Mathletics

Series F Student

Geometry

My name

First edition printed 2009 in Australia.

A catalogue record for this book is available from 3P Learning Ltd.

ISBN 978-1-921860-85-0

Published 3P Learning Ltd

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Series F – Geometry

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Topic 4 – Position (pp. 25–44)

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Lines and angles – lines

When we classify lines we use terms such as parallel, perpendicular, vertical and horizontal. Knowing these terms makes it easier for us to understand and work with shapes.

1 **Follow the instructions and fill in the missing information:**

a Look at the **horizontal** line in the box below. Horizontal lines lie ☐ flat ☐ standing up (tick one box). We call the line AB as it starts at A and ends at B.

b Draw a 5 cm **vertical** line up from point A. What kind of angle is formed by the two lines at A? ________________

c When two lines meet in such an angle, we say that they're **perpendicular** to each other. Draw another 5 cm line up from B. Is this line perpendicular to line AB as well? ________________

d Now look at lines AC and BD. Are they perpendicular or parallel to each other? ________________

e If you said **parallel**, you'd be right. Parallel lines are always the same distance away from each other at any point and can never meet.

f Draw a line that is parallel to line AB by joining CD.

g Curves can also be parallel. Draw 2 parallel curves in the shape.

2 **See if you understand these terms by completing this quick test. Draw:**

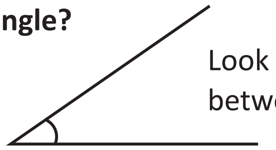
a 2 parallel lines

b 2 lines perpendicular to each other

c a horizontal line

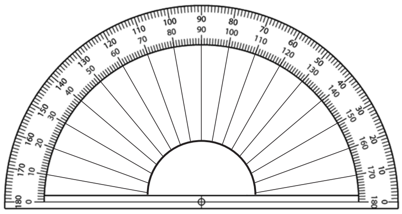
d a vertical line

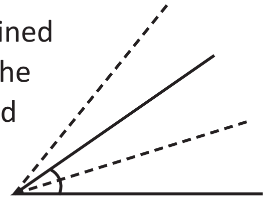
What is an angle?



Look at where these two lines meet. The angle is the amount of space between where they join. It's also the amount of turn between them.

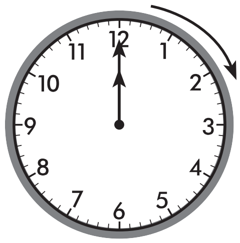
If we imagine that these two lines are joined at their meeting point, we could rotate the lines around this point. They'll stay joined but the amount of turn will change.





We measure angles using degrees – the symbol for this is °.
We use a protractor as our measuring tool.

3 **A circle is a full turn and is 360°. Think of it as a clock – from 12:00 round to 12:00. Copy this page and then cut out the circle below and try the following:**

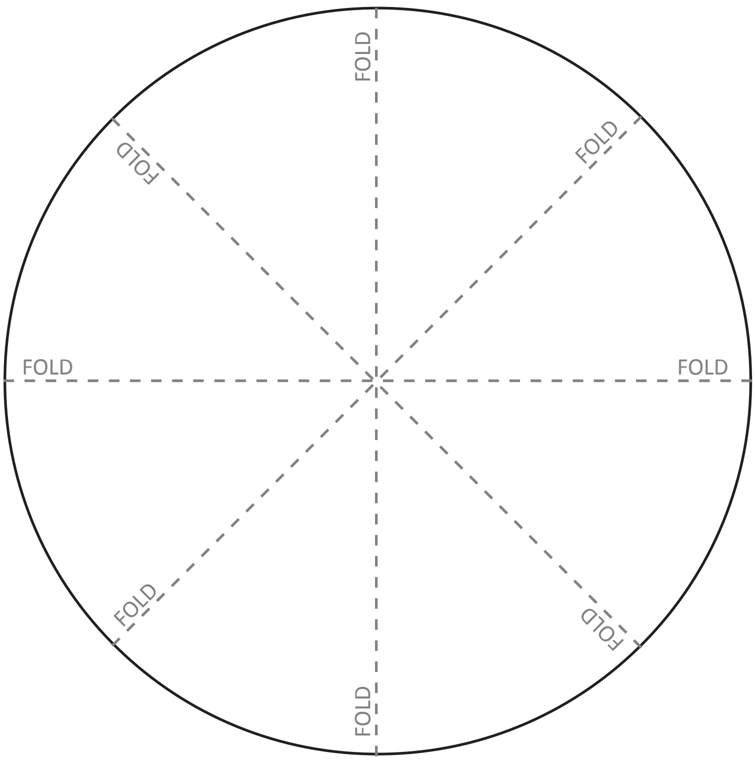


copy

a Fold the circle in half. How many degrees are in a half circle? ____________________

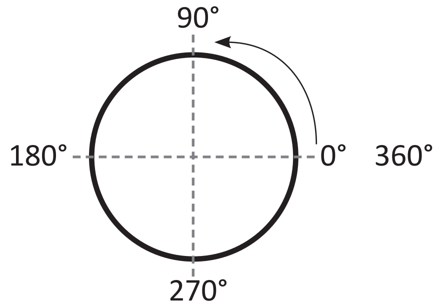
b Fold it in half again. You now have a quarter circle. How many degrees are in a quarter of a circle? ____________________

c Fold it in half once more. You have an eighth of a circle. How many degrees are in one eighth of a circle? ____________________



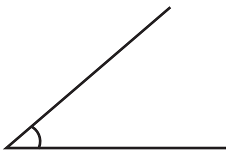
Lines and angles – introducing angles

When an angle is less than a quarter turn of 90° we say it's **acute**.
When it's exactly 90° we say it's a **right** angle.
When it's between 90° and 180° we say it's **obtuse**.
When it's exactly 180° we say it's a **straight** angle.
When it's more than 180° we say it's a **reflex** angle.
We use an arc to show where we're measuring.
With right angles, we use a square symbol like this .



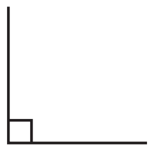
1 **Label each of these angles as right, acute or obtuse:**

a



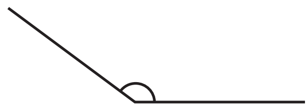
| | angle

b



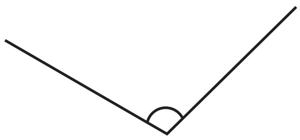
| | angle

c



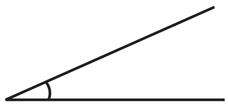
| | angle

d



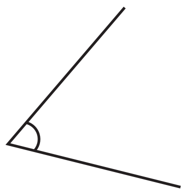
| | angle

e



| | angle

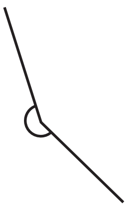
f



| | angle

2 **Wally the work experience boy made some mistakes labelling these angles. Correct any mistakes you see.**

a

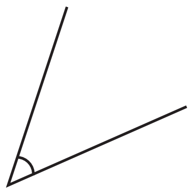


obtuse angle

b

straight angle

c



reflex angle

d

acute angle

3 **Draw the other line to create an angle that is:**

a

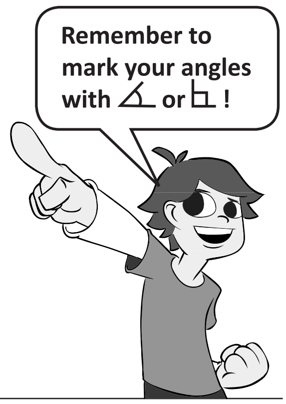
acute

b

right

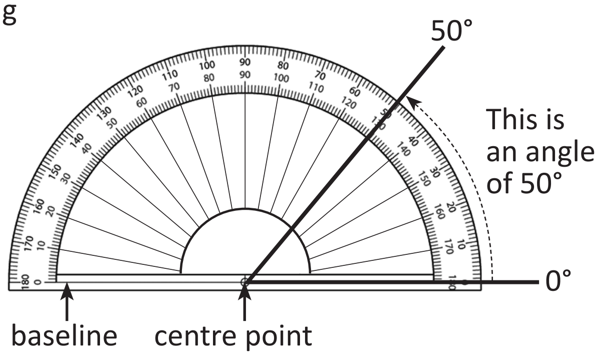
c

obtuse

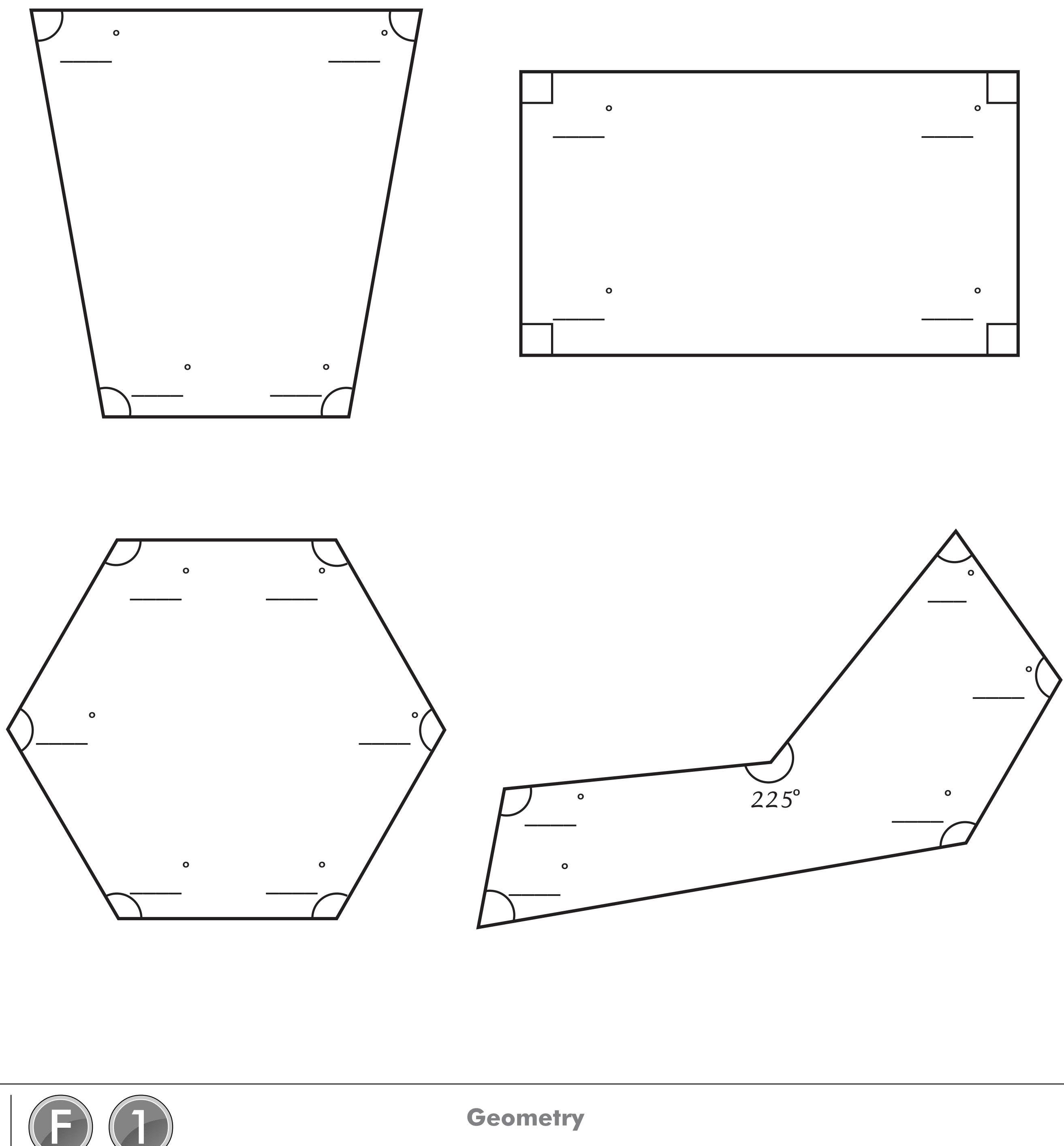


Sometimes we need to be more precise when naming angles, instead of just using terms such as acute or obtuse. This is where a protractor comes in handy. To measure an angle using a protractor we:

- fit the baseline of the protractor to one line of the angle, lining up the centre point of the protractor with the vertex of the angle
- look where the other line intersects the numbers, making sure we read round from 0°.



1 **Use a protractor to measure all of these marked angles. Write the answers in the angles:**



2 **Use a protractor to complete these angles. One line is drawn for you. You need to measure and draw the other line. Draw it about the same length as the other line. Mark the angles with the measurements.**

a

45°

b

60°

c

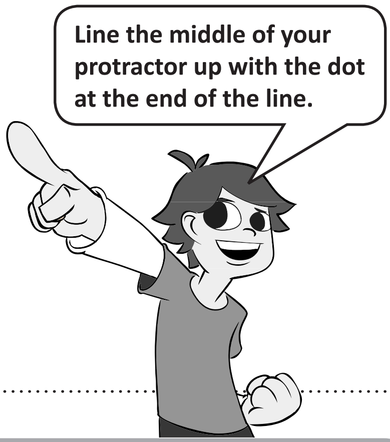
90°

d

110°

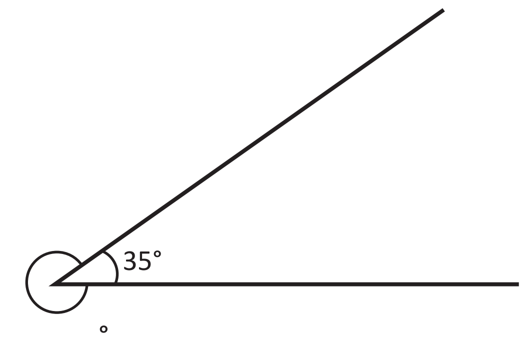
e

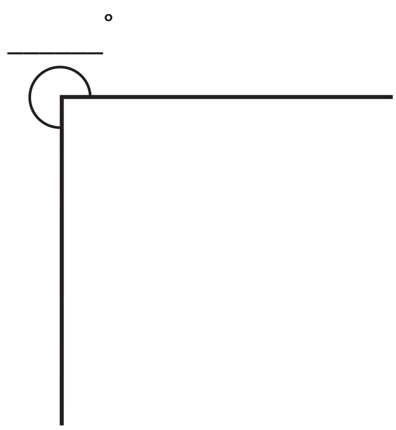
10°



When we talk about measuring angles we usually mean the interior angle. We can also measure the exterior angle – the one on the outside.

3 **Can you think of a way to measure the exterior angles of these 2 figures? Maybe a full (360°) protractor would help or is there another way to calculate that outside angle without actually measuring it? What else could you measure?**





Time passes investigate

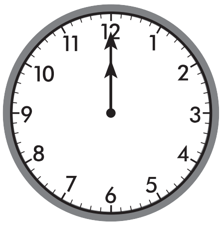
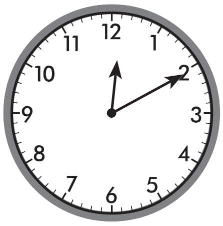
Getting ready

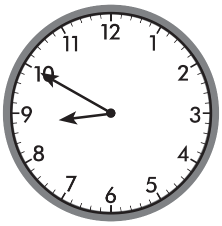
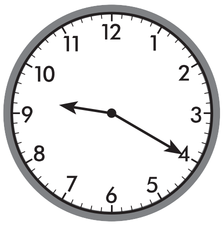
In this activity you will measure the passing of time not in minutes and hours, but in degrees.

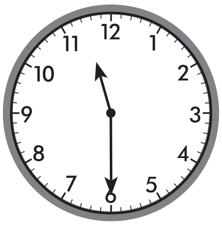
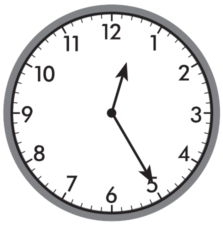
You can work with a partner and you may like to use a clockface with movable hands to help you work out the answers.

What to do

Use the clocks to calculate how many degrees have 'passed' between the minute hands:

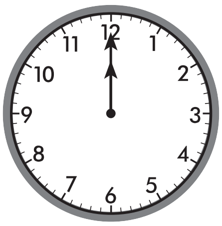
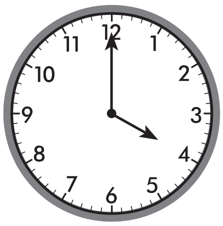
a   _________°

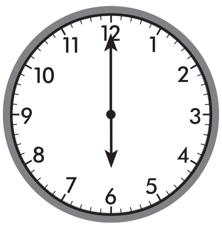
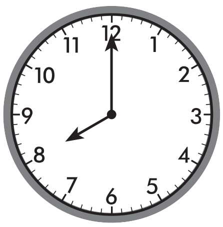
b   _________°

c   _________°

DISCOVER

Now consider the hour hands – how many degrees have 'passed' between the 2 hour hands?

a   _________°

b   _________°

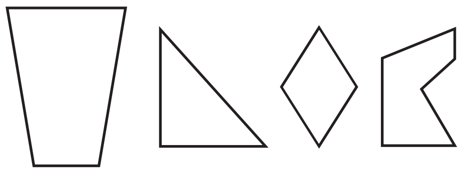
What to do next

If the minute hand moves 180°, how many degrees has the hour hand 'passed'?

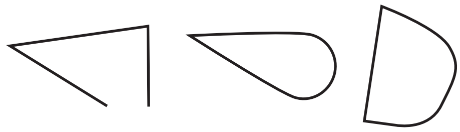
2D shapes – polygons

A polygon is a 2D (flat) shape with 3 or more straight sides. The word comes from the Greek words, *poly* and *gonia*, meaning many angles.

All polygons are closed – they have no break in their boundaries. They have no curved sides.

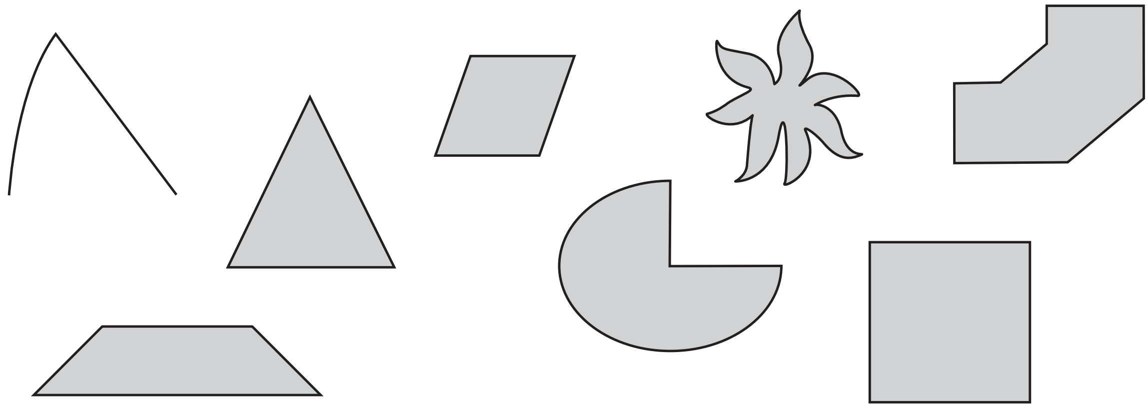


These are polygons.



These are not polygons.

1 **Use the rules and examples in the box above to decide if the following shapes are polygons. Circle the polygons:**



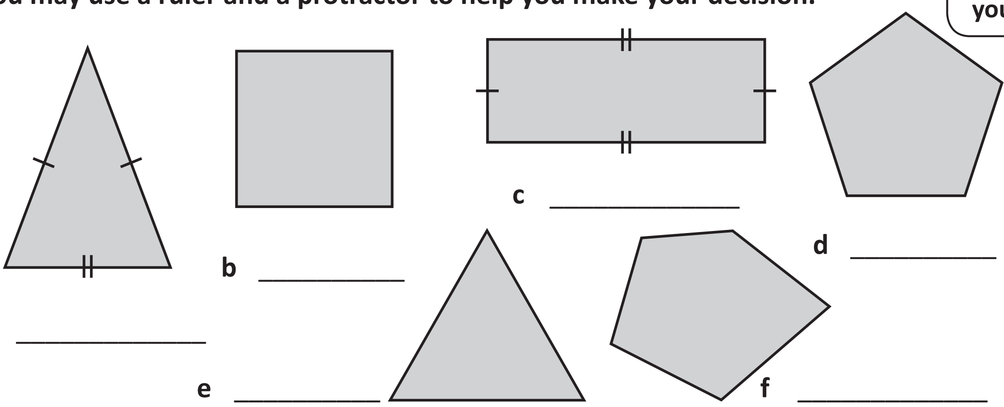
Polygons can be regular or irregular.

Regular polygons have **all sides** of equal length and **all angles** of equal size.

Irregular polygons have sides of unequal length and angles of unequal size.

Sometimes we can think irregular shapes are not 'proper' as they look different to the more common ones. These shapes are both hexagons because they both have six sides – but one is regular  and one is irregular .

2 **Look at these polygons. Are they regular or irregular? Label them. You may use a ruler and a protractor to help you make your decision.**



a ______________

b ______________

c ______________

d ______________

e ______________

f ______________

2D shapes – polygons

3 **Polygons are classified and named differently depending upon their sides and angles. Label and draw at least one example of each of the following. Remember they don't have to be regular. Research the names of any you don't know:**

a 3 angles and 3 sides triangle

b 4 angles and 4 sides ______________

c 5 angles and 5 sides ______________

d 6 angles and 6 sides ______________

e 7 angles and 7 sides ______________

f 8 angles and 8 sides ______________

g 9 angles and 9 sides ______________

h 10 angles and 10 sides ______________

i 11 angles and 11 sides ______________

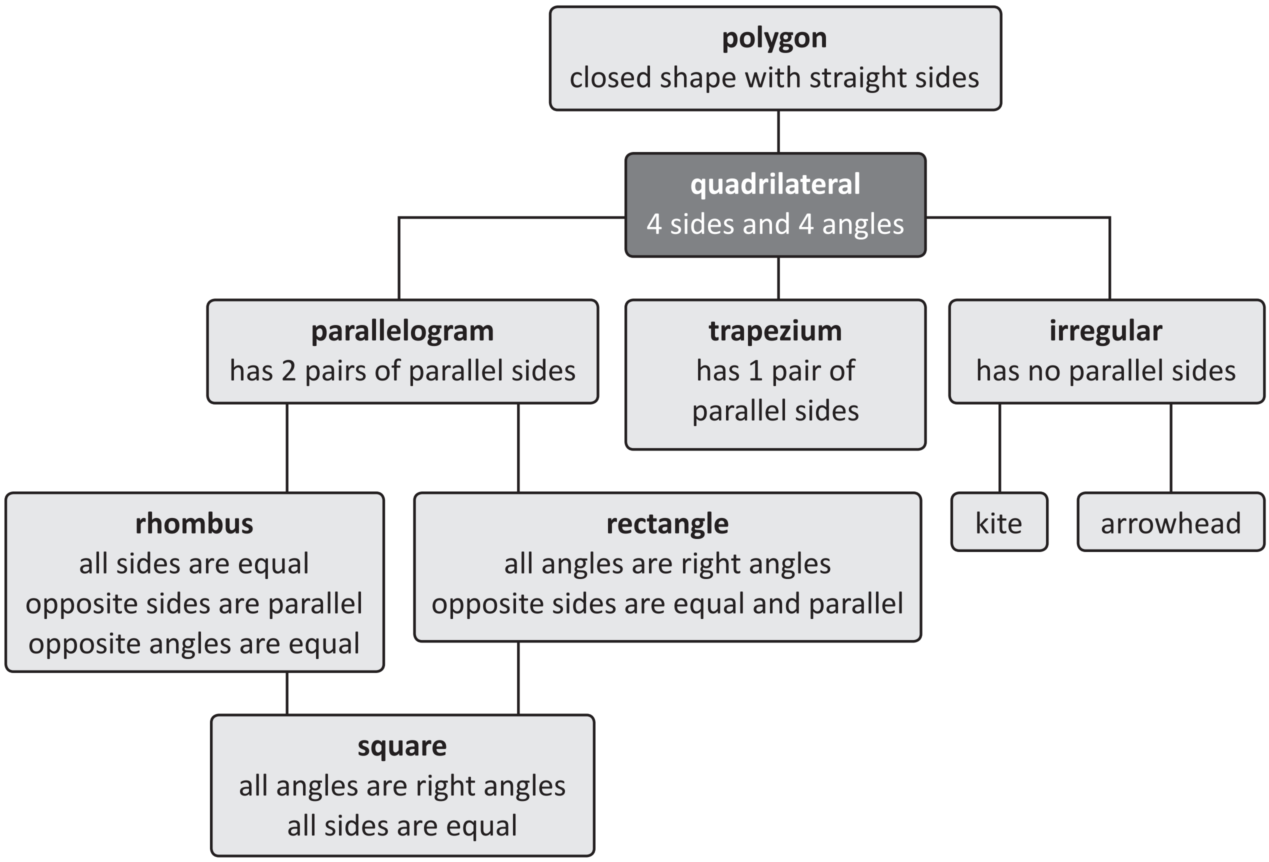
j 12 angles and 12 sides ______________

4 **What have you called the 4 sided shape? Compare your answer with those of 3 others. Do they agree with you? Why might there be differences?**

2D shapes – quadrilaterals

A quadrilateral is a kind of polygon. It's a closed, flat shape with 4 straight sides and 4 angles. The name comes from the Latin, *quad* and *latus*, meaning 4 sides.

One of the things that can be confusing about quadrilaterals is that there are a number of classifications, and shapes can be called different names. This is how they all fit together:



So a square is a kind of rhombus AND a rectangle AND a parallelogram AND a quadrilateral AND a polygon. It's kind of like a Gardener's Delight is a cherry tomato AND a tomato AND a fruit AND is considered a vegetable AND is a food.

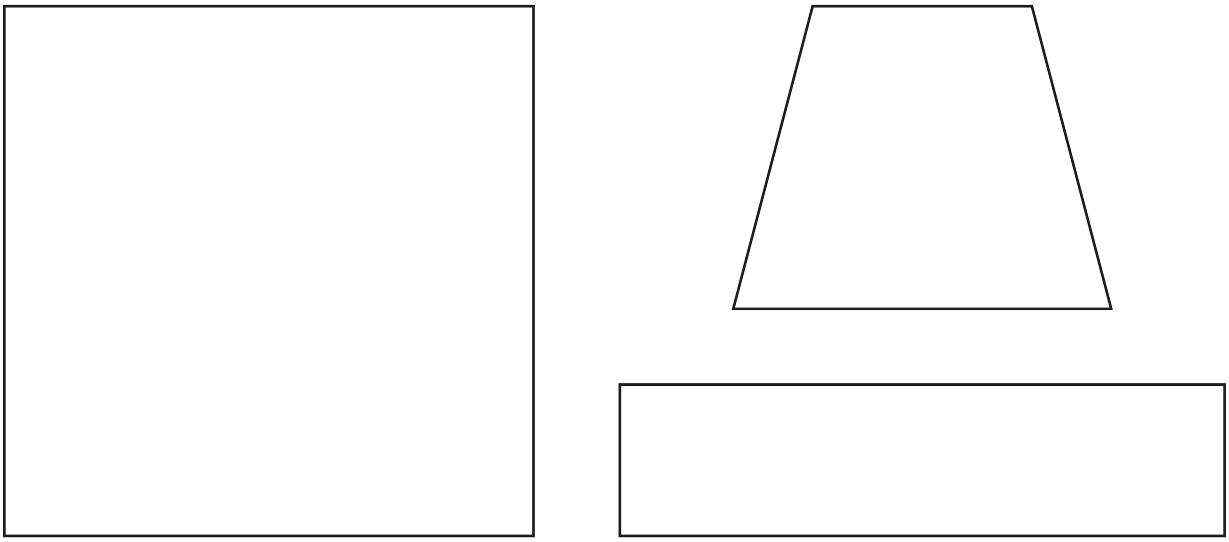
1 **Use the information above and the dot paper below to create a square, a rectangle, a rhombus and a trapezium. Check them against the criteria. Do they match? Swap with a partner and label each other's shapes.**

2D shapes – quadrilaterals

2 **As well as always having 4 sides, quadrilaterals have one other feature in common. Use a protractor to carefully measure the angles of these quadrilaterals. Add the 4 angles of each shape together. What do you find?**

a The angles of a quadrilateral always add to ___________________________.

b Find 4 more quadrilaterals around the room and test out the theory.



3 **Use the information below to draw the following quadrilaterals. Check your drawings with other pupils. Do they agree with you? Is it possible your drawings may be different and still correct? Why?**

a I have 4 sides of equal length.
I have 4 equal angles. They're all right angles.
If you draw my diagonals, the lines form right angles where they intersect.

I'm a __________________________________

b Sometimes I'm called an oblong.
I have 4 sides.
My opposite sides are equal.
If you draw my diagonals, the angles opposite each other at the intersection are equal.

I'm a __________________________________

c I have 2 pairs of equal sides.
My opposite sides are equal in length.
My opposite angles are equal.
None of my angles are 90º.

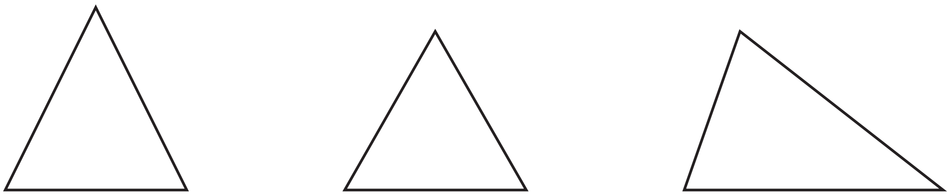
I'm a __________________________________

d Sometimes I'm known as a trapezoid.
I have one pair of opposite parallel lines.

I'm a __________________________________

2D shapes – triangles

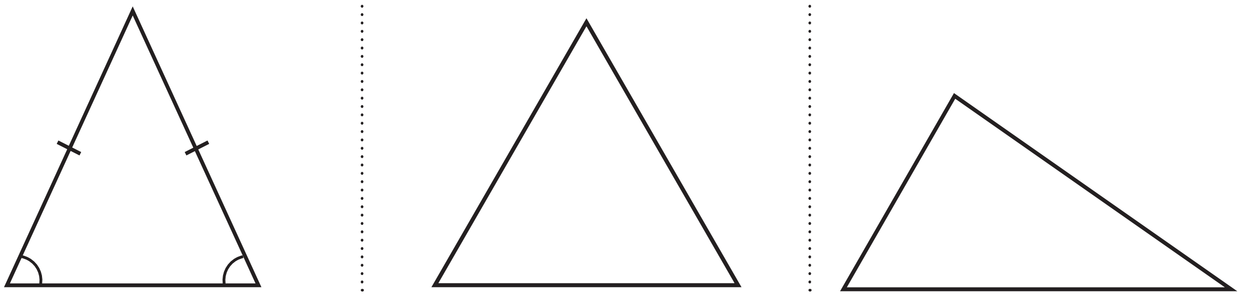
A triangle is a type of polygon. It has three sides and three angles. The three interior angles always add to 180°. Here are the 3 main types of triangles:



isosceles equilateral scalene

1 **Triangles are classified into the 3 different groups depending upon their angles. Below is an example of each group. Use a protractor to measure the angles of the triangles. Mark any angles that are the same in a triangle with an arc. The first triangle has been done for you.**

isosceles **equilateral** **scalene**



2 **What do you notice? Complete the following statements:**

a Isosceles triangles have __________ equal angles.

b Equilateral triangles have__________ equal angles.

c Scalene triangles have __________ equal angles.

3 **Now measure the lengths of the sides. Mark any lines that are the same length in a triangle with a little line. The first triangle has been marked for you in Question 1. What do you notice? Complete the following statements:**

a Isosceles triangles have __________ equal sides.

b Equilateral triangles have__________ equal sides.

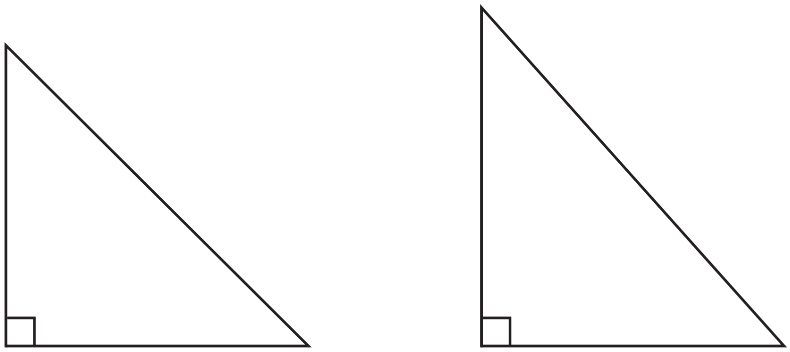
c Scalene triangles have __________ equal sides.

4 **What do you notice about the relationship between the angles and the sides of a triangle? (This is always the case. They're a consequence of each other.)**

2D shapes – triangles

There is another type of triangle you will come across. It's called the right angled triangle. Look at these examples. How many degrees are the marked angles? What symbol tells you this?

5 **Measure the sides of both triangles to the nearest $\frac{1}{2}$ cm and mark any equal sides.**



a Based on your measurements, can right angled triangles be either isosceles or scalene? ____________

b Can they be equilateral? Why or why not?

____

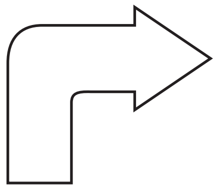
____

6 **Using a protractor to help you, draw an example of a right angled, equilateral, isosceles and scalene triangle below. Don't label them or mark the angles or sides as equal. Switch papers with a partner and measure and label each other's triangles. Switch back and check.**

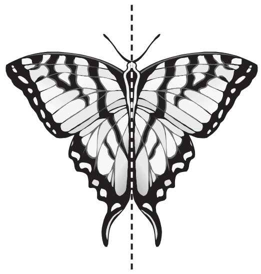
2D shapes – symmetry

Reflective or line symmetry describes mirror image, when one half of a shape or picture matches the other exactly. The middle line that divides the two halves is called the line of symmetry.
Shapes may have:

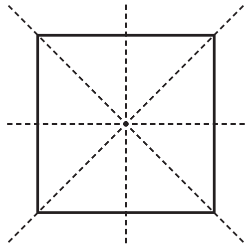
no line of symmetry



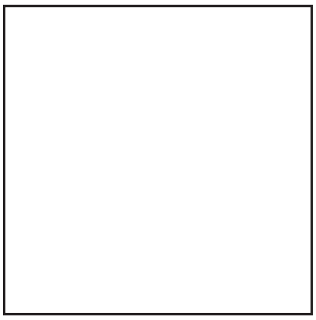
one line of symmetry



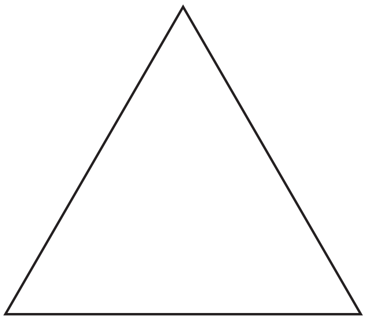
more than one line of symmetry



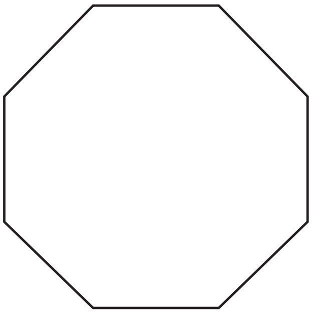
1 **Find and mark any lines of symmetry on these regular polygons. These can be vertical, horizontal or diagonal. If it's easier, cut out copies of the shapes and fold them to test them.**



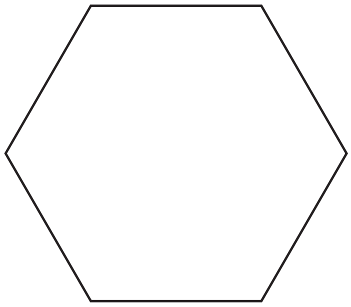
a A square has _____ lines of symmetry.



b An equilateral triangle has _____ lines of symmetry.



c An octagon has _____ lines of symmetry.



d A hexagon has _____ lines of symmetry.

2 **What do you notice about lines of symmetry in regular polygons?**

3 **Look at these letters of the alphabet. Work with a partner to decide which ones have lines of symmetry when written in this font. Which ones have more than one? Which ones have none? Record them in the table below:**

A B C D E F G H I

J K L M N O P Q R

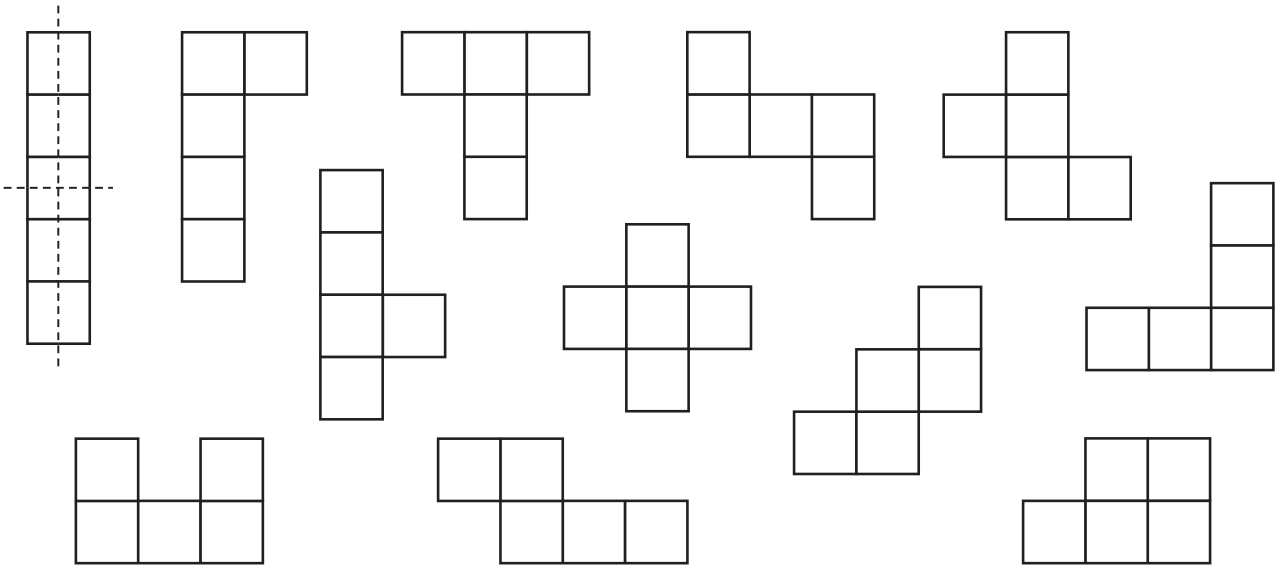
S T U V W X Y Z

Vertical line of symmetry	Horizontal line of symmetry	More than one line of symmetry	No lines of symmetry

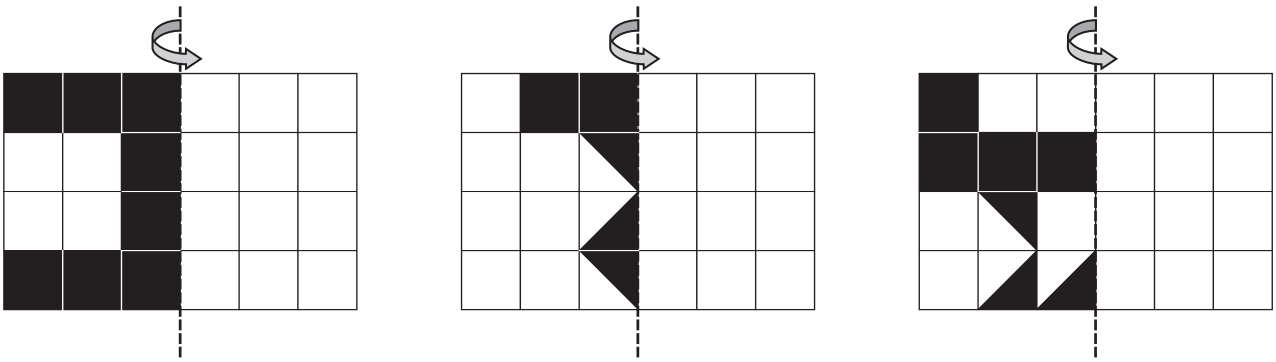
4 **Compare your list with that of another group. Do they agree? If there are any letters you disagree on, present your cases to each other and see if you can reach a consensus.**

2D shapes – symmetry

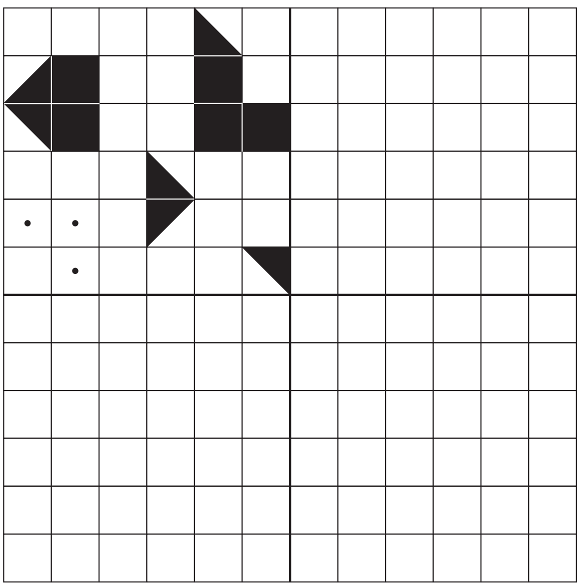
5 **These shapes are called pentominoes. Some have lines of symmetry. Draw them in. The first one has been done for you.**



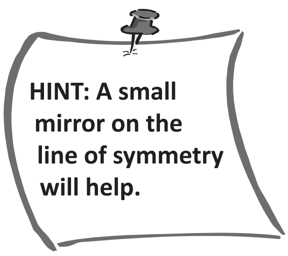
6 **Colour the other half of these pictures so that they're symmetrical:**



7 **Using the vertical line as the line of symmetry, draw the mirror image in the top right square. Now reflect the picture on the other side of the horizontal line of symmetry.**



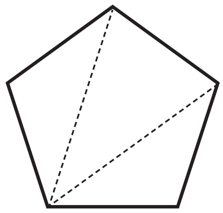
HINT: A small mirror on the line of symmetry will help.



How many triangles? investigate

Getting ready

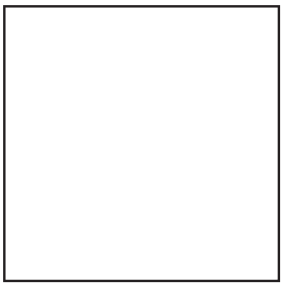
Use the shapes below. Your task is to section each shape into triangles. Your lines must go from corner (vertex) to corner and can't cross over each other.

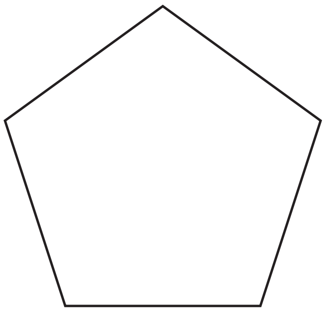


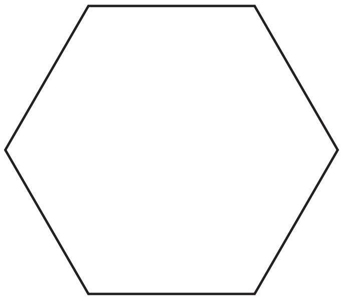
What to do

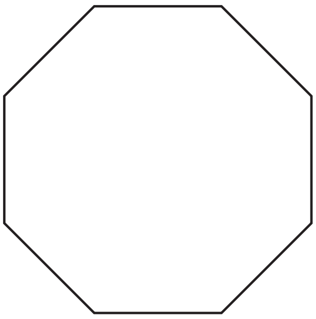
Record your findings in the table. Do you see any patterns?

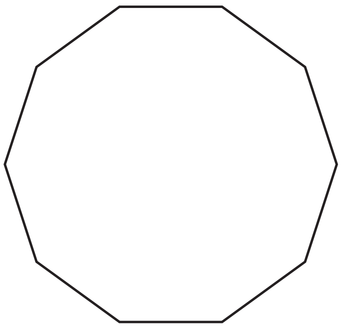
Shape	Number of sides	Number of triangles	Sum of angles
square			
pentagon			
hexagon			
octagon			
decagon			
dodecagon			

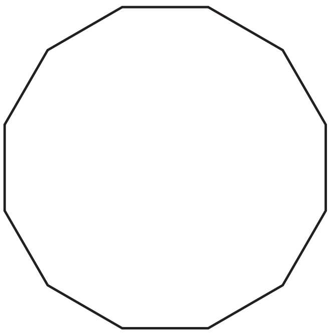












Getting ready

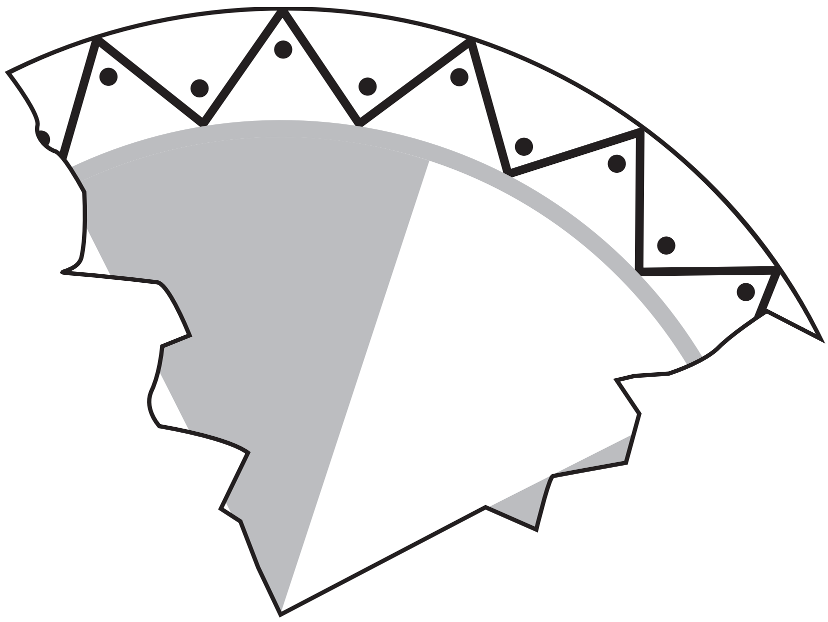
While working on an archaeological dig with the famous Dr Jones, you come across a portion of a beautiful old plate.

Dr Jones thinks it may be $\frac{1}{4}$ of the Lost Plate of Icarus, a priceless find. He asks you to recreate what you think the entire plate may have looked like.

What to do

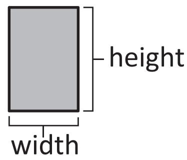
You have $\frac{1}{4}$ of the plate. You need to find a way to recreate the rest of it. How will you do this? Would a compass help? How will you find the right centre point?

Then, use your knowledge of symmetry and tessellation to complete the design.



3D shapes – introduction

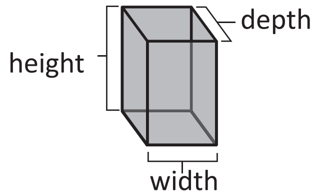
2D shapes have 2 dimensions – width and height. They're flat.



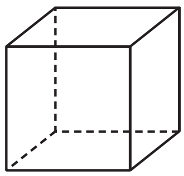
3D shapes have 3 dimensions – height, width and depth.

Sometimes we call them solids. When we draw them, we often show them as transparent or as skeletons so we can 'see' all their faces.

3D shapes can have all flat sides, all curved sides, or a mixture of both.

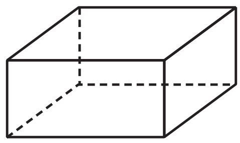


1 **Look at these 3D shapes. Which 2D shapes form their sides? If it helps, find the solids in your classroom and study them.**



a This is made of:

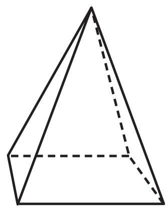
_____ squares



b This is made of:

2 ________________

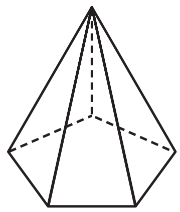
4 ________________



c This is made of:

1 ________________

_____ _____________



d This is made of:

_____ _____________

_____ triangles

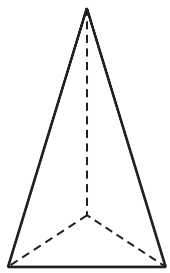
The 2D shapes are the **faces** of a 3D shape. The **edge** is where 2 faces meet. The point where 2 or more faces meet is called the **vertex**. If we're talking about more than one vertex, we call them **vertices**.

2 **Study the shape and answer the following:**

a How many faces does this shape have? [ ]

b How many vertices? [ ]

c How many edges? [ ]

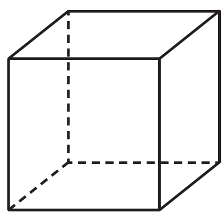


3 **Have these questions been answered correctly? Correct any mistakes:**

a How many faces does this shape have? *6*

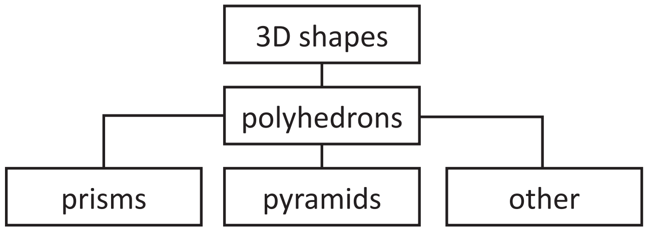
b How many vertices? *12*

c How many edges? *8*



3D shapes – polyhedrons

Some 3D shapes are polyhedrons. The word comes from the Greek: 'poly-' meaning 'many', and '-edron' meaning 'faces'. This means each face is a polygon. The polyhedrons we most commonly come across are pyramids and prisms.

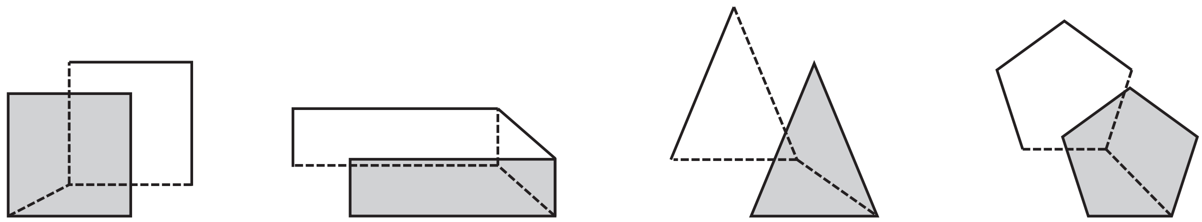


However, rectangular prisms are more usually known as cuboids, and we normally call square prisms cubes.

Prisms have identical parallel faces joined by rectangles. Boxes are a good example of prisms – have a look in your kitchen cupboard at home at the cereal and pasta boxes.

Most prisms are named after their end faces (e.g. hexagonal prism, triangular prism).

1 **Finish these prisms by ruling the missing edges. Name them according to their faces. The first one has been done for you.**



a *cube or square* prism

b ________________ prism (or cubiod)

c ________________ prism

d ________________ prism

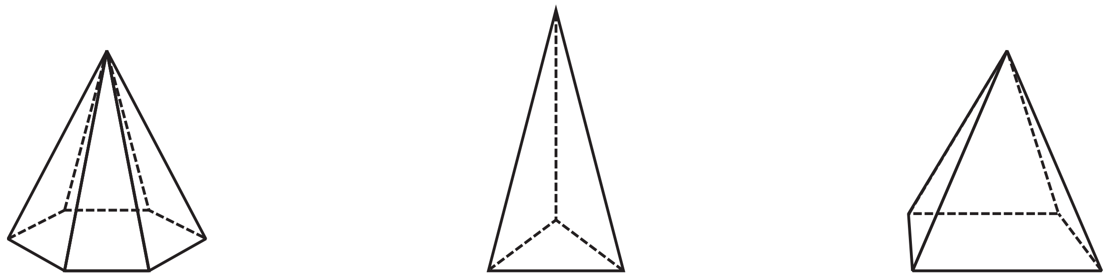
2 **Count the number of sides on each grey face. Now count the number of rectangular faces each shape has. What do you notice?**

3 **Use classroom equipment such as geoshapes, polydrons or straws and plasticine to create 2 different prisms. Name them here and record how many vertices, edges and faces they have.**

3D shapes – polyhedrons

Pyramids have a base with 3 or more flat triangular faces that meet at an apex (a type of vertex).

4 **What kind of pyramids are these? Remember a pyramid is named after its base.**



a ________________ pyramid **b** ________________ pyramid **c** ________________ pyramid

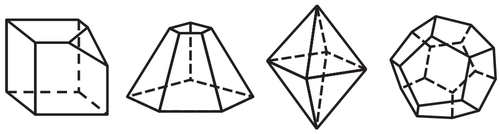
5 **What do you notice about the number of sides on the base and the number of triangular faces?**

6 **Pretend you've cut apart a hexagonal pyramid. Draw all its faces. What shape will the base be? How many triangular sides will you draw?**

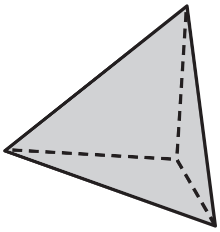
7 **What are 3 things pyramids and prisms have in common? What is something that makes them different?**

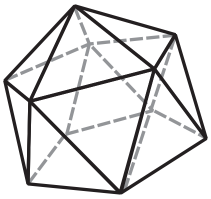
3D shapes – polyhedrons

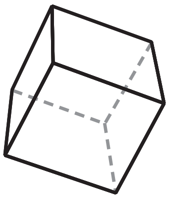
There are other kinds of polyhedrons. They're also made up of polygons and have flat faces, but they don't fit the rules for pyramids and prisms. Here are some examples:



8 **Many polyhedrons are named according to the number of faces they have. Colour match the information with the shape and the name. You may need to do some research! The first one has been done for you.**







octahedron

tetrahedron

4 faces, 6 edges, 4 vertices

dodecahedron

icosahedron

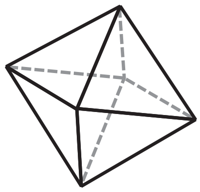
8 faces, 12 edges, 6 vertices

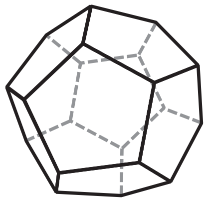
12 faces, 30 edges, 20 vertices

cube or hexahedron

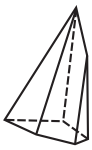
6 faces, 12 edges, 8 vertices

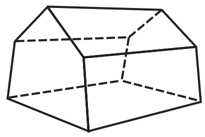
20 faces, 30 edges, 12 vertices





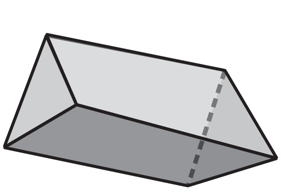
3D shapes don't have to be regular. They can be made up of different shapes and have angles and sides of different sizes.

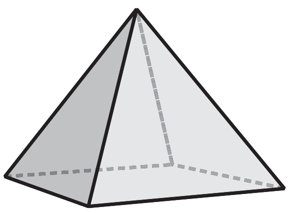
This is still a polyhedron: 

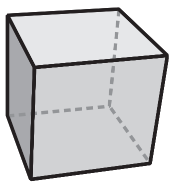
This is still a pentagonal prism: 

9 **Create a polyhedron out of polydrons or geoshapes. Count how many faces it has. Can you find out what it should be called?**

10 **Change these shapes so they're still polyhedrons but no longer regular prisms or pyramids. Maybe you could draw in a dotted line to show a cut or add some extra faces.**



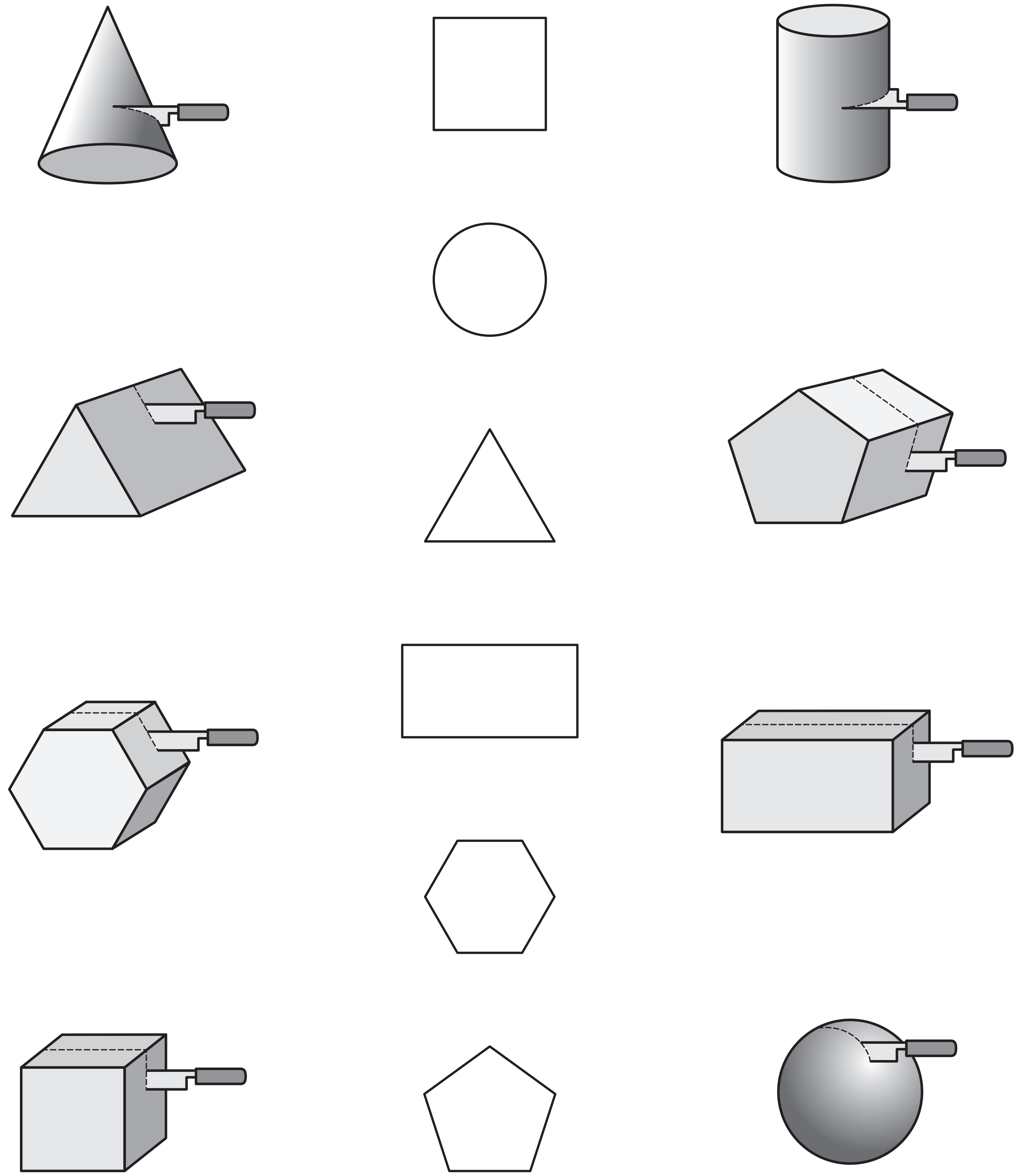




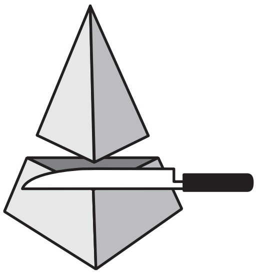
3D shapes – cross sections

A cross section of a 3D shape is when you slice right through something.

1 **Each of these shapes represents the cross section of the solids below. Draw a line to match each shape to its cross section.**

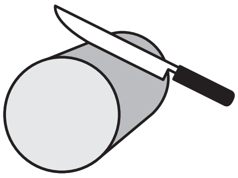


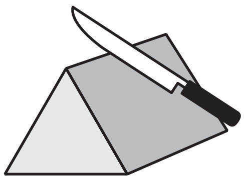
3D shapes – cross sections

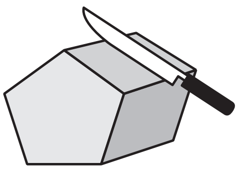


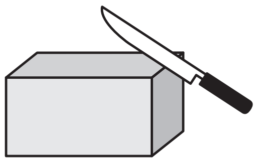
A cross section is what you see when you slice right through something.

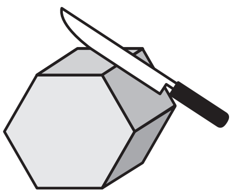
1 **Draw the cross section next to each shape:**

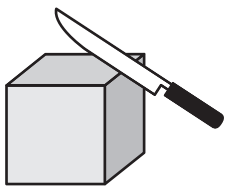
a 

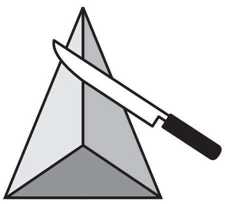
b 

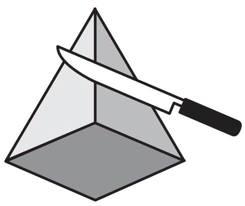
c 

d 

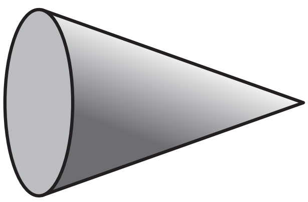
e 

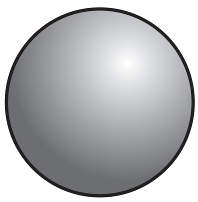
f 

g 

h 

2 **Draw a line on each shape to show where you would cut to get the smallest possible circle.**

a 

b 

Tomb Raider investigate

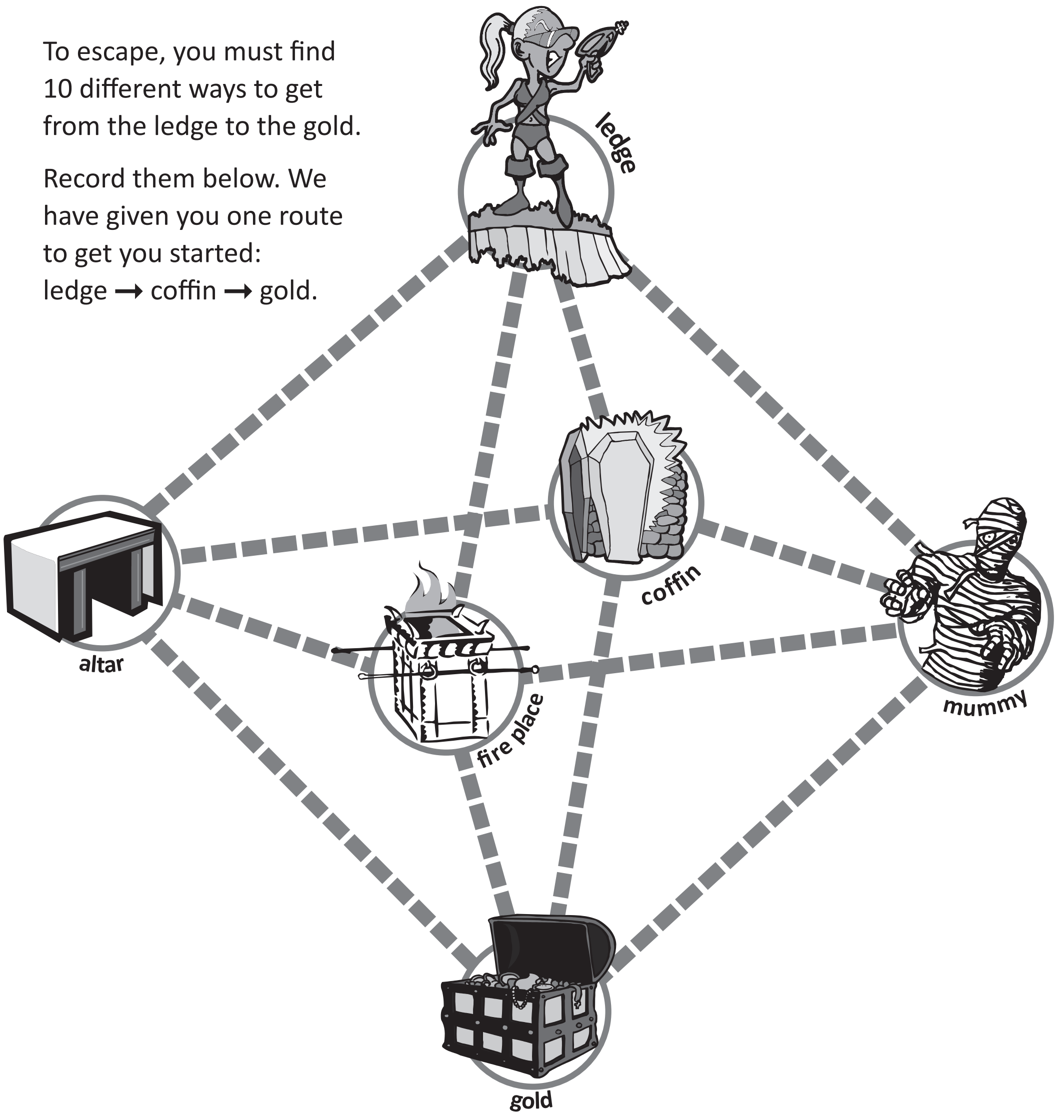
Getting ready

You're trapped in a tomb far underground. There are 6 key zones in the tomb.

What to do

To escape, you must find 10 different ways to get from the ledge to the gold.

Record them below. We have given you one route to get you started:
ledge → coffin → gold.

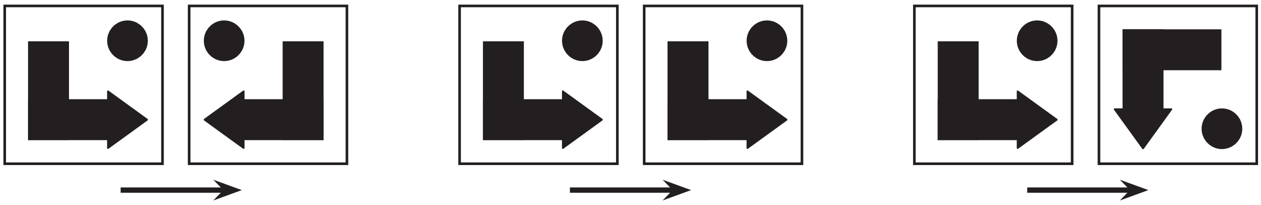


What to do next

Present your findings to the Guardian of Power (that would be your teacher). If they're correct, you may escape scot free. If not? Well, only they know what punishment is in store. There are 28 routes in total. For an extra challenge, you could try and find them all.

Position – transformation

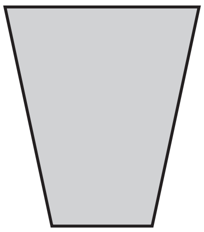
When we move a shape, we **transform** it. This tile shows three ways we can do this:



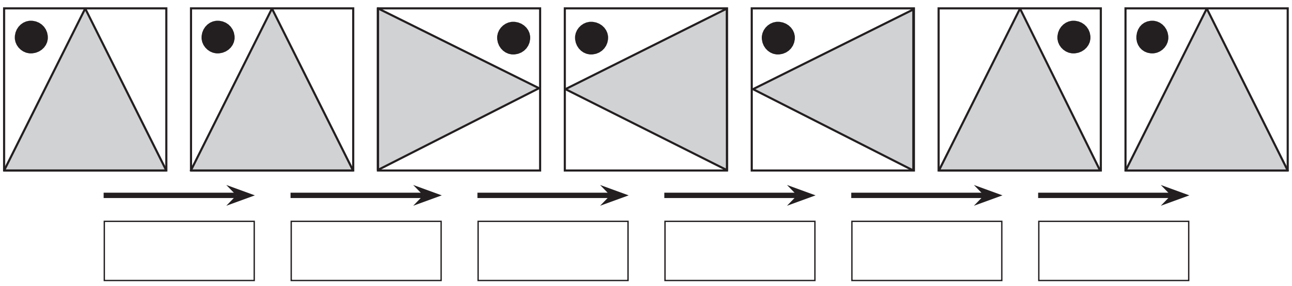
reflect (flip) | **translate** (slide) | **rotate** (turn)

When we're asked to flip, slide or turn, it helps to visualise the move in our heads.

1 **Look at this trapezium. Flip it in your head and then record what it looks like. Then turn it 180˚ clockwise (a half turn) in your head and record what it looks like now. Turn it another 90˚ clockwise (a quarter turn) and record.**



2 **What has been done to this tile? Describe each transformation as either a flip, slide or turn:**



3 **Transform these letters:**

a T → turn 90° clockwise

b H → flip

c J → slide

d N → flip

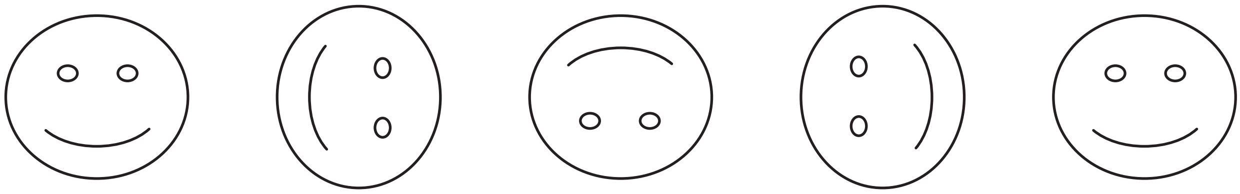
e Q → flip

f W → turn 180°

4 **Think of the name of a capital city somewhere in the world. Disguise its name by choosing to either flip, slide or turn each capital letter. Ask a partner to decode it. For example, PARIS could be disguised as ꟼ>ЯIꙅ.**

....

These are common rotations:



