

Lower Secondary
Mathematics
WORKBOOK

7

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7

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Introduction

Welcome to *Cambridge Lower Secondary Mathematics Workbook Stage 7*. This is the first of three books intended to provide practise in the skills you have acquired by using the Cambridge Lower Secondary Mathematics series of student's books. Each of the workbooks is planned to complement the corresponding student's book, which is split into three sections containing units from the four areas of the Cambridge Lower Secondary Mathematics curriculum framework. This workbook is intended to help you acquire the skills to be fully competent in your mathematics. Just as the *Student's Book* included green, amber and red questions in the exercises to indicate the level of the question, this workbook includes a traffic light system to highlight the same levelling.



This symbol indicates the green level from the *Student's Book*. They are introductory questions.



This symbol indicates the amber level. They are more challenging questions.



This symbol indicates the red level. They are questions to really challenge yourself.



This star shows that you will be thinking and working mathematically (TWM).

There is no set way to approach using this workbook – you may wish to use it to supplement your understanding as you work through the *Student's Book*, or you may prefer to use it to recap on particular topics. It is hoped that the organisation of the material in the book is flexible enough for whichever approach you prefer.

So now it is time to start. Read each question carefully, think about it, then write down the answer in the space provided or as instructed. Ask for help if you need it but try hard first. Try to learn by thinking and working mathematically. Write down what you are thinking so that others can understand what you have done and help to correct your mistakes.

SECTION 1

1

Addition, subtraction, multiplication and division

Exercise 1.1



1 Calculate:

a $62 + 18 = \dots\dots\dots$

b $24 + 36 = \dots\dots\dots$

c $17 + 73 = \dots\dots\dots$

d $68 - 23 = \dots\dots\dots$

e $54 - 31 = \dots\dots\dots$

f $73 - 25 = \dots\dots\dots$

2 Ben is going on a bike ride. He starts in Brighton and cycles 32 miles to Chichester. From Chichester, he then cycles 17 miles to Portsmouth.

a What is the total distance Ben cycles?

.....

.....

b Ben then cycles all the way home from Portsmouth back to Brighton, cycling the same route he went on the way there. What is his total distance?

.....

.....

3 Work out:

a $121 + 59 = \dots\dots\dots$

b $263 + 27 = \dots\dots\dots$

c $15 + 235 = \dots\dots\dots$

d $42 - (-28) = \dots\dots\dots$

e $73 - (-137) = \dots\dots\dots$

f $-86 - (-46) = \dots\dots\dots$

4 A jug contains 720 ml of lemonade. When filled, each glass holds 200 ml of lemonade.

a How many glasses can be filled?

.....

.....



b How much lemonade is left in the jug?

.....

.....

5 A sunflower grows 12 cm every fortnight. The sunflower has a current height of 53 cm. Calculate how many weeks until the sunflower is over 100 cm tall.

.....

.....

.....

6 A bus can carry a total of 65 passengers. At the first stop 17 people get on the bus.

a How many more passengers can the bus carry after the first stop?

.....

.....

b Throughout the trip, the bus picks up a total of 52 passengers. How many passengers were picked up after the first stop?

.....

.....

Exercises 1.2–1.3

1 Work out:

a $210 \times 8 = \dots\dots\dots$

b $15 \times 40 = \dots\dots\dots$

c $120 \times 60 = \dots\dots\dots$

d $35 \times 20 = \dots\dots\dots$

e $3200 \times 5 = \dots\dots\dots$

f $85 \times 600 = \dots\dots\dots$

2 Work out:

a $136 \div 8 = \dots\dots\dots$

b $4200 \div 6 = \dots\dots\dots$

c $640 \div 80 = \dots\dots\dots$

d $120 \div 40 = \dots\dots\dots$

e $480 \div 4 = \dots\dots\dots$

f $7200 \div 60 = \dots\dots\dots$

3 William owns a bakery and each week he sells 24 loaves of bread. How many loaves of bread does he sell in 6 weeks?

.....

.....

4 In a field there are 40 sheep, 12 horses and 25 chickens. How many legs are in the field?

.....

.....

5 On an aeroplane there are 215 seats. In each row there are 2 seats on one side of the aisle and 3 seats on the other side. How many rows are there in total?

.....

.....

.....

6 Calculate:

a $-13 \times 5 = \dots\dots\dots$

b $-22 \times -15 = \dots\dots\dots$

c $-540 \div 60 = \dots\dots\dots$

d $-125 \times 8 = \dots\dots\dots$

e $7200 \div -9 = \dots\dots\dots$

7 Fill in the missing values from the multiplication table below.

\times	-12	180
-7	-210
-25

2

Properties of two-dimensional shapes

Exercises 2.1–2.3

1 Give the name of each shape and then draw all the lines of reflection symmetry on these shapes.

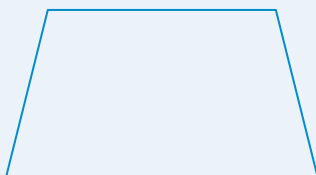
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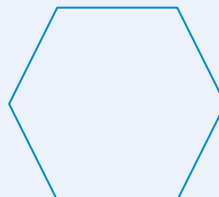
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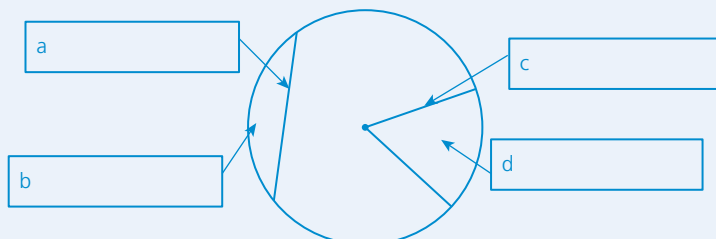
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d Name:



2 Fill in the labels on the circle below.



3 Here are three quadrilaterals.



a If the parallelogram is the odd one out, give a reason why this is the case.

.....

.....

b If the square is the odd one out, give a reason why this is the case.

.....

.....

4 Here are three quadrilaterals.



To help classify them, give two properties they all have in common.

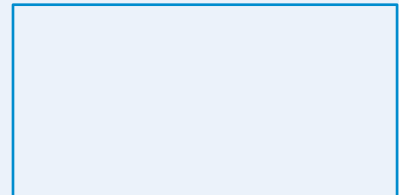
i)

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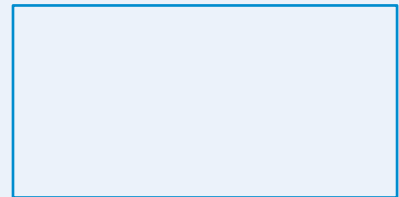
ii)

.....

5 Draw two straight lines inside the rectangle opposite to split it into a square and two right-angled triangles.



6 Draw one straight line inside the rectangle opposite to split it into a trapezium and a right-angled triangle.



7 a Is a square a type of rectangle?

☐ Yes ☐ No

Give reasons for your answer.

.....

.....

.....

b Is a rectangle a type of square?

☐ Yes ☐ No

Give reasons for your answer.

.....

.....

.....

3

Data collection and sampling

Exercises 3.1–3.2

1 Decide which of the following types of data are discrete, which are continuous and which are categorical. Tick the correct box.

a Wing span of birds (cm)

☐ Discrete

☐ Continuous

☐ Categorical

b The favourite colours of students in your class

☐ Discrete

☐ Continuous

☐ Categorical

c Number of marbles in a bag

☐ Discrete

☐ Continuous

☐ Categorical

d Weight of dogs (kg)

☐ Discrete

☐ Continuous

☐ Categorical

2 Fill in the following definitions using the words below. Use each word once. One word will not be used.

Population

Categorical

Continuous

Sample

Quantitative

Discrete

a data can only take specific values.

b data can take any value.

c Data that cannot be measured numerically is known as data.

d The of a data collection is the total number of people that could be asked.

e The of a data collection is the number of people from the population that were asked.

f Write your own definition for the word not used above.

.....

.....

.....

- 3 Give three examples of continuous data and the unit they could be measured in. One has been done for you.

Type of data	Measured in
Weight of horses	kilograms

Exercise 3.3

- 1 Freya wants to know how often people go to the gym. She asks people the following question.

How often do you go to the gym?

☐ 1 ☐ 2 ☐ 3 ☐ more than 4

- a Give one criticism of the question.

.....

- b Give two criticisms of the response section.

i)

ii)

- c Freya stands outside her local gym and asks the people entering the gym.

Give one criticism of the sample of people she has chosen.

.....

- 2 John wants to find out how much fruit and vegetables people eat.

Design a suitable question and response section for his survey questionnaire.

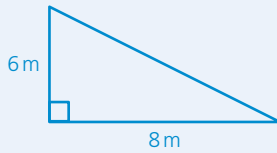
4

Area of a triangle

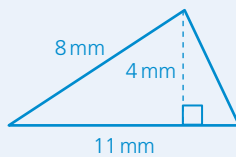
Exercise 4.1

1 Calculate the area of each of the triangles below.

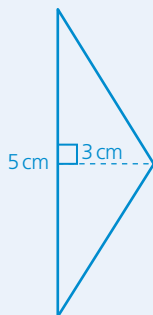
a



b



c



- 2 Use the formula for the area of a triangle to work out the missing values in the table below.

	Base length	Perpendicular height	Area
a	3.8 cm	5.1 cm	
b	12 mm		48 mm^2
c		5 m	30 m^2
d	14 cm		49 cm^2

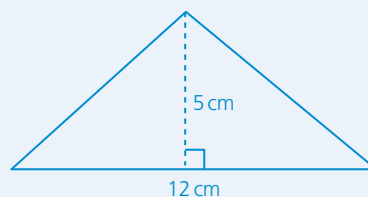
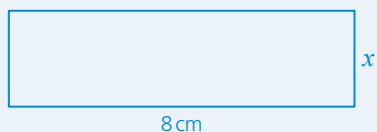
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- 3 a The areas of the shapes below are equal. Find the length of the missing side labelled x .

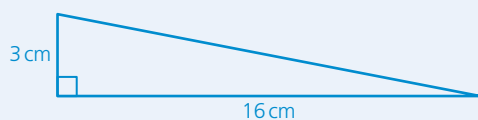


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- b The area of the triangle below is twice the area of the rectangle. Find the length of the missing side labelled x .



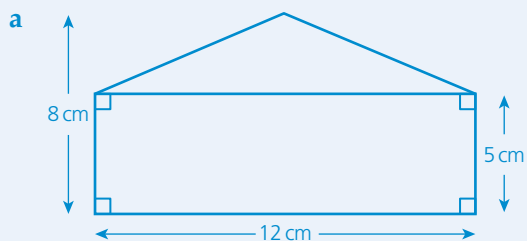
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Exercise 4.2

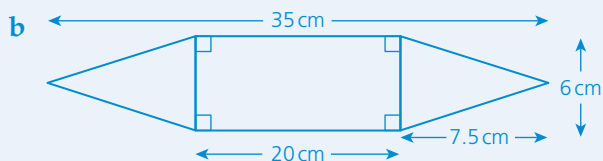
- 1 Calculate the area of each of the shapes below.



.....

.....

.....



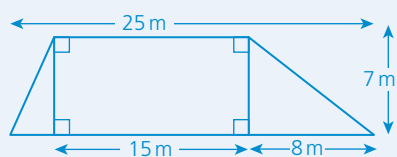
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- 2 Peter wants to turf his garden. Below is a diagram of Peter's garden.

Turf costs \$4 per m^2 . How much will it cost Peter to turf his garden?



.....

.....

.....

.....

5

Order of operations

Exercise 5.1

1 Work out the following:

a $3 + 5 \times 2 - 7 = \dots\dots\dots$

b $3 \times 5 + 2 \times 7 = \dots\dots\dots$

c $8 \times 3 - 4 + 2 = \dots\dots\dots$

d $2 + 16 \div 2 - 3 = \dots\dots\dots$

e $3 \times (2 + 7) - 5 = \dots\dots\dots$

f $4 \times 3 \times 5 - 7 = \dots\dots\dots$

g $(3 - 5) \times 7 + 20 = \dots\dots\dots$

h $4 + 27 \div 3^2 = \dots\dots\dots$

i $10 \div 5 \times 4 \times 3 = \dots\dots\dots$

j $(7 + 2)^2 \div (8 - 5) = \dots\dots\dots$

2 Two pupils, Joe and Thea, are discussing the following calculation:

5×2^2

Joe says the answer is 20, whilst Thea says the answer is 100.

a Which pupil is right? Justify your answer.

.....

.....

b What mistake was made by the pupil who got it wrong?

.....

.....

3 Calculate the following. Circle the correct answer.

a $3 + 7 \times 3 - 5 =$

25 19 -20 15

b $8 + (7 - 3) \times 4 =$

48 3 24 16

c $3 + 4^2 \times 2 =$

35

19

38

98

d $3 + 9 \div 3 \times 2 =$

8

4.5

9

2

4 The following is Jamila's method for calculating the answer to $3^2 + 4 \times 2$.

Is her method correct? Explain your answer.

$$3^2 + 4 \times 2$$

$$6 + 4 \times 2$$

$$10 \times 2 = 20$$

$$\text{Answer} = 20$$

5 In the following calculations, insert brackets in order to make them correct.

a $7 + 3 \times 5 - 2 = 16$

b $3 + 5^2 \div 2 = 32$

c $4 \times 3 + 2 \times 5 = 52$

d $18 \div 2 + 4 \times 5 = 15$

6 Insert any of the following signs, +, -, ×, ÷, in the spaces provided to make the calculations correct.

a $8 + 7 \square 3 + 1 = 13$

b $2 \times 5 \square 3 \times 4 = 22$

c $50 \square 5 - 2 \times 3 = 4$

d $(6 + 3) \times 4 \square 10 = 26$

7 Insert any of the following signs, +, -, ×, ÷ or (), in between the numbers to make the calculations correct.

a $3 \quad 2 \quad 7 = 13$

b $4 \quad 2 \quad 5 = 14$

c $6 \quad 2 \quad 3 = 6$

d $10 \quad 6 \quad 3 = 1$

e $4 \quad 2 \quad 5 = 28$

f $10 \quad 5 \quad 3 \quad 1 = 20$

g $3 \quad 4 \quad 7 \quad 2 = -30$

6

Algebra beginnings – using letters for unknown numbers

Exercises 6.1–6.2

1 Simplify the following expressions.

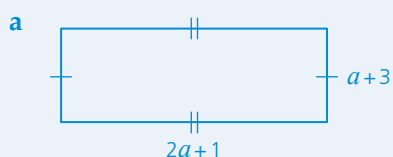
a $x+5+x+5$

b $2a+3b+a+5b$

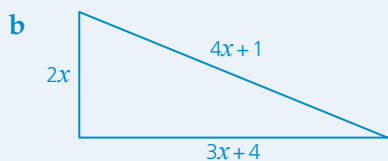
c $8y-2y+3$

d $3g+2f-5g+6f$

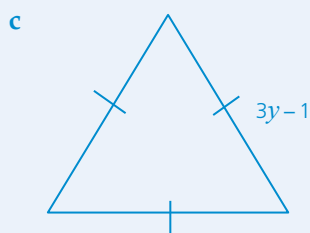
2 Find the perimeter of these shapes. Leave your answer in its simplest form.



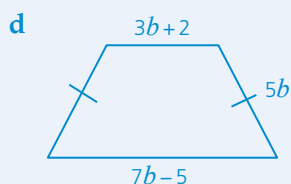
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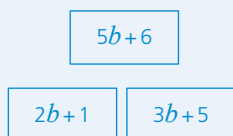


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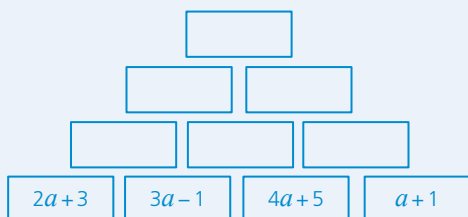


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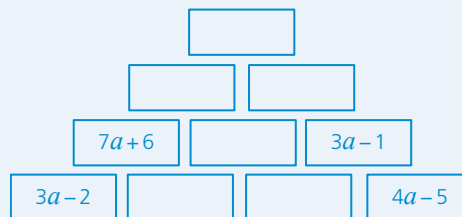
- 3 Each box is equal to the sum of the two boxes directly below it. Complete the pyramids; one has been done for you as an example.



a

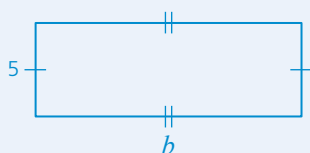


b



- 4 Find an expression for the area of each of the following shapes. Simplify your answer.

a

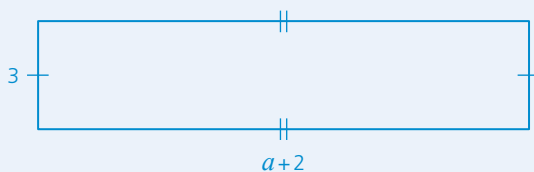


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b



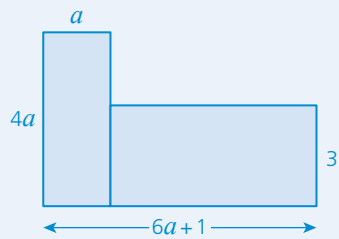
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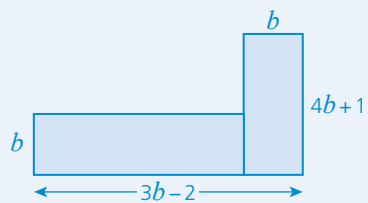
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5 Find an expression for the area of each of the following shapes. Simplify your answer.

a



b



Exercise 6.3

1 Find the value of each expression when $a=2$, $b=3$ and $c=5$.

- | | |
|------------------|---------------|
| a $2b+3$ | b $4ab$ |
| c $2c+3b$ | d abc |
| e $10b-4a$ | f $-3c$ |

2 Find the value of each expression when $x=3$, $y=-2$, $z=-6$.

- | | |
|-----------------|-------------------|
| a $3x+y$ | b $x+y$ |
| c $4y-z$ | d xyz |
| e x^2+z | f z^2+y^2 |

3 The formula to calculate distance travelled is $d=st$, where d =distance travelled, s =average speed and t =time.

a Find the distance travelled, d , when:

- i) $s=30$ mph and $t=2$ hours.....
- ii) $s=65$ mph and $t=0.5$ hours.....
- iii) $s=20$ mph and $t=1.5$ hours.....

b Find the average speed, s , when:

- i) $d=60$ miles and $t=1.5$ hours.....
- ii) $d=210$ miles and $t=3$ hours.....
- iii) $d=200$ metres and $t=40$ seconds.....

7

Organising and presenting data

Exercises 7.1–7.2

- 1 The frequency table below shows the average temperature on Christmas Day in eight different capital cities.

Capital city	Average temperature (°C)
London	6
Lisbon	9
Bangkok	26
Ottawa	−14
Quito	13
Helsinki	−5
New Delhi	15
Kathmandu	10

- a Which city has the lowest average temperature?
- b What is the difference between the lowest and highest average temperatures?
.....
- c Order the temperatures from lowest to highest.
.....
- d How many cities have an average temperature of 10°C or higher?
.....

- 2 Jessica measured the weight of 12 babies.

2.7kg, 4.9kg, 3.2kg, 4.7kg, 2.9kg, 6.6kg, 3.6kg, 6.5kg, 4.2kg, 6.1kg, 5.3kg, 3.8kg

Fill in the grouped frequency table for her data.

Weight (kg)	Tally	Frequency
2–3		
3–4		
4–5		
5–6		
6–7		

3 A school puts on a bake sale to raise money for charity. The amount of each type of cake that was made was recorded in a two-way table. In total there were 198 cakes for sale.

a Complete the table.

	Cupcakes	Traybake	Large sponge	Total
Chocolate	75	12		90
Vanilla			10	
Fruit		10		54
Total	155		15	

b How many vanilla cupcakes were made?

.....

c How many traybakes were there in total?

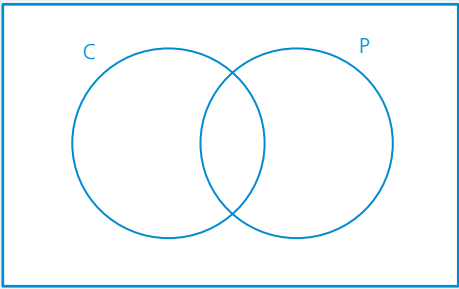
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d How many more chocolate cakes were made than vanilla cakes?

.....

4 A group of 20 adults are asked whether they have children (C) or pets (P): 5 adults have both children and pets; 12 adults have pets; 4 adults have only children.

a Fill in the Venn diagram using the information given.



b How many adults have no pets or children?

.....

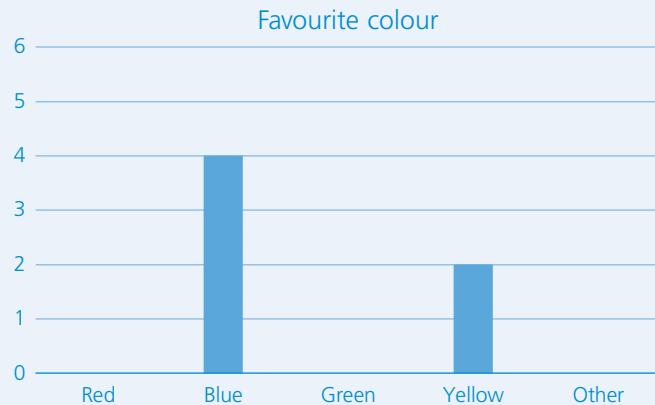
c How many adults have only pets and no children?

.....

Exercises 7.3–7.4

- 1 A group of 20 children were asked what their favourite colour was. Complete the frequency table and bar chart based on the information you have been given.

Favourite colour	Frequency
Red	5
Blue	
Green	3
Yellow	
Other	6



- 2 A theatre puts on a show every Saturday and Sunday evening.

On Saturday they sell 26 child tickets and 15 adult tickets.

On Sunday they sell 38 child tickets and 21 adult tickets.

- a Using the set of axes given, draw a dual frequency diagram to represent this information.



- b If the total made from selling child tickets on Saturday was £143, how much did the theatre make from selling child tickets on Sunday?

.....

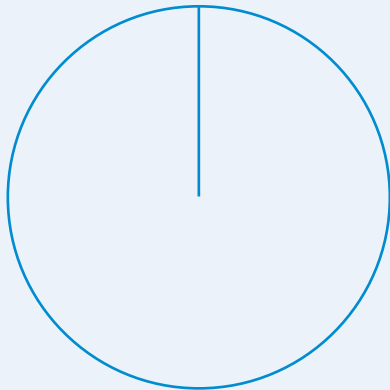
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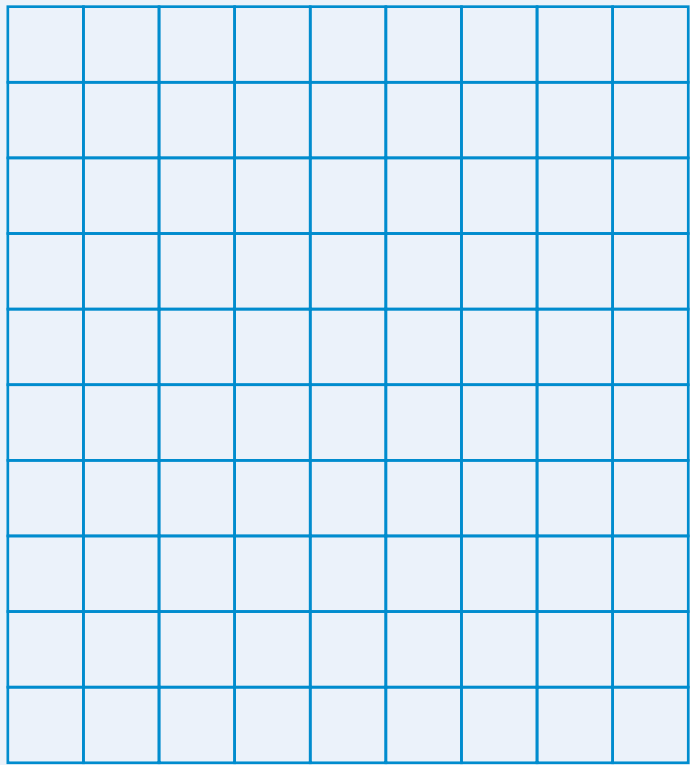
- 3 The number of portions of fruit and vegetables eaten a day by 180 teenagers is recorded in the table below.

Number of portions	0	1	2	3	4	5	6	7
Frequency	5	10	20	35	10	60	30	10

- a Draw a pie chart for this data.



- b Draw a waffle diagram for this data.

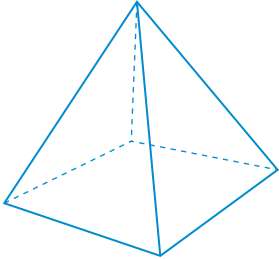
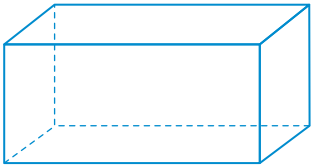
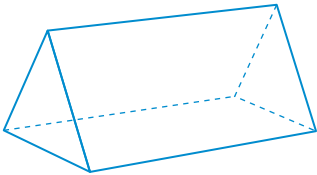
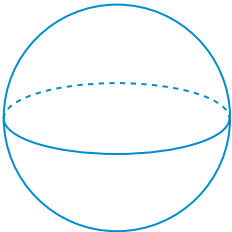


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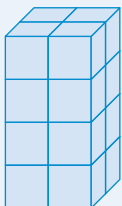
Properties of three-dimensional shapes

Exercises 8.1–8.3

- 1 Fill in the classification table below with the name of each 3D shape and the number of faces, edges and vertices it has.

3D shape	Name	Number of faces	Number of edges	Number of vertices
				
				
				
				

- 2 This cuboid is made from joining together 1 cm^3 cubes. Calculate the volume. State the units of your answer.



.....

.....



- 3 The dimensions of four cuboids have been given below. All dimensions are given in centimetres.

	Cuboid A	Cuboid B	Cuboid C	Cuboid D
Length	3	4	6	8
Width	6	1	6	4
Height	5	7	2	3

- a Which cuboid has the greatest volume?

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.....

.....

- b What is the total volume of all four cuboids?

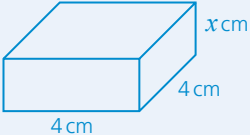
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- 4 For each cuboid, find the missing length labelled x .

a




Volume = 32 cm^3

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.....

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b



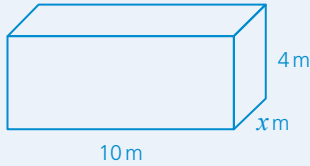
Volume = 48 mm^3

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.....

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c



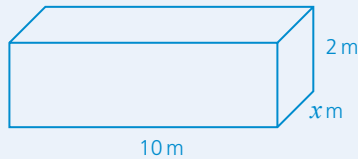
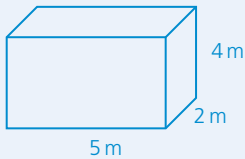
$$\text{Volume} = 100 \text{ m}^3$$

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- 5 The volumes of the two cuboids below are equal. Find the length of the missing length labelled x .



.....

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- 6 A cuboid has a volume of 36 cm^3 . Give three possible dimensions that this cuboid could have.

i) Length = Width = Height =

ii) Length = Width = Height =

iii) Length = Width = Height =

- 7 A cuboidal bathtub has the following dimensions:

Length = 160 cm

Width = 40 cm

Height = 50 cm

$1000 \text{ cm}^3 = 1 \text{ litre}$. Find the maximum capacity of the bathtub. Give your answer in litres.

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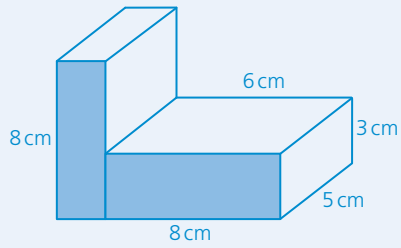
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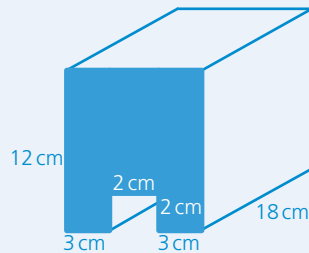
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8 Find the volume of the following composite three-dimensional shapes:

a



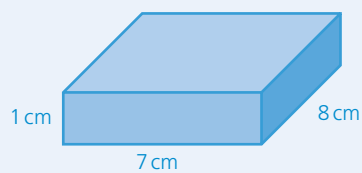
b



Exercise 8.4

1 Calculate the total surface area of each cuboid.

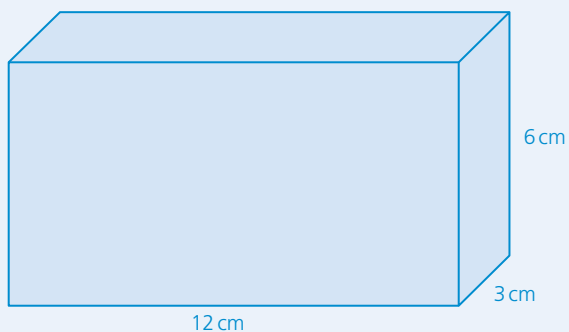
a



b



- 2 Marcel has a block of cheese, pictured below.



- a Find the total surface area of the block of cheese.

- b Marcel wants to wrap the block of cheese in plastic film. Give a reason why the total surface area would not be an appropriate measurement for the amount of film he needs.

9

Multiples and factors

Exercises 9.1–9.2



1 List all of the factors of the following numbers:

- a 32.....
- b 100.....
- c 56.....
- d 720.....
-
-

2 Write down the first six multiples of the following numbers:

- a 8.....
- b 13.....
- c 15.....
- d 21.....

3 Here is a list of numbers:

8, 7, 15, 36, 45, 48

From the list, choose the number or numbers that:

- a are a factor of 28
- b are a multiple of 24
- c have a common factor of 5 and
- d have a common multiple of 560. and

4 Find the highest common factor of the following:

- a 12 and 32.....
- b 28 and 49.....
- c 24, 36 and 54.....



5 Find the lowest common multiple of the following:

- a 6 and 15.....
- b 14 and 35.....
- c 8, 12 and 6.....



6 At a bus station, the buses leaving for Lewes and Eastbourne both leave together at 8 a.m. Following this, the bus to Lewes leaves every 20 minutes and the bus to Eastbourne leaves every 25 minutes.

At what time will the buses next be leaving the station at the same time?

.....

.....

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7 Trevor has a box with four cards in it. Each card has a different number on it. Trevor picks three cards, multiplies the numbers together and then places them back into the box. He repeats this and records his results below.

First: 360 Second: 280 Third: 315

Give convincing reasons for what the four different numbers on the cards could be.

