Term Four

Unit 1: Whole numbers

1.1 Order and represent numbers ... 283
1.2 Investigate even and odd numbers ... 285

Unit 2: Whole numbers: Addition and subtraction

2.1 Revision and practice ... 286
2.2 Add and subtract in context ... 289
2.3 Rounding off in context ... 290

Unit 3: Properties of three-dimensional objects

3.1 Rectangular prisms ... 292
3.2 Nets of rectangular prisms ... 293
3.3 Nets of other prisms ... 296
3.4 Nets of a square-based pyramid ... 298
3.5 Nets of a cylinder and a cone ... 299

Unit 4: Common fractions

4.1 Fractions of whole numbers ... 301
4.2 Fractions in diagrams ... 304
4.3 Fractions on the number line ... 306
4.4 Solving problems ... 307

Unit 5: Whole numbers: Division

5.1 Revision practice ... 310
5.2 Making pictures smaller and bigger ... 311
5.3 Ratios of enlargement and reduction ... 312
5.4 Ratio again ... 315

Unit 6: Perimeter, area and volume

6.1 Perimeter 319
6.2 Area 323
6.3 Volume and capacity 327

Unit 7: Position and movement

7.1 Moving between positions on a grid map 331

Unit 8: Transformations

8.1 Rotations, reflections and translations in art 333
8.2 Tessellations 335

Unit 9: Geometric patterns

9.1 Making a geometric pattern 338
9.2 Describing patterns 339
9.3 Completing tables 341

Unit 10: Number sentences

10.1 Solve and complete number sentences by trial and improvement.. 342
10.2 Flow diagrams, number sentences and tables 344

Unit 11: Probability

11.1 A coin-tossing experiment 346
11.2 Spinner Experiment 1 347
11.3 Spinner Experiment 2 349

UNIT 1

WHOLE NUMBERS

1.1 Order and represent numbers

1. Count in four hundreds from 120 000 until you pass 123 000. Write down the number symbols as you go along.

2. Count in two thousands from 222 000 until you reach 244 000. Write down the number symbols as you go along.

3. Copy the number grid and fill in all the numbers. You have to count in 40 000s to do this.

120 000	160 000	200 000		
				480 000
520 000				
		800 000		
			1 040 000	

4. Which numbers are missing at the marks on this number line? Write the numbers from smallest to biggest in your book.

   You have to count in 3 000s to do this.

5. Arrange the following seven numbers in ascending order (from smallest to biggest).

   686 132   786 987   195 123   298 829

   201 065   477 677   439 365

6. Arrange the following seven numbers in descending order (from biggest to smallest).

   127 140   903 546   865 153   721 122

   258 121   865 199   831 001

7. (a) How many whole numbers between 0 and 1 000 are odd?
   (b) How many whole numbers between 0 and 10 000 are multiples of 10?
   (c) How many whole numbers between 1 and 1 million are odd?
   (d) How many whole numbers between 1 and 1 million are multiples of 10?
   (e) How many whole numbers between 1 and 1 million are multiples of 3?

8. Write the expanded notations *and* number symbols for these numbers.
   (a) hundred and twenty-four thousand, five hundred and sixty-five
   (b) two hundred and ten thousand, seven hundred and sixty-three
   (c) four hundred and one thousand, eight hundred and seven
   (d) seven hundred and eleven thousand, three hundred and twelve
   (e) one hundred and twenty-seven thousand, seven hundred and ninety-five
   (f) nine hundred and ninety-six thousand, six hundred and six

9. Write the expanded notations and number names for these numbers.

(a) 216 786	(b) 785 092	(c) 670 548
(d) 108 805	(e) 632 104	(f) 405 696

10. Round off each of the numbers in question 9 to the nearest:
   (a) five
   (b) ten
   (c) hundred
   (d) thousand.

1.2 Investigate even and odd numbers

An **even number** is formed when any whole number is doubled (multiplied by 2), for example:

2 × 37 = 74, 2 × 459 = 918 and 2 × 344 924 = 689 848

74 and 918 and 689 848 are all even numbers.

The *units part* of any even number is 0, 2, 4, 6 or 8.

An **odd number** is formed by adding 1 to an even number, for example:

74 + 1 = 75, 918 + 1 = 919 and 689 848 + 1 = 689 849

75 and 919 and 689 849 are all odd numbers.

The *units part* of any odd number is 1, 3, 5, 7 or 9.

1. Can you think of a number that is not odd, and also not even?
2. (a) In each case, form an even number by doubling.
   47 78 361
   (b) Add 1 to each of your even numbers to form an odd number.
3. Is it true that when two odd numbers are added, the result is always an even number? Give *five* examples to support your answer.
4. Decide whether the statement is true or false. Give *one* example if the statement is false and *five* examples if the statement is true.
   (a) When an *odd* number and an *even* number are added, the result is always an odd number.
   (b) When *any three odd* numbers are added, the result is an even number.
   (c) When any *even number* of odd numbers are added, the result is an even number.
   (d) When any *odd number* of odd numbers are added, the result is an odd number.
   (e) The difference between two odd numbers is an odd number.
   (f) The difference between two even numbers is an even number.

Unit 2 Whole numbers: Addition and subtraction

2.1 Revision and practice

1. Write as single numbers.
   (a) 30 000 + 400 + 6
   (b) 30 000 + 4 000 + 60
   (c) 30 000 + 4 000 + 6
   (d) 40 000 + 13 000 + 1 700 + 340 + 17
   (e) 40 000 + 3 000 + 10 700 + 1 340 + 17
2. How much is each of the following?
   (a) 8 000 + 7 000 + 4 000 + 8 000 + 3 000
   (b) 800 + 70 000 + 40 + 8 + 3 000
   (c) 20 000 + 40 000 + 30 000
   (d) 70 000 – 40 000
   (e) 170 000 – 40 000
   (f) 170 000 – 140 000
3. Write as single numbers.
   (a) 60 000 + 3 000 + 900 + 50 + 1
   (b) 952 + 62 999
   (c) 3 952 + 59 999
   (d) 50 000 + 12 000 + 1 800 + 140 + 11
   (e) 50 000 + 13 000 + 900 + 40 + 11
4. How much is each of the following?
   (a) 7 843 + 7 843 + 7 843 + 7 843 + 7 843 + 7 843 + 7 843
   (b) 7 843 + 7 843 + 7 843 + 7 843 + 7 843 + 7 843 + 7 843 + 7 843
   (c) 34 725 – 18 847 + 44 718 – 34 720
   (d) 34 725 – 34 720 + 44 718 – 18 847
   (e) 73 548 – 23 456 + 43 457 – 33 548

5. Do not calculate the answers to these questions now. Just estimate the answers to the nearest 10 000.

   (a) 23 767 is added to a certain number and the answer is 59 789. What is this number?

   (b) 23 767 is subtracted from a certain number and the answer is 59 789. What is this number?

   (c) A certain number is 23 767 more than 59 789. What is this number?

6. Calculate the exact answers for question 5. Then round off your answers to the nearest 10 000.

7. Which of the following will be useful replacements for 63 951 if you have to calculate 63 951 – 19 826? Explain your choices by showing how you would do the calculation with each of your choices.

   (a) 63 951 = 60 000 + 3 000 + 900 + 50 + 1

   (b) 63 951 = 952 + 62 999

   (c) 63 951 = 3 952 + 59 999

   (d) 63 951 = 50 000 + 12 000 + 1 800 + 140 + 11

   (e) 63 951 = 50 000 + 13 000 + 900 + 40 + 11

8. 23 876 + 9 246 + 28 387 + 7 845 can be calculated as shown on the right.
   State which numbers were added to obtain each of the part answers in red.
   Also write the final answer.

23 876	
9 246	
28 387	
+ 7 845	
24	(a)
230	(b)
2 100	(c)
27 000	(d)
40 000	(e)
......	(f)

9. (a) Can you think of a quick way to find the answer for 3 823 + 3 812 + 3 807 + 3 835 + 3 823 + 3 832 + 3 861 + 3 814 + 3 841 + 3 821?

   (b) Find the answer.

10. On the right you can see what someone wrote to calculate 84 286 – 32 849.

    (a) Check the answer by doing addition.

    (b) If the answer is incorrect, explain what the person may have done to get it wrong.

```
  84 286
– 32 849
  52 643
```

11. On the right you can see what someone wrote to calculate 42 843 – 18 264.

    (a) Do you think the answer is correct?

    (b) If the answer is incorrect, explain what the person did to get it wrong.

```
  39 999
– 18 264
  21 735
```

12. Which of the following *do you think* will have the same answer?

    (a) 88 547 – 63 488 + 72 723 – 43 876

    (b) 88 547 – 72 723 + 73 488 – 43 876

    (c) 88 547 – 43 876 + 73 488 – 72 723

    (d) 88 547 – 43 876 + 72 723 – 63 488

13. Do the calculations in question 12 to check your predictions.

14. Find the sum of the numbers in each column. Do it with as little work as possible.

(a)	(b)	(c)	(d)	(e)
21 856	8 546	7 234	6 762	6 324
8 235	8 548	7 234	6 762	3 676
679	8 550	7 234	6 762	6 324
34 538	8 552	7 234	6 762	3 676
21 856	8 554	7 234	6 762	6 324
8 235	8 556	7 234	6 762	3 676
679	8 558	7 234	6 762	6 324
34 538	8 560	7 234	6 762	3 676
	8 562	7 234	6 762	6 324
	8 564	7 234		3 676

2.2 Add and subtract in context

1. During 2013, the population of Town A increased from 67 867 to 71 264. What was the population increase?
2. At the beginning of 2013, the population of Town B was 56 692. The population increased by 6 534 during the year. What was the population at the end of 2013?
3. At the beginning of 2013, the population of Town C was 84 328. The population decreased by 5 307 during 2013. During 2014 it decreased by 6 378 and during 2015 by 8 704.
   (a) What was the total decrease over the three years?
   (b) What was the population of Town C at the end of 2013, at the end of 2014 and at the end of 2015?
   (c) Use your answer for (a) to check your answer for the last part of question (b).
4. Here are the results of a local election, for three positions on a Council:

   Candidate A: 23 713 votes

   Candidate B: 11 908 votes

   Candidate C: 18 976 votes

   Candidate D: 14 327 votes

   Candidate E: 15 989 votes

   (a) Estimate the total number of votes to the nearest 10 000.
   (b) Which three candidates won seats on the Council?
   (c) How many votes were cast in total?
   (d) How many more votes than Candidate D did Candidate A get?
   (e) What is the difference between the number of votes for Candidates D and E?
5. A provincial document shows that 78 866 learners attended Grade 1 last year, while 10 236 more were enrolled at the beginning of this year. How many learners were enrolled this year?

6. On a hot day, 23 756 ℓ of water from a small farm dam is used for irrigation. At the end of the day, there is 46 700 ℓ left. How much water was in the dam at the beginning of the day?
7. At the time of the 2011 election, there were 63 458 registered municipal voters. At the time of the 2015 election, there were 53 089 voters. Did the number of voters increase or decrease, and by how many?
8. During a local election, 98 065 people voted for the Green Party and 97 676 people voted for the Anti-Corruption Party. By how many votes did the Green Party win?

2.3 Rounding off in context

The numbers of learners in the different schools in a certain region are given in the table below.

589	574	571	845	708	480
485	403	486	481	352	377
767	521	741	483	879	421
339	430	393	404	402	352
636	829	593	771	539	584
307	485	457	530	583	336
355	633	792	582	406	335
399	463	586	521	379	533
314	574	352	871	783	493
550	582	498	301	397	346
361	878	691	787	718	836
313	304	492	448	554	446
589	574	571	845	708	480

How can you quickly make a good estimate of the total number of learners in these schools?

Here are some plans:

A. Multiply the number of schools by 500.

B. Multiply the number of schools by 600.

C. Multiply the number of schools by some other number you decide on.

D. Add up the numbers in one column and multiply by 6.

E. Round off each number to the nearest hundred and work from there.

F. Work with the hundreds parts of the numbers only.

Answer the following questions.

1. (a) Which plan do you think will be quickest to follow?

   (b) Carry out this plan.

2. (a) Which plan do you think will produce the best estimate of the total number of learners?

   (b) Carry out this plan.

3. (a) Which plan do you think will produce the worst estimate of the total number of learners?

   (b) Carry out this plan.

4. (a) Carry out any other one of the given plans.

   (b) If you have not used Plan C yet, do it now.

5. Add up all the numbers in the table.

6. You made four or five estimates of the actual total number of learners. Which was the best estimate?

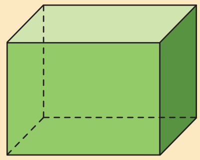
7. Can you think of a better plan to make an estimate than any of the plans given above?

Unit 3 Properties of three-dimensional objects

3.1 Rectangular prisms

Boxes with *six faces* that are all *rectangles* are called **rectangular prisms**.

The pairs of opposite faces are exactly the same shape and size.

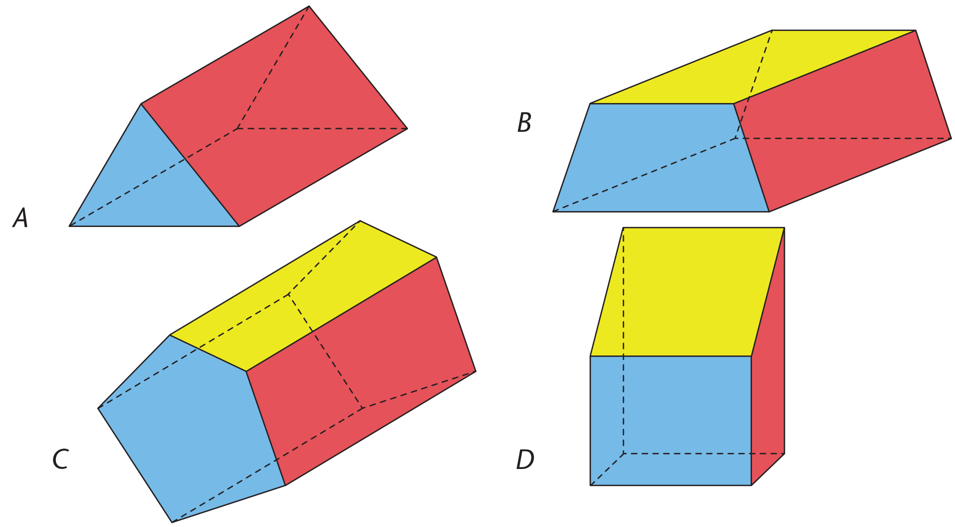


If all six faces of a rectangular prism have exactly the same shape and size, the rectangular prism is called a **cube**.

1. Draw the following rectangular prisms.
   (a) The object has six faces. All faces are squares.
   (b) The object has six faces.
   Two opposite faces are squares.
   All other faces are rectangles that are not squares.
2. Suppose you are told that a certain object has six faces.
   (a) Is it possible that the object is a rectangular prism?
   (b) Can you be sure that it is actually a rectangular prism?
   If you think you cannot be sure, explain why.
3. Answer the same two questions (2(a) and 2(b)) in each of the following cases.
   (a) All you know about the object is that is has rectangular faces.
   (b) You only have information about two faces of the object, and what you know is that these two faces are rectangular.
   (c) You only have information about three faces of the object, and what you know is that these three faces are rectangular.
   (d) You only have information about four faces of the object, and what you know is that these four faces are rectangular.
4. (a) Which of the objects on the next page can be the object in 3(a)?
   (b) Which of the objects on the next page can be the object in 3(b)?

(c) Which of these objects can be the object in 3(c)?

(d) Which of these objects can be the object in 3(d)?

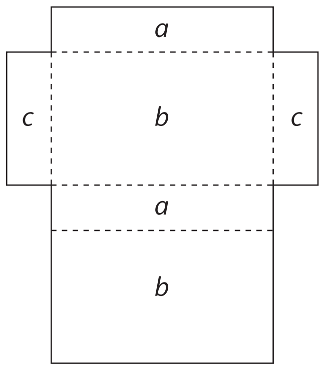


3.2 Nets of rectangular prisms

1. Use boxes that are rectangular prisms.

   (a) Make as few cuts as possible to open each box flat onto your table. All the faces of the box must still be attached. Cut off all the overlapping pieces.

The flat figure that shows all the faces of a 3-D object is called the **net** of the object.



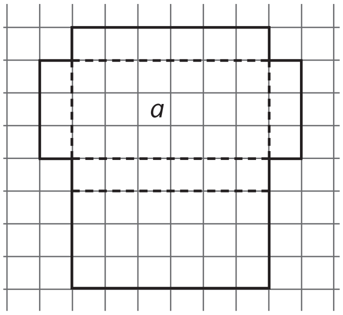
Net of a rectangular prism

   (b) Label the faces on the nets of your boxes to explain which faces are opposite each other when the net is folded into a prism. Write the same letter on the opposite faces.

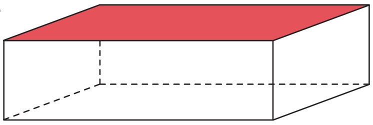
   (c) Compare your nets with a classmate's nets. Draw two different ways to cut open a box to make a net. Use the same letters to label the faces that are opposite each other when the net is folded into a prism.

2. (a) Draw four copies of this net on squared paper.

   (b) Shade the faces on your nets that are shown in red on the prisms below. Let *a* be the face that is the base (it is at the bottom; it stays on the table).



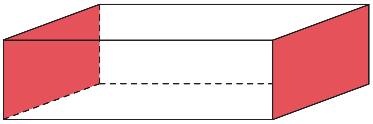
A



B

C

D



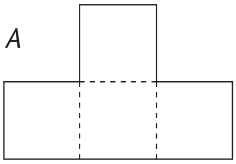
3. Work out which diagrams below are nets of a cube.

   (a) Draw the diagrams on squared paper.

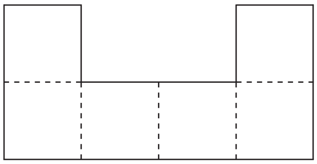
   (b) Use the same letters to label the faces that are opposite each other when the net is folded into a cube.

   (c) If a diagram is not the net of a cube, explain why this is so.

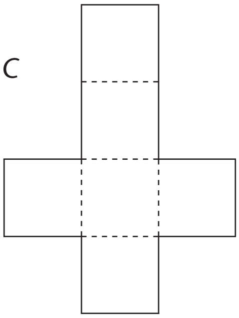
A



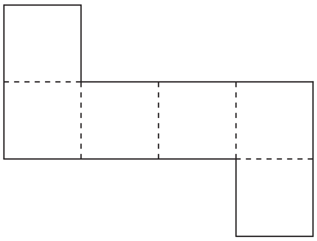
B



C

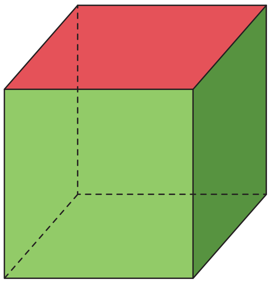


D

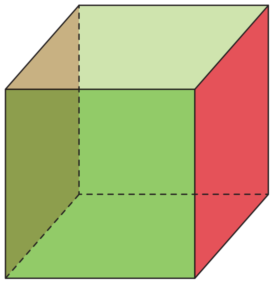


4. Draw the nets of the following cubes on squared paper. Shade the faces that are red on the cubes below. Let *a* be the face that is the base (it is at the bottom; it stays on the table).

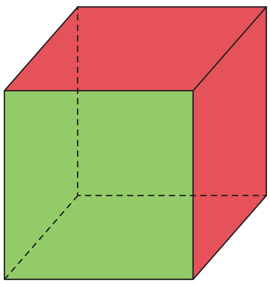
(a)



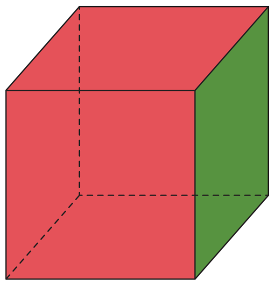
(b)



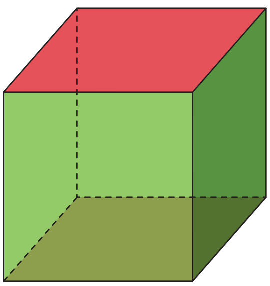
(c)



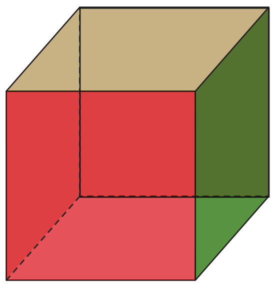
(d)



(e)



(f)

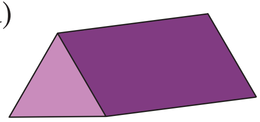


3.3 Nets of other prisms

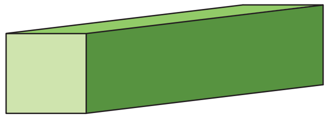
The diagrams in questions 1(a) to (d) below show prisms. They are **prisms** because they have one pair of opposite faces that are exactly the same shape and size, and the other faces are all rectangles that are the same shape and size.

1. Match each prism with a net below.

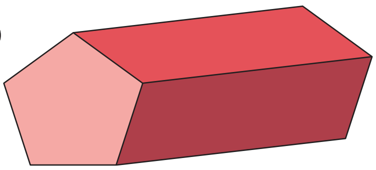
(a)



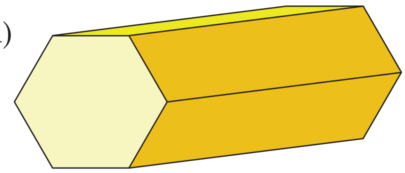
(b)

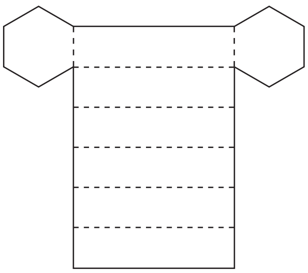


(c)

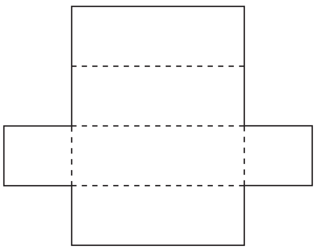


(d)

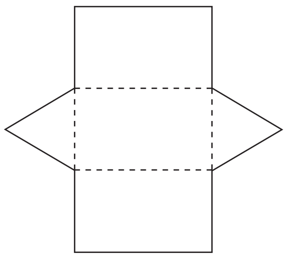




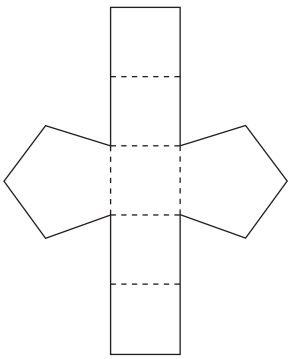
A



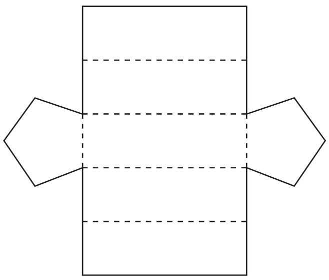
B



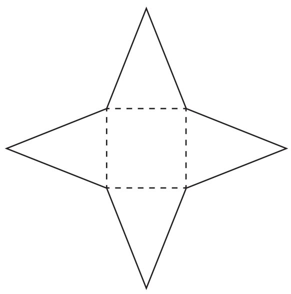
C



D



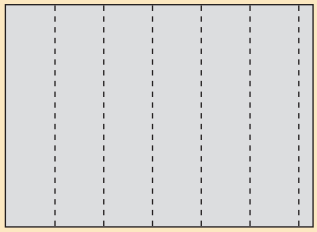
E



F

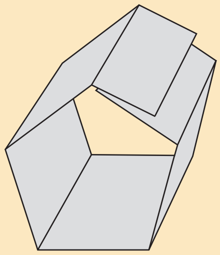
A quick way to make a paper prism

Step 1: Fold sections on a sheet of A4 paper, more or less as shown by the broken lines in the diagram on the right.



Step 2: Fold the sheet into a "tube" with five or six faces along its length.

Step 3: With a little extra work, you can now make a paper prism. You need to draw and cut out two bases so that they fit the openings.



2. Make four prisms using the bases below. You can follow the instructions above to make the "tube" of rectangular faces for each prism.

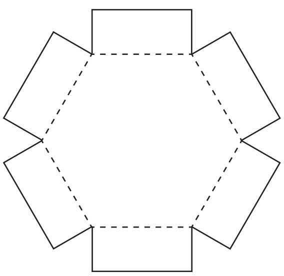
Trace the bases and cut them out. Use the flaps to stick the bases to the rectangular faces.

   (a) a prism with one pair of opposite faces that are triangles

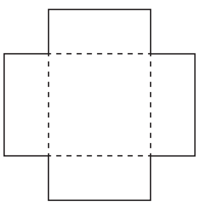
   (b) a prism with one pair of opposite faces that are squares

   (c) a prism with one pair of opposite faces that are pentagons

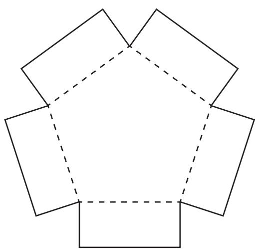
   (d) a prism with one pair of opposite faces that are hexagons



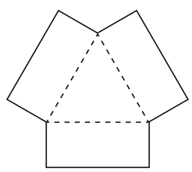
A



B

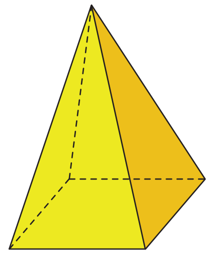


C



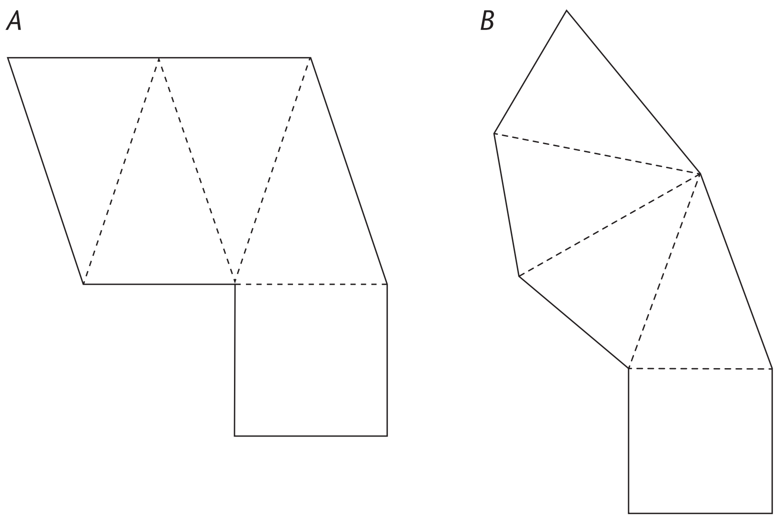
D

3.4 Nets of a square-based pyramid



1. Look at the diagram of a square-based pyramid.
   (a) How many faces does a square-based pyramid have?
   (b) Describe the shapes of the faces.

2. (a) Which of these diagrams is a net of a square-based pyramid? Explain your answer.



   (b) Draw a different net that can be folded to make a square-based pyramid. Cut out your net and test if it works.
   (c) Write to someone in another class. Explain how to make a net for a square-based pyramid. Make sure you say which sides of the polygons must have the same length.

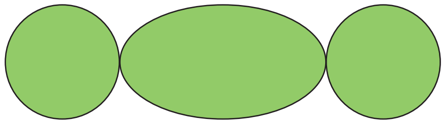
3.5 Nets of a cylinder and a cone

1. Use the tube of an empty toilet paper roll.
   (a) Trace the circles on a sheet of paper.
   (b) Cut open the tube along a straight line.
   (c) Trace the shape of the cut tube on a sheet of paper.
   (d) Cut out the three flat figures and use them to make a closed cylinder.

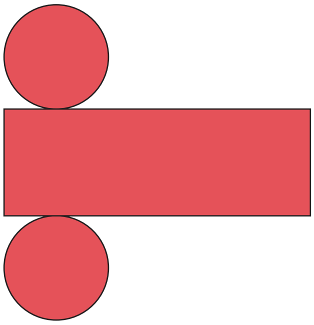
2. Which of the following diagrams are nets for a cylinder? Explain why the others will not make a cylinder.

A

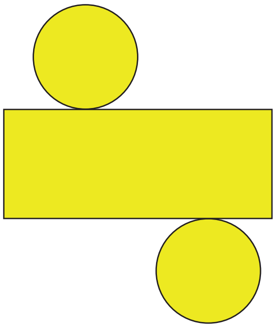
B



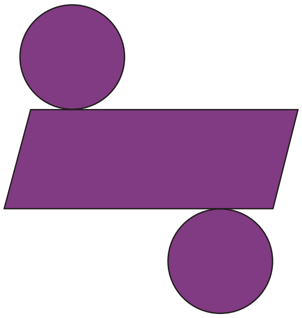
C



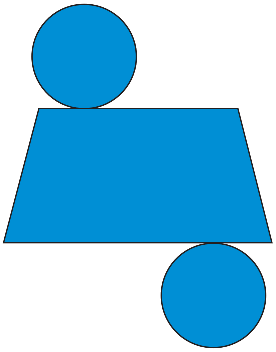
D



E



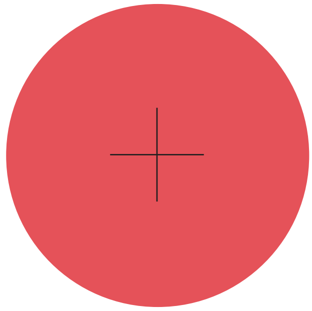
F



3. Make cones.

(a) Draw a circle by tracing around a round object, such as a plate or a saucer. (You can also use a round paper plate.)

(b) Find the centre of the circle by folding. Mark the centre.



(c) Cut out a wedge from the circle, as shown.

(d) Use both parts to make open cones.

(e) Trace the openings of the cones to make the circle bases for the cones.

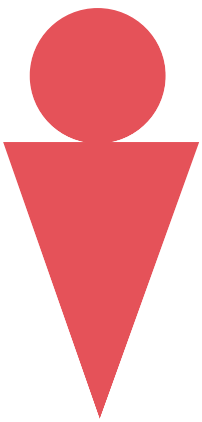
(f) Describe the difference between the two completed cones.

4. Which of the diagrams below are nets for a cone? Explain why the others will not make cones.

(a)

(b)

(c)



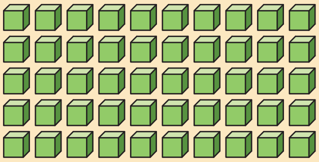
(d)

UNIT 4 COMMON FRACTIONS

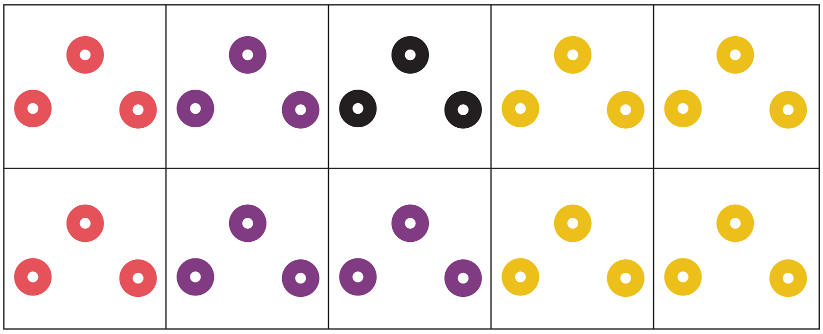
4.1 Fractions of whole numbers

$50 \div 5 = 10$

This means that $\frac{1}{5}$ of 50 is 10.



1. (a) How many beads are shown here, altogether?



(b) What fraction of all the beads is red?

(c) What fraction of all the beads is purple?

(d) What fraction of all the beads is black?

(e) What fraction of all the beads is yellow?

2. (a) How many beads do you have if you have $\frac{1}{10}$ of 30 beads?

(b) How many beads do you have if you have $\frac{3}{10}$ of 30 beads?

(c) How many beads do you have if you have $\frac{4}{10}$ of 30 beads?

(d) How many beads do you have if you have $\frac{2}{10}$ of 30 beads?

(e) How many beads do you have if you have $\frac{4}{10}$ of 120 beads?

(f) How many beads do you have if you have $\frac{2}{10}$ of 80 beads?

3. (a) How many beads are $\frac{1}{8}$ of 40 beads?

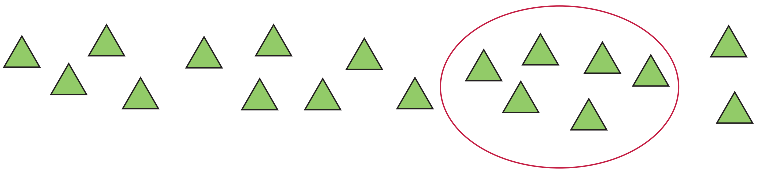
   (b) How many beads are $\frac{3}{8}$ of 40 beads?

   (c) How many beads are $\frac{4}{8}$ of 40 beads?

   (d) How many beads are $\frac{2}{8}$ of 40 beads?

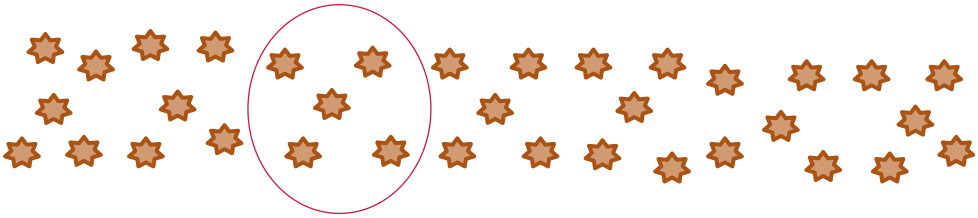
4. Below are some collections of objects.

   (a) What fraction of the collection of triangles is in the circle?

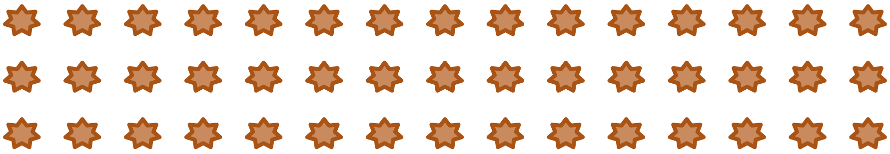


   (b) Write down the steps that you followed when you found the fraction of the triangles in (a).

   (c) Here are biscuits that look like stars. What fraction of the number of biscuits is in the circle?



5. This is one sixth of the biscuits that Mama Themba made for the church function. How many biscuits did she bake?



6. R420 was stolen from Biza's bag. He said: "Someone stole exactly one tenth of the money I earned this month." How much money did Biza earn this month?

7. Calculate:

(a) $\frac{2}{5}$ of 250

(b) $\frac{2}{3}$ of 99

(c) $\frac{5}{8}$ of 720

(d) $\frac{5}{9}$ of 819

(e) $\frac{7}{12}$ of 1 440

(f) $\frac{7}{10}$ of 12 340

(g) $\frac{3}{7}$ of 840

(h) $\frac{5}{6}$ of 1 440

Nick has to calculate $2\frac{5}{8}$ of 16. He thinks like this:

$2\frac{5}{8}$ means $2 + \frac{5}{8}$. So $2\frac{5}{8}$ of 16 means two 16s plus $\frac{5}{8}$ of 16.

That is 32 plus 10, which is 42.

8. Use your answers in question 7 and calculate:

(a) $1\frac{2}{5}$ of 250

(b) $1\frac{2}{3}$ of 99

(c) $2\frac{5}{8}$ of 720

(d) $3\frac{5}{9}$ of 819

(e) $1\frac{7}{12}$ of 1 440

(f) $2\frac{7}{10}$ of 12 340

(g) $2\frac{3}{7}$ of 840

(h) $1\frac{5}{6}$ of 1 440

9. You should be able to do the following mentally. This means you should be able to write down the final answer straight away without writing down anything else.

(a) $1\frac{1}{2}$ of 8

(b) $2\frac{1}{3}$ of 9

(c) $2\frac{1}{6}$ of 12

(d) $2\frac{3}{4}$ of 20

(e) $3\frac{2}{5}$ of 50

(f) $2\frac{3}{10}$ of 30

10. Three friends share two chocolate bars equally. How much chocolate does each one get?

4.2 Fractions in diagrams

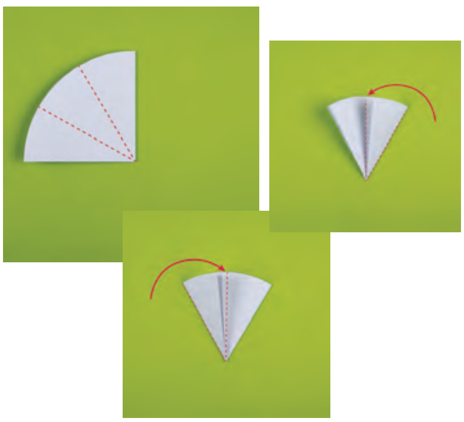
1. Follow the instructions below and make *four* circles:

Step 1: Trace around a round object to draw a circle.

Step 2: Cut out the circle.

Step 3: Fold it in half.

Step 4: Fold it in half again. You now have four quarters.



Step 5: Fold the two sides over so that the two folded parts are exactly the same size.

Step 6: Unfold and draw clear lines on the folds.

(a) Shade one quarter of your first circle.

(b) Shade three twelfths of your second circle.

(c) Shade two twelfths of your third circle.

(d) Shade one sixth of your fourth circle.

2. (a) What do you notice about one quarter and three twelfths?

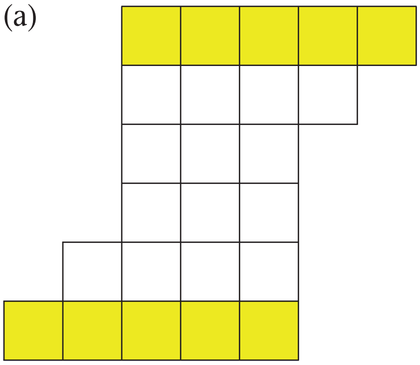
   (b) What do you notice about one sixth and two twelfths?

   (c) Write what you understand by *equivalent* fractions.

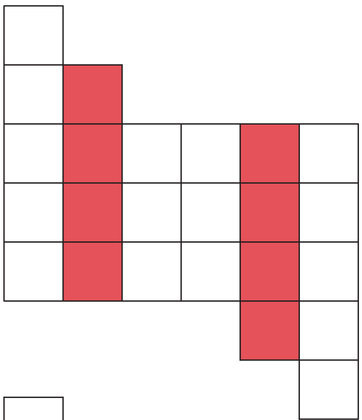
Equivalent fractions are fractions with different names but with the same value.

3. What fraction of the whole figure is shaded in each case? If possible, write the fraction in more than one way.

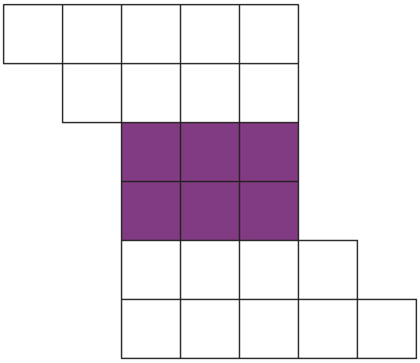
(a)



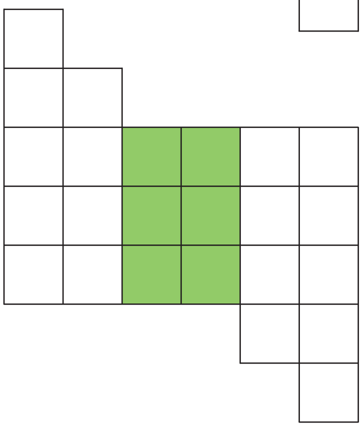
(b)



(c)



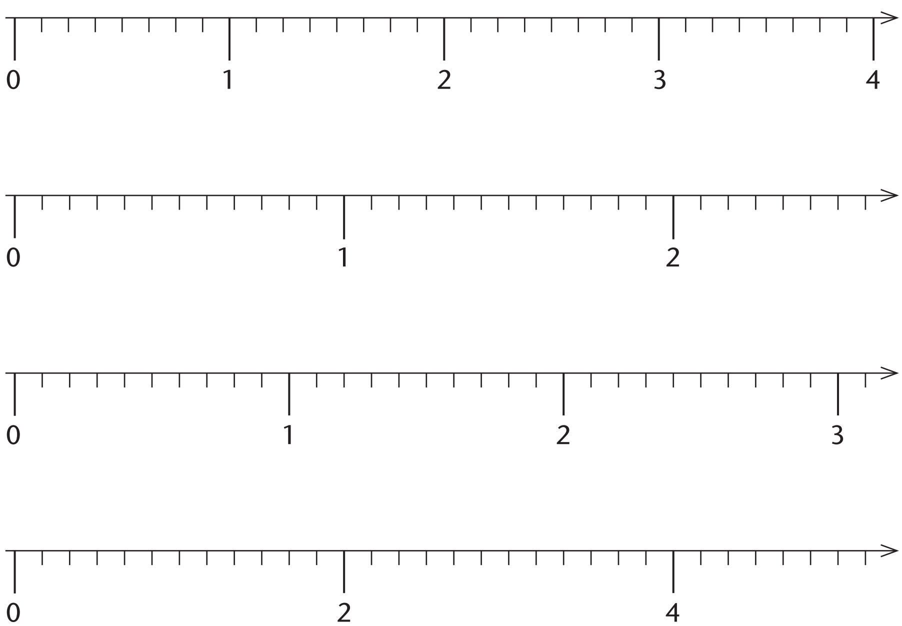
(d)



4.3 Fractions on the number line

1. Copy the four number lines below and write the following fractions at the correct places on the number lines. Note that it is sometimes possible to place more than one fraction in a certain position. Some fractions can also be put on more than one of the number lines. Try to find those fractions and do it.

(a) $\frac{1}{2}$	(b) $\frac{3}{4}$	(c) $\frac{8}{10}$	(d) $\frac{11}{12}$
(e) $1\frac{3}{5}$	(f) $\frac{2}{6}$	(g) $\frac{4}{12}$	(h) $\frac{6}{8}$
(i) $2\frac{6}{10}$	(j) $1\frac{1}{3}$	(k) $\frac{2}{10}$	(l) $2\frac{5}{8}$
(m) $\frac{9}{12}$	(n) $1\frac{1}{4}$	(o) $1\frac{4}{6}$	(p) $2\frac{4}{8}$



2. Make a list of all the equivalent fractions that you found in question 1.

4.4 Solving problems

1. 

    (a) What part of the strip is green?

    (b) What part of the strip is red?

    (c) What part of the strip is white?

    (d) What part of the strip is yellow?

    (e) What is $1 - \frac{8}{9}$?

    (f) What is $1 - \frac{9}{10}$?

    (g) What is $5 - \frac{3}{10}$?

    (h) What is $3 - \frac{3}{7}$?

2. A cake is cut into ten equal slices. Katie eats 2 slices, Farida eats 1 slice and Busile eats 3 slices. What fraction of the whole cake is left over?

3. Each child at a party eats one third of a slab of chocolate. Each child drinks two fifths of a large bottle of juice. If there are 20 children at the party,

    (a) how much chocolate do they eat?

    (b) how much juice do they drink?

4. (a) How many centimetres are in three-fifths of a metre?

    (b) How many centimetres are in three-tenths of a metre?

    (c) How many millimetres are in two and a half centimetres?

    (d) How many metres are there in six-eighths of a kilometre?

    (e) How many grams are in six-tenths of a kilogram?

    (f) How many grams are in three-fifths of a kilogram?

    (g) How many grams are in three-eighths of a kilogram?

    (h) How many grams are in three-quarters of a kilogram?

(i) How many millilitres are in two-fifths of a litre?

(j) How many millilitres are in three-quarters of a litre?

(k) How many millilitres are in three-eighths of a litre?

5. There are ten children at a camp and 12 loaves of bread are shared equally between them.

   (a) What fraction of all the bread does each child get?

   (b) What fraction of all the bread do two of these children together get?

   (c) What fraction of all the bread do three of these children together get?

   (d) What fraction of all the bread do four of these children together get?

   (e) What fraction of all the bread do five of these children together get?

   (f) What fraction of all the bread do six of these children together get?

   (g) What fraction of all the bread do eight of these children together get?

   (h) What fraction of all the bread do nine of these children together get?

   (i) What fraction of all the bread do ten of these children together get?

6. 34 loaves of bread are shared equally among 8 families. How much bread does each family get?

7. Nick, Faaiez and Thandeka worked on a project. Not everyone did the same amount of work. They decided that if they win the prize, they will share it in the following way:

   Thandeka will get half of the money. Faaiez will get three-eighths of the money. Nick will get the rest.

   (a) What fraction of the money will Nick get?

   (b) How much money will each of them get if the prize is R600?

8. A chocolate slab is divided into 12 small blocks.

   (a) What fraction of the whole slab is 1 small block?

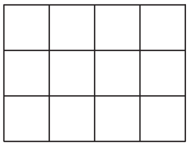
   (b) What fraction of the whole slab is 2 small blocks?

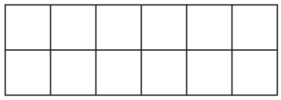
   (c) What fraction of the whole slab is 3 small blocks?

   (d) What fraction of the whole slab is 4 small blocks?

   (e) What fraction of the whole slab is 6 small blocks?

9. Juliet draws the chocolate slab in question 8 in two different ways:





   (a) She says: "In question 8(b) I wrote that two small blocks are two twelfths of the whole slab. If I colour the first column in my second drawing I can see that two blocks can also be one sixth of the whole slab."

   Can you explain Juliet's thinking?

   (b) Look at the two drawings of the slab and find more than one way to write 3, 4 and 6 small blocks as a fraction of the whole slab.

   (c) What fraction of the whole slab is 10 small blocks?

   (d) Can you write that fraction in a different way?

   (e) What fraction of the whole slab is 5 small blocks?

   (f) What fraction of the whole slab is 8 small blocks?

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Unit 5 Whole numbers: Division

5.1 Revision practice

1. Thivha's hens laid 908 eggs. Thivha packs the eggs into egg boxes that take 36 eggs each. How many egg boxes can Thivha fill? How many eggs are left over?
2. 32 boxes of fruit juice cost R416 in total. How much does one box cost?
3. The fruit seller fills bags with guavas. How many bags can he fill with 16 guavas each, if he picked 525 guavas from his orchard?
4. How many buses are needed to transport 342 learners to an athletics meeting if 48 learners may travel in one bus?
5. If the length of one shoelace is 46 cm, how many shoelaces can be cut from 830 cm shoelace string?
6. Daniel has to divide 488 toffees equally into 23 packets.
   (a) How many toffees will go into each packet?
   (b) How many toffees will be left over?
7. Calculate.
   (a) $902 \div 27$ (b) $792 \div 47$
   (c) $539 \div 18$ (d) $837 \div 34$
   (e) $937 \div 84$ (f) $937 \div 42$
8. The mass of 13 same-sized bags of dog food is 325 kg. What is the mass of one bag of dog food?
9. (a) If an elephant eats 40 times as much as a goat in one day, how much does the elephant eat when the goat eats 2 kg of food?
   (b) If an elephant eats 40 times as much as a goat in one day, how much does the goat eat when the elephant eats 200 kg of food?
10. A hotel needs 270 new dinner plates. The plates are sold in boxes of 24 plates each. How many boxes should the hotel buy?

5.2 Making pictures smaller and bigger

Picture 1

Picture 2

Look closely at the two pictures above. Picture 2 is exactly the same as Picture 1, only much larger. All the parts have been drawn bigger in exactly the same way.

1. A picture of another house is drawn bigger, so that it is 6 times as big.
   (a) If a window is 5 mm high in the small picture, how high is it in the big picture?
   (b) If a door is 120 mm high in the big picture, how high is it in the small picture?
   (c) If the house is 192 mm high in the big picture, how high is it in the small picture?
2. A house is 60 times as big as the drawings on the plan of the house.
   (a) If a window is 8 mm high on the plan, how high is the window in the actual house?
   (b) A door of the actual house is 1 800 mm high. How high is the door on the plan?
   (c) A wall of the actual house is 2 160 mm high. How high is the wall on the plan?

5.3 Ratios of enlargement and reduction

Three pictures of a bird are shown below.

1. Is it the same bird in the three pictures?
2. Are the pictures the same? If not, in what way do they differ?

Picture A

Picture B

Picture A is 50 mm high and 75 mm wide.

3. How high is Picture B, and how wide is it?
4. Check whether Picture C is 30 mm high and 45 mm wide.
5. Measure the lengths of the red lines that have been drawn on the three pictures.

Picture C

Picture A is an **enlargement** of Picture B. All the parts are made bigger in exactly the same way. To "enlarge" means to make bigger.

Picture C is a **reduction** of Picture B. To "reduce" means to make smaller.

6. Now check whether the measurements for Pictures A, B and C in this table agree with the measurements you made.

	Picture A	Picture B	Picture C
Height in mm	50	40	30
Width in mm	75	60	45
Length of red line in mm	90	72	54

7. Picture D is an enlargement of Picture C, and it is three times as big as Picture C. Picture D is not shown here.

   (a) How high and how wide do you think Picture D is?

   (b) How long do you think the red line on Picture D is?

8. Picture E is a reduction of Picture B. Picture E is 20 mm high. Picture E is also not shown here.

   (a) What do you think is the width of Picture E?

   (b) What do you think the length of the red line on Picture E is?

9. Is Picture F on the next page an enlargement of Picture E?

10. Which of Figures Y and Z below is a true reduction of Figure X? Remember that in a reduction all the parts are smaller in exactly the same way.

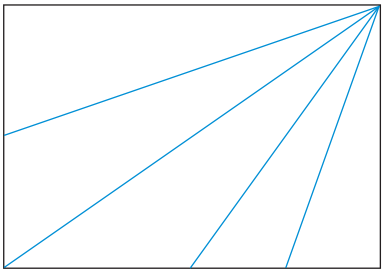


Figure X

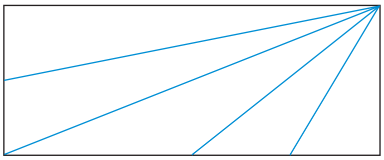


Figure Y

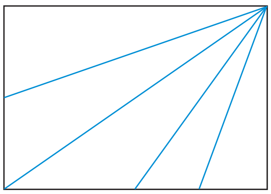


Figure Z

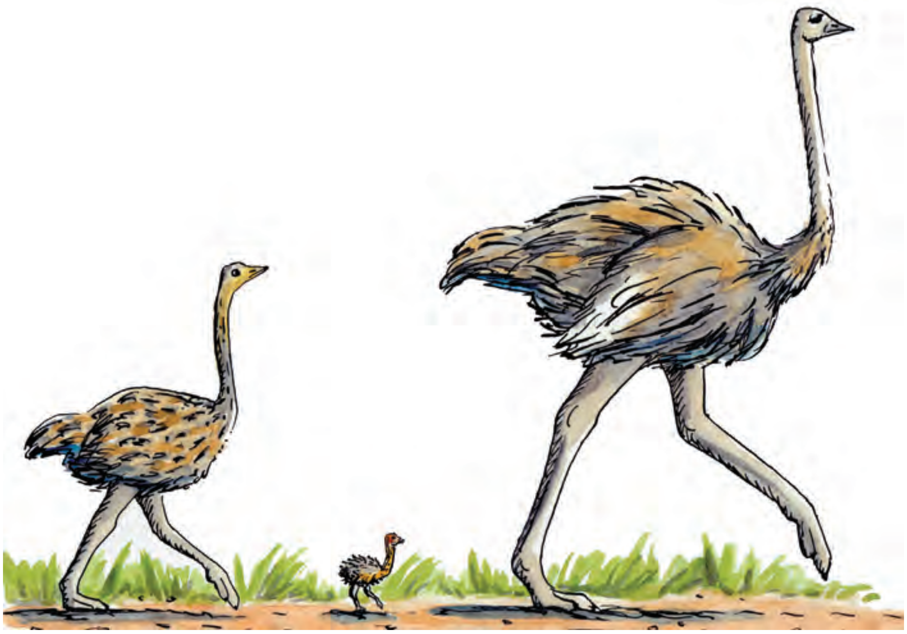
11. Take the measurements of Pictures D and E to check your answers for questions 7 and 8.

Picture D

Picture E

Picture F

5.4 Ratio again



To keep up with his mother, baby ostrich Jasper has to take 20 steps for every one step his mother takes.

1. How many steps must Jasper take while his mother takes two steps, if he wants to keep up with her?
2. How many steps must Jasper take in each case below, to keep up?
   (a) While his mother takes 3 steps
   (b) While his mother takes 10 steps

The young ostrich Lenka, on the left in the picture, has to take 5 steps to keep up with the mother while she takes 3 steps.

3. How many steps must Lenka take in each case below?
   (a) While the mother takes 6 steps
   (b) While the mother takes 15 steps

4. Copy this table. Then complete it to show how many steps Jasper has to take while his mother takes 1, 2, 3, 6, 9, 15, 30 and 48 steps. You will have to do some calculations.

Number of steps by the mother	1	2	3	6	9	15	30	48
Number of steps by Jasper								

5. Copy this table. Then complete it to show how many steps Lenka has to take while the mother takes 3, 6, 9, 15, 30 and 48 steps. You will have to do some calculations.

Number of steps by the mother	3	6	9	15	30	48
Number of steps by Lenka						

To describe how Lenka's numbers of steps compare to the mother's numbers of steps when they walk together, we may say the following:

> Lenka takes 5 steps for every 3 steps the mother takes.
>
> We may also say:
>
> Lenka's number of steps and the mother's number of steps are **in the ratio 5 to 3**.

Here is another way of saying this:

The ratio between Lenka's number of steps and the mother's number of steps is 5 to 3.

The ratio between the mother's number of steps and Lenka's number of steps is 3 to 5. (Notice that the numbers are the other way round now.)

6. How many steps must Jasper take when Lenka takes 15 steps, to keep up?
(You may skip this question now if you wish, and try to do it later.)

7. (a) How many steps must Lenka take when the mother takes 30 steps, to keep up?

   (b) How many steps must Jasper take when his mother takes 30 steps?

   (c) How many steps must Jasper take when Lenka takes 50 steps?

   (d) How many steps must Jasper take when Lenka takes 15 steps? (You may skip this question again if you wish, and try to do it later.)

8. (a) One day Jasper had to take 280 steps to keep up with his mother. How many steps did she take?

   (b) On another day Jasper had to take 540 steps to keep up with his mother. How many steps did she take?

9. (a) One day Lenka had to take 200 steps to keep up with the mother. How many steps did the mother take?

   (b) One day Lenka had to take 350 steps to keep up with the mother. How many steps did the mother take?

10. (a) How many steps must Jasper take for five steps that Lenka takes, to keep up with her and the mother?

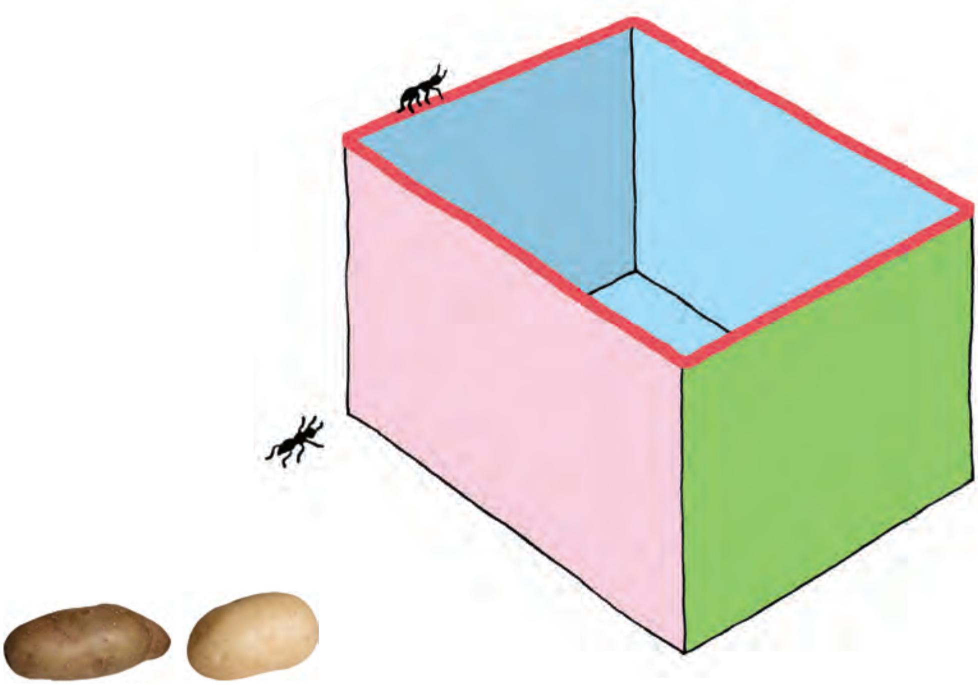
    (b) How many steps must Jasper take for 60 steps that Lenka takes, to keep up with her and the mother?

11. (a) How many steps must Lenka take for 60 steps that Jasper takes, to keep up with him and his mother?

    (b) How many steps must Lenka take for 300 steps that Jasper takes, to keep up with him and his mother?

12. If you have not answered question 6 yet, try to answer it now.

Unit 6 Perimeter, area and volume



The ant can crawl right around the top edge of the box, until it is back at the corner where it started.

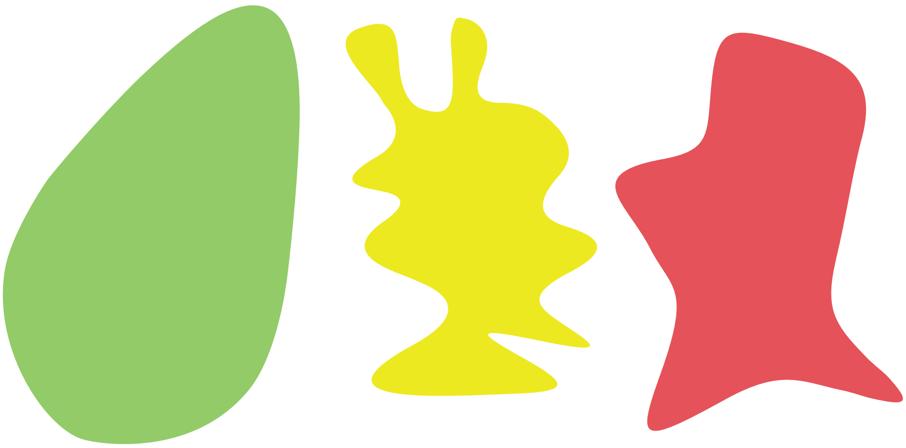
The **perimeter** of the open face of the box is the distance that the ant will crawl if it goes around once, and stays on the red edge all the time.

1. Do you think the perimeter of the green face is equal to the perimeter of the open face of the box?
2. Do you think there is enough space inside the box for 200 potatoes like the ones shown?
3. Which of the two potatoes do you think is the biggest?
4. Suppose you want to paint the side faces of the box with expensive paint. Which face will need more paint, the green face or the pink face?

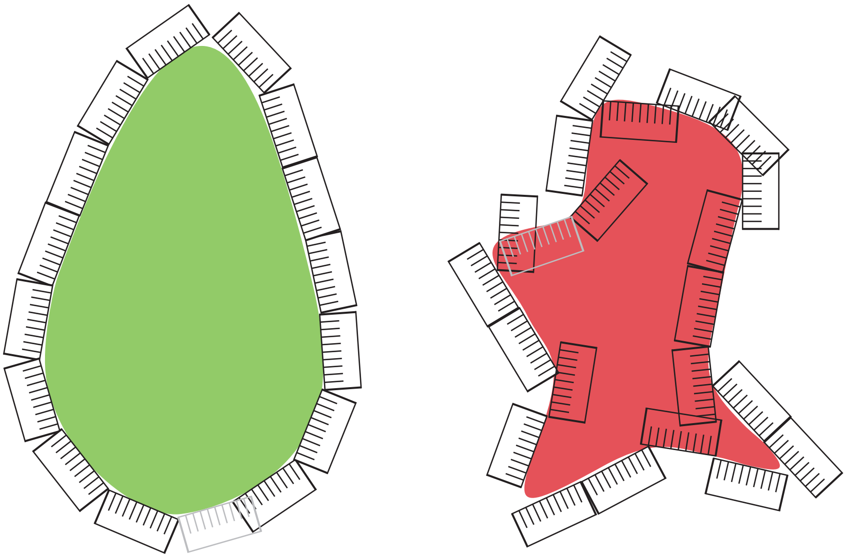
Maths_English_LB_Grade5_Book.indb 318 2016/12/15 1:14:55 PM

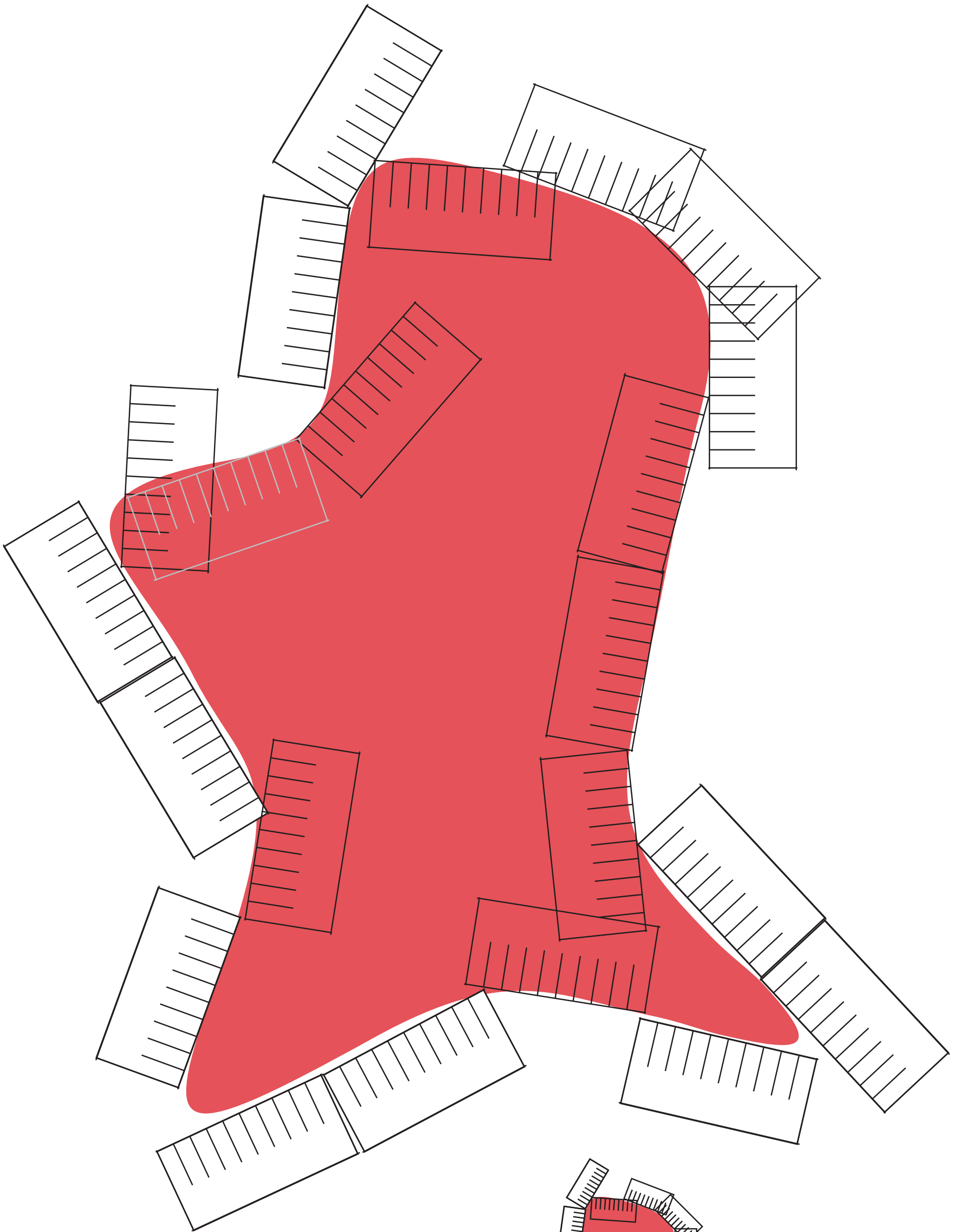
6.1 Perimeter

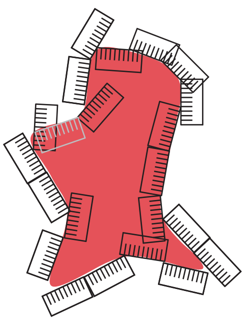
1. Which of these three splashes of paint do you think has the biggest perimeter, and which one has the smallest perimeter?



2. If you want to paint the splashes blue, which splash will need the most paint, and which will need the least paint?
3. The small rulers in the diagrams below are marked in millimetres. Measure the perimeters of the two splashes. Try to be accurate to the nearest millimetre. An enlargement of the diagram for the red splash is given on the next page, to make it easier for you.



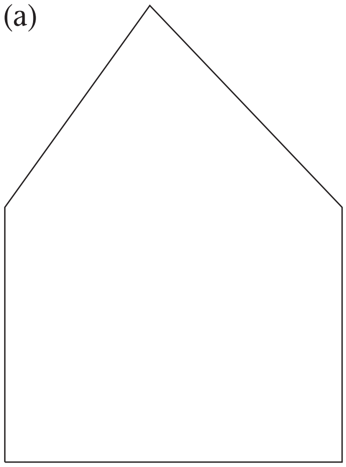




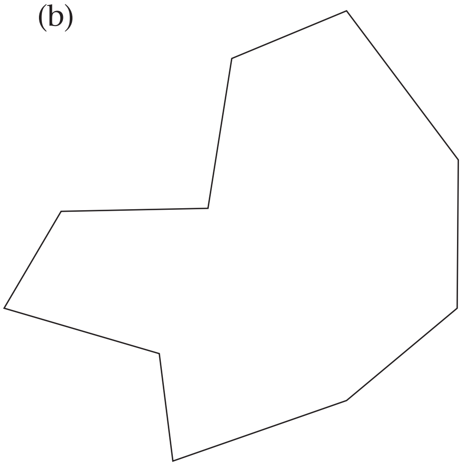
4. Measure the perimeter of these figures with your ruler. Give each of your answers in millimetres, in centimetres and millimetres, and in centimetres and fractions of a centimetre, for example:

136 mm = 13 cm and 6 mm = $13\frac{6}{10}$ cm.

(a)

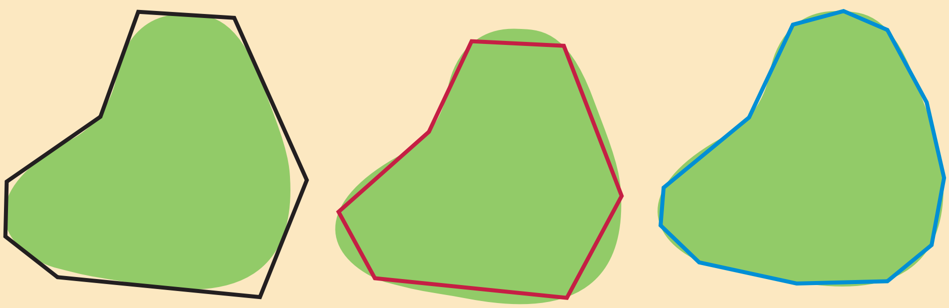


(b)



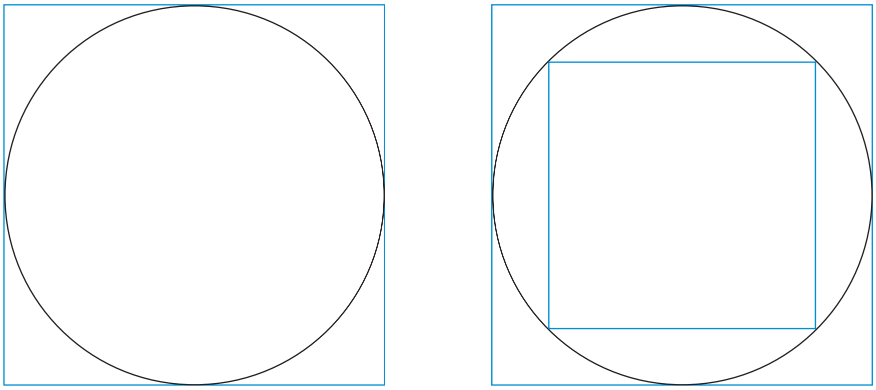
To approximately measure the perimeter of a curved figure, you can put a piece of string around the edge and then measure the length of the string.

Another method is to draw a polygon close to the curved figure, and then measure the perimeter of the polygon.



5. Which of the three polygons will provide the best approximation of the perimeter of the green curved figure?

6. Use a round object like a glass, mug, tin or saucer to draw a circle. Draw four copies of the circle.
7. Draw a polygon inside or outside the first circle and use it to make an estimate of the perimeter of the circle.
8. Draw a square outside the second circle, and another square inside the circle as shown below.



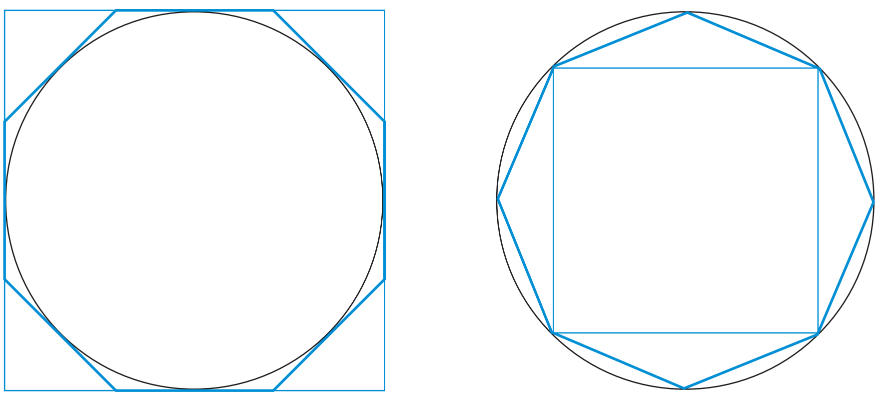
Do you think the perimeter of your circle is

(a) bigger than the perimeter of the outer square, or

(b) smaller than the perimeter of the inner square, or

(c) a number between the perimeter of the outer square and the perimeter of the inner square?

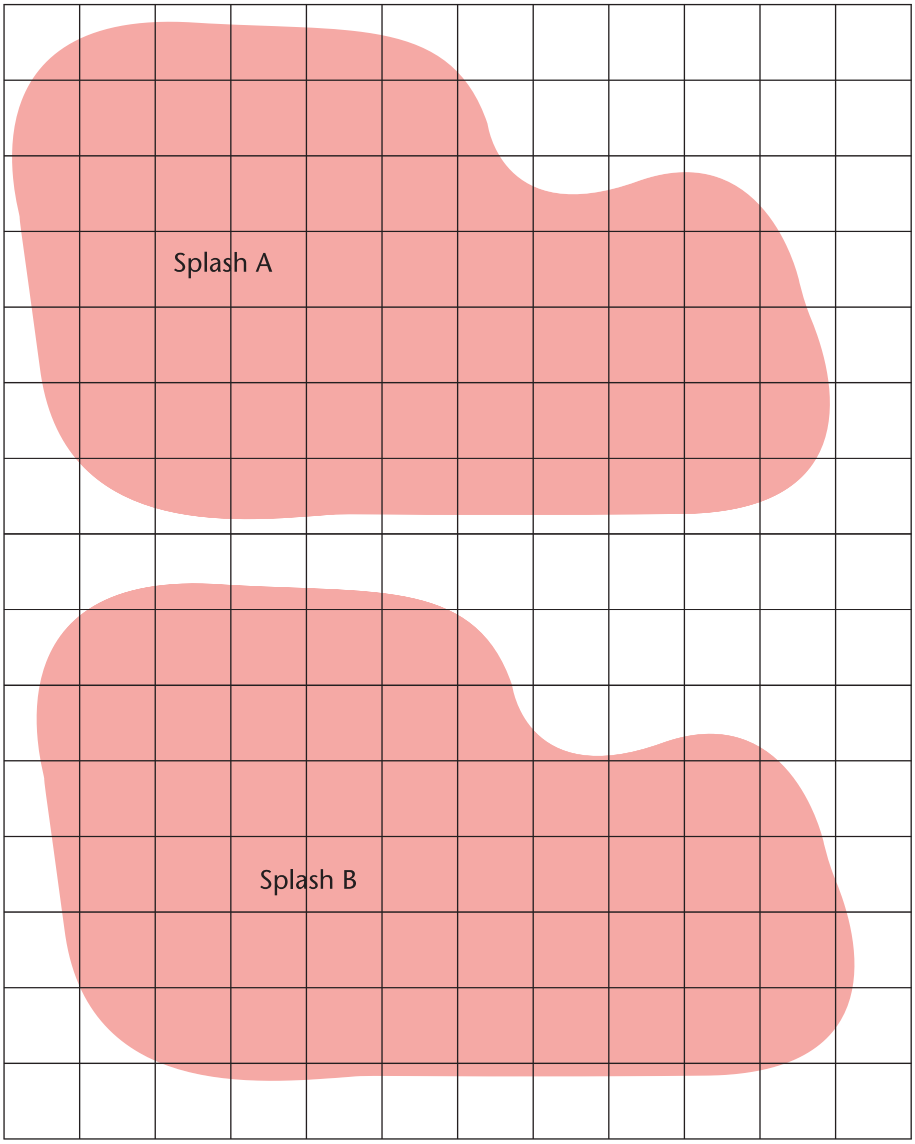
9. Now use your third and fourth circles. Make drawings as shown below and use them to make a good estimate of the perimeter of each circle.



6.2 Area

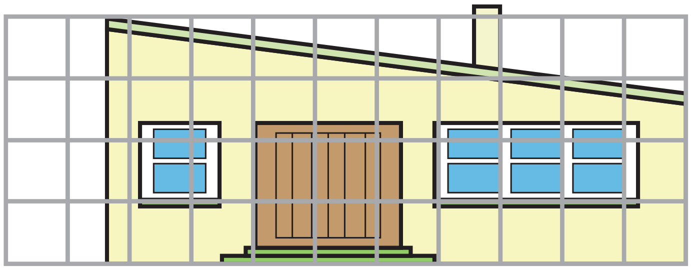
1. (a) Estimate how many stickers like this can be cut from each of the coloured parts on the grid below.

   (b) Draw a 2 cm grid on a loose sheet of paper and cut out some 2 cm by 2 cm squares. Pack the squares on the coloured areas below to see how many can fit without overlapping.



Maths_English_LB_Grade5_Book.indb 323 2016/12/15 1:14:56 PM

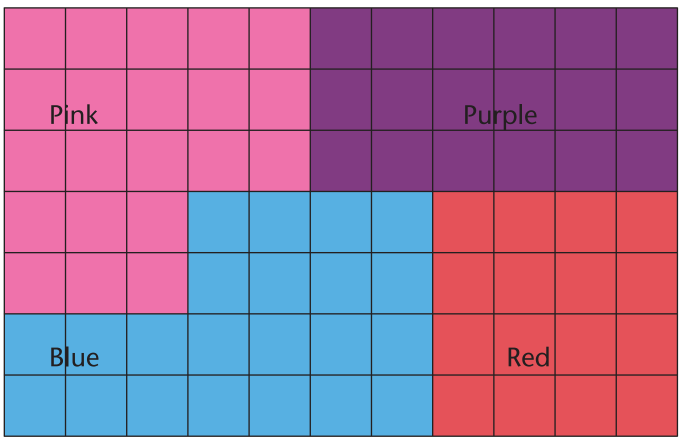
2. 240 ml of paint is needed to paint one square patch of wall, 1 m by 1 m. The grid over this picture of the wall of a building shows square blocks of 1 m by 1 m.



Make a good estimate of how much paint is needed to paint the wall shown in the picture.

3. This picture shows a wall painted in four different colours.

If the wall is repainted, which part will need the most paint, and which part will need the least paint?



We say the red part of the wall has a smaller **surface area**, or **area** for short, than the pink part.

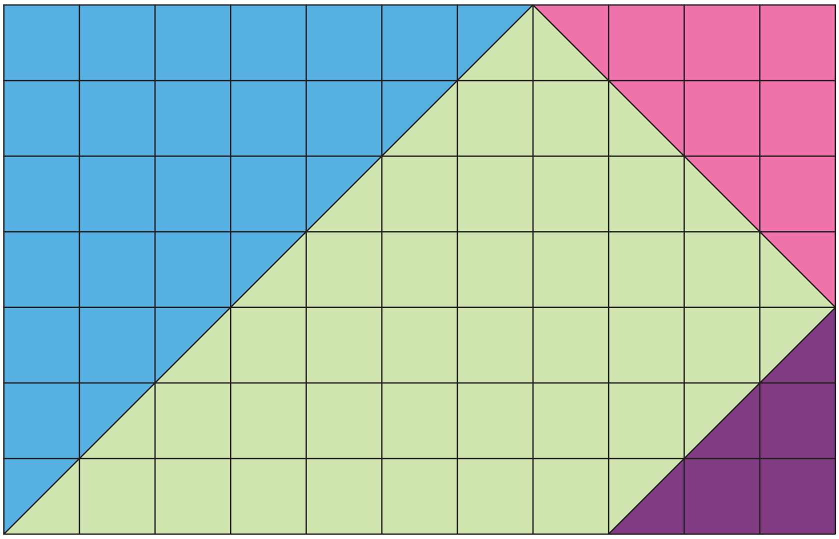
To compare the area of different surfaces or different parts of the same surface, you can put a grid over it and count the number of grid squares on each part.

4. We can say the purple part of the wall has an area of 18 grid squares. How many grid squares is the area of each of the other three parts?

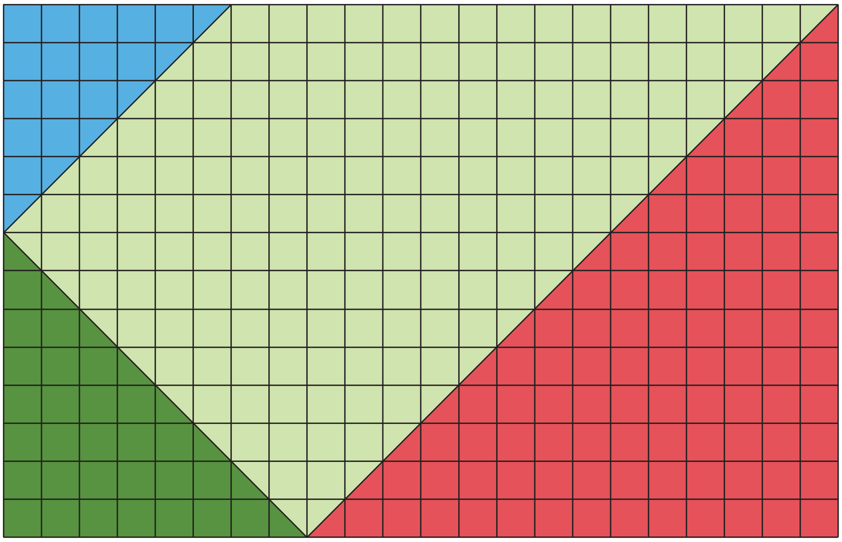
Maths_English_LB_Grade5_Book.indb 324 2016/12/15 1:14:56 PM

5. (a) What is the area of each coloured part of this surface?

(b) What is the area of the four parts together?



6. What is the area of each coloured part of this surface?



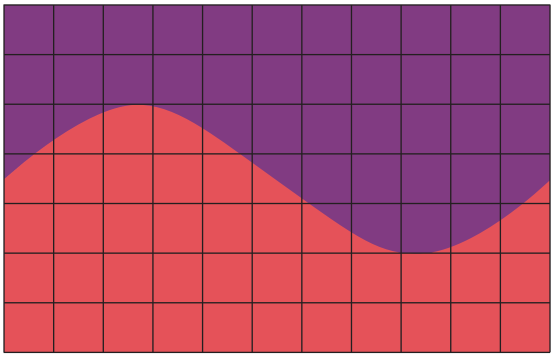
7. Is the blue triangle in question 6 bigger than the purple triangle in question 5?

Maths_English_LB_Grade5_Book.indb 325 2016/12/15 1:14:56 PM

8. The grid squares in question 1 on page 323 are 1 cm by 1 cm. Count the grid squares to find and compare the areas of Splash A and Splash B.

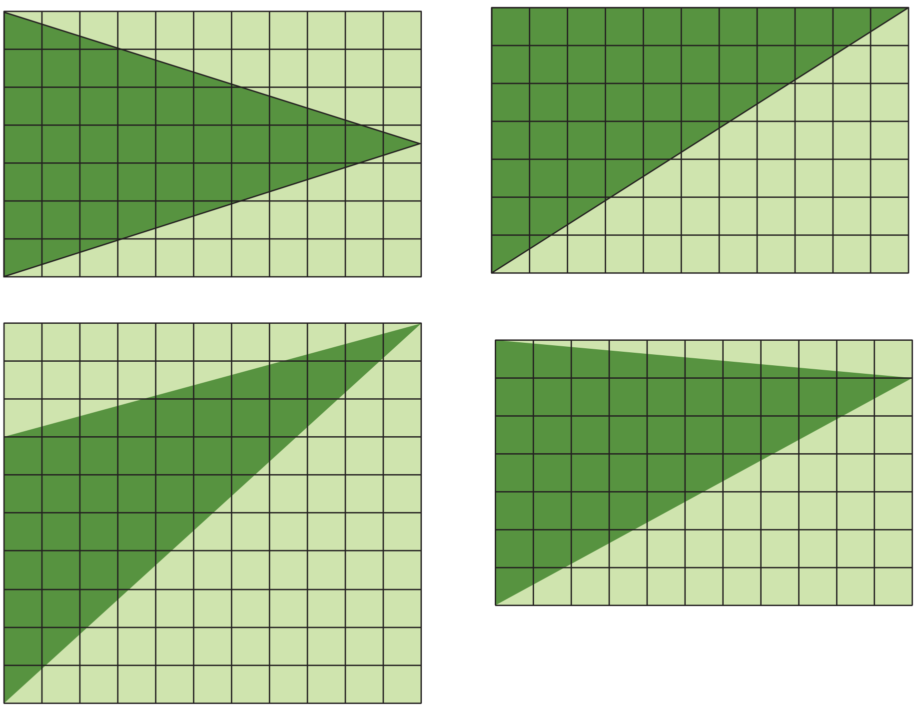
9. (a) Find the area of the purple part and of the red part of this rectangular surface.

(b) Find the approximate perimeter of each part.



10. (a) Do the four dark triangles have equal areas? Find out.

(b) Do the four dark triangles have equal perimeters? Find out.



6.3 Volume and capacity

Building bricks are made from wet clay.

To give shape to the bricks, wet clay is first put into trays. This is just as though you put dough into a bread pan to bake it.

1. Do you think the tray on the right has enough space for all the clay shown on the left?

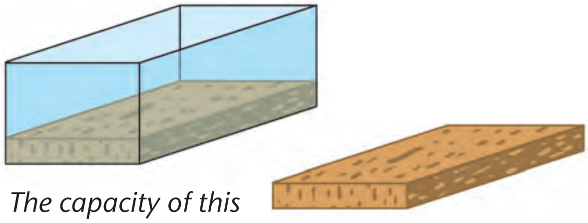
To form a brick, the tray is filled with clay. The full tray is turned upside down and the tray is removed. The brick is then baked to make it dry and hard.

Almost 2 ℓ of clay is needed to make one normal brick. Hence the tray used to form bricks must have just enough space for 2 ℓ of clay. We say it has a **capacity** of 2 ℓ.

An actual brick is slightly smaller than 2 ℓ; it has a **volume** of 1 922 ml.

The **capacity** of a container tells us how much space the container has.

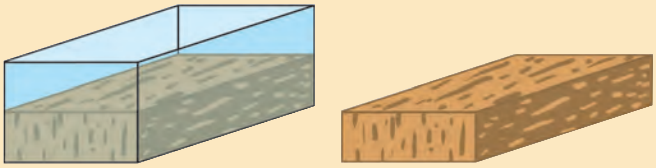
The **volume** of an object tells us how much space the object takes up.



The capacity of this tray is 2 ℓ = 2 000 ml

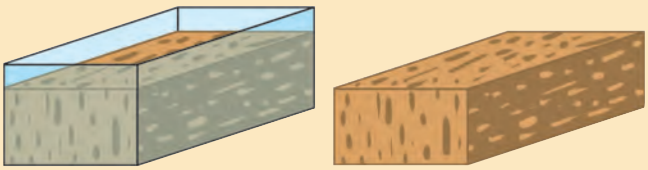
The volume of the brick is $\frac{1}{2}$ ℓ = 500 ml

A 2 ℓ brick tray can be used to make smaller bricks:



The capacity of this tray is 2 ℓ = 2 000 ml

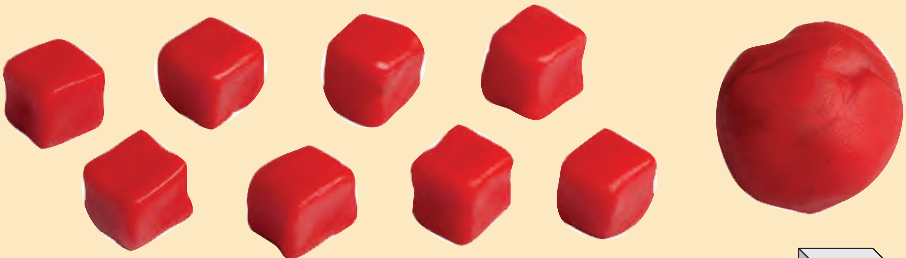
The volume of the flat brick is 1 ℓ = 1 000 ml



The capacity of this tray is 2 ℓ = 2 000 ml

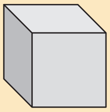
The volume of the flat brick is $1\frac{2}{5}$ ℓ = 1 400 ml

The ball of clay on the right takes up about the same space as 8 millilitre cubes.



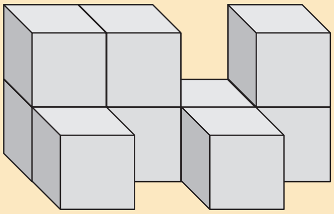
Hence we can say the volume of the clay is about 8 ml.

Each edge of a millilitre cube is 1 cm long.



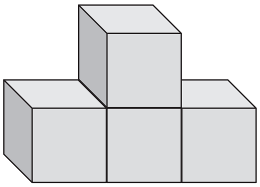
To describe the volume of an object with irregular surfaces, we can state how many cubes will take up the same space.

There are 9 cubes in this stack. Hence we can say the volume of the stack is 9 cubes.

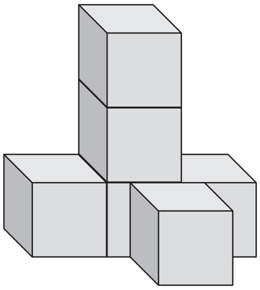


2. What is the volume of each of these stacks?

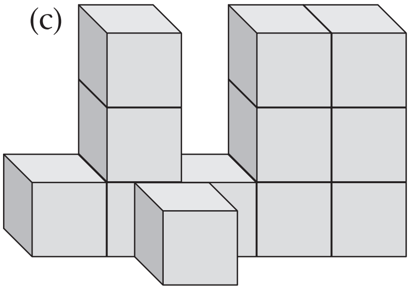
(a)



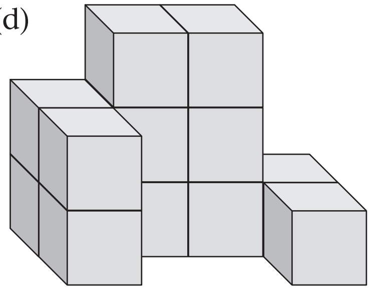
(b)



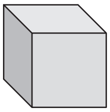
(c)



(d)

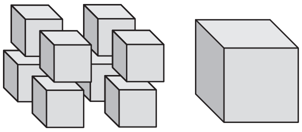


A millilitre cube is also called a **1 cm by 1 cm by 1 cm cube**, or a **centimetre cube**.

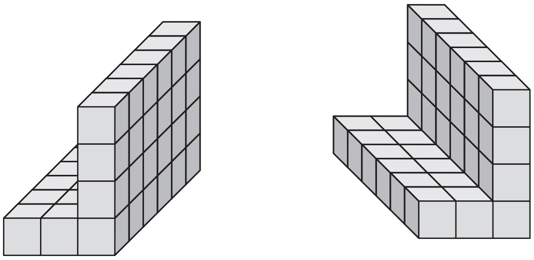


3. How many of these smaller cubes together, do you think, have the same volume as a 1 cm by 1 cm by 1 cm cube?

The edges of the smaller cubes are all 5 mm long.

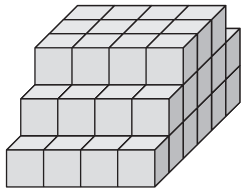


4. Here are two different views of the same stack of cubes.

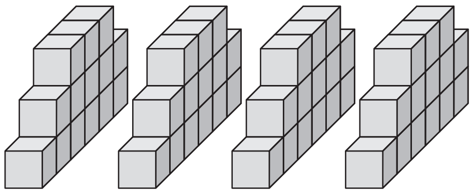


How many cubes are there in this stack?

5. How many cubes are there in the stack on the right?

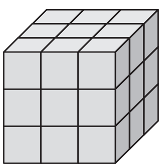


It was formed by putting the four stacks below together.

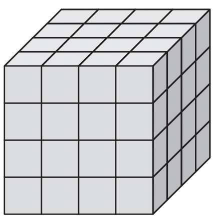


6. Each of the stacks below was formed by putting equal stacks together, like the stack in question 5.
How many cubes are there in each stack?

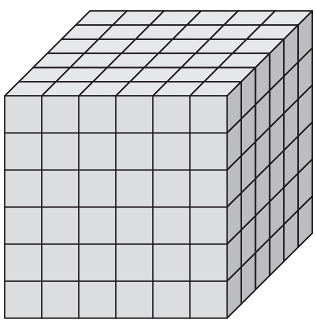
(a)



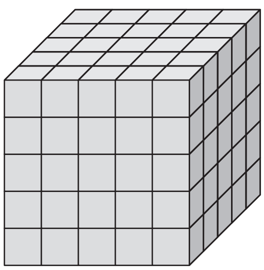
(b)



(c)



(d)



Maths_English_LB_Grade5_Book.indb 330 2016/12/15 1:15:00 PM

UNIT 7

POSITION AND MOVEMENT

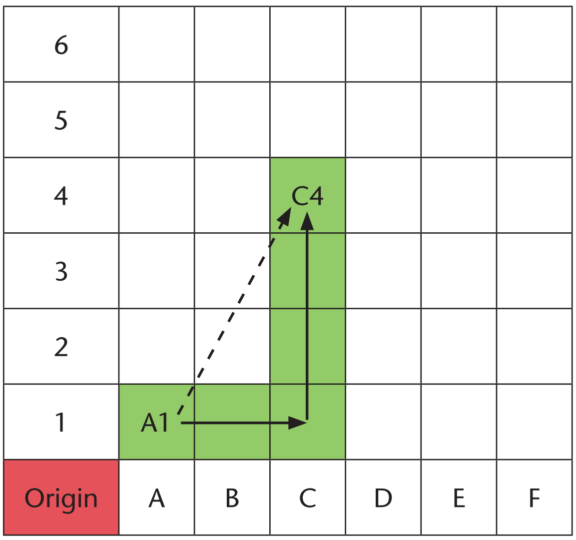
7.1 Moving between positions on a grid map

The rules for moving on a grid map are as follows:

- You may not move in a slanted direction.
- You may move right or left.
- You may move up or down.
- You may never move backwards.

For example, if you want to get from Block A1 to Block C4, you may move two blocks to the right and three blocks up.

Is there another way?



1. Work on squared paper. Make a grid map with the origin in the bottom left corner of the page. Your map must have 10 columns from left to right, and 10 rows from top to bottom. Label the blocks from left to right with the letters A to J. Label the blocks from bottom to top with numbers 1 to 10.

Maths_English_LB_Grade5_Book.indb 331 2016/12/15 1:15:02 PM

2. Draw straight dotted lines between the following pairs of blocks. Explain how to move on the map between the blocks. Remember, you may not move on the slanted dotted lines that you drew!
   (a) A1 and C4
   (b) A1 and D4
   (c) A1 and E4
   (d) A1 and J4

Let each block be 1 unit of distance.
This means we move 2 units from A1 to get to C1.
We move 3 units to get from C1 to C4.
We move 5 units to get from A1 to C4.

3. How many units do you move between the following blocks?
   (a) A1 and C4
   (b) A1 and D4
   (c) A1 and E4
   (d) A1 and J4
4. Describe a different way to move between the pairs of blocks in question 2.
5. (a) Which two blocks on your grid map are the greatest distance from each other?
   (b) Are the blocks that you identified in (a) the only blocks that are this far apart?
6. You want to move from A1 to J10. Shade the following blocks for your journey:

   A1 to C1; C1 to C3; C3 to E3; E3 to E5; E5 to G5; G5 to G7; G7 to I7; I7 to I9; I9 to J9; J9 to J10.

   Compare your journey with a classmate to make sure you did not miss any steps. What distance did you move from A1 to J10?
7. Mark the following blocks on the grid: B10 and I2.
   Write down two different grid routes to get from B10 to I2. Make sure you do not turn back with any move.
   Compare the distances of your routes.

Unit 8

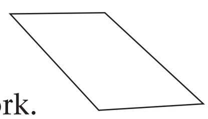
Transformations

8.1 Rotations, reflections and translations in art

This is an artwork by the famous Ndebele artist Esther Mahlangu.

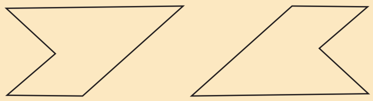
The drawing below shows one of the reflections in the above artwork.

1. In the above artwork, there is also a reflection of the figure shown here: Draw a copy of this figure, and its reflection as you can see it in the artwork.

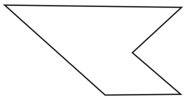


2. Draw a copy of another figure and its reflection that you see in the artwork.

This drawing shows one of the rotations in the artwork.



3. There is also a rotation of this figure in the artwork:



(a) Draw a copy of the figure and its rotation as you see it in the artwork.

(b) Draw a reflection of this figure.

4. (a) Make a drawing of a black triangle and its rotation that you see in the bottom part of the artwork above.

(b) Make a drawing of another rotation of the same triangle that you see in the artwork.

5. (a) Make a drawing of a figure and its rotation in the artwork below, where the colours are the same in the two figures.

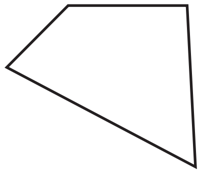
(b) Make a drawing of a figure and its rotation in the artwork below, where the colours are different in the two figures.

Maths_English_LB_Grade5_Book.indb 334 2016/12/15 1:15:03 PM

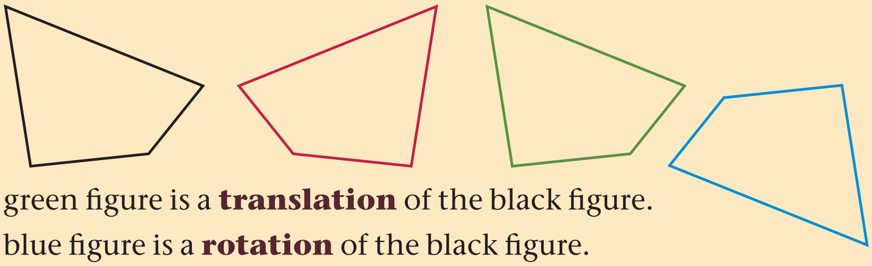
8.2 Tessellations

1. (a) Trace a copy of this quadrilateral onto thick paper or cardboard and cut it out.

   (b) Move your quadrilateral on the figures below to check whether the statements are true.



The red figure is a **reflection** of the black figure.



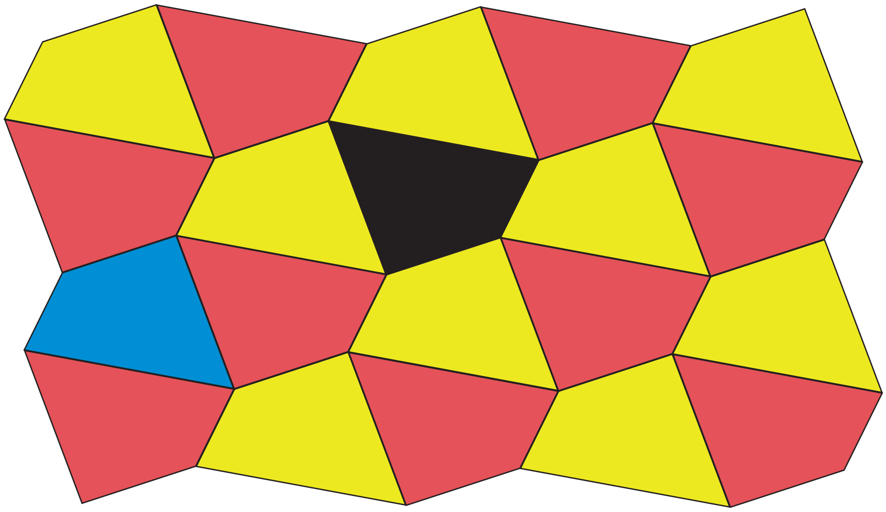
The green figure is a **translation** of the black figure.
The blue figure is a **rotation** of the black figure.

You can use your cut-out quadrilateral when you do question 2.

2. (a) Which quadrilaterals in the tessellation below are translations of the black quadrilateral?

   (b) Which quadrilaterals are rotations of the black quadrilateral?

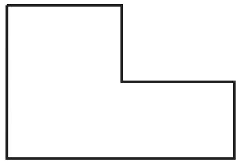
   (c) Is there a reflection of the blue figure in the tessellation?



3. Use your cut-out quadrilateral to draw a copy of this tessellation.

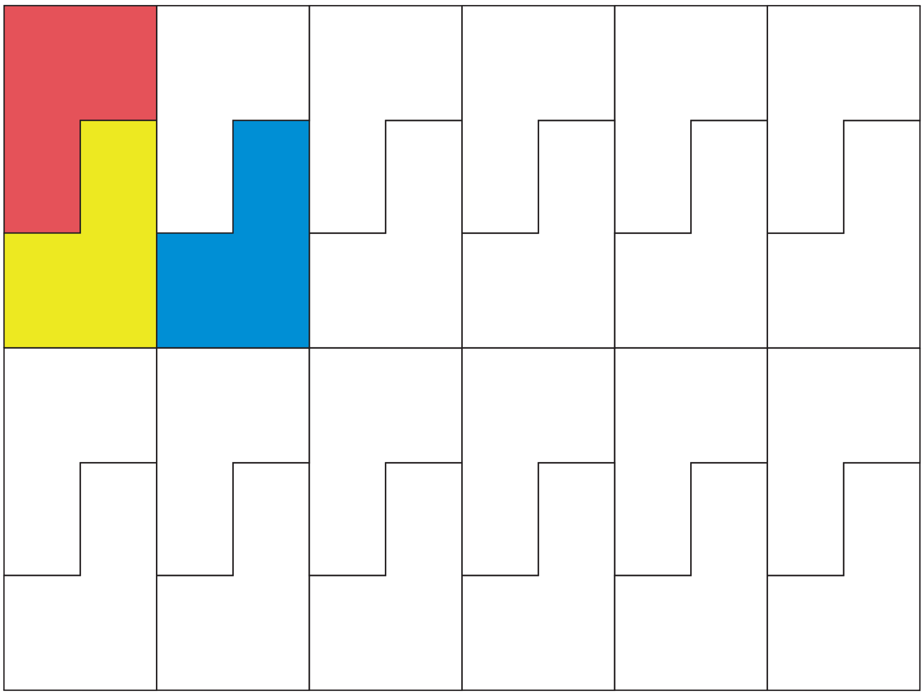
4. Trace a copy of this hexagon onto thick paper or cardboard and cut it out.

   You will use it as a template to draw tessellations when you do questions 5 to 9.



5. (a) Put your template in the red position below, then rotate it to the yellow position.

   (b) Translate the template from the yellow position to the blue position.



   (c) Continue to rotate and translate the template until you have covered all the hexagons in the tessellation.

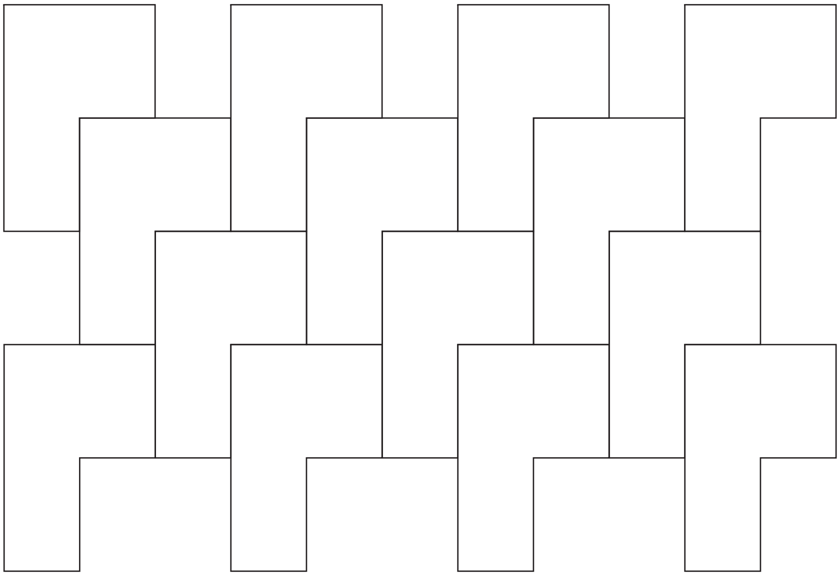
6. (a) Can you draw the above tessellation by making rotations only?

   (b) Can you draw it by making reflections only?

   (c) Can you draw it by making translations only?

7. Can you draw the tessellation in question 2 by making rotations only with the quadrilateral template?

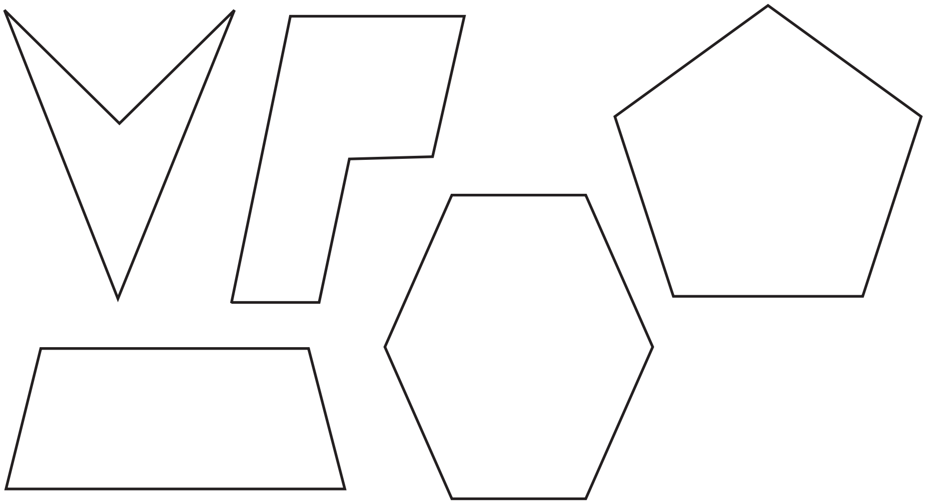
8. (a) Use your hexagon template to draw a copy of this tessellation.



(b) In what way did you move the template to draw this tessellation?

9. Use reflections only to draw another tessellation with your hexagon template.

10. Select one of the figures below, make a template, and draw a tessellation if you can. Describe how you moved your template to draw the tessellation.



Unit 9

Geometric patterns

9.1 Making a geometric pattern

Mathume makes this interesting sequence of pictures. He makes each new picture by repeating the same steps.

- He starts with a square (Figure 1) and colours it.
- To make Figure 2, he first draws a square of the same size as Figure 1. He then connects the midpoints of the sides of the square to form a new smaller square inside the square and then he colours the smaller square.
- To make Figure 3, he again connects the midpoints of the sides of the new square as shown.
- He continues with these same steps to make more and more pictures.

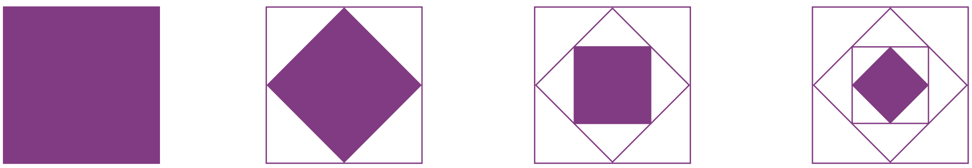


Figure 1 Figure 2 Figure 3 Figure 4

1. If we think of Figure 1 as the whole (1), what fraction of the whole figure is coloured in Figure 2? What fraction is coloured in Figure 3?
2. Complete this table to show Mathume's geometric sequence as a numeric sequence.

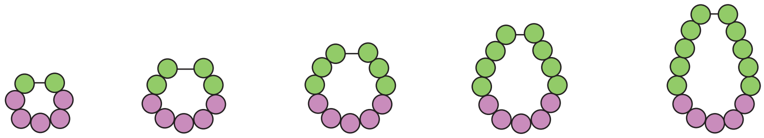
   Explain your methods and discuss patterns in the table.

Figure no.	1	2	3	4	5	6	10
Fraction of figure that is coloured	1						

9.2 Describing patterns

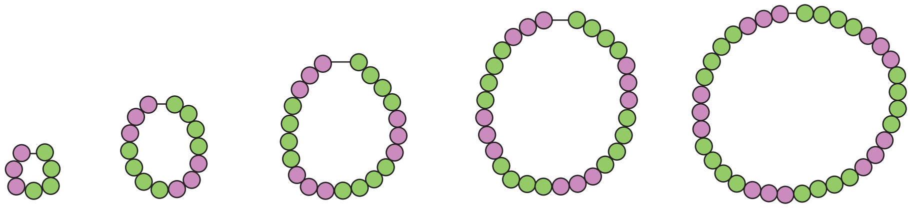
Mandla makes these different patterns of bead necklaces of different sizes.

Pattern 1



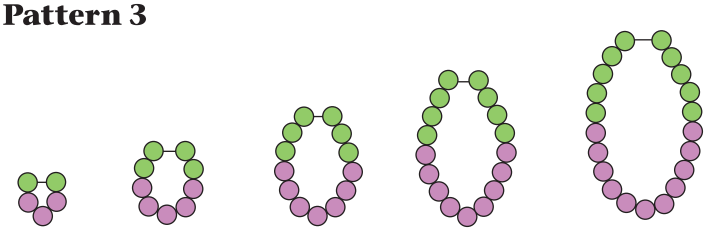
Size 1 Size 2 Size 3 Size 4 Size 5

Pattern 2



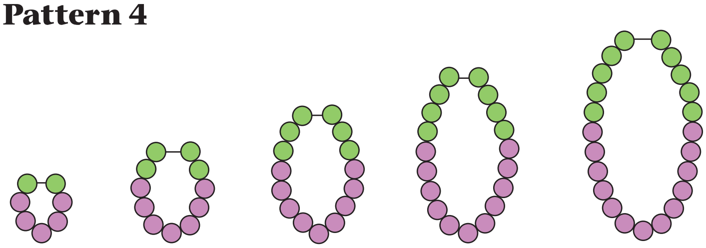
Size 1 Size 2 Size 3 Size 4 Size 5

Pattern 3



Size 1 Size 2 Size 3 Size 4 Size 5

Pattern 4



Size 1 Size 2 Size 3 Size 4 Size 5

1. For Pattern 1:

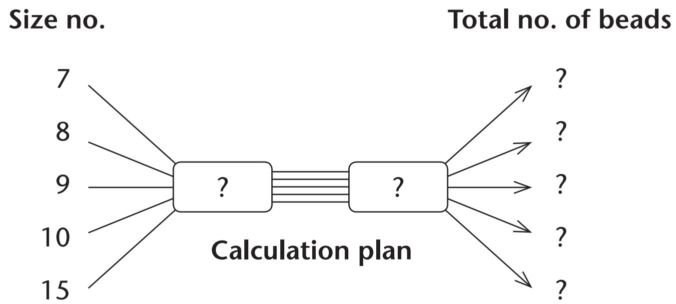
   (a) Describe a Size 6 necklace in words.
   How many green beads, how many purple beads, and how many beads in total are there in a Size 6 necklace?

   (b) Describe a Size 20 necklace in words.
   How many green beads, how many purple beads, and how many beads in total are there in a Size 20 necklace?

   (c) Complete this table. Describe and discuss your methods.
   Describe and discuss what patterns you see in the table.

Size no.	1	2	3	4	5	6	20
No. of green beads	2	4					
No. of purple beads	5	5					
Total no. of beads	7	9					

   (d) Complete this flow diagram as a plan to calculate the total number of beads for different sizes of necklaces. Then calculate the missing output numbers.



2. For Pattern 2, answer the same questions as for Pattern 1.
3. For Pattern 3, answer the same questions as for Pattern 1.
4. For Pattern 4, answer the same questions as for Pattern 1.

9.3 Completing tables

Look at this growing geometric pattern of triangles:

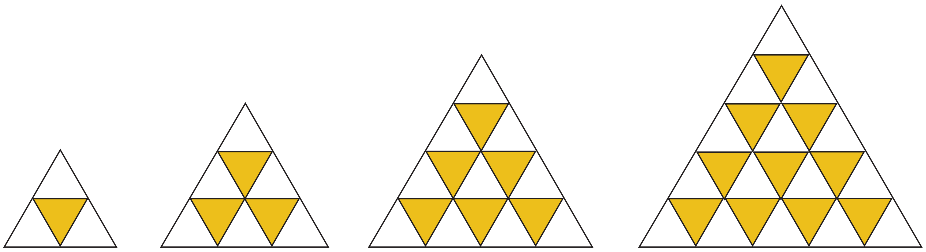


Figure 1 Figure 2 Figure 3 Figure 4

1. Complete this table. Describe and discuss the methods that you used.

Figure no.	1	2	3	4	5	6	10
No. of yellow tiles	1	3					
No. of white tiles	3	6					
Total no. of tiles	4	9					

2. Describe and discuss horizontal numeric patterns in the table.
3. How many triangles are there in total in Figure 50?

UNIT **10**

NUMBER SENTENCES

10.1 Solve and complete number sentences by trial and improvement

Here is a puzzle to think about:

Hundred minus three times a certain number is equal to four less than five times the number. What is this number?

Can this number be 5?

Mpho investigated:

$100 - 3 \times 5 = 100 - 15 = \mathbf{85}$

$5 \times 5 = 25$ and 4 less than 25 is **21**.

No, 21 is far less than 85!

1. Investigate whether the missing number in the puzzle can be 10.
2. Investigate whether it can be 20, or maybe 15.
3. Find out what the number is!
4. Find the number that will make this number sentence true:
   $100 - 3 \times \square = 5 \times \square - 4$
5. (a) Investigate whether any of the numbers 20, 10 or 5 will make this number sentence true:

   $4 \times \square + 7 = 6 \times \square - 9$

   (b) For which of the three numbers you tried are $4 \times \square + 7$ and $6 \times \square - 9$ closest to each other?

   (c) For which of the three numbers you tried is $4 \times \square + 7$ bigger than $6 \times \square - 9$?

   (d) Investigate more numbers until you find the number that makes the number sentence true.

   (e) Write ten different numbers for which $4 \times \square + 7$ is smaller than $6 \times \square - 9$. (We can also write $4 \times \square + 7 < 6 \times \square - 9$.)

   (f) Write three different numbers for which $4 \times \square + 7 > 6 \times \square - 9$.

The work that you did in questions 1, 2 and 3 can be recorded in a table like this:

Number investigated	5	10	20	15	. . .	. . .	13
100 – 3 × □	85	70	40	55	. . .	. . .	61
5 × □ – 4	21	46	96	71	. . .	. . .	61
Difference	64	24	(56)	(16)	. . .	. . .	0

6. When the number was increased from 5 to 10, the difference between 100 – 3 × □ and 5 × □ – 4 decreased from 64 to 24.

    (a) What happened to the difference when the number was increased to 20?

    (b) What happened to the difference when the number was decreased again?

"To increase" means to make bigger and "to decrease" means to make smaller.

7. Try 5, 10 and other numbers until you find a number for which 40 + 3 × □ is equal to 10 × □ – 9.

    Record your work in a table like the above.

8. Try 1, 5 and 10 and other numbers until you find a number for which 5 × □ – 12 = 4 × □ + 12.

    Record your work in a table.

9. Try 2 and 100, and other numbers of your own choice until you find a number for which 3 × □ + 50 = 5 × □ – 70.

10. In each case, find the number that makes the number sentence true.

    (a) 3 × □ + 100 = 5 × □ – 20

    (b) 3 × □ + 120 = 5 × □

    (c) 120 = 2 × □

11. In each case, find the number that makes the number sentence true.

    (a) 6 × □ – 30 = 4 × □ + 6

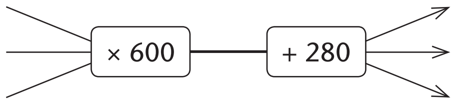
    (b) 200 – 3 × □ = 5 × □ – 56

    (c) 13 × □ – 5 = 20 – 12 × □

10.2 Flow diagrams, number sentences and tables

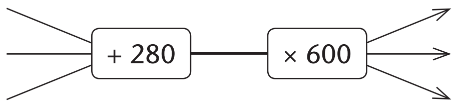
1. What are the output numbers for the input numbers 5, 2 and 3 in Flow diagram A?

Flow diagram A



2. What are the output numbers for the input numbers 5, 2 and 3 in Flow diagram B?

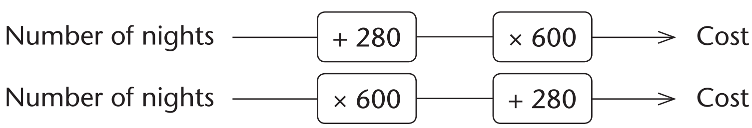
Flow diagram B



At the private hospital *Careplace* you have to pay R280 to be admitted, and then R600 for each night that you sleep there.

For example, Thabile was admitted to *Careplace* and stayed for three nights. She had to pay R280 + 3 × R600 which is R280 + R1 800 = R2 080.

3. How much do you have to pay if you are admitted to *Careplace* hospital and sleep there for two nights?
4. How long was Ben in the hospital if he had to pay R2 080?
5. Which of these flow diagrams show how the cost of staying at *Careplace* can be calculated?



Here is another way to describe how you can calculate the cost of staying in the private hospital *Careplace*:

Cost = 600 × *the number of nights* + 280, or

Cost for □ nights = 600 × □ + 280

6. Calculate the total cost for admission and accommodation at the *Careplace* private hospital for
   (a) 6 nights (b) 12 nights

At *Goodcare* private hospital the admission cost is R100 and the rate for one night is R620.

7. Calculate the total cost for admission and accommodation at the *Goodcare* private hospital for
   (a) 6 nights (b) 12 nights

8. Which hospital do you think is cheaper, *Careplace* or *Goodcare*? Explain your answer.

9. Make a table like this to show the costs of staying in the *Careplace* or *Goodcare* hospitals. The costs for *Thulare*, a third hospital, are also shown in the table below.

Number of nights	1	2	3	4	5
Careplace	880	1 480	2 080		
Goodcare					
Thulare	960	1 460	1 960	2 460	2 960

6	7	8	9	10	11	12
3 460	3 960	4 460	4 960	5 460	5 960	6 460

10. When you have completed your table for question 9, look again at question 8 and at your answer. You may now give a better answer if you want to.

11. (a) What is the admission fee and the daily rate at *Thulare*?
    (b) Using a flow diagram or another method, describe how the cost of staying at *Thulare* can be calculated.

Unit 11 Probability

11.1 A coin-tossing experiment

1. Imagine you toss a coin many times. You check every toss to see if it is “heads” or “tails”.

   (a) Write down what you think the results will be when you toss a coin 20 times.

   (b) How many “heads” do you think you will get if you toss the coin many, many times?

   (c) How many “tails” do you think you will get if you toss the coin many, many times? Explain why you say so.

A coin has two sides. The “tail” side of a coin is the side that says what the coin is worth. The ”head” side is the side with the country’s coat of arms. A coin toss has **two outcomes**, either ”heads” or ”tails”.

2. Work with a classmate to do the coin-tossing experiment. Record your results in a tally table.

   Each of you must toss the coin 20 times. At the end you should have the result of your 20 tosses, and your classmate should have the result of his or her 20 tosses.

Frequency means how often a certain outcome has occurred; in this case, how many times you got ”heads” and how many times you got ”tails”.

	Tallies	Frequency
Heads		
Tails		

   (a) What fraction of *your* 20 results is “heads” ($\frac{?}{20}$)? Did your experiment work out the way you thought it would? Explain why you say so.

   (b) What fraction of *your classmate’s* 20 results is “heads” ($\frac{?}{20}$)? Do you think there is a problem with the experiment if your results are very different? Explain why you say so.

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3. You recorded 20 tosses and your classmate recorded 20 tosses. Put your results together with those of two other classmates, so that you have the results of 80 tosses altogether.
   (a) What fraction of the results is "heads"?
   (b) What fraction of the results is "tails"?
   (c) Are you surprised by the results? Explain why you say so.

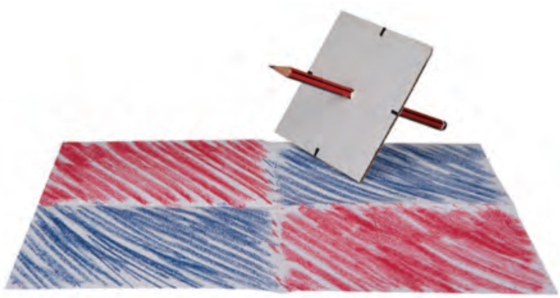
11.2 Spinner Experiment 1

Make your own spinner

Look at the picture. Take a square piece of cardboard and make a hole in the centre. Put your pencil through the hole. Then make a dot or mark at the centre of each of the sides of the square.

Make sure you have paper to record your results in tally tables and to draw graphs.

Practise spinning your spinner properly at a fast speed. When the spinner stops and topples over, the dot on the side on which the spinner comes to rest gives the position of the spinner.



Fold a clean page in half, and crosswise in half again. Open up the page. It now has *four* parts of equal size.

Mark the central point, that is, the point where the folds intersect. Colour two of the four parts red (or just write RED in them). Colour the other two parts blue (or just write BLUE in them).

Put your spinner on the central point of the page and spin it properly. Note whether the dot lands on a blue or a red part of the page. Spin the spinner 20 times. Each time write down the result of the spin (outcome) in a tally table.

1. Think about Spinner Experiment 1.
   (a) Do you think the results could be influenced by where you place the spinner when you start to spin?
   (b) Do you think your experiment could be influenced by how slow or fast you spin the spinner?
   (c) Will it matter if the parts are coloured in such a way that the two red parts (areas) are next to each other and the two blue parts are next to each other?
   Why do you say so?
   (d) What are the possible outcomes of Spinner Experiment 1?
2. Compare your data (that is, the results of Spinner Experiment 1) with that of other classmates. What fraction of the 20 spins in their experiments was RED?
3. Work with the rest of the class.
   Use the information in your tally tables to make a pictograph to show how many REDS each classmate got out of 20 spins.
   (a) Draw a number line in your book that runs from 0 to 20. Nobody will be able to get more than 20 REDS in 20 spins.
   (b) As each learner says how many REDS he or she got, make a cross above that number.
   (c) Write a short paragraph about the story of the graph.

Sometimes people think the number of RED results and the number of BLUE results must be the same in any experiment, because the page is divided into two equal parts. This is not true.

Only when we do an experiment with many, many spins can we expect to see *almost* the same number of RED and BLUE results if the page is divided into two equal parts. We cannot expect that in small experiments.

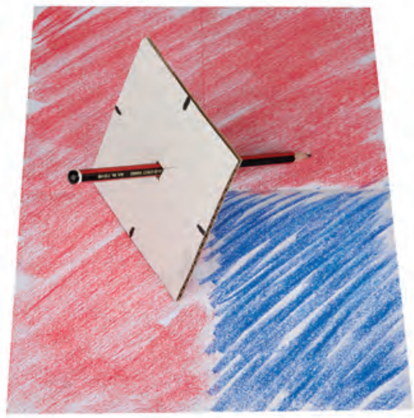
11.3 Spinner Experiment 2

Fold a clean page in half, and crosswise in half again. Your page now has four parts of equal size.

Open the page up and mark the point where the folds intersect.

Colour three of the four parts red (or just write RED in them).

Colour the remaining part blue (or just write BLUE in it).



1. Before you start, first think about the experiment.
   (a) What are the possible outcomes of Spinner Experiment 2?
   (b) Do you think the results will be similar to your results for Spinner Experiment 1? Why do you say so?

2. Now do Spinner Experiment 2. Put your spinner at the centre of the page and spin it properly. Note whether the dot lands on a blue or a red part of the page.

   Spin the spinner 20 times. Each time record the result of the spin in a tally table.

   (a) Combine your data with the data of four classmates so that you have 100 results.
   (b) What fraction of the 100 results was RED? What fraction was BLUE?