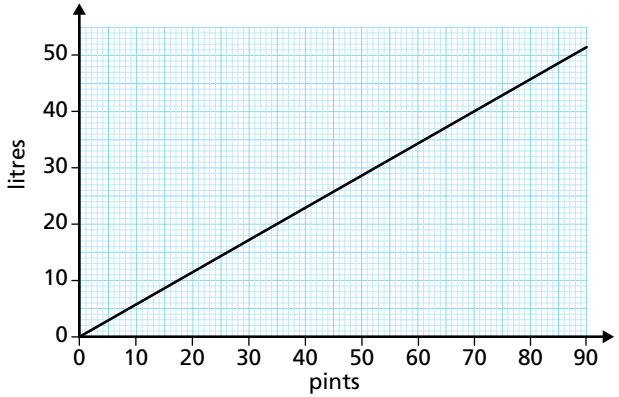
50 pints = ☐ litres

So 100 pints = ☐ litres

c) Choose one of these methods to convert 100 litres into pints.

Explore conversion graphs

2 This is a conversion graph between pints and litres.



a) Use the graph to make approximate conversions.

40 pints = ☐ litres

20 litres = ☐ pints

40 litres = ☐ pints

35 pints = ☐ litres

b) Jack and Dora want to convert 100 pints to litres. Complete their methods.

Jack's method

100 pints = 70 pints + 30 pints

70 pints = ☐ litres

30 pints = ☐ litres

So 100 pints = ☐ litres

Dora's method

100 pints = 2 × 50 pints

50 pints = ☐ litres

So 100 pints = ☐ litres

c) Choose one of these methods to convert 100 litres into pints.

3 20 kg is approximately equal to 44 lbs.
Use this information to draw a conversion graph.

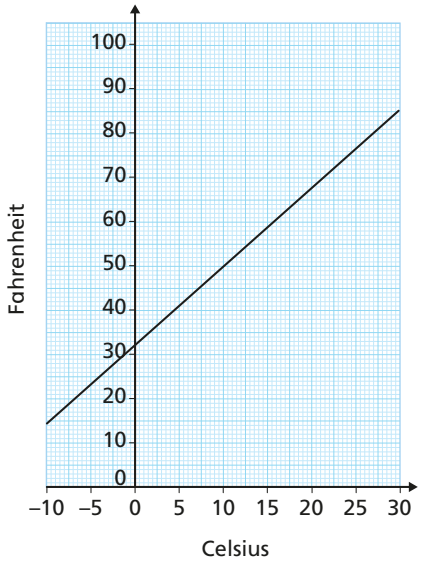
a) Use your graph to complete the approximate conversions.

75 lbs = ☐ kg

82 kg = ☐ lbs

b) Use the graph to find your own conversions.

4 The graph shows a conversion between Celsius and Fahrenheit.



The table shows the temperature at midnight and midday in Oslo and New York.

Oslo		New York	
Midnight	Midday	Midnight	Midday
–5°C	41°F	32°F	8°C

In which city does the temperature change the most between midnight and midday? Show your workings.

Convert between currencies

1 The currency of Iceland is the Icelandic króna (kr).

£1 = 160 kr

a) How many kr can you buy with £5?

b) How many kr can you buy with £20?

c) How many kr can you buy with £73?

d) How many £ can you buy with 1,600 kr?

e) How many £ can you buy with 4,000 kr?

f) How many £ can you buy with 80 kr?

g) Explain why Ron is wrong.

2 The currency in Australia is the Australian dollar ($).

$1 = £0.55

a) Which is worth more: £5 or $5?

b) How many £ can you buy with $20?

c) How many £ can you buy with $44?

d) How many $ can you buy with £33?

e) How many $ can you buy with £440?

f) How many $ can you buy with £6.60?

g) In Australia, a pair of jeans costs $90

In the UK, the same pair of jeans costs £50

Is it cheaper to buy the jeans in Australia or the UK?

Give reasons for your answer.

3 Whitney uses her calculator to make some currency conversions.
Round her answers to the nearest penny and complete the table.
The first one has been done for you.

Answer on calculator	Answer to the nearest penny
18.36846	£18.37
419.51289	
3.718	
18.98721	

4 Use the fact that 1 pound (£) is equal to 1.13 euros (€) to convert the amounts.

Give your answers to the nearest penny or nearest cent.

a) £30

b) €30

c) €100

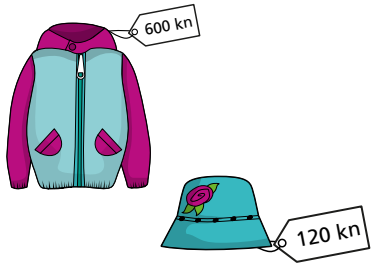
d) £12.50

5 Eva is on holiday in Croatia.

She goes shopping and buys a jacket and a hat.

The exchange rate is £1 = 8.34 kuna (kn).

Work out the total cost of the hat and jacket in pounds.



6 The exchange rate between pounds and US dollars is £1 = $1.27

a) Annie goes on holiday to the USA.

She buys £500 worth of dollars.

She spends $550 and converts the rest back to £ at the same rate.

How much money does she receive?

b) Amir buys $1,000 at the same exchange rate.

He also pays a 3% commission charge.

How much does he pay altogether?

7 £1 buys 136 Japanese yen.

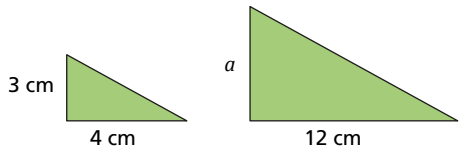
£1 buys 4,640 Ugandan shillings.

Convert 1 million Japanese yen into Ugandan shillings.

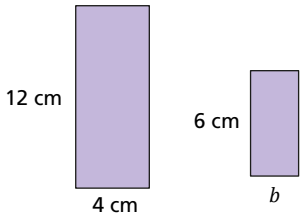
Explore relationships between similar shapes

1 Work out the missing lengths in these pairs of similar shapes.

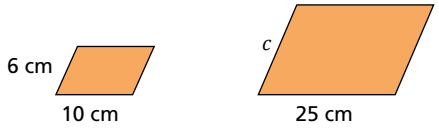
a)



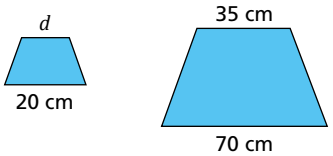
b)



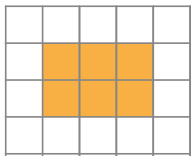
c)



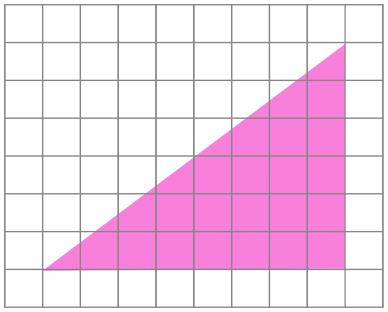
d)



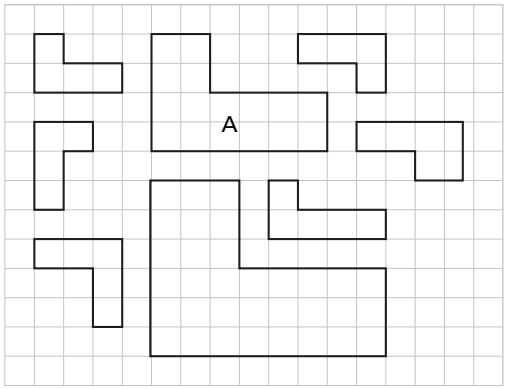
2 Draw two similar rectangles.



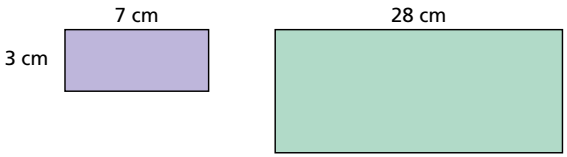
3 Draw two similar triangles.



4 Which of these shapes are similar to shape A?



5 These two shapes are similar.



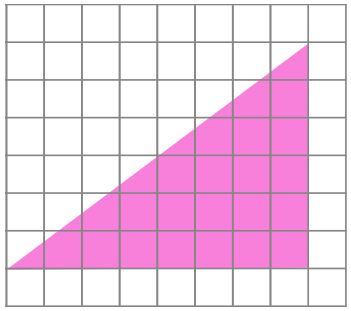
a) Work out the perimeter of the smaller rectangle.

b) Work out the perimeter of the larger rectangle.

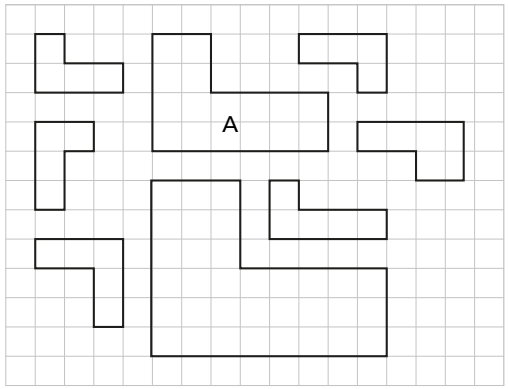
c) What do you notice about your answers in part a) and part b)? Discuss it with a partner.

Explore relationships between similar shapes

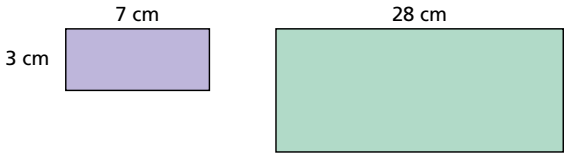
3 Draw two similar triangles.



4 Which of these shapes are similar to shape A?



5 These two shapes are similar.

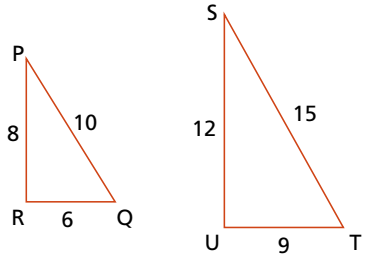


a) Work out the perimeter of the smaller rectangle.

b) Work out the perimeter of the larger rectangle.

c) What do you notice about your answers in part a) and part b)?
Discuss it with a partner.

6



a) Work out the ratios, giving your answers in the simplest form.

PR : SU ☐ : ☐ RQ : UT ☐ : ☐ PQ : ST ☐ : ☐

b) What do you notice about your answers?

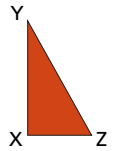
c) Work out the ratios, giving your answers in the simplest form.

PR : RQ ☐ : ☐ SU : UT ☐ : ☐

d) Triangle XYZ is similar to triangle PRQ

XY = 78

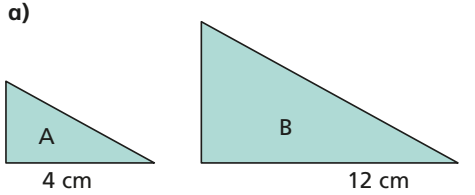
Find the value of YZ.



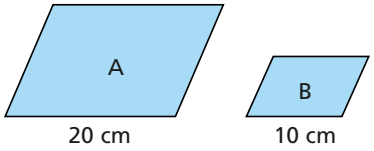
Understand scale factors as multiplicative representations

1 For each pair of similar shapes, write the scale factor from shape A to shape B.

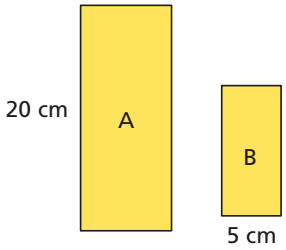
a)



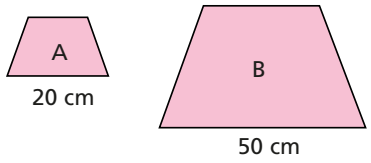
c)



b)



d)



2 A rectangle has a length of 12 cm and a width of 9 cm.

Work out the length and width of the rectangle if it is enlarged by these scale factors.

a) scale factor 3

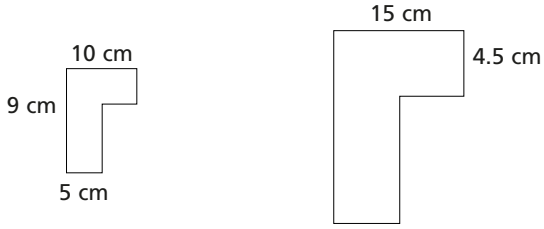
b) scale factor $\frac{1}{2}$

c) scale factor 4

d) scale factor $\frac{1}{3}$

e) scale factor $\frac{2}{3}$

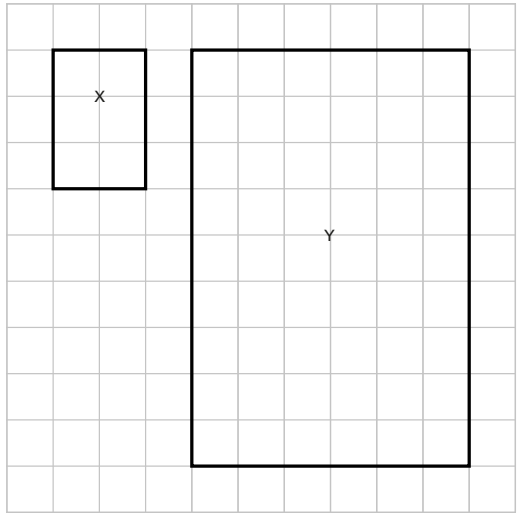
3 These hexagons are similar.



a) What is the scale factor of enlargement?

b) Work out all the missing lengths.

4



a) What is the scale factor of enlargement from shape X to shape Y?

b) Write the ratio width X : width Y.

c) Write the ratio length X : length Y.

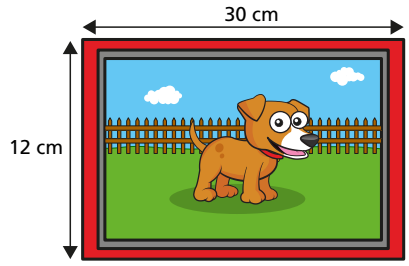
d) What is the ratio of the lengths of the diagonals of shapes X and Y?

e) What is the ratio of the perimeters of shapes X and Y?

f) Compare answers with a partner.

g) Explain any connections between your answers.

5 A photograph is 12 cm by 30 cm.



Mo has some enlargements made of the photograph.

a) Find the length and width of the photograph if it is enlarged by a scale factor of 5

b) Find the length and width of the photograph if it is enlarged by a scale factor of 3.6

c) Find the width of the photograph if its length is 84 cm after an enlargement.

d) Find the length of the photograph if its width is 4.5 m after an enlargement.

Draw and interpret scale diagrams

1 A rectangle is 40 cm long and 30 cm wide.

Draw a scale diagram of the rectangle if:

a) The length of each square represents 10 cm.

b) The length of each square represents 5 cm.

c) The length of each square represents 20 cm.

2 The scale on a diagram is such that 2 cm represents 1 m.

a) What does 8 cm represent?

b) What does 12 cm represent?

c) What does 1 cm represent?

d) What does 6.6 cm represent?

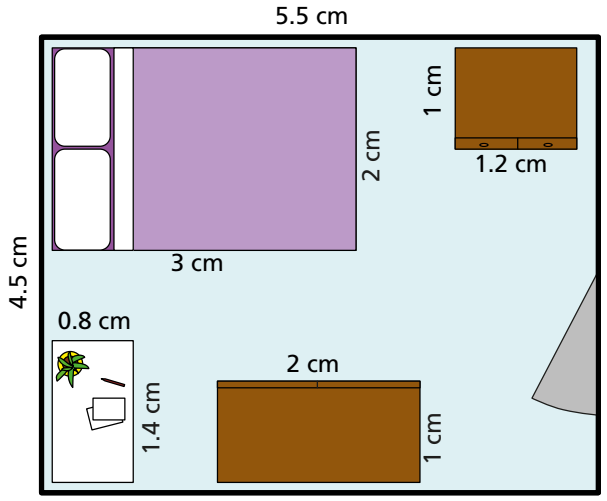
e) Use the same scale to draw a scale diagram of a window 3 m wide and 1 m tall.

3 A rectangular school hall measures 16 m by 10 m.

a) Draw a scale diagram of the hall on squared paper where one square represents 2m.

b) If the scale is changed so that 2 squares represents 1 m, what are the dimensions of the scale diagram?

4 This is a plan of a bedroom drawn to a scale of 1 to 50



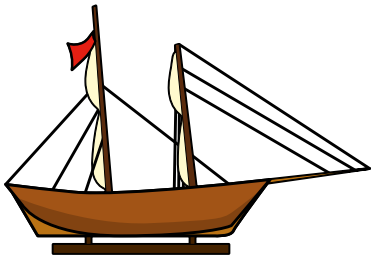
a) What does 2 cm on the plan represent?

b) What are the actual dimensions of the bed?

c) What are the actual dimensions of the desk?

d) A chair with an actual size of 80 cm by 60 cm is added to the room. Draw the chair and label it with the scaled measurements.

5 A model boat is built to a scale of 1 to 20



a) What length on the model represents 1 m on the real boat?

b) The masts are 5 m and 4 m tall. How long are they on the model?

c) There are two masts on the model.
How many masts are there on the real boat?

Interpret maps using scale factors and ratios

1 Match the statements on the left with the ratios on the right.

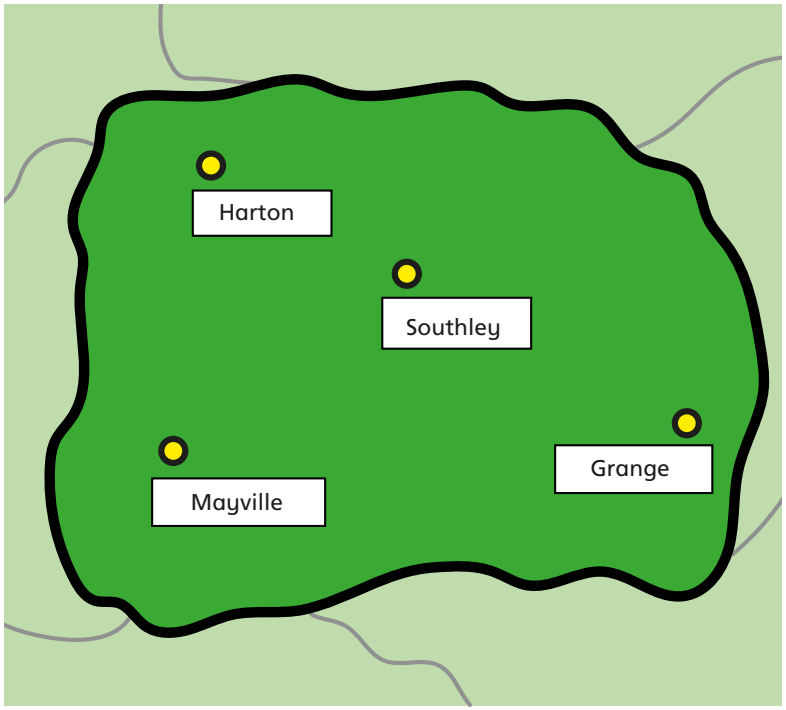
1 cm represents 2 cm	1 : 5
1 cm represents 5 cm	2 : 1
1 cm represents 50 cm	1 : 2
1 cm represents 0.5 cm	1 : 50

2 Match the statements on the left with the ratios on the right.

1 cm represents 1 m	1 : 500
1 cm represents 5 m	1 : 100,000
1 cm represents 1 km	1 : 100
1 cm represents 500 m	1 : 50,000

3 This map shows four towns.

The scale of the map is: 1 cm represents 30 miles.



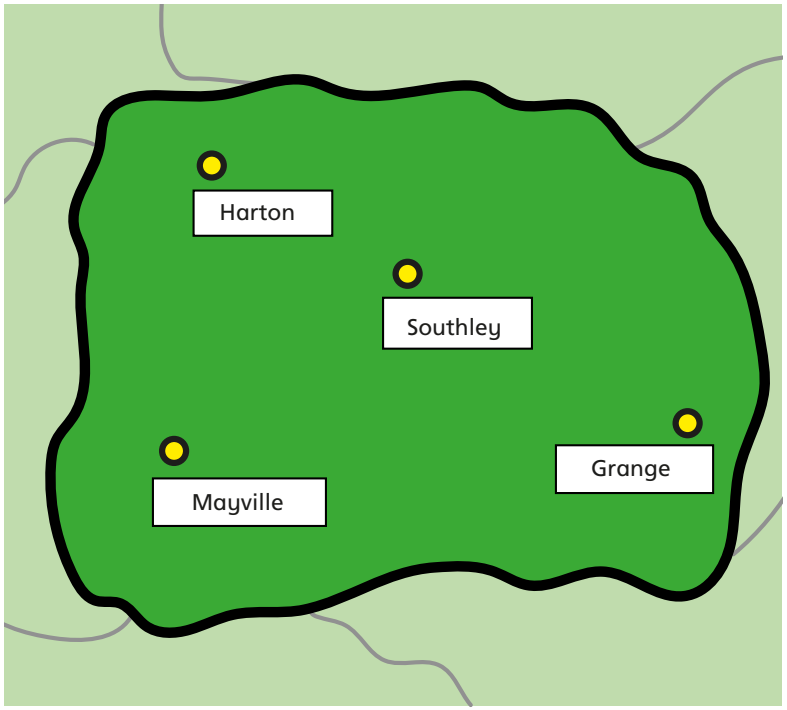
Complete the table showing the distances between the towns.

	Harton	Mayville	Southley	Grange
Harton				
Mayville				
Southley				
Grange				

Interpret maps using scale factors and ratios

3 This map shows four towns.

The scale of the map is: 1 cm represents 30 miles.



Complete the table showing the distances between the towns.

	Harton	Mayville	Southley	Grange
Harton				
Mayville				
Southley				
Grange				

4 A map is drawn to a scale of 1: 20,000

a) Complete the sentences.

1 cm represents 20,000 cm

So 2 cm represents 40,000 cm

40,000 ÷ 100 = ☐

So 2 cm represents ☐ m

1 cm represents 20,000 cm

So 5 cm represents ☐ cm

☐ ÷ 100 = ☐

So 5 cm represents ☐ m

This is the same as ☐ km.

b) What distance on the map would represent an actual distance of 2 km?

c) Two towns are 15 cm apart on the map.
How far apart would the towns be on a map with a scale of 1 : 10,000?

5 Which of these ratios are the same as a scale factor of $\frac{1}{50}$?

1 cm represents 0.5 m	5 inches represents 250 inches
4 cm represents 2 m	1 km is represented by 20 m

6 Are these statements always, sometimes or never true?
Explain your answers.

On a map with a scale of 1 : 20,000, a given distance is represented by a line twice the length of the corresponding line on a 1 : 40,000 map.

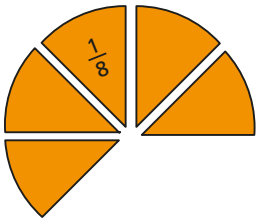
A map has a scale where 1 cm represents 1 km.
This is the same as 1 : 1,000

If the scale factor of a drawing is greater than 1, then the drawing is larger than the actual object.

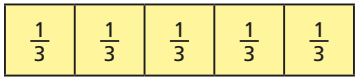
Represent multiplication of fractions

1 What multiplications are represented?

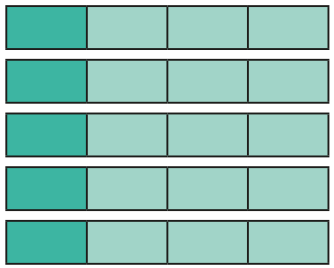
a)



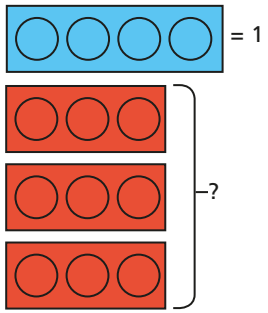
b)



c)



d)



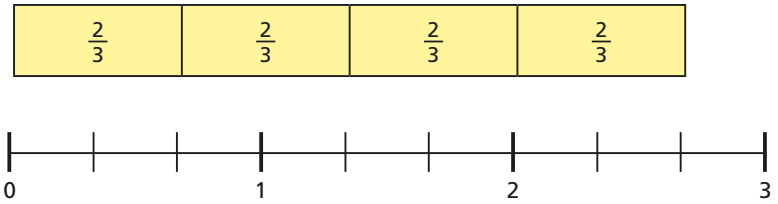
2 Match the multiplications to the corresponding additions.

$5 \times \frac{1}{2}$	$\frac{2}{3} + \frac{2}{3}$
$4 \times \frac{1}{3}$	$\frac{1}{4} + \frac{1}{4} + \frac{1}{4}$
$\frac{1}{4} \times 3$	$\frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3}$
$\frac{2}{3} \times 2$	$\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$

3 Draw a diagram to represent each calculation.

a) $3 \times \frac{1}{5}$ **b)** $3 \times \frac{2}{5}$ **c)** $\frac{2}{3} \times 4$

4 This number line represents the calculation $4 \times \frac{2}{3}$



Draw on a number line to represent the calculations.

a) $7 \times \frac{1}{3}$ **b)** $3 \times \frac{3}{5}$ **c)** $5 \times \frac{3}{4}$ **d)** $\frac{5}{6} \times 4$

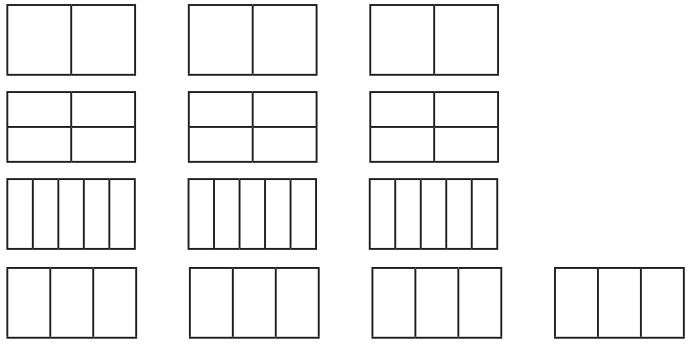
5 Shade the diagrams to represent the multiplications.

a) $5 \times \frac{1}{2}$

b) $4 \times \frac{3}{4}$

c) $3 \times \frac{4}{5}$

d) $\frac{2}{3} \times 5$

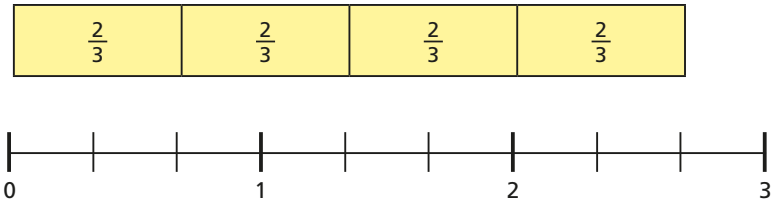


Represent multiplication of fractions

3 Draw a diagram to represent each calculation.

a) $3 \times \frac{1}{5}$ **b)** $3 \times \frac{2}{5}$ **c)** $\frac{2}{3} \times 4$

4 This number line represents the calculation $4 \times \frac{2}{3}$



Draw on a number line to represent the calculations.

a) $7 \times \frac{1}{3}$ **b)** $3 \times \frac{3}{5}$ **c)** $5 \times \frac{3}{4}$ **d)** $\frac{5}{6} \times 4$

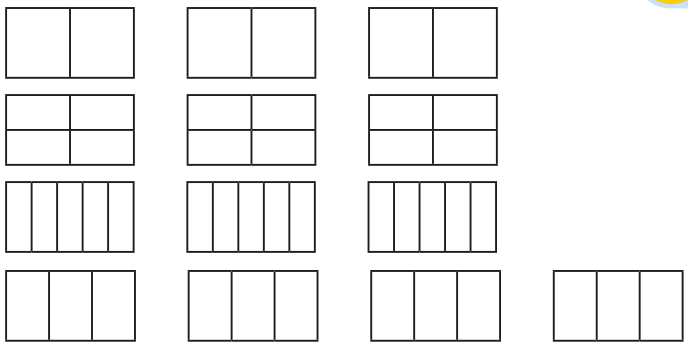
5 Shade the diagrams to represent the multiplications.

a) $5 \times \frac{1}{2}$

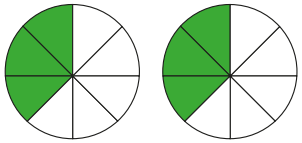
b) $4 \times \frac{3}{4}$

c) $3 \times \frac{4}{5}$

d) $\frac{2}{3} \times 5$

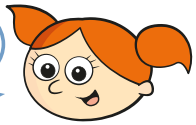


6



This diagram shows $2 \times \frac{3}{8}$

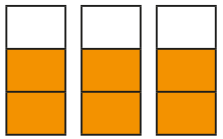
This diagram shows $\frac{5}{8} \times 2$



Explain why Whitney and Alex could both be right.

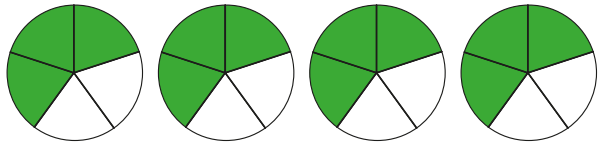
7 Which calculations could the diagrams represent?

a)



$3 \times \frac{2}{3}$ $\frac{2}{3} + \frac{2}{3} + \frac{2}{3}$ $\frac{1}{2} + \frac{1}{2} + \frac{1}{2}$ $\frac{2}{3} \times 3$ $\frac{1}{3} \times 6$ $6 \times \frac{1}{3}$

b)



$4 \times \frac{3}{5}$ $\frac{2}{5} + \frac{2}{5} + \frac{2}{5} + \frac{2}{5}$ $\frac{3}{5} + \frac{3}{5} + \frac{3}{5}$ $\frac{3}{5} \times 4$ $\frac{1}{5} \times 12$

Multiply a fraction by an integer

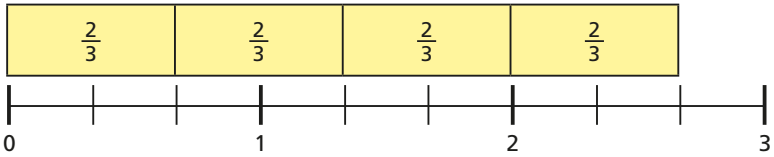
1 Solve the calculations.

a) 5×3 **b)** $5 \times 3a$ **c)** $5 \times 3xy$ **d)** $5 \times \frac{3}{7}$

2 Match the calculations to the correct answers.

$3 \times \frac{2}{5}$	$\frac{6}{15}$
$\frac{3}{4} \times 5$	$\frac{8}{5}$
$\frac{1}{15} \times 6$	$\frac{15}{4}$
$\frac{4}{5} \times 2$	$\frac{6}{5}$

3 This diagram represents $4 \times \frac{2}{3} = \frac{8}{3} = 2\frac{2}{3}$



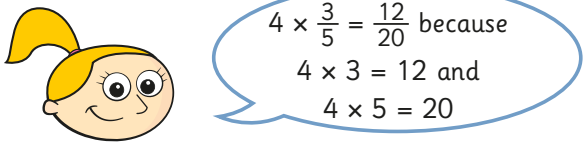
Draw diagrams to represent the calculations.

a) $3 \times \frac{3}{4} = \frac{9}{4} = 2\frac{1}{4}$ **b)** $6 \times \frac{2}{3} = \frac{12}{3} = 4$

4 Convert the improper fractions to mixed numbers.

a) $\frac{5}{2}$ **b)** $\frac{11}{4}$ **c)** $\frac{18}{5}$ **d)** $\frac{30}{6}$

5



Explain why Eva is wrong.

6 Solve the calculations.

Give your answers as mixed numbers in their simplest form where appropriate.

a) $7 \times \frac{1}{2}$ **e)** $\frac{5}{8} \times 8$ **i)** $12 \times \frac{5}{6}$

b) $8 \times \frac{2}{3}$ **f)** $9 \times \frac{3}{4}$ **j)** $18 \times \frac{1}{3}$

c) $\frac{5}{8} \times 3$ **g)** $\frac{2}{17} \times 6$

d) $\frac{5}{8} \times 4$ **h)** $\frac{2}{3} \times 10$

7 Give your answers as mixed numbers in their simplest form where appropriate.

a) A piece of wood is $\frac{4}{5}$ m long.

How long are six of these pieces of wood, placed end-to-end?

b) At a school, lunchtime is $\frac{3}{4}$ hour.

What is the total time taken for lunch over a full school week?

c) Rosie buys 10 bags of dried fruit.

Each bag weighs $\frac{2}{5}$ kg.

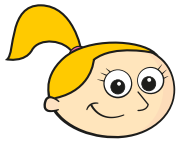
What is the total weight of all 10 bags?

Multiply a fraction by an integer

4 Convert the improper fractions to mixed numbers.

a) $\frac{5}{2}$ **b)** $\frac{11}{4}$ **c)** $\frac{18}{5}$ **d)** $\frac{30}{6}$

5



$4 \times \frac{3}{5} = \frac{12}{20}$ because
$4 \times 3 = 12$ and
$4 \times 5 = 20$

Explain why Eva is wrong.

6 Solve the calculations.

Give your answers as mixed numbers in their simplest form where appropriate.

a) $7 \times \frac{1}{2}$ **e)** $\frac{5}{8} \times 8$ **i)** $12 \times \frac{5}{6}$

b) $8 \times \frac{2}{3}$ **f)** $9 \times \frac{3}{4}$ **j)** $18 \times \frac{1}{3}$

c) $\frac{5}{8} \times 3$ **g)** $\frac{2}{17} \times 6$

d) $\frac{5}{8} \times 4$ **h)** $\frac{2}{3} \times 10$

7 Give your answers as mixed numbers in their simplest form where appropriate.

a) A piece of wood is $\frac{4}{5}$ m long.

How long are six of these pieces of wood, placed end-to-end?

b) At a school, lunchtime is $\frac{3}{4}$ hour.

What is the total time taken for lunch over a full school week?

c) Rosie buys 10 bags of dried fruit.

Each bag weighs $\frac{2}{5}$ kg.

What is the total weight of all 10 bags?

8 Find the missing numbers in these calculations.

a) $\frac{2}{7} \times \square = \frac{6}{7}$

b) $\frac{3}{8} \times \square = \frac{15}{8} = 1\frac{7}{8}$

c) $6 \times \square = \frac{18}{11} = \square$

d) $5 \times \square = \square = 3\frac{1}{8}$

e) $6 \times \square = \frac{\square}{4} = 4\frac{1}{2}$

9

I know these all have the same answer without having to work them all out.

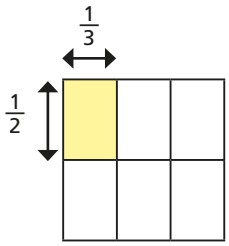
$8 \times \frac{4}{5}$	$4 \times \frac{8}{5}$	$2 \times 0.8 \times 4$	$\frac{2}{5} \times 16$

How does Amir know these calculations are equivalent?

Compare answers with a partner.

Find the product of a pair of unit fractions

1 **a)** How does this diagram represent $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$?

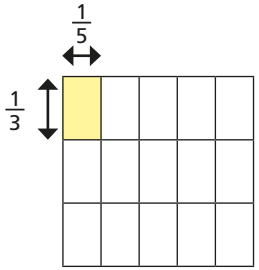


Discuss it with a partner.

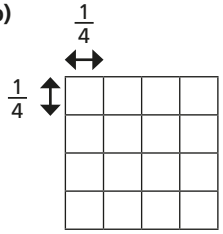
b) Use a similar diagram to represent $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

2 Write and solve the calculations represented by the diagrams.

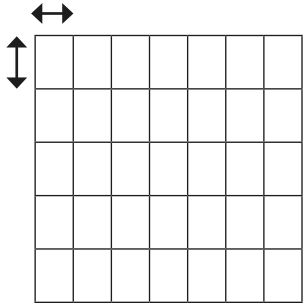
a)



b)



c)



3 Match the calculations to the correct answers.

$\frac{1}{6} \times \frac{1}{5}$	$\frac{1}{4} \times \frac{1}{3}$	$\frac{1}{7} \times \frac{1}{2}$	$\frac{1}{5} \times \frac{1}{4}$
$\frac{1}{14}$	$\frac{1}{12}$	$\frac{1}{20}$	$\frac{1}{30}$

4 Solve the calculations.

a) $\frac{1}{4} \times \frac{1}{2}$

b) $\frac{1}{3} \times \frac{1}{7}$

c) $\frac{1}{8} \times \frac{1}{5}$

d) $\frac{1}{6} \times \frac{1}{7}$

e) $\left(\frac{1}{4}\right)^2 = \frac{1}{4} \times \frac{1}{4}$

f) $\left(\frac{1}{5}\right)^2$

g) 0.1^2

h) $\frac{1}{2} \times \frac{1}{\square} = \frac{1}{10}$

i) $\frac{1}{\square} \times \frac{1}{6} = \frac{1}{12}$

j) $\frac{1}{\square} \times 0.1 = \frac{1}{40}$

5 Complete the multiplications.

a) $\frac{1}{\square} \times \frac{1}{\square} = \frac{1}{24}$ **b)** $\frac{1}{\square} \times \frac{1}{\square} = \frac{1}{36}$ **c)** $\frac{1}{\square} \times \frac{1}{\square} = \frac{1}{40}$

Are there other ways to complete these multiplications?

Which calculation has the most options? Why?

6

When you multiply two unit fractions the answer is always a unit fraction.

Is Jack correct?

Explain your answer.

Find the product of a pair of unit fractions

4 Complete the calculations.

a) $\frac{1}{4} \times \frac{1}{2}$

b) $\frac{1}{3} \times \frac{1}{7}$

c) $\frac{1}{8} \times \frac{1}{5}$

d) $\frac{1}{6} \times \frac{1}{7}$

e) $\left(\frac{1}{4}\right)^2 = \frac{1}{4} \times \frac{1}{4}$

f) $\left(\frac{1}{5}\right)^2$

g) 0.1^2

h) $\frac{1}{2} \times \frac{1}{\square} = \frac{1}{10}$

i) $\frac{1}{\square} \times \frac{1}{6} = \frac{1}{12}$

j) $\frac{1}{\square} \times 0.1 = \frac{1}{40}$

5 Complete the multiplications.

a) $\frac{1}{\square} \times \frac{1}{\square} = \frac{1}{24}$ **b)** $\frac{1}{\square} \times \frac{1}{\square} = \frac{1}{36}$ **c)** $\frac{1}{\square} \times \frac{1}{\square} = \frac{1}{40}$

Are there other ways to complete these multiplications?

Which calculation has the most options? Why?

6

When you multiply two unit fractions the answer is always a unit fraction.

Is Jack correct?

Explain your answer.

7 **a)** A school's lunchtime lasts for half an hour.

Huan spends one-third of lunchtime in the library.

What fraction of an hour does Huan spend in the library?

b) A running track is $\frac{1}{4}$ km long.

Esther runs exactly half the length of the running track.

What fraction of a kilometre does Esther run?

Brett runs on the same running track, but only runs for $\frac{1}{20}$ km altogether.

What fraction of the running track does Brett run?

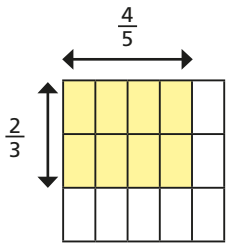
8 **a)** Write 0.2 as a fraction in its simplest form.

b) Use your answer to part a) to work out 0.2^2, giving your answer as a fraction.

c) Calculate 0.5^2, giving your answer as a fraction.

Find the product of a pair of any fractions

1 **a)** How does this diagram represent $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$?

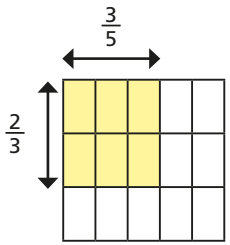


Discuss it with a partner.

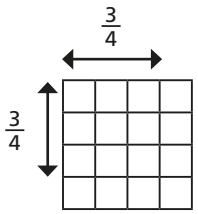
b) Use a similar diagram to represent $\frac{3}{4} \times \frac{5}{7} = \frac{15}{28}$

2 Write and solve the calculations represented by the diagrams.

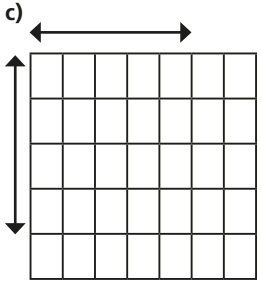
a)



b)



c)



3 Match the calculations to the correct answers.

$\frac{1}{3} \times \frac{4}{5}$	$\frac{2}{5} \times \frac{1}{3}$	$\frac{4}{5} \times \frac{2}{3}$	$\frac{3}{5} \times \frac{1}{3}$
$\frac{2}{15}$	$\frac{8}{15}$	$\frac{4}{15}$	$\frac{1}{5}$

4 Solve the calculations.

a) $\frac{3}{4} \times \frac{1}{2}$

b) $\frac{2}{3} \times \frac{4}{7}$

c) $\frac{5}{8} \times \frac{2}{3}$

d) $\frac{5}{6} \times \frac{1}{3}$

e) $\left(\frac{3}{4}\right)^2 = \frac{3}{4} \times \frac{3}{4}$

f) $\left(\frac{4}{5}\right)^2$

g) 0.3^2

h) $\frac{2}{5} \times \frac{4}{\square} = \frac{8}{25}$

i) $\frac{1}{\square} \times \frac{6}{7} = \frac{6}{49}$

j) $\frac{7}{\square} \times 0.1 = \frac{7}{90}$

5 Complete the multiplications.

a) $\frac{\square}{\square} \times \frac{\square}{\square} = \frac{5}{18}$ **b)** $\frac{\square}{\square} \times \frac{\square}{\square} = \frac{8}{15}$ **c)** $\frac{\square}{\square} \times \frac{\square}{\square} = \frac{1}{10}$

Are there other ways to complete these multiplications?

Which has the most options? Why?

6

When you multiply two fractions that are both less than one, the answer will be less than one.

Is Whitney correct?

Explain your answer.

Find the product of a pair of any fractions

4 Solve the calculations.

a) $\frac{3}{4} \times \frac{1}{2}$

b) $\frac{2}{3} \times \frac{4}{7}$

c) $\frac{5}{8} \times \frac{2}{3}$

d) $\frac{5}{6} \times \frac{1}{3}$

e) $\left(\frac{3}{4}\right)^2 = \frac{3}{4} \times \frac{3}{4}$

f) $\left(\frac{4}{5}\right)^2$

g) 0.3^2

h) $\frac{2}{5} \times \frac{4}{\square} = \frac{8}{25}$

i) $\frac{1}{\square} \times \frac{6}{7} = \frac{6}{49}$

j) $\frac{7}{\square} \times 0.1 = \frac{7}{90}$

5 Complete the multiplications.

a) $\frac{\square}{\square} \times \frac{\square}{\square} = \frac{5}{18}$

b) $\frac{\square}{\square} \times \frac{\square}{\square} = \frac{8}{15}$

c) $\frac{\square}{\square} \times \frac{\square}{\square} = \frac{1}{10}$

Are there other ways to complete these multiplications?

Which has the most options? Why?

6

When you multiply two fractions that are both less than one, the answer will be less than one.

Is Whitney correct?

Explain your answer.

7 Look at these methods of working out $\frac{5}{6} \times \frac{3}{10}$

$\frac{5}{6} \times \frac{9}{10} = \frac{45}{60} = \frac{9}{12} = \frac{3}{4}$

$\frac{\cancel{5}^{1}}{\cancel{6}_{2}} \times \frac{\cancel{9}^{3}}{\cancel{10}_{2}} = \frac{1 \times 3}{2 \times 2} = \frac{3}{4}$

Discuss both methods with a partner.

Use your preferred method to solve the calculations.
Give your answers in their simplest form.

a) $\frac{1}{15} \times \frac{5}{21}$

b) $\frac{7}{15} \times \frac{5}{21}$

c) $\frac{7}{15} \times \frac{10}{21}$

d) $\frac{14}{15} \times \frac{5}{21}$

e) $\frac{2}{3} \times \frac{9}{20}$

f) $\frac{8}{11} \times \frac{33}{40}$

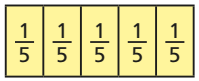
g) $\frac{7}{20} \times \frac{5}{14}$

h) $\frac{18}{25} \times \frac{10}{27}$

Divide an integer by a fraction

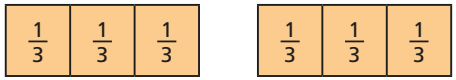
1 Complete the sentences.

a)



There are ☐ fifths in one whole. So $1 \div \frac{1}{5} =$ ☐

b)



There are ☐ thirds in one whole. So $1 \div \frac{1}{3} =$ ☐ and $2 \div \frac{1}{3} =$ ☐

c) Complete the calculations. Use your answers to part a) and b) to help you.

$2 \div \frac{1}{5} =$ ☐ $3 \div \frac{1}{5} =$ ☐ $4 \div \frac{1}{5} =$ ☐

2 Match the equivalent calculations.

$3 \div \frac{1}{2}$	$4 \div \frac{1}{3}$	$3 \div \frac{1}{5}$	$4 \div \frac{1}{2}$
4×2	4×3	3×2	3×5

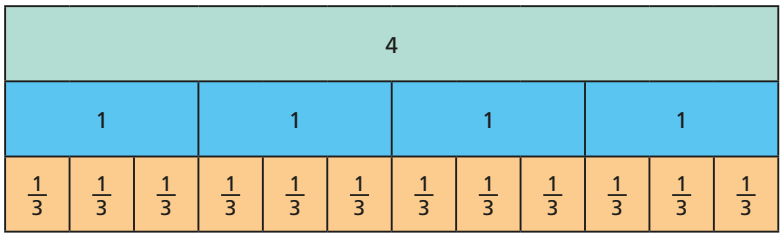
3 Solve the calculations.

a) $3 \div \frac{1}{2}$ **d)** $6 \div \frac{1}{2}$ **g)** $30 \div \frac{1}{2}$ **j)** $x \div \frac{1}{4}$

b) $3 \div \frac{1}{3}$ **e)** $6 \div \frac{1}{3}$ **h)** $30 \div \frac{1}{3}$

c) $3 \div \frac{1}{4}$ **f)** $6 \div \frac{1}{4}$ **i)** $30 \div \frac{1}{4}$

4



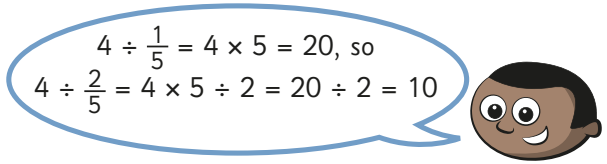
Explain how the diagram represents the calculations.

a) $4 \div \frac{1}{3} = 12$

b) $4 \div \frac{2}{3} = 6$

Compare answers with a partner.

5



Use Mo's method to complete the calculations.

a) $6 \div \frac{3}{4} = 6 \times 4 \div 3 = 24 \div 3 =$ ☐

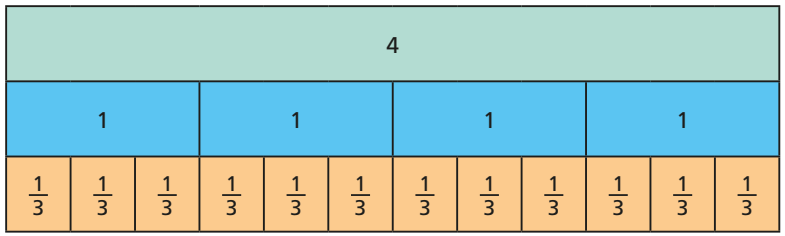
b) $10 \div \frac{2}{3} = 10 \times 3 \div 2 =$ ☐ ÷ ☐ = ☐

c) $10 \div \frac{5}{8} = 10 \times$ ☐ ÷ ☐ = ☐

d) $9 \div \frac{3}{5} = 9 \times$ ☐ ÷ ☐ = ☐

Divide an integer by a fraction

4



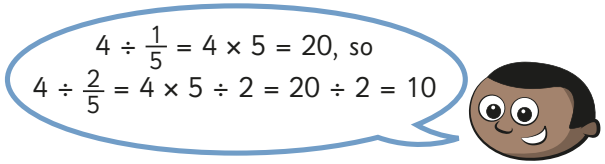
Explain how the diagram represents the calculations.

a) $4 \div \frac{1}{3} = 12$

b) $4 \div \frac{2}{3} = 6$

Compare answers with a partner.

5



Use Mo's method to complete the calculations.

a) $6 \div \frac{3}{4} = 6 \times 4 \div 3 = 24 \div 3 =$ ☐

b) $10 \div \frac{2}{3} = 10 \times 3 \div 2 =$ ☐ $\div$ ☐ $=$ ☐

c) $10 \div \frac{5}{8} = 10 \times$ ☐ $\div$ ☐ $=$ ☐

d) $9 \div \frac{3}{5} = 9 \times$ ☐ $\div$ ☐ $=$ ☐

6

Sort the calculations into two groups that have the same answers.

$8 \div \frac{1}{4}$	$8 \times \frac{1}{4}$	$16 \times \frac{1}{8}$	$8 \div 4$	8×4
16×2	$16 \div 8$	$16 \div \frac{1}{2}$	$4 \div \frac{1}{8}$	

7

Work out the value of $4x$ and $\frac{4}{x}$ for the given values of x.

a) $x = \frac{1}{2}$ **b)** $x = \frac{1}{4}$ **c)** $x = \frac{1}{6}$

8

A large coil of wire is 12 m long.

a) How many pieces of wire $\frac{1}{2}$ m long can be cut from the coil?

b) How many pieces of wire $\frac{1}{4}$ m long can be cut from the coil?

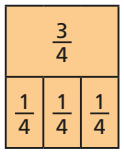
c) How many pieces of wire $\frac{3}{4}$ m long can be cut from the coil?

d) How many pieces of wire $\frac{3}{5}$ m long can be cut from the coil?

Divide a fraction by a unit fraction

1 Use the bar models to answer the questions and complete the calculations.

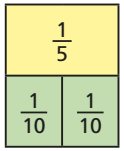
a)



How many quarters are there in three-quarters?

$\frac{3}{4} \div \frac{1}{4} = \square$

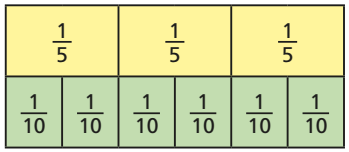
b)



How many tenths are there in one-fifth?

$\frac{1}{5} \div \frac{1}{10} = \square$

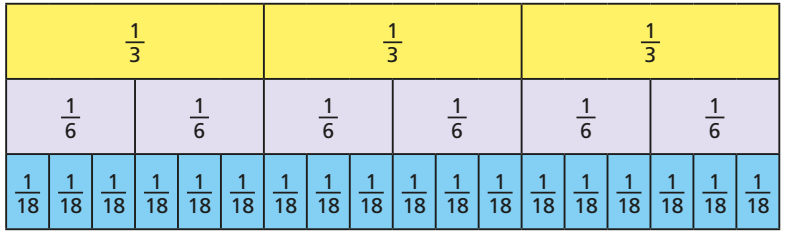
c)



How many tenths are there in three-fifths?

$\frac{3}{5} \div \frac{1}{10} = \square$

2 Use the fraction wall to solve the calculations.



a) $\frac{1}{3} \div \frac{1}{6}$ **c)** $\frac{2}{3} \div \frac{1}{6}$ **e)** $\frac{5}{3} \div \frac{1}{18}$

b) $\frac{1}{3} \div \frac{1}{18}$ **d)** $\frac{2}{3} \div \frac{1}{18}$

Use the fraction wall, and the fact that $\frac{2}{18} = \frac{1}{9}$, to help you solve the calculations.

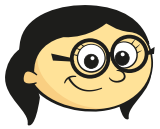
f) $\frac{1}{3} \div \frac{1}{9}$ **g)** $\frac{2}{3} \div \frac{1}{9}$

3 Solve the calculations.

Draw diagrams to help you.

a) $\frac{2}{3} \div \frac{1}{6}$ **b)** $\frac{2}{3} \div \frac{1}{12}$ **c)** $\frac{3}{4} \div \frac{1}{12}$

4



$\frac{1}{2} \div \frac{1}{8}$ is greater than $\frac{1}{2} \div \frac{1}{4}$

Draw diagrams to show Annie is correct.

5 Write <, > or = to compare the statements.

$\frac{1}{3} \div \frac{1}{12} \bigcirc \frac{1}{3} \div \frac{1}{18}$ $\frac{1}{3} \div \frac{1}{12} \bigcirc \frac{2}{3} \div \frac{1}{12}$

$\frac{1}{3} \div \frac{1}{12} \bigcirc \frac{1}{4} \div \frac{1}{12}$ $\frac{1}{3} \div \frac{1}{12} \bigcirc \frac{1}{3} \times \frac{1}{12}$

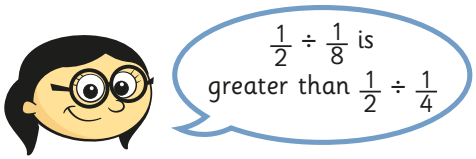
Divide a fraction by a unit fraction

3 Solve the calculations.

Draw diagrams to help you.

a) $\frac{2}{3} \div \frac{1}{6}$ **b)** $\frac{2}{3} \div \frac{1}{12}$ **c)** $\frac{3}{4} \div \frac{1}{12}$

4



Draw diagrams to show Annie is correct.

5 Write <, > or = to compare the statements.

$\frac{1}{3} \div \frac{1}{12}$ ◯ $\frac{1}{3} \div \frac{1}{18}$

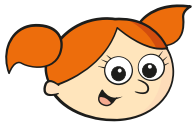
$\frac{1}{3} \div \frac{1}{12}$ ◯ $\frac{2}{3} \div \frac{1}{12}$

$\frac{1}{3} \div \frac{1}{12}$ ◯ $\frac{1}{4} \div \frac{1}{12}$

$\frac{1}{3} \div \frac{1}{12}$ ◯ $\frac{1}{3} \times \frac{1}{12}$

6 Alex divides by unit fractions using equivalent fractions.

Here is Alex's method.



$$\frac{2}{3} \div \frac{1}{9}$$
$$= \frac{6}{9} \div \frac{1}{9}$$
$$= 6 \div 1$$
$$= 6$$

Use Alex's method to complete the calculations.

a) $\frac{3}{4} \div \frac{1}{8} = \frac{\square}{8} \div \frac{1}{8} = \square \div 1 = \square$

b) $\frac{3}{4} \div \frac{1}{12} = \frac{\square}{\square} \div \frac{1}{12} = \square \div 1 = \square$

c) $\frac{3}{4} \div \frac{1}{20} = \frac{\square}{\square} \div \frac{1}{20} = \square \div \square = \square$

7 Solve the equations.

a) $\frac{1}{15}a = \frac{1}{3}$ **c)** $\frac{1}{33}c = \frac{6}{11}$

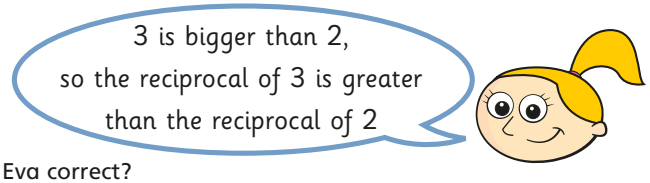
b) $\frac{1}{10}b = \frac{1}{2}$ **d)** $\frac{1}{12}d = \frac{5}{6}$

Understand and use the reciprocal

1 Match the numbers and fractions to their reciprocals.

3	$\frac{3}{4}$	$\frac{1}{15}$	2	$\frac{1}{x}$	$\frac{2}{x}$
15	$\frac{1}{3}$	$\frac{4}{3}$	$\frac{x}{2}$	$\frac{1}{2}$	x

2



Is Eva correct?

Explain your reasoning.

3 Work out the pairs of calculations. Use a number line to help you.

a) $1 \div \frac{1}{5}$ $\quad$ 1×5

b) $2 \div \frac{1}{5}$ $\quad$ 2×5

c) $3 \div \frac{1}{5}$ $\quad$ 3×5

d) $4 \div \frac{1}{5}$ $\quad$ 4×5

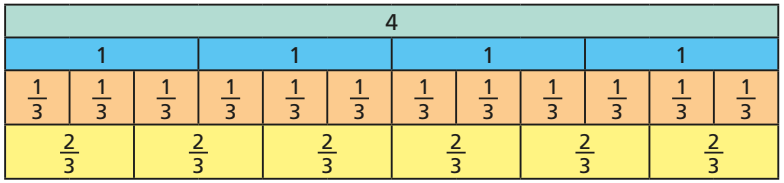
Complete the sentence.

_____ by a fraction is the same as _____ by its reciprocal.

4 Solve the calculations.

a) $6 \div \frac{1}{5}$ $\quad$ **b)** $7 \div \frac{1}{5}$ $\quad$ **c)** $5 \div \frac{1}{4}$ $\quad$ **d)** $8 \div \frac{1}{4}$

5



Tommy has written these calculations using the fraction wall.

$4 \div \frac{1}{3} = 4 \times 3 = 12$ $\quad$ $4 \div \frac{2}{3} = 4 \times 3 \div 2 = 6$

Discuss Tommy's method with a partner. What has he done?

Use Tommy's method to complete the calculations.

a) $3 \div \frac{1}{4} = 3 \times \square = \square$

b) $3 \div \frac{3}{4} = 3 \times \square \div \square = \square$

c) $3 \div \frac{1}{8} = 3 \times \square = \square$

d) $3 \div \frac{3}{8} = 3 \times \square \div \square = \square$

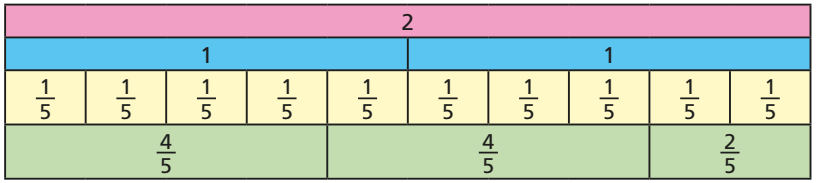
e) $6 \div \frac{3}{4} = \square$

f) $9 \div \frac{2}{3} = \square$

g) $2 \div \frac{2}{5} = \square$

h) $2 \div \frac{4}{5} = \square$

6 Use the fraction wall to calculate $2 \div \frac{4}{5}$



Discuss your answer with a partner.

7 Solve the calculations.

a) $3 \div \frac{1}{3}$ $\quad$ **b)** $3 \div \frac{2}{3}$ $\quad$ **c)** $\frac{1}{2} \div \frac{1}{3}$ $\quad$ **d)** $\frac{1}{2} \div \frac{2}{3}$ $\quad$ **e)** $3 \div \frac{1}{3}$ $\quad$ **f)** $3 \div \frac{2}{3}$

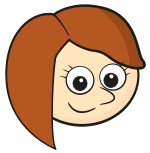
Explain how you could use fractions to work out $0.5 \div 0.125$

Divide any pair of fractions

1 Solve the calculations.

a) $6 \div \frac{1}{3}$ **b)** $6 \div \frac{1}{4}$

2



To divide a number by a fraction you multiply by its reciprocal.

$3 \div \frac{4}{5} = 3 \times \frac{5}{4} = \frac{15}{4} = 3\frac{3}{4}$

$\frac{5}{8} \div \frac{1}{4} = \frac{5}{8} \times \frac{4}{1} = \frac{20}{8} = \frac{5}{2} = 2\frac{1}{2}$

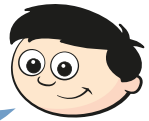
Use Rosie's method to solve the calculations.

a) $\frac{2}{3} \div \frac{1}{6}$ **c)** $5 \div \frac{3}{10}$ **e)** $\frac{3}{5} \div \frac{3}{4}$ **g)** $\frac{11}{16} \div \frac{3}{4}$

b) $\frac{1}{6} \div \frac{2}{3}$ **d)** $\frac{3}{10} \div 5$ **f)** $\frac{3}{4} \div \frac{3}{5}$ **h)** $\frac{3}{4} \div \frac{11}{16}$

3

To divide a pair of fractions, convert them so they have the same denominator and then divide the numerators.



$\frac{5}{8} \div \frac{1}{4} = \frac{5}{8} \div \frac{2}{8} = \frac{5}{2} = 2\frac{1}{2}$

$3 \div \frac{4}{5} = \frac{3}{1} \div \frac{4}{5} = \frac{15}{5} \div \frac{4}{5} = \frac{15}{4} = 3\frac{3}{4}$

Use Dexter's method to work out:

a) $\frac{2}{3} \div \frac{1}{6}$ **c)** $5 \div \frac{3}{10}$ **e)** $\frac{3}{5} \div \frac{3}{4}$ **g)** $\frac{11}{16} \div \frac{3}{4}$

b) $\frac{1}{6} \div \frac{2}{3}$ **d)** $\frac{3}{10} \div 5$ **f)** $\frac{3}{4} \div \frac{3}{5}$ **h)** $\frac{3}{4} \div \frac{11}{16}$

4 Compare your answers to questions 2 and 3

Which method did you prefer using, and why?

Discuss it with a partner.

5 Look at the method shown to work out $4 \div 0.6$

$4 \div 0.6 = 4 \div \frac{3}{5} = 4 \times \frac{5}{3} = \frac{20}{3} = 6\frac{2}{3}$

Use this method to solve the calculations.

a) $3 \div 0.2$ **b)** $6 \div 0.4$

6 Convert both decimals into fractions to solve the calculations.

a) $0.75 \div 0.25$ **b)** $0.5 \div 0.125$ **c)** $0.6 \div 0.25$ **d)** $0.9 \div 0.25$

7 Which calculation in each set gives a different answer?

a) $\frac{3}{4} \div \frac{2}{3}$ $\frac{3}{4} \times \frac{2}{3}$ $\frac{3}{4} \times \frac{3}{2}$

b) $\frac{4}{5} \div \frac{1}{3}$ $\frac{1}{3} \div \frac{4}{5}$ $\frac{5}{4} \times \frac{1}{3}$

c) $\frac{5}{8} \times \frac{2}{3}$ $\frac{2}{3} \times \frac{5}{8}$ $\frac{2}{3} \div \frac{5}{8}$ $\frac{5}{8} \div \frac{3}{2}$

8 Work out these values if $x = \frac{1}{2}$, $y = \frac{3}{4}$ and $z = \frac{4}{5}$

a) xy **c)** yz **e)** xyz

b) $\frac{x}{y}$ **d)** $\frac{y}{z}$ **f)** $\frac{xy}{z}$

Multiply and divide improper and mixed fractions

H

1 Dora and Teddy are working out $3\frac{1}{2} \times \frac{1}{5}$

Dora

$$3\frac{1}{2} \times \frac{1}{5} = 3 \times \frac{1}{5} + \frac{1}{2} \times \frac{1}{5}$$
$$= \frac{3}{5} + \frac{1}{10}$$
$$= \frac{6}{10} + \frac{1}{10} = \frac{7}{10}$$

Teddy

$$3\frac{1}{2} \times \frac{1}{5} = \frac{7}{2} \times \frac{1}{5}$$
$$= \frac{7}{10}$$

Whose method do you prefer? Talk about it with a partner.

2 Solve the calculations. Show all your workings.

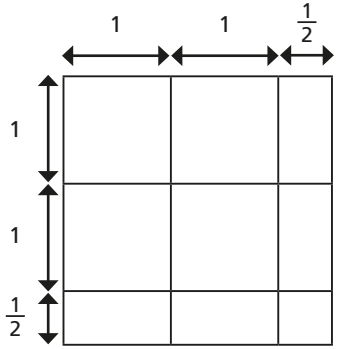
a) $2\frac{2}{3} \times \frac{1}{3}$ **c)** $5 \times 1\frac{3}{10}$ **e)** $3 \times 2\frac{3}{4}$

b) $3\frac{1}{6} \times 2$ **d)** $5\frac{1}{2} \times 3$ **f)** $2 \times 1\frac{3}{5} \times 3$

3 Dexter works out $\left(2\frac{1}{2}\right)^2$

$$2\frac{1}{2} \times 2\frac{1}{2} = \frac{5}{2} \times \frac{5}{2} = \frac{25}{4} = 6\frac{1}{4}$$

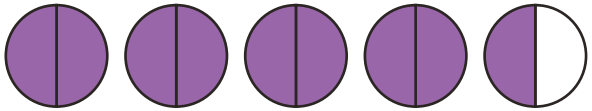
Use the diagram to show that Dexter's answer is correct.



4 Work out these multiplications.

a) $2\frac{2}{3} \times 2\frac{1}{3}$ **b)** $3\frac{5}{6} \times 2\frac{1}{2}$ **c)** $\frac{9}{10} \times 3\frac{1}{4}$

5 **a)** How does the diagram represent $4\frac{1}{2} \div \frac{1}{2} = 9$?



Discuss it with a partner.

b) How does this diagram represent $4\frac{1}{2} \div 1\frac{1}{2} = 3$?

Discuss it with a partner.

c) Solve the calculations. Use diagrams to help you.

$6\frac{1}{4} \div 1\frac{1}{4}$ $5\frac{1}{3} \div 1\frac{1}{3}$

6 Solve the calculations.

a) $3\frac{1}{2} \div 2$ **b)** $3\frac{1}{2} \div 2\frac{1}{2}$ **c)** $3\frac{1}{2} \div 2\frac{1}{4}$ **d)** $6\frac{1}{4} \div 3\frac{1}{8}$

7 **a)** How many pieces of wood $1\frac{3}{4}$ m long can be cut from a length of 9 m?

b) Find the area of a triangle with a base of $3\frac{5}{8}$ cm and perpendicular height of $2\frac{1}{2}$ cm.

c) A parallelogram with a base of 3.25 cm has an area of 12.6 cm^2
Use fractions to work out the height of the parallelogram.

Multiply and divide algebraic fractions

H

1 **a)** Work out $7 \times \frac{1}{2}$

b) Work out $x \times \frac{1}{2}$

c) Substitute $x = 7$ into your answer to part b).

d) What do you notice about your answers to a) and c)?

2 Match each expression to a simplified version.

$x \times \frac{2}{5}$	$\frac{3}{4} \times x$	$5x \div 2$	$4 \times x \div 3$
$\frac{5x}{2}$	$\frac{4x}{3}$	$\frac{2x}{5}$	$\frac{3}{4}x$

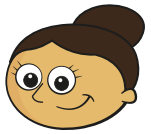
3

Teddy

$\frac{3}{4}x$ and $\frac{3x}{4}$ are exactly the same fraction.

No, they're not. The numbers and letters are arranged differently.

Dora



Work out $\frac{3}{4}x$ and $\frac{3x}{4}$ using the given values of x.

a) $x = 2$

b) $x = 3$

c) $x = 10$

Do you agree with Teddy or Dora? _____

Explain why.

4 Simplify the calculations.

a) $x \times \frac{1}{3}$ **c)** $\frac{1}{5} \times z \times 3$ **e)** $\frac{y}{5} \times \frac{2}{3}$

b) $\frac{4}{5} \times y$ **d)** $\frac{x}{2} \times \frac{1}{3}$ **f)** $\frac{3}{5} \times \frac{z}{2} \times 4$

5 Which expression in each set is **not** equivalent to the others?

a) $\frac{2a}{5}$ $a \times 2 \div 5$ $\frac{a \times 2}{5}$ $a \div 2 \times 5$

b) $\frac{2a}{3}$ $a \times \frac{2}{3}$ $a \div 2 \times 3$ $a \div 3 \times 2$

6 Solve the calculations.

a) $\frac{w}{7} \div 2$ **b)** $\frac{3}{w} \div 2$ **c)** $\frac{3}{w} \div w$ **d)** $\frac{w}{5} \div 2w$

7 Simplify the expressions.

a) $\frac{a}{5} \times \frac{b}{3}$ **d)** $\frac{a}{5} \div \frac{3}{b}$

b) $\frac{a}{5} \times \frac{3}{b}$ **e)** $\frac{a}{4} \times \frac{b}{2}$

c) $\frac{a}{5} \div \frac{b}{3}$ **f)** $\frac{2}{b} \times \frac{a}{4}$