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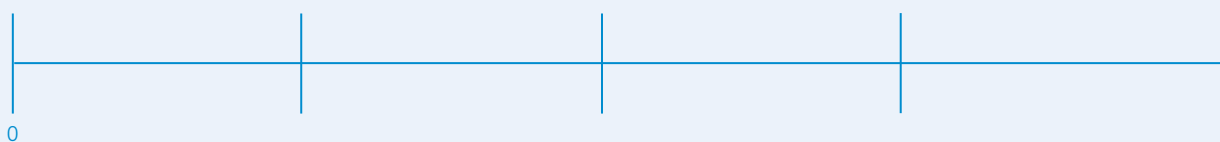
10

Probability and the likelihood of events

Exercise 10.1

1 On the probability scale below, label where the following probabilities would be.

- a Probability that the sun will set each night.
- b Probability of getting heads on a fair coin.
- c Probability of rolling a 7 on an ordinary dice.



2 A fair dice has been rolled 24 times.

- a How many 6s would you expect the dice to land on?

.....

- b Is it certain that this many 6s were rolled?

.....

- c The actual results are recorded below.

Number rolled	1	2	3	4	5	6
Frequency	2	3	6	4	5	4

Is the dice fair? Give a reason for your answer.

.....

.....

3 A code consists of four digits. Each digit is a number from 0 to 9.

Lottie knows that the code starts with 317. She has been told that the last digit is an even number, but it is not 2.

What is the probability that Lottie chooses the correct number?

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SECTION 1

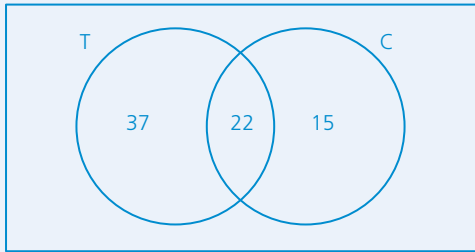
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- 

How many different combinations can Tia choose? Justify your answer.

This image shows a blank sheet of white paper with horizontal blue dashed lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no other markings or text on the page.

- 6 A group of 100 people are asked whether they drink tea or coffee. The results are in the Venn diagram below.



- a Complete the Venn diagram.
- b If a person is picked at random, what is the probability that they drink tea?
-
-
- c If a person who drinks coffee is picked at random, what is the probability that they also drink tea?
-
-

SECTION 2

11

Rounding and estimation – calculations with decimals

Exercise 11.1

1 Round the following:

- a 36.47 to 1 decimal place. b 0.78 to 1 decimal place.
 c 465.732 to 2 decimal places. d 45.215 to 2 decimal places.
 e 14.99 to 1 decimal place. f 87.08 to 1 decimal place.

2 Ezra calculates the following using his calculator and rounds the answer to 1 decimal place.

$$\sqrt{153} = 12.3$$

What do you notice about Ezra's answer?

.....

.....

3 A number was rounded to 2 decimal places to give 36.72.

Circle all the possible values it could have been before it was rounded.

36.725

36.724

36.7163

36.71488

36.72

36.718

36.652

4 The length of a leaf was measured accurately to 4 decimal places and then rounded to 3 decimal places when being recorded. It was recorded as measuring 6.378 cm.

a What is the shortest length the leaf could have been when it was measured accurately?

.....

b What is the longest length the leaf could have been when it was measured accurately?

.....

Exercise 11.2



1 Using a written method, calculate the answer to the following.

a $68.32 + 104.802$

b $468.7 - 382.61$

2 Three colleagues go to a café during their lunchbreak.

Here is their order:

- 2 sandwiches
- 1 jacket potato
- 1 cup of tea
- 1 fizzy drink
- 1 tap water

MENU

Drinks:

Tea.....\$1.20

Coffee.....\$1.65

Fizzy drink.....\$2.35

Tap water.....Free!

Food:

Sandwich.....\$4.99

Baguette.....\$5.65

Jacket potato.....\$9.85

a They estimate the order will cost \$23 in total. Is this a good estimate? Give reasons for your answer.

.....

.....

b How much was their bill in total?

.....

.....

c They paid with a \$20 note and a \$10 note. How much change did they get?

.....

.....



- 3 A takeaway business offers the following for home delivery or collection.

Takeaway menu

Chips – \$1.25

Chips with cheese – \$1.45

Pizza – \$8.90

Chicken kebab – \$7.99

Vegetable kebab – \$8.49

Falafel – \$5.39

Veggie burger – \$3.99

Collection: discount of \$1.35 per order

Home delivery: extra £\$0.55 per order

- a The following has been ordered for home delivery. What is the total cost?

Order #1: home delivery

2 x chicken kebab

2 x chips

1 x chips with cheese

1 x veggie burger

2 x falafel

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- b The following has been ordered for collection. What is the total cost?

Order #2: collection

1 x vegetable kebab

2 x pizza

3 x chips

1 x falafel

.....

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Exercise 11.3

- 1 Calculate the following:

- a $430 \div 10$ b 2237×10^2
- c 72.5×10^3 d 82.34×10^3
- e 0.302×10^2 f $4.37 \div 10^2$
- g 38.7×10^5 h $425.71 \div 10^4$
- i $1.0043 \div 10^2$ j $83.62 \div 10^5$

- 2 Match up the values which are equivalent.

423.6×10
$423\,600 \div 10^5$
0.4236×10^2
$4236 \div 10^4$
4.236×10^4

$423.6 \div 10$
$42.36 \div 10^2$
0.4236×10
4.236×10^3
$4\,236\,000 \div 10^2$

Exercise 11.4



1 Use a written method to estimate the following multiplications.

a 342.5×719.34

b 28.54×4.08

2 Use a written method to estimate the following divisions.

a $512.4 \div 1.2$

b $85.8 \div 0.24$

3 $324.8 \div 1.75 = 185.6$

Use this calculation to find the answer to the following.

a $3248 \div 1.75$

b 185.6×175

c $3248 \div 175$

d 18560×17.5

12

Mode, mean, median and range

Exercises 12.1–12.2

1 Find the mean, mode, median and range of each set of numbers.

a 3, 7, 5, 5, 6, 4, 3, 3, 9, 5

Mean =

Mode =

Median =

Range =

b 10.6, 5.7, 6.3, 7.4, 3.5, 2.8

Mean =

Mode =

Median =

Range =

c 30, 40, 50, 30, 30, 70, 70, 50, 60, 30

Mean =

Mode =

Median =

Range =

2 Sandra measured the heights of all the sunflowers in her garden.

1.2 m	0.9 m	1 m	1.35 m	6.5 m
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a Explain why the mean would not be a suitable average for this data.

.....

.....

- b** What would be the most suitable average to use for this data? Tick a box.

Give a reason for your answer.

☐ Median

☐ Mode

.....

.....

- 3** Find a set of five positive integers that have the following:

a a mean of 4

a median of 6

a mode of 6

a range of 5.

--	--	--	--	--

b a mean of 10

a median of 8

a mode of 15

a range of 10.

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- 4** The mean of this set of eight numbers is 5.

3, 5, 6, 3, 3, 9, 7, x

Find the missing number x .

.....

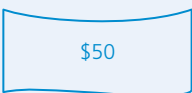
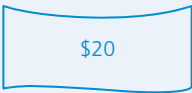
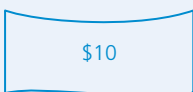
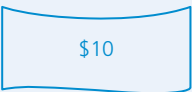
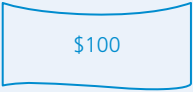
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5 Here are five notes.



One note is removed. The remaining notes have a mean of \$45. Which note was removed?

.....

.....

6 The table shows the scores of 20 students in a test.

Work out the mean score.

Score	Frequency
7	6
8	9
9	4
10	1
Total	20

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7 These expressions represent four numbers. The value of the median of the expressions is 20.

$3x$ $8x$ $12x$ $14x$

Work out the value of the range of the expressions.

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13

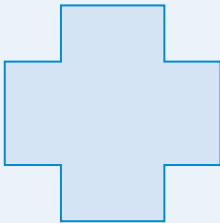
Transformations of two-dimensional shapes

Exercises 13.1–13.2

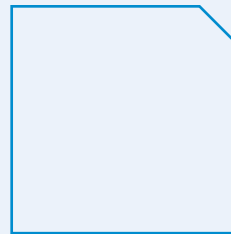
1 For each shape below:

- i) draw the lines of reflection symmetry
- ii) state the order of rotational symmetry.

a i)



b i)

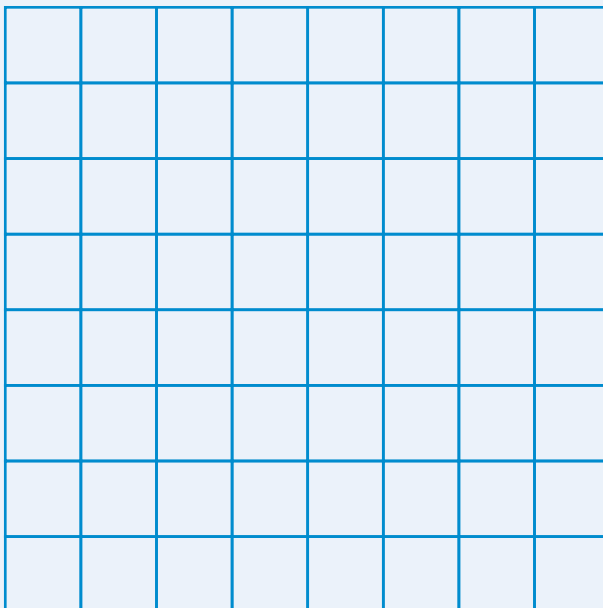


ii)

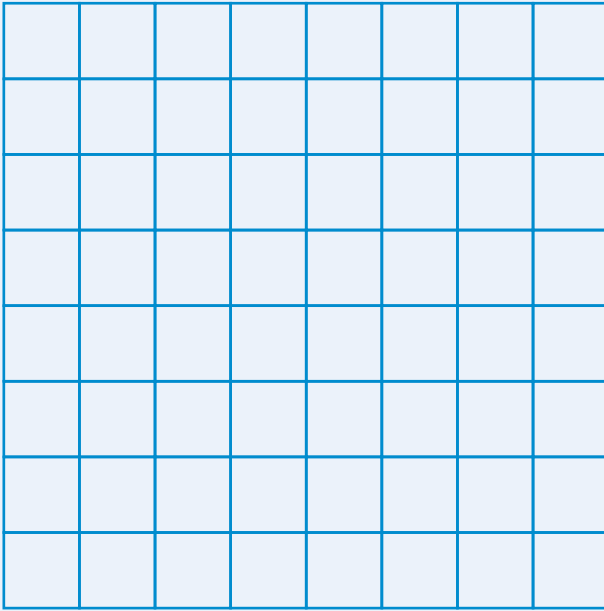
ii)

2 On the centimetre grids below, draw a quadrilateral that has the symmetry stated.

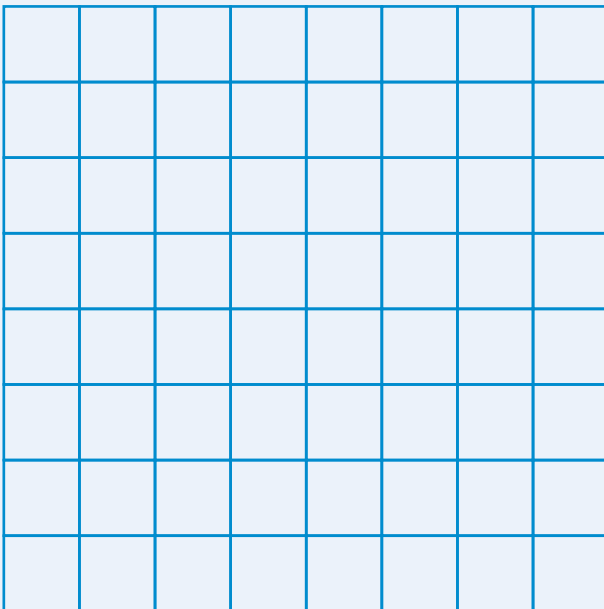
- a 4 lines of reflection symmetry and order 4 rotational symmetry.



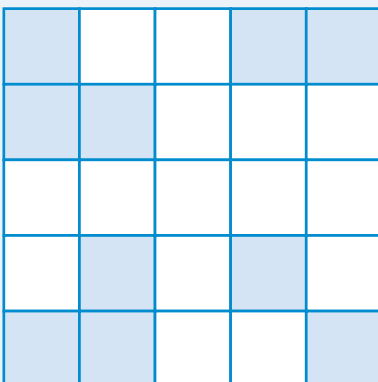
- b** 0 lines of reflection symmetry and order 2 rotational symmetry.



- c** 1 line of reflection symmetry and order 1 rotational symmetry.

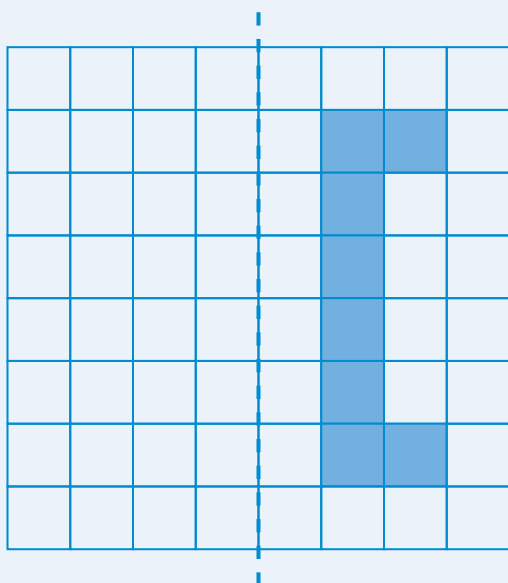


- 3** Shade in three more squares so that the pattern has rotational symmetry order 4.

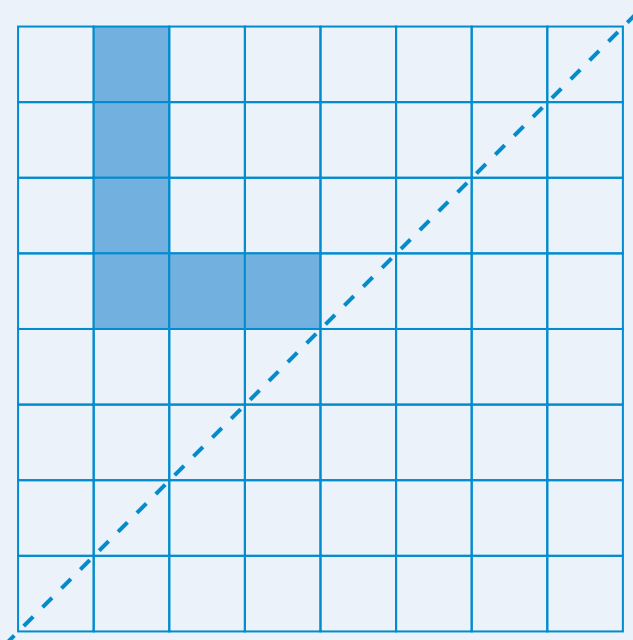


4 Reflect the shapes in their mirror lines (shown by the dotted line).

a



b

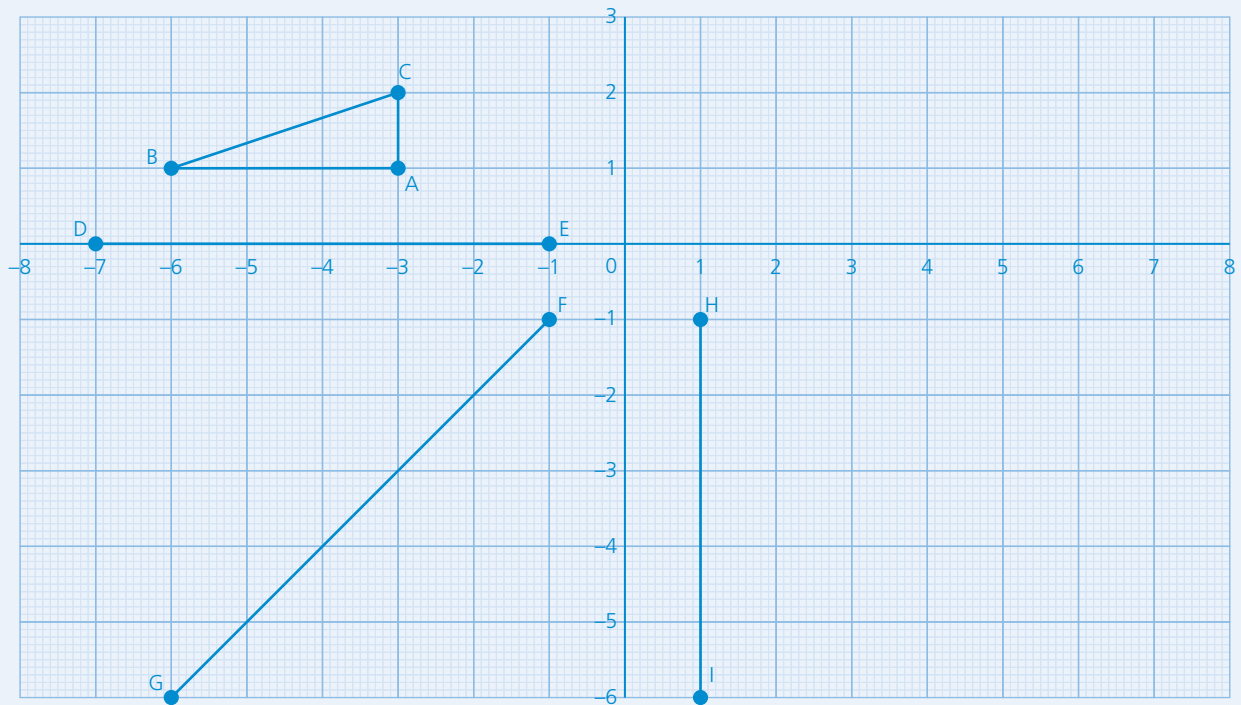


5 On the grid below, reflect the following.

a Reflect triangle ABC in the line DE, label this shape X.

b Reflect shape X in the line GF, label this shape Y.

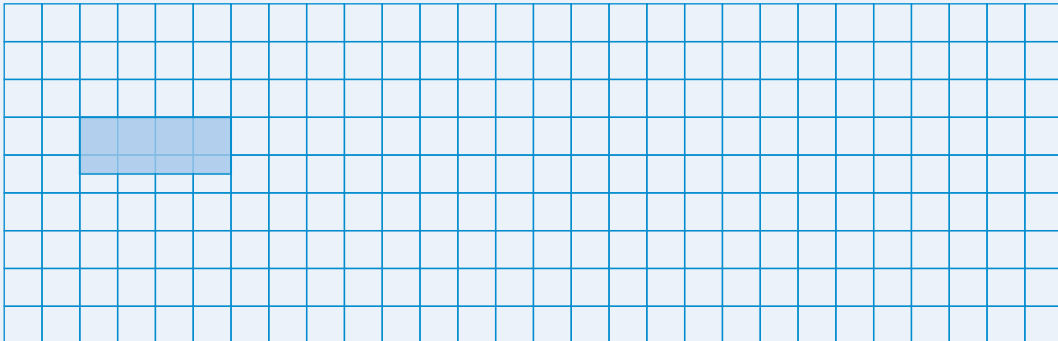
c Reflect Y in the line HI, label this shape Z.



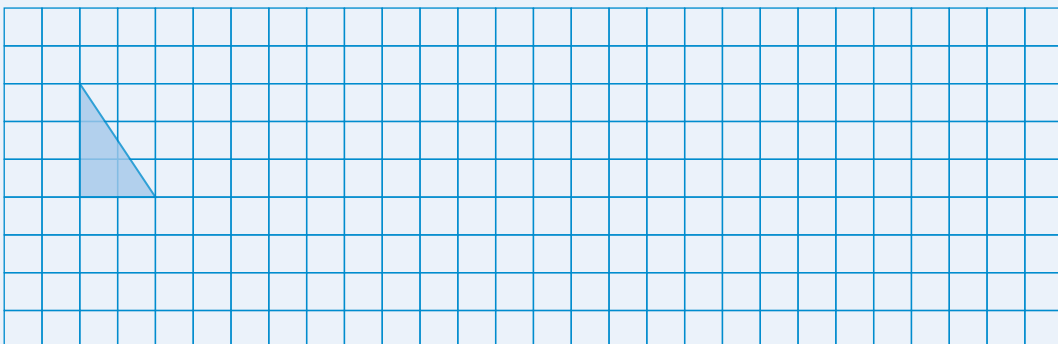
Exercises 13.3–13.4

1 Enlarge each shape by the scale factor given.

a Enlarge by a scale factor 2.

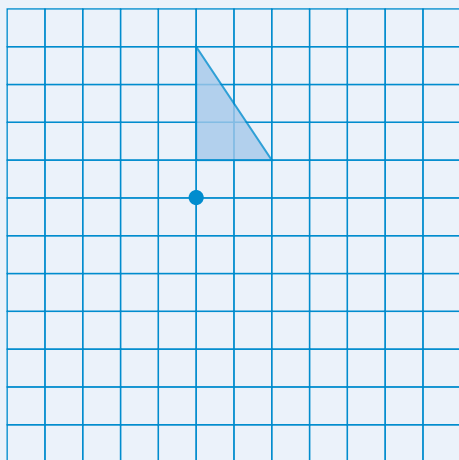


b Enlarge by a scale factor 3.

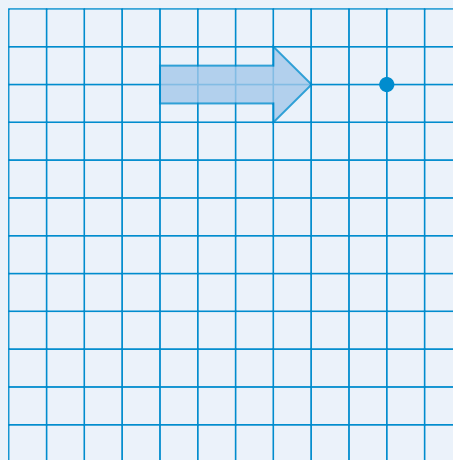


2 Rotate the shapes around their centre of rotation. You can use tracing paper to help you.

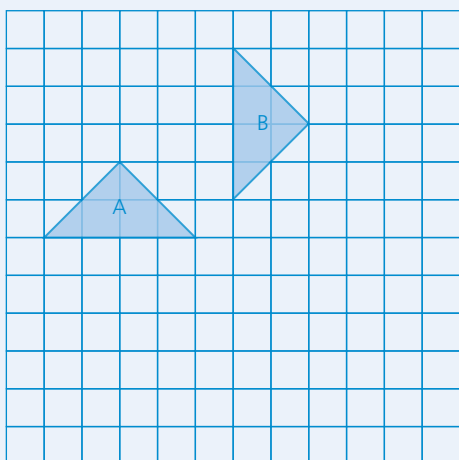
a Rotate 90° clockwise.



b Rotate 90° anti-clockwise.



3 Describe the rotation that maps shape A onto shape B.



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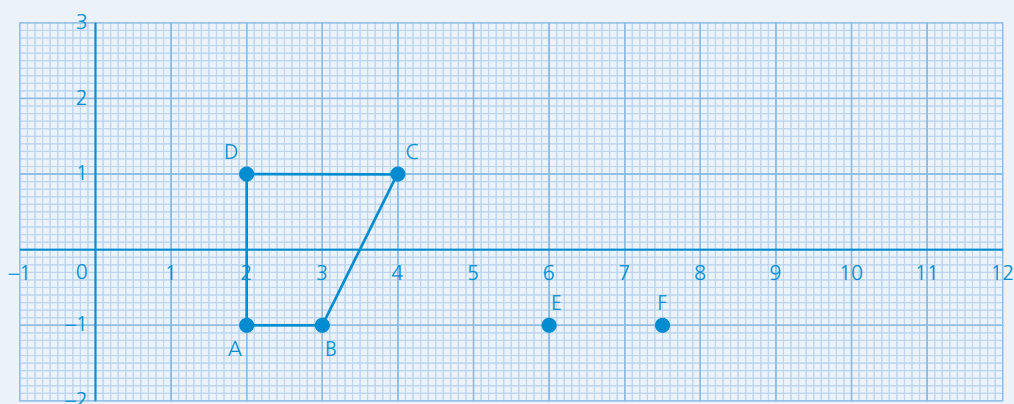
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4 On the grid below, shape ABCD has been enlarged to give shape EFGH. EF is an enlargement of AB. Complete and label shape EFGH.



14

Manipulating algebraic expressions

Exercises 14.1–14.2

1 Simplify the following expressions.

a $4a + 3a + 7a = \dots\dots\dots$

b $10b - 3b + 5b = \dots\dots\dots$

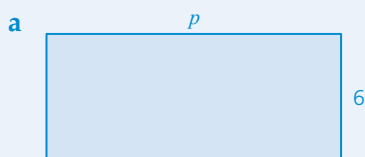
c $5c + 6 - 7c + 2 + 10c = \dots\dots\dots$

d $7 + 8d - 3d - 4 = \dots\dots\dots$

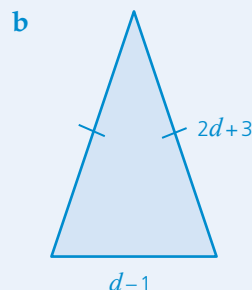
e $5e + 11e - e + 3 = \dots\dots\dots$

f $-5f - 7 + 14f + 3 = \dots\dots\dots$

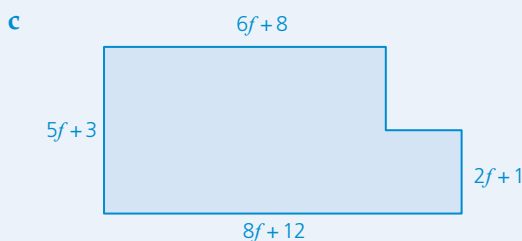
2 For each shape below, find an expression for the perimeter. Simplify your answer.



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.....



.....

3 Expand the brackets.

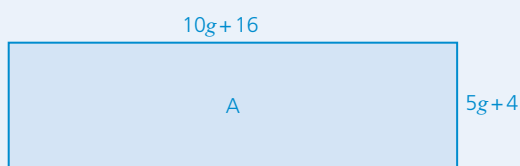
a $4(2a + 3) \dots\dots\dots$

b $6(c - 5) \dots\dots\dots$

c $2d(3 + c) \dots\dots\dots$

d $3(2f - 4g + 10) \dots\dots\dots$

4 Here is rectangle A.



a Find an expression for the perimeter of the rectangle.

.....

b Rectangle A is cut in half like so, to give rectangle B.

Find the perimeter of rectangle B.

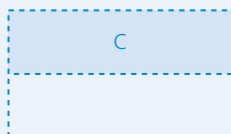


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c Rectangle B is cut in half like so, to give rectangle C.

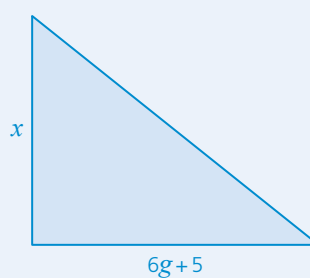
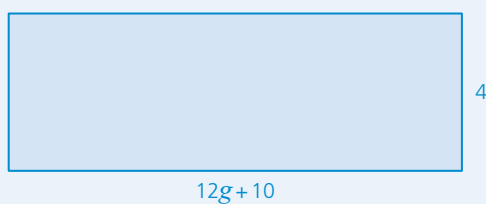
Find the perimeter of rectangle C.



.....

.....

5 The rectangle and the triangle have the same area. Find the missing length labelled x .



.....

.....

.....

15

Fractions, decimals and percentages

Exercise 15.1



- 1 Match up the equivalent fractions, decimals and percentages. There are two numbers that do not have pairs: for each of these fill in the blank with a fraction, decimal or percentage that is equal to the number given.

$\frac{4}{5}$
0.7
95%
$\frac{12}{40}$
0.03
108%

0.95
0.8
$\frac{7}{10}$
$\frac{6}{200}$

- 2 Convert all of the following into fractions, decimals or percentages. Rearrange into ascending order.

$\frac{2}{5}$ 0.75 65% $\frac{17}{20}$ 1.02 30% $\frac{1}{3}$

.....

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Write the original numbers, in ascending order, below.

.....

.....

.....

Exercise 15.2

- 1 Ellie buys a dress in the sale for $\frac{1}{5}$ off the original price. She also has a discount code which gives her a further $\frac{1}{10}$ off that price. In total what fraction does Ellie get off the original price of the dress?

.....

.....

- 2 Parts of this sum are missing.
Find the denominators of both fractions.

$$\frac{1}{\boxed{}} + \frac{3}{\boxed{}} = \frac{22}{24}$$

- 3 Liam thinks of a fraction. He says that the difference between his fraction and $\frac{4}{15}$ is $\frac{1}{4}$.
- a What two fractions could Liam be thinking of?

.....

.....

- b Liam says that if you add $\frac{1}{10}$ to his fraction you will get $\frac{7}{60}$. What was his fraction?

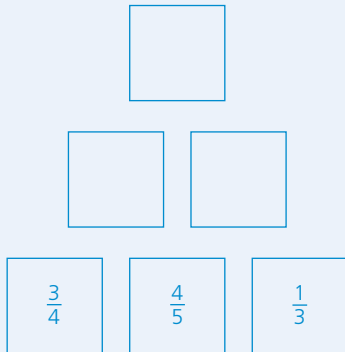
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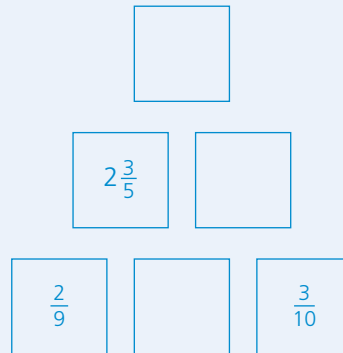
Exercise 15.3

- 1 In the following pyramids, each fraction is the sum of the two fractions below it. Fill in the missing fractions, leaving your answers as mixed numbers in their simplest form where possible.

a



b



- 2 Here is a sequence:



- a What is the rule to get from one term to the next?

.....

- b Find the 7th term. Give your answer as a mixed number in its simplest form.

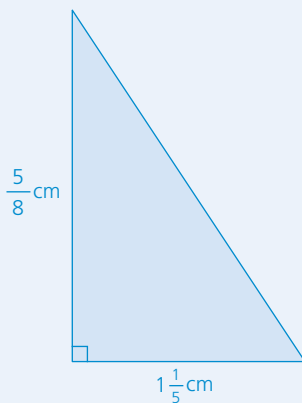
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Exercise 15.4

- 1 Find the area of these triangles. Leave your answers as mixed numbers in their simplest form where possible.

a



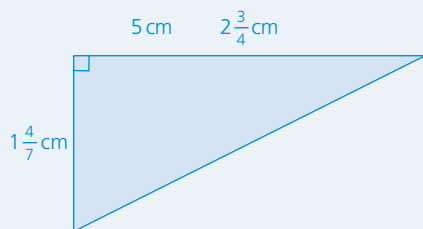
.....

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b



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Exercise 15.5

1 Order the following fractions from smallest to largest:

a $\frac{1}{2}$ $\frac{9}{10}$ $\frac{1}{7}$ $\frac{3}{14}$

.....

.....

b $\frac{7}{10}$ $1\frac{2}{5}$ $\frac{1}{3}$ $\frac{4}{9}$

.....

.....

2 Without using a calculator, work out the following:

a $12 \times 7 \times 0.25 =$

.....

b $0.5 \times 9 \times 18 =$

.....

c $1.5 \times 14 \times 4 =$

.....

d $13 \times 4.2 =$

.....

e $25 \times 10.5 =$

.....

16

Probability and outcomes

Exercises 16.1–16.2

1 A prime number between 1 and 10 is chosen at random.

a What are the possible numbers that can be chosen?

.....

b What is the probability that the number 3 is chosen?

.....

2 Tickets are numbered 1–20 and are drawn at random.

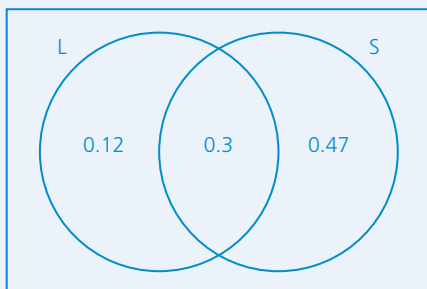
a What is the probability a multiple of 5 is chosen?

.....

b What is the probability a multiple of 6 is chosen?

.....

3 A college offers its students the option of studying Latin (L) or Spanish (S). Below is a Venn diagram showing the probability of students who choose each.



a What is the probability of a student not studying any language?

.....

b A student is chosen at random. What is the probability that they study Spanish?

.....

c Are the two options mutually exclusive? Give a reason for your answer.

.....

- 4 A six-sided dice is rolled 10 times and lands on the following numbers: 2, 3, 5, 2, 2, 2, 3, 4, 5, 4.

- a Is the dice biased? Tick a box. Give a reason for your answer.

☐ Yes ☐ No ☐ Cannot tell

Reason:

.....

- b The same dice is rolled 100 times and the results are shown in the table below.

Number rolled	Frequency
1	15
2	34
3	17
4	10
5	13
6	11

Is the dice biased? Tick a box. Give a convincing reason for your answer.

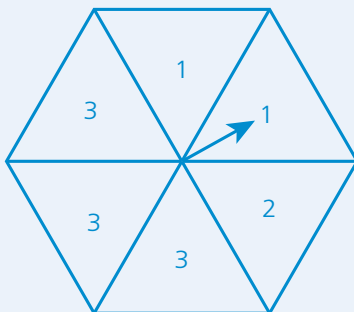
☐ Yes ☐ No ☐ Cannot tell

Reason:

.....

.....

- 5 Serena has made the following spinner.



- a She wants to see if her spinner is fair. What could she do to check?

.....

- b What is the theoretical probability of the spinner landing on:

i) 1?

ii) 2?

iii) 3?

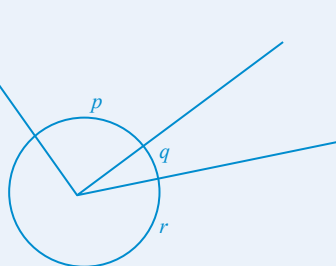
17

Angle properties

Exercises 17.1–17.2

1 Measure the following angles.

a

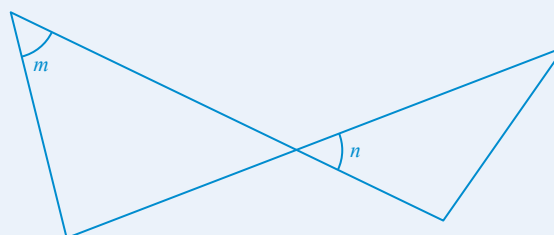


$p = \dots\dots\dots$

$q = \dots\dots\dots$

$r = \dots\dots\dots$

b

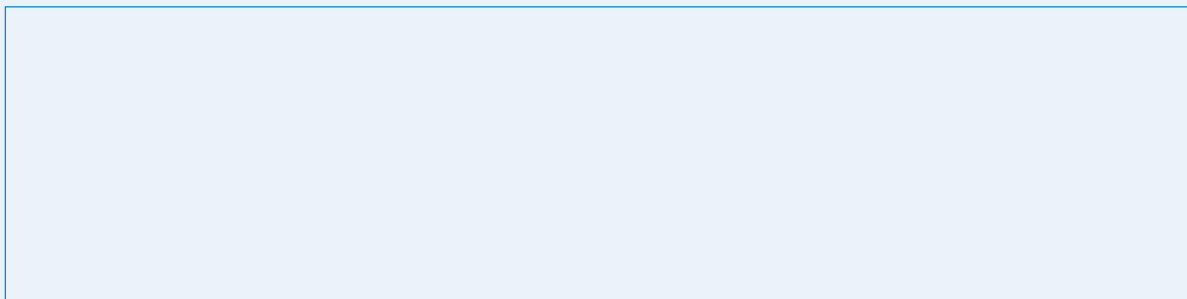


$m = \dots\dots\dots$

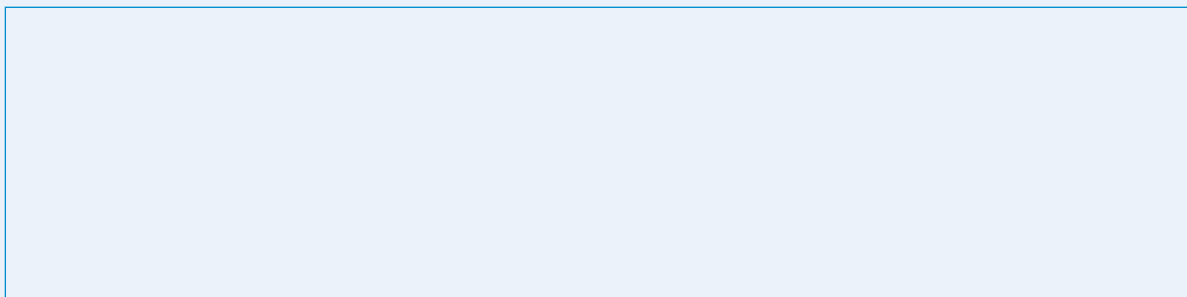
$n = \dots\dots\dots$

2 Using a ruler and set squares only, construct the following quadrilaterals.

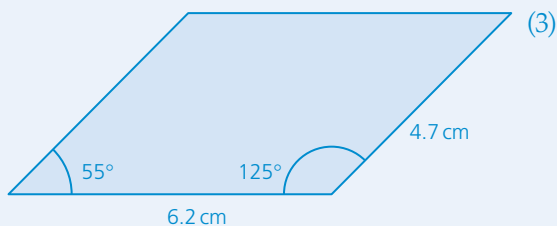
a A square with side length of 4.5 cm.



b A 5 cm by 7.5 cm rectangle.

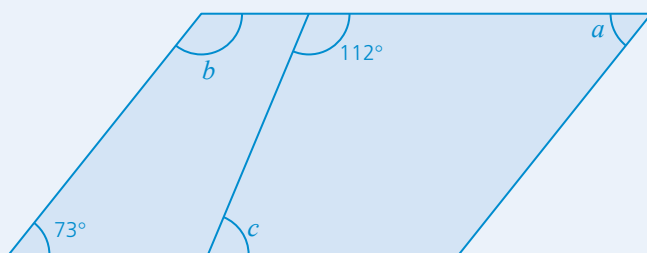


- 3 Construct the following using appropriate geometric equipment.



Exercises 17.3–17.4

- 1 The diagram below shows a parallelogram split into two parts by a straight line.



Find the size of the missing angles labelled a , b and c . Justify your answers.

a $a = \dots\dots\dots$

Reason:

.....

.....

b $b = \dots\dots\dots$

Reason:

.....

.....



c $c = \dots\dots\dots$

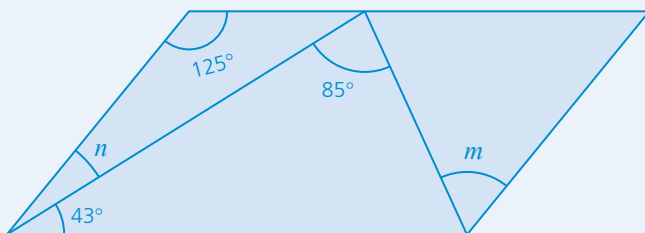
Reason:

.....

.....

- 2 The diagram shows a parallelogram.

Find the size of angles n and m .

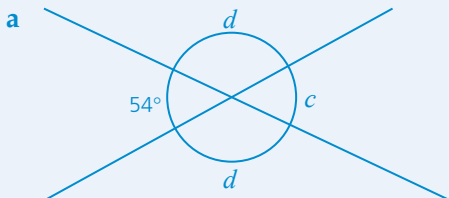


$n = \dots\dots\dots$

$m = \dots\dots\dots$

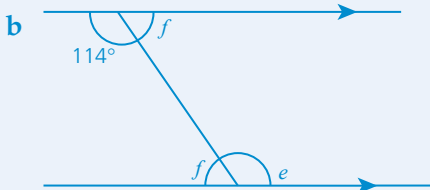
Exercises 17.5–17.7

- 1 Find the size of the missing angles in these diagrams. For each question, give a convincing reason for your answer.



$c = \dots\dots\dots$ Reasons:

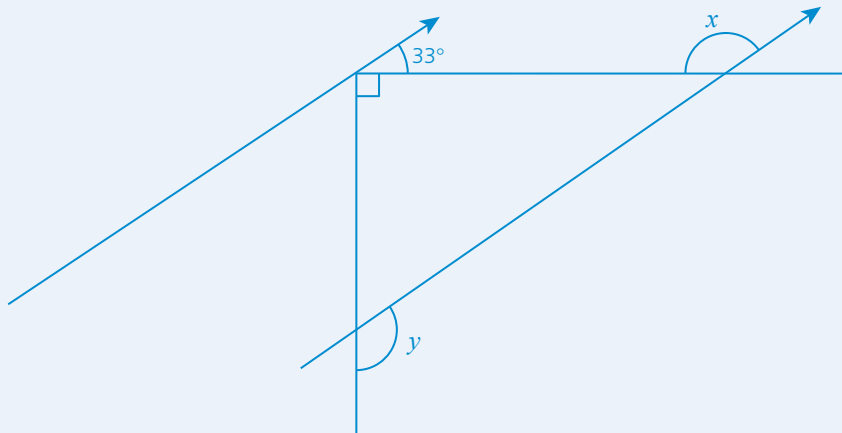
$d = \dots\dots\dots$ Reasons:



$e = \dots\dots\dots$ Reasons:

$f = \dots\dots\dots$ Reasons:

- 2 Find the size of angles x and y in this diagram. Justify your answers.



$x = \dots\dots\dots$

Reasons:

.....

$y = \dots\dots\dots$

Reasons:

.....

18

Algebraic expressions and formulae

Exercises 18.1–18.2

1 Jackie is x years old.

a Andy is 7 years younger than Jackie. Write an expression, in terms of x , for Andy's age.

.....

b Ally is twice Jackie's age. Write an expression, in terms of x , for Ally's age.

.....

c Find an expression for the combined age of Jackie, Andy and Ally. Give your answer in its simplest form.

.....

2 Elsa has f amount of sweets.

a Joseph has two more sweets than Elsa. Write an expression, in terms of f , for the number of sweets Joseph has.

.....

b Kristian has triple the amount of sweets that Joseph has. Write an expression, in terms of f , for the number of sweets Kristian has.

.....

c Find an expression for the combined number of sweets that Elsa, Joseph and Kristian have. Give your answer in its simplest form.

.....

3 Two rectangles, A and B, are shown below.



a Give a reason why x cannot equal 1.

.....

.....

- b If $x=5$, which rectangle has the greater perimeter?

.....

.....

.....

- c Find a value of x where the perimeter of B is more than twice the perimeter of A.

.....

.....

.....

.....

- 4 A plumber charges \$35 per hour (h) and a \$20 callout fee.

- a Derive a formula for the total cost (C) in terms of h .

.....

.....

- b Find the total cost if the plumber is called out for a job that takes him 3 hours.

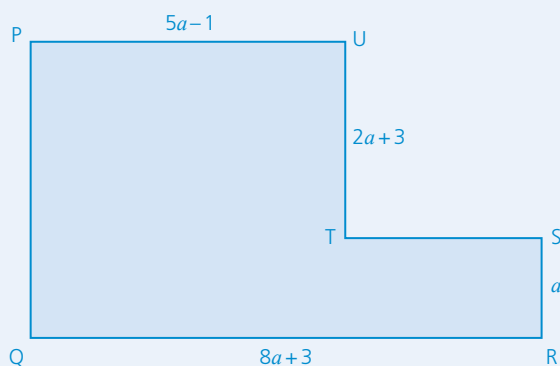
.....

.....

- 5 The diagram shows the shape PQRSTU.

All of the corners are right angles.

The lengths of four of the sides have been given in terms of a .



- a** Find a simplified expression for the length PQ.

.....

.....

.....

- b** Find a simplified expression for the length ST.

.....

.....

.....

- c** Find a simplified expression for the perimeter of the shape PQRSTU.

.....

.....

.....

- 6** The recipe for roast chicken states that the chicken needs to be roasting for 30 minutes per kg (W). It then needs to roast for a further 45 minutes, regardless of the weight.

- a** Derive a formula for the total time (T), in hours, needed for roast chicken, in terms of W .

.....

.....

.....

- b** How long would a 3.5 kg chicken need in the oven to roast? Give your answer in hours and minutes.

.....

.....

.....

19

Probability experiments

Exercise 19.1

- 1 a If a coin is flipped 100 times, how many times would you expect it to land on heads? Give a reason for your answer.

.....

.....

.....

- b Flip a coin 100 times and record how many times the coin lands on heads in the tally chart below.

Side of the coin	Tally
Heads	
Tails	

- c Use your tally chart to calculate the relative frequency of landing on a head.

.....

- d Is your coin fair? Give a reason for your answer.

.....



2 Roll a dice 30 times.

a Record the results in the tally chart below.

Number	Tally
1	
2	
3	
4	
5	
6	

b From your results, what is the experimental probability of rolling a 6?

.....

c From your results, what is the experimental probability of rolling an odd number?

.....

d Were these probabilities what you expected? Explain your answer.

.....

.....

.....

.....

e What could you do to get more reliable experimental probabilities?

.....

.....

.....

20

Introduction to equations and inequalities

Exercises 20.1–20.2

1 Solve the following equations.

a $2m + 3 = 15$

.....

$m = \dots\dots\dots$

b $5n - 1 = 29$

.....

$n = \dots\dots\dots$

c $5t + 7 = 42$

.....

$t = \dots\dots\dots$

d $10 + 4f = 34$

.....

$f = \dots\dots\dots$

e $15q - 3 = 57$

.....

$q = \dots\dots\dots$

f $106 = 4r + 6$

.....

$r = \dots\dots\dots$

Exercise 20.3

1 For each of the following, form and solve an equation to find x .

a I think of a number, x , I add 3 and get 17. What number am I thinking of?

.....

$x = \dots\dots\dots$

b I think of a number, x , the product of my number and 5 is 65. What number am I thinking of?

.....

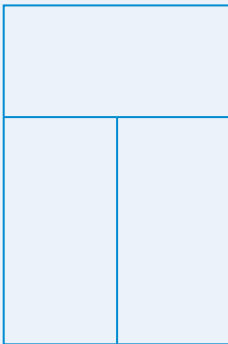
$x = \dots\dots\dots$

c I think of a positive number, x , the difference between my number and 4 is 18. What number am I thinking of?

.....

$x = \dots\dots\dots$

2 The following rectangle is made up of three identical smaller rectangles.



The perimeter of one small rectangle is 30 cm.

Find the perimeter of the big rectangle.

.....

.....

.....

.....

.....

Exercise 20.4

1 Represent each of the following inequalities on the number lines below.

a $x \leq 5$



b $x > -3$



c $x < -1$



d $x \geq 0$



2 What inequalities are represented by the following number lines?



.....



.....

3 Write the following statements as inequalities.

a The maximum depth of a swimming pool is 3 m.

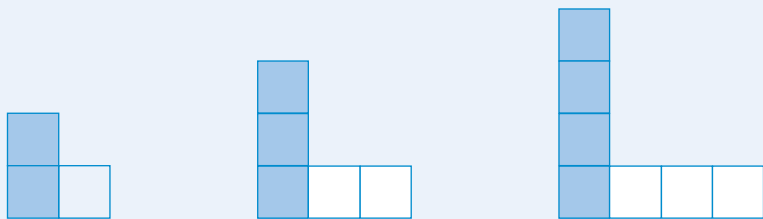
b If you multiply x by 3 and then add 8, the answer is less than 26.

.....

c The minimum temperature in December was -6°C

Exercise 21.1

1 This diagram shows the first three patterns of a sequence.



a Draw the next two diagrams in the sequence.

b Complete this table for the first five patterns of the sequence.

Number of white tiles	1	2	3	4	5
Number of grey tiles					

c Describe the pattern linking the number of white tiles to the number of grey tiles.

.....

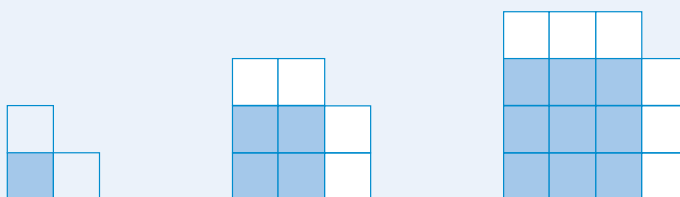
.....

.....

d How many grey tiles will there be in the pattern that has 35 white tiles?

.....

- 2 This diagram shows the first three patterns in a sequence.



- a Draw the next two diagrams in the sequence.
- b Complete this table for the first five patterns of the sequence.
- | | | | | | |
|-----------------------|--|--|--|--|--|
| Number of white tiles | | | | | |
| Number of grey tiles | | | | | |
- c Describe the pattern of grey tiles.
- d How many grey tiles will there be in the pattern that has 42 white tiles?

.....

Exercise 21.2

- 1 For each of the following sequences:
- describe the term-to-term rule
 - write down the next two terms of the sequence
 - calculate the 10th term.

a 3, 6, 9, 12, 15

i)

ii)

iii)

c 1, 7, 13, 19, 25

i)

ii)

iii)

b 5, 7, 9, 11, 13

i)

ii)

iii)

d 20, 15, 10, 5, 0

i)

ii)

iii)

- 2 Ruth has two daughters. She tells them that on the 1st day of the month she will give them each \$1 pocket money, on the 2nd day of the month she will give them each \$2, on the 3rd day she will give them each \$3 and so on.

a How much would each daughter have received by the 10th day of the month?

.....

.....

.....

b Ruth says that the maximum she can afford to give her daughters in total is \$300. For how many days can she keep giving them pocket money?

.....

.....

.....

Exercise 21.3

- 1 In the following sequences:

- i) find the general rule for the n th term
ii) calculate the 100th term of the sequence.

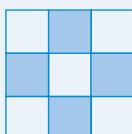
a 4, 5, 6, 7, 8

- i)
ii)

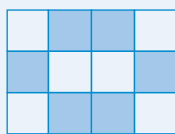
b 4, 8, 12, 16, 20

- i)
ii)

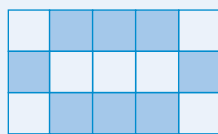
- 2 The diagram below shows the first three patterns of a sequence.



Pattern 1



Pattern 2



Pattern 3

a Find an expression for the number of grey squares in pattern n .

.....

b Will the number of white squares always alternate from odd to even? Tick a box.

☐ Yes

☐ No

Give a reason for your answer.

.....

.....

3 The diagram shows a sequence of patterns.

a Draw the next two patterns.

Pattern 1



Pattern 2



Pattern 3



Pattern 4

Pattern 5

b In total, how many dots will be in the first eight patterns?

.....

.....

c Which pattern has 51 dots?

.....

.....

4 Here is an algebraic sequence.

$a + b$ $2a + 3b$ $3a + 5b$ $5a + 9b$

a Find the missing expression in the sequence

b Write down the 10th term in the sequence.

.....

.....

22

Percentages of whole numbers

Exercise 22.1



1 Work out the following percentages of amounts.

a 50% of 500 =

b 25% of 280 =

c 30% of 250 =

d 75% of 600 =

e 37.5% of 640 =

2 A college has 620 students. 45% of the students are studying a language. What number of students are not studying a language?

.....

.....

3 At a restaurant the cost of the food comes to \$68. The restaurant then adds a 15% service charge on to the cost of the food to get the final bill. How much is the service charge?

.....

.....

4 120 people work in an office. 70% of the people are right-handed. Of the right-handed people, 25% have black hair. How many people in the office are right-handed and have black hair?

.....

.....

.....

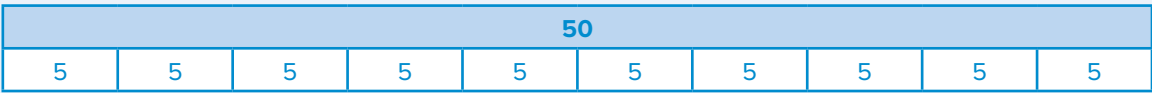


- 5 Connect the percentages on the left with their corresponding fractions on the right. For the percentages that do not have an equivalent fraction pair, write the equivalent fraction in its simplest form.

40%
175%
10%
$\frac{1}{4}\%$
65%
90%

$\frac{1}{10}$
$\frac{1}{400}$
$\frac{4}{10}$
$\frac{7}{4}$

- 6 The following bar model shows how 10% of 50 is 5.



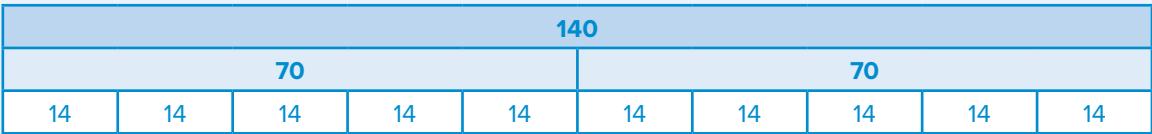
- a Use the bar model below to show what 20% of 400 is.



- b Use the bar model below to show what 12.5% of 160 is.



- 7 The bar model below shows that 20% of 70 is equal to 10% of 140.



- a Explain how the bar model shows this.

.....

.....

.....

- b Using a similar bar model, show that 25% of 90 is equivalent to 12.5% of 180.



Exercise 22.2

1 Write the following quantities as a percentage of the other.

- a 45 out of 90 = % b 15 out of 150 = %
c 4 out of 20 = % d 2 out of 80 = %

2 Gabriella's football team went to a tournament where they played eight matches. Of these eight matches, they won four, drew three and lost one. Express the number of matches won, drawn and lost as a percentage of the total number of matches played.

Won = % Drew = % Lost = %

3 A pen factory produces 1800 pens a day. Of these pens, 810 are black, 540 are red and the rest are blue.

What percentage of the pens are black, red and blue?

Black = % Red = % Blue = %

4 A stable yard has 36 horses, of which all eat hay. It is estimated that each horse will eat four bales of hay a month. The yard can only buy bales of hay in bundles of 25. The yard buys 150 bales a month.

What percentage of the total number of bales bought is left over?

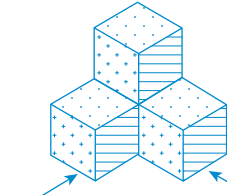
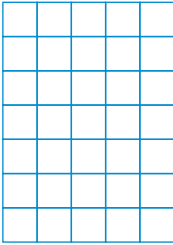
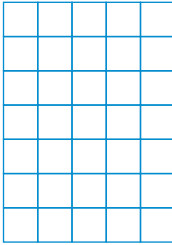
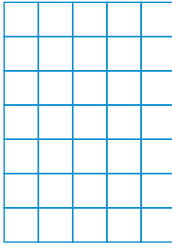
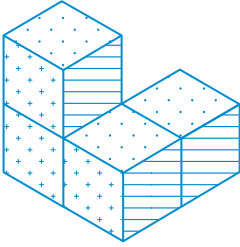
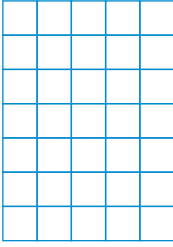
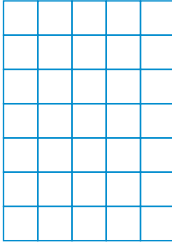
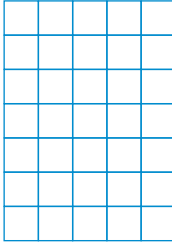
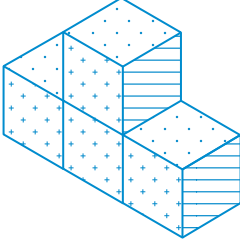
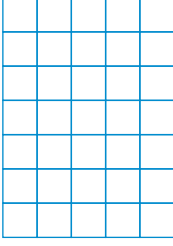
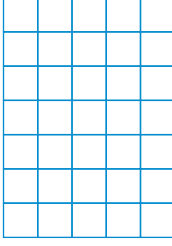
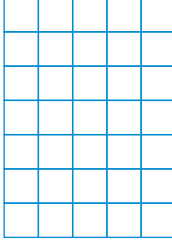
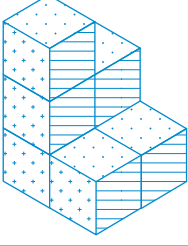
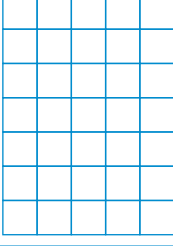
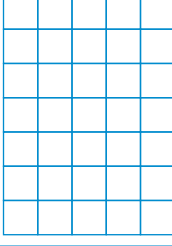
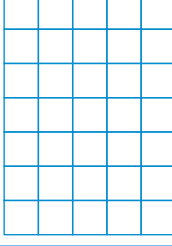
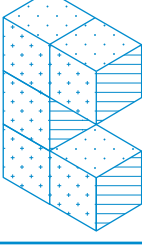
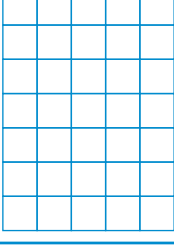
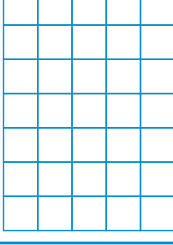
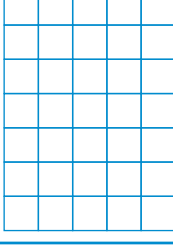
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23

Visualising 3D shapes

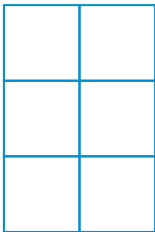
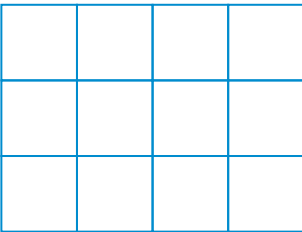
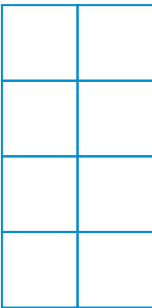



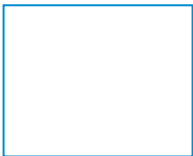
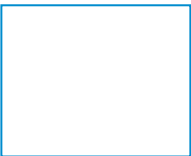
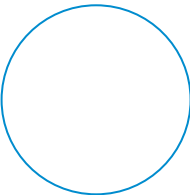
Exercises 23.1–23.2

- For each of the following isometric drawings of 3D shapes, draw the front, side and plan view. Assume front, side and plan directions are the same for all drawings.

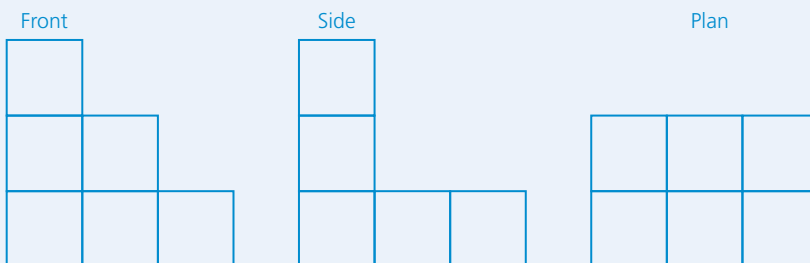
3D shape	Front	Side	Plan
 <p>Front elevation</p> <p>Side elevation</p>			
			
			
			
			



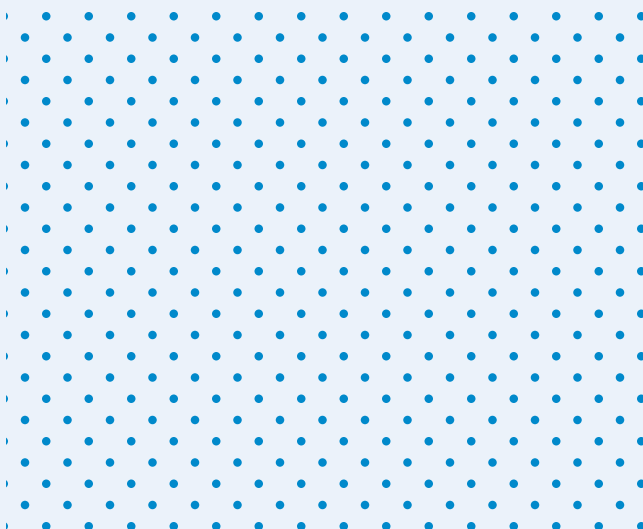
2 Write down the mathematical name for these 3D shapes, using their front, side and plan view.

Front	Side	Plan	Mathematical name
			
			
			

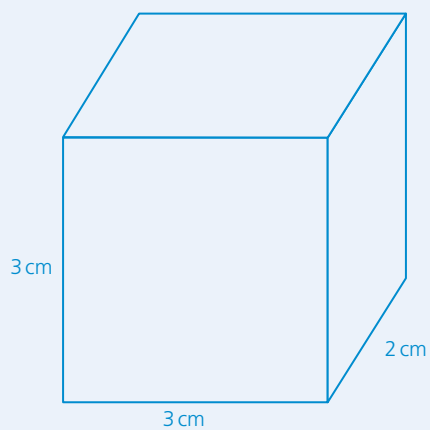
3 A solid shape is made from 9 centimetre cubes. Below are the front, side and plan view of the shape.



a Draw this shape on the isometric paper below.



- b** How many more centimetre cubes would need to be added to make the cuboid below?



.....

24

Introduction to functions

Exercises 24.1–24.2

1 Write the following functions in machine form.

a $w = x + 7$

b $d = f - 3$

c $v = 2h$

2 Complete the following tables for the functions.

a Input \rightarrow $\times 2$ \rightarrow Output

Input	Output
1	
2	
3	
4	

b Input \rightarrow $\times 3$ \rightarrow Output

Input	Output
-2	
-1	
0	
1	
2	

3 Molly has \$28 more money than Reece does. Let the amount of money Molly has be M and the amount of money Reece has be R . Write an algebraic function machine to work out the amount of money Reece has from the amount of money Molly has.

.....

4 Here is a function machine.

Input \rightarrow $\div 2$ \rightarrow Output

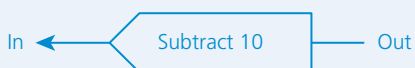
a Write down the inverse function machine.

b Complete the table.

Input	Output
2	
	5
18	
	-3
1	

5 Three inverse machines are given below.

a Match them to the correct input/output table.



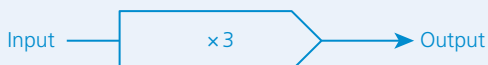
Input	Output
	20
	12.5
14	24
25	
15	

Input	Output
	1.5
	2
	2.5
8	6
	3.5

Input	Output
2	
40	10
8	
	25
240	

b Complete the input/output tables above.

6 Here are two function machines.



Prove that there is only one input value that will produce the same output values for both function machines.

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25

Coordinates and two-dimensional shapes

Exercises 25.1–25.2

1 Plot and label the following points on the axes below.

$A = (2, 3)$

$B = (4, 4)$

$C = (-1, 3)$

$D = (5, -7)$

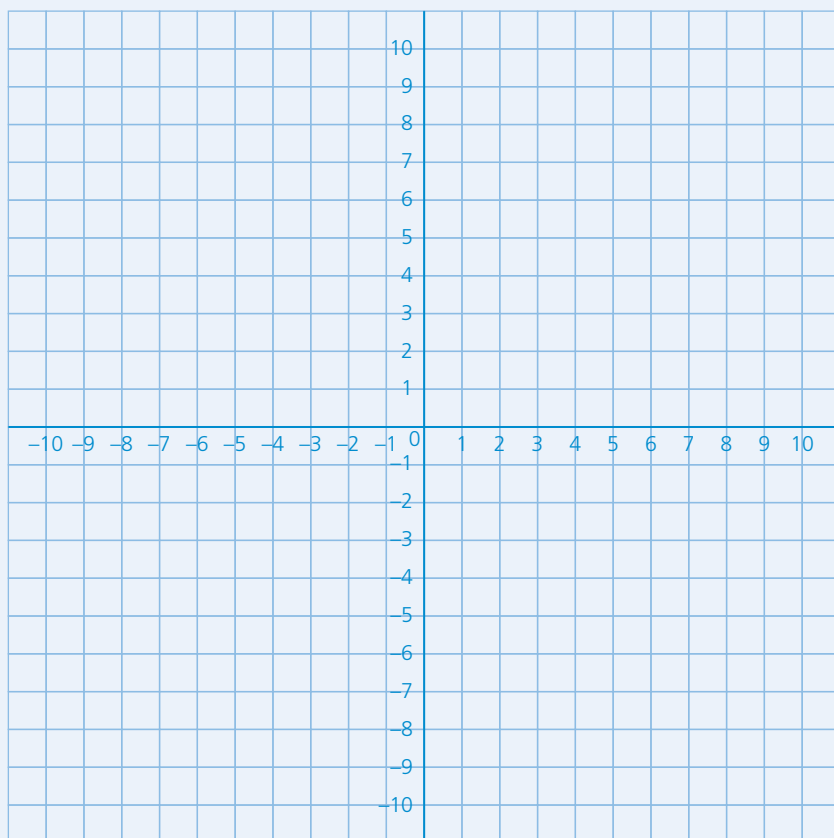
$E = (-8, -3)$

$F = (1.5, 7)$

$G = (0, 6.5)$

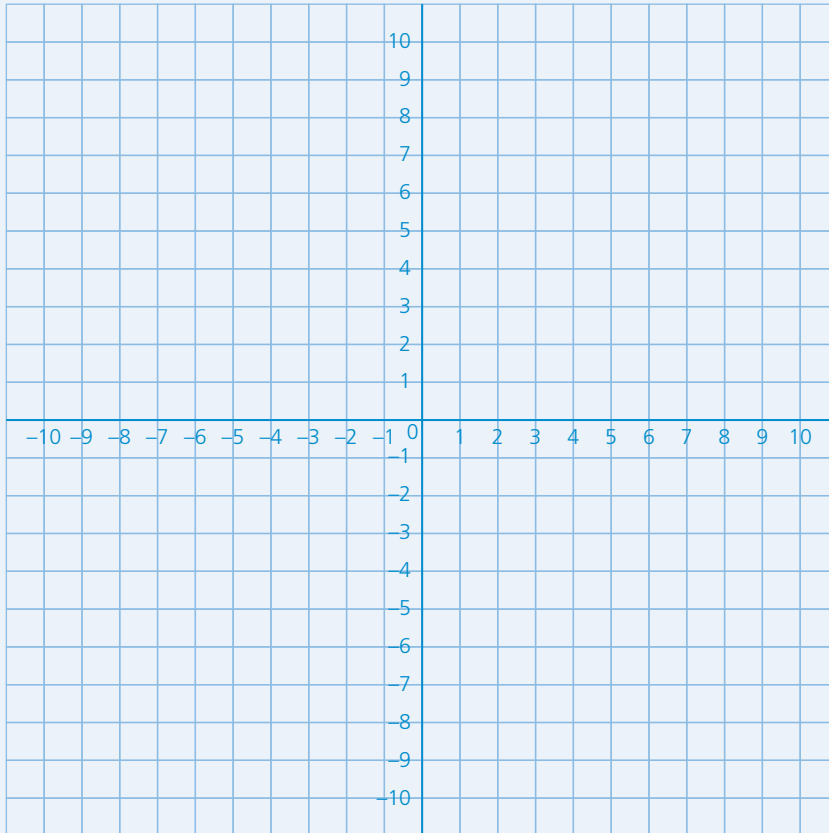
$H = (-9.5, -3)$

$I = (-0.5, -5.5)$



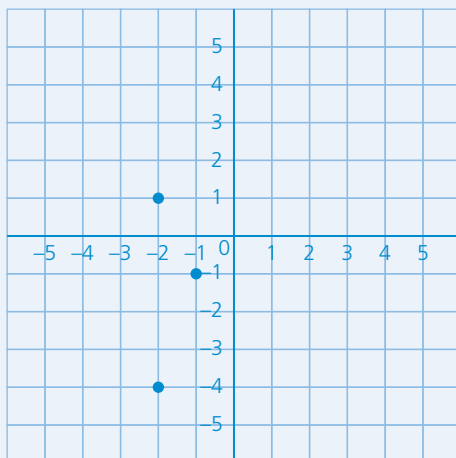
- 2 Using the grid below, plot each set of points and join them up in order. Each set of points will form a shape. In the table, write the mathematical name of each shape.

	Coordinates	Shape name
A	(3, 1) (3, 3) (-2, 1) (-2, 3)	
B	(-9, -3) (-9, -8) (-4, -8)	
C	(1, -7) (3, -4) (8, -4) (6, -7)	

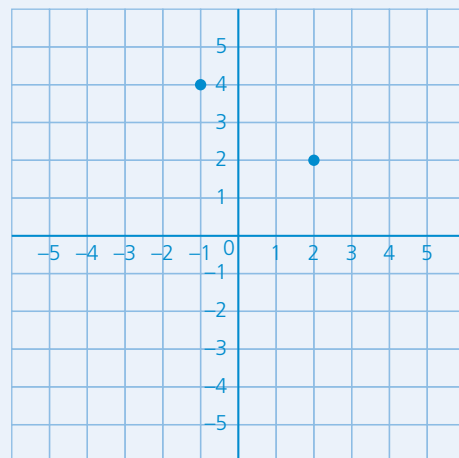


- 3 For each of the following, add one more point to make the desired shape stated. Write down the coordinates of the point added.

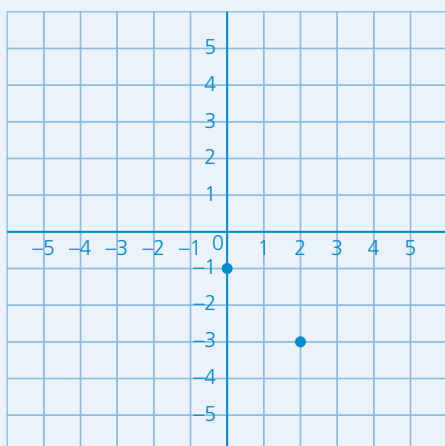
a Kite



b Isosceles triangle



c Right-angled triangle

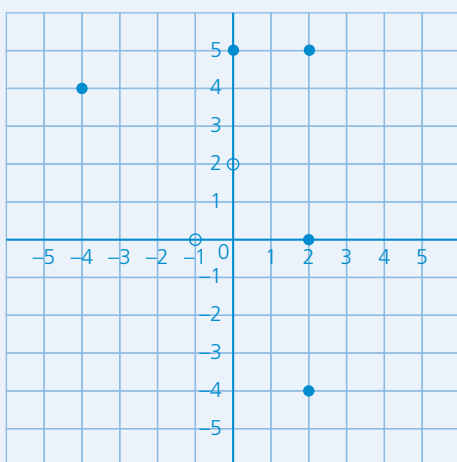


- 4 The points below are each vertices of rectangles.

There are three rectangles hidden in the grid. The open points are the vertices that are shared between two rectangles. All the other points are vertices belonging to only one rectangle.

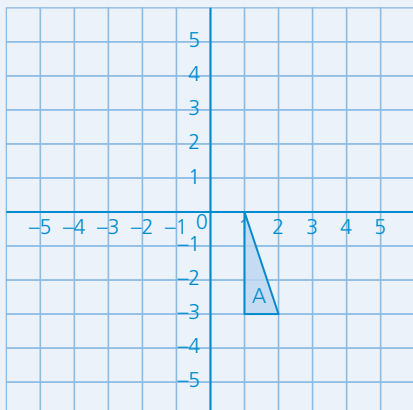
Find the three hidden rectangles and mark the missing vertices.

The rectangles do not have to be equal in size.

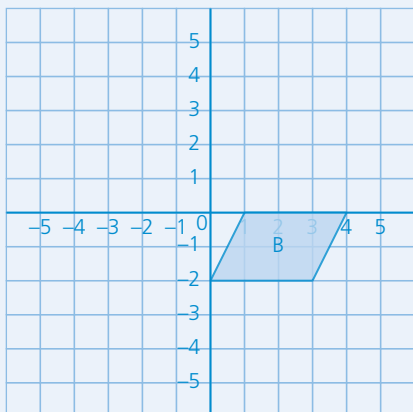


Exercise 25.3

- 1 Translate shape A so that it moves 3 units to the left and 1 unit up. Label the translated shape B.



- 2 Shape A is translated 2 units to the right and 4 units down to give shape B. Shape B is shown on the grid below.



What are the coordinates of the vertices of shape A?

.....

- 3 Triangle X has vertices with coordinates (2, 3), (2, 7) and (5, 3).

Triangle X is translated 5 units to the left and 1 unit down to give triangle Y.

- a What are the coordinates of the vertices of triangle Y?

.....

- b What is the translation that translates triangle Y to triangle X?

.....

- c What type of triangle are X and Y? Give a reason for your answer.

.....

.....

26

Squares, square roots, cubes and cube roots

Exercises 26.1–26.2

1 Evaluate the following.

a $7^2 = \dots\dots\dots$

b $\sqrt{81} = \dots\dots\dots$

c $3^3 = \dots\dots\dots$

d $\sqrt{169} = \dots\dots\dots$

e $\sqrt[3]{64} = \dots\dots\dots$

2 Evaluate the following.

a $\sqrt{\frac{1}{4}} = \dots\dots\dots$

b $\sqrt{\frac{16}{100}} = \dots\dots\dots$

c $\sqrt{\frac{1}{121}} = \dots\dots\dots$

d $\sqrt{0.49} = \dots\dots\dots$

3 A square jigsaw is made from 10 000 pieces. Each piece is 2 cm by 2 cm in size. What is the width and length of the jigsaw when it is finished? Give the units of your answer.

.....

4 Find the value of x in each of the following questions:

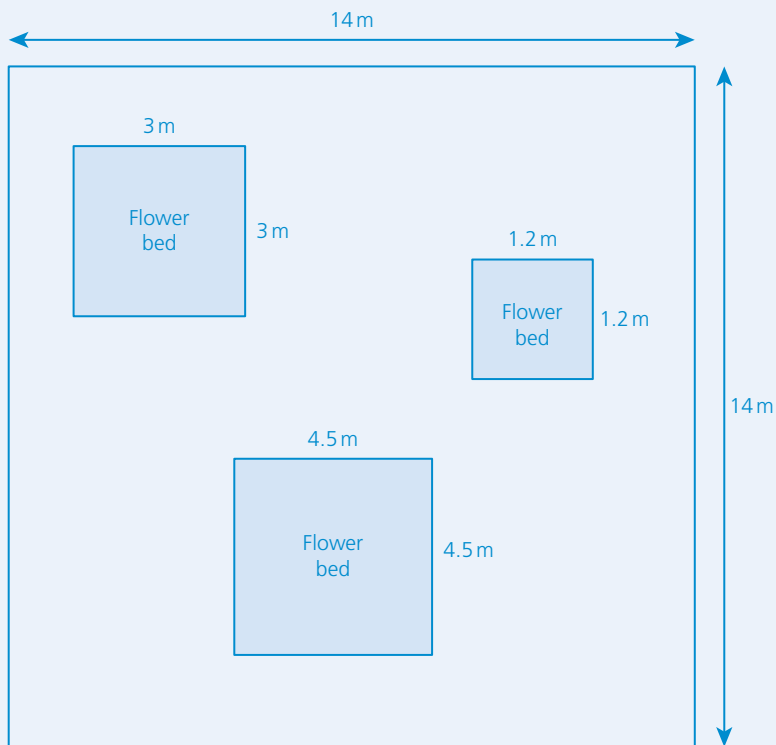
a $\sqrt{x} = 12 \dots\dots\dots$

b $x^2 = 81 \dots\dots\dots$

c $\sqrt[3]{x} = 6 \dots\dots\dots$

d $\sqrt[3]{x} = 3 \dots\dots\dots$

- 5 A gardener has been asked to turf the following garden. The flower beds do not need to be turfed.



Turf costs \$4 per m^2 . How much will it cost to turf the garden?

.....

.....

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27

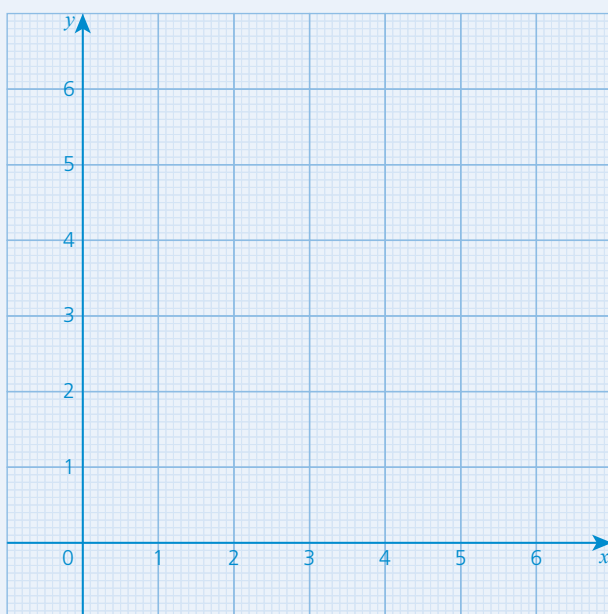
Linear functions

Exercises 27.1–27.2

- 1 a Complete the table below to give some of the coordinates of the line $y=x+2$.

x	0	1	2	3	4
y					

- b Draw the graph $y=x+2$ on the axes below.



- 2 Circle the line/lines on which the coordinates $(2, 5)$ lie.

$y=2x$

$y=5$

$y=x-3$

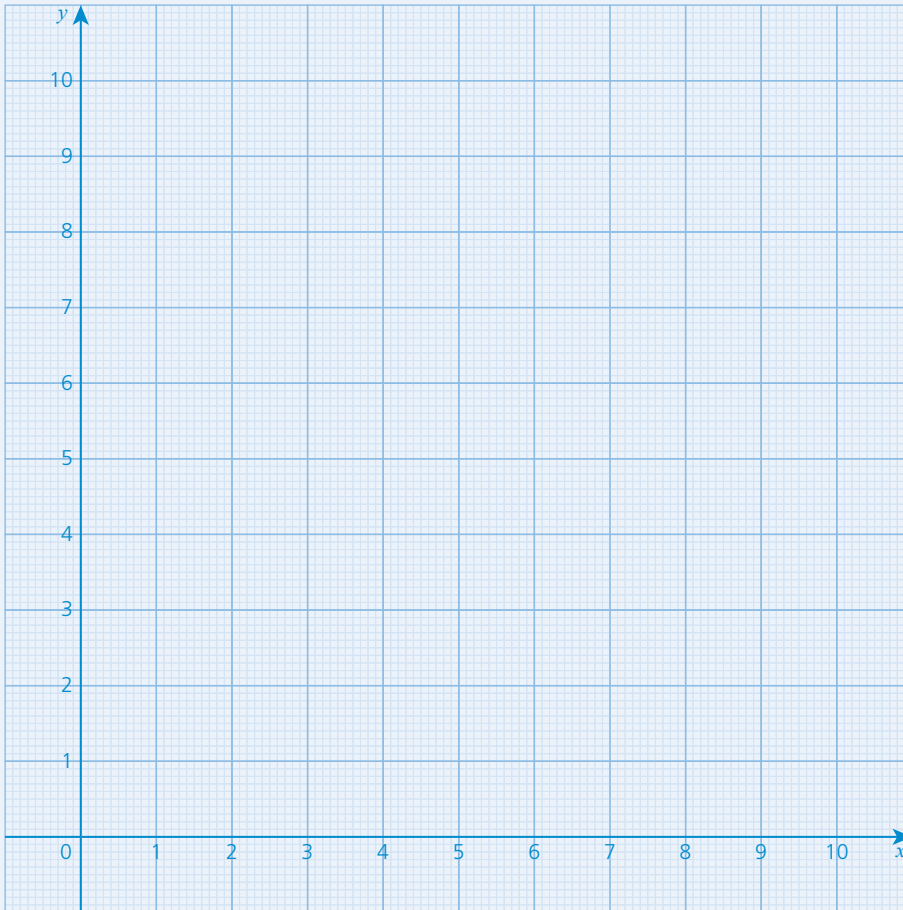
$y=2x+1$

$y=3x-1$

- 3 a Complete the table below to give some of the coordinates of the line $y=2x$.

x	0	1	2	3	4
y					

- b Draw the graph $y=2x$ on the axes below.



- c On the same axes, draw the line $x=3$.
- d What are the coordinates of the point where the lines $y=2x$ and $x=3$ meet?

.....

- 4 Two different car rental companies work out the total cost of hire (C), depending on the amount of days (d) the car is rented for.

InterCars charge \$15 per day, whereas MotorLoans charge \$70 as a fixed rate for up to 10 days.

- a Write an equation linking C and d for InterCars.

.....

- b Write an equation linking C and d for MotorLoans.

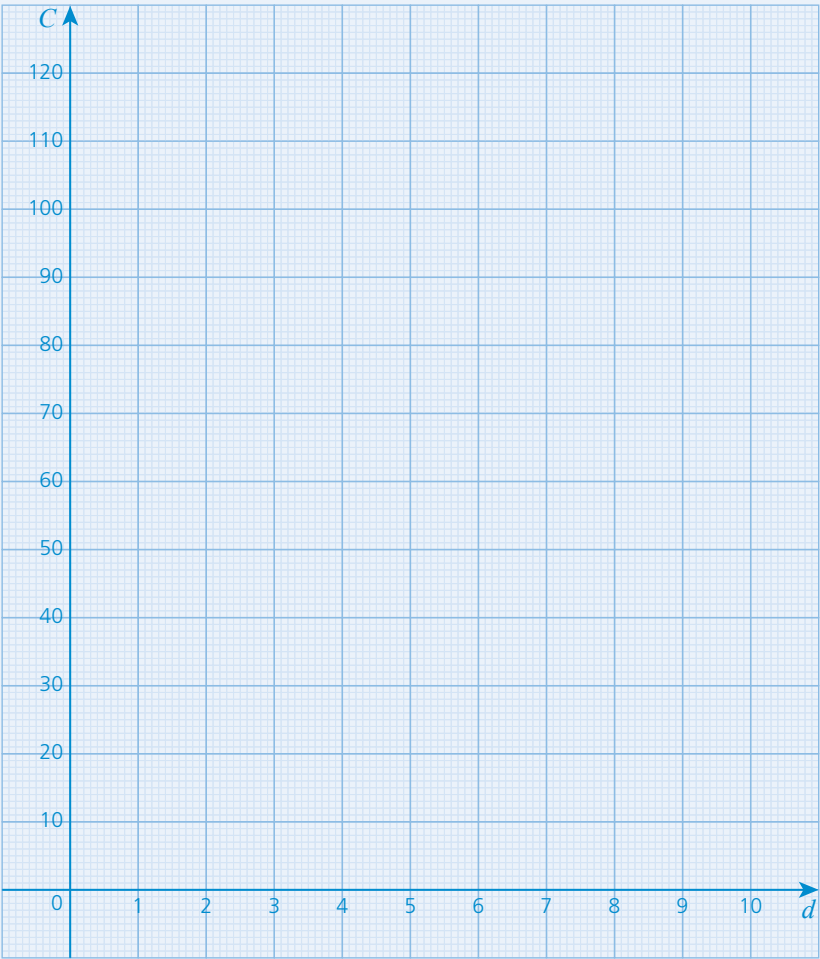
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- c Plot both lines on the axes below for the total C of car rental between 0 and 10 days for both companies. Label each linear function with the equation.

Completing the tables below may help you to draw each linear function.

InterCars	
Days	Cost
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

MotorLoans	
Days	Cost
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	



- d After how many whole days does it become cheaper to hire a car through MotorLoans?

.....

Exercises 28.1–28.3

1 Complete the conversions below.

- a $1\text{ m} = \dots\dots\dots\text{cm}$ b $1\text{ cm} = \dots\dots\text{mm}$ c $1\text{ m} = \dots\dots\dots\text{mm}$ d $1\text{ km} = \dots\dots\dots\text{m}$

2 For each of the statements below, pick an appropriate unit you would use for measurement.

mm cm m km mg g kg tonne ml litre

a Weight of a book c Amount of tea in a cup

b Height of a skyscraper d Weight of an aeroplane

3 Convert these measurements to millimetres.

- a $3.5\text{ cm} = \dots\dots\dots$ b $0.8\text{ cm} = \dots\dots\dots$ c $2\text{ m} = \dots\dots\dots$ d $1.2\text{ cm} = \dots\dots\dots$

4 Convert these measurements to metres.

- a $1700\text{ cm} = \dots\dots\dots$ b $20\text{ mm} = \dots\dots\dots$ c $2.8\text{ km} = \dots\dots\dots$ d $850\text{ cm} = \dots\dots\dots$

5 Convert these measurements to millilitres.

- a $1.9\text{ litres} = \dots\dots\dots$ b $0.5\text{ litres} = \dots\dots\dots$ c $1.05\text{ litres} = \dots\dots\dots$

6 Convert these measurements to litres.

- a $3100\text{ ml} = \dots\dots\dots$ b $200\text{ ml} = \dots\dots\dots$ c $6172\text{ ml} = \dots\dots\dots$

7 Complete the following.

- a $6\text{ cm}^2 = \dots\dots\dots\text{mm}^2$ b $14\text{ mm}^2 = \dots\dots\dots\text{cm}^2$ c $80\,000\text{ cm}^2 = \dots\dots\dots\text{m}^2$

8 Claire has a 1.5 litre bottle of cola. She drinks 350 ml. How much cola is left?

.....

9 David has a 1.5 tonne pile of logs. He uses a total of 600 kg over the winter. How much does he have left?

.....

10 Sina is travelling 68 km on a bicycle across 3 days. On the first day he travels 12 450 m, on the second day he travels 24 830 m.

How far does he have to travel on the final day?

.....

- 11 Susan is a professional baker. Every time she bakes a cake she uses 750 g of flour, every time she bakes a batch of cookies she uses 400 g of flour. A 1 kg bag of flour costs her \$1.25.

Assuming she bakes 7 cakes and 12 batches of cookies a week, how much does she spend on flour per year? She can only buy flour in 1 kg bags.

.....

.....

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Exercise 28.4

- 1 Calculate the actual length (in metres) represented by each of these lengths on a scale drawing. The scale of each diagram is given in brackets.

a 20 cm (1 : 30) = b 85 mm (1 : 200) = c 50 cm (2 : 65) =

- 2 Calculate the length (in centimetres) that represents each of these actual lengths on a scale drawing. The scale of each diagram is given in brackets.

a 40 m (1 : 200) = b 150 m (1 : 5000) = c 6 km (1 : 1500) =

- 3 In each of these pairs of lengths, the first is the length on a scale drawing, and the second is the corresponding length in real life.

Calculate the scale in each case.

a 3 cm 150 cm =:..... b 35 cm 70 m =:..... c 6 cm 12 km =:.....

- 4 A rectangular field is 300 m long and 200 m wide. Draw a scale drawing of the field, using the scale 100 m = 2 cm.

- 5 The map below is a copy and shows the distances (in mm) between some cities in India on the original map and the scale it used.



- a Calculate the actual distance between Pune and Delhi.

.....

- b Rosie drives from Kochi to Raipur, then from Raipur to Agra. Assuming she drives the shortest possible distance, how far does she drive?

.....

.....

Exercises 29.1–29.2

1 Simplify the following ratios.

a $3:12 = \dots\dots\dots$

b $15:35 = \dots\dots\dots$

c $120:500 = \dots\dots\dots$

d $14:42 = \dots\dots\dots$

2 Write the following ratios in the form $1:n$.

a $5:25 = \dots\dots\dots$

b $4:18 = \dots\dots\dots$

c $6:39 = \dots\dots\dots$

3 In a school, 350 students have brown eyes and 400 students have blue eyes. Write the ratio of students with brown eyes to students with blue eyes in its simplest form.

.....

4 In a fruit juice, the ratio of orange juice to mango juice is $5:2$. If there is 750 ml of orange juice, how much mango juice is there?

.....

5 There are 120 diners in a restaurant. 40 of the diners order roast chicken, 35 diners order risotto and the rest order spaghetti.

Calculate the ratio of chicken to risotto to spaghetti. Write the ratio in its simplest form.

.....

.....

6 The pattern of beads in a necklace is made up of three different shaped beads as shown below.



a Write the ratio of circular to triangular to square beads in its simplest form.

.....

b If there were 24 circular beads on the necklace, how many would be square?

.....

- c A necklace with the same design has 48 beads in total. How many beads of each shape does it have?

.....

.....

- 7 The length and width of a rectangle are in the ratio 3:1.

- a The length of the rectangle is 2.1 m. What is the width?

.....

- b What is the perimeter of the rectangle?

.....

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Exercise 29.3

- 1 An emergency electrician charges \$45 per 30 minutes' work. How much would the electrician charge for a job lasting 1 hour and 10 minutes?

.....

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- 2 In a factory, the workers are paid \$15 every time they produce two pairs of jeans. One worker manages to produce 21 pairs of jeans in a day. How much will the worker be paid? (The workers get paid for *every* pair of jeans they produce.)

.....

.....

- 3 A farmer is sowing seeds in his field using his tractor and can cover a distance of 20 m every 3 minutes.

- a After how long will he have covered a distance of 1.5 km? Give your answer in hours and minutes.

.....

.....

- b The farmer is sowing seeds for 5 hours in total. What is the total distance covered?
Give your answer in km.

.....

.....

- 4 A small bag of sugar weighing 600 g costs \$1.20. A large bag of sugar weighing 1.5 kg costs \$2.50.
Are the weight and cost directly proportional? Give a reason for your answer.

.....

.....

Exercise 29.4

- 1 The ratio of men to women at an office is 8:5. There are 32 men. How many women are there?

.....

.....

- 2 The ingredients for animal feed are meat and cereals in the ratio 2:7. In the ingredients for one bag of animal feed there is 1.2 kg of meat. How much cereal is in the bag?

.....

.....

- 3 The sizes of three angles in a triangle are in the ratio 1:2:3.
What type of triangle is it? Give a reason for your answer.

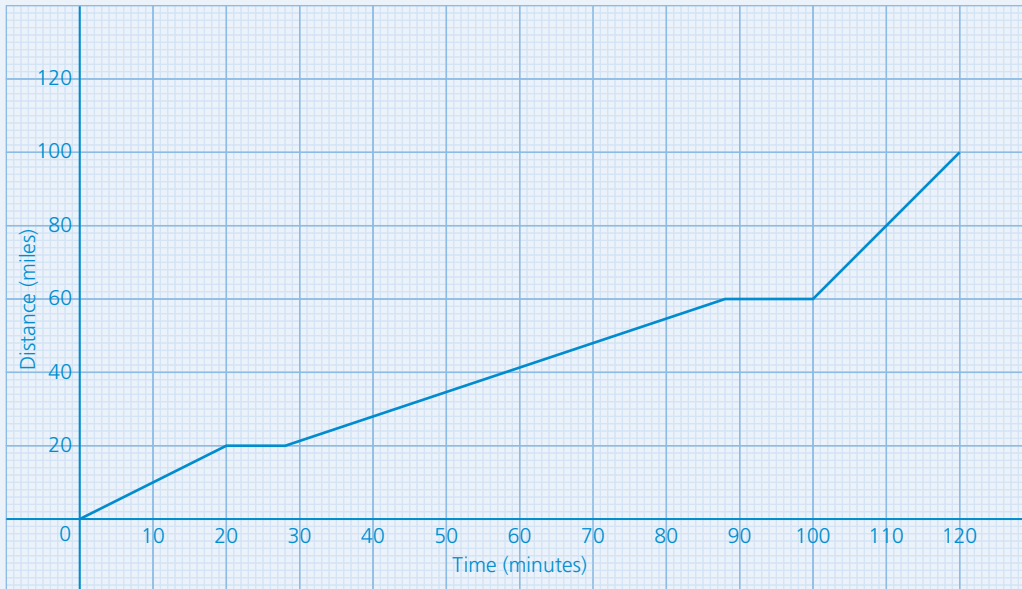
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Exercises 30.1–30.2

- 1 The distance–time graph below shows the journey a coach takes over a 2-hour period on the way to the airport.



- a Describe the journey shown on the graph.

.....

.....

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- b For how long is the coach stationary in total?

.....

- c How far does the coach travel in the first 10 minutes?

.....

- d How long does it take the coach to travel 60 miles?

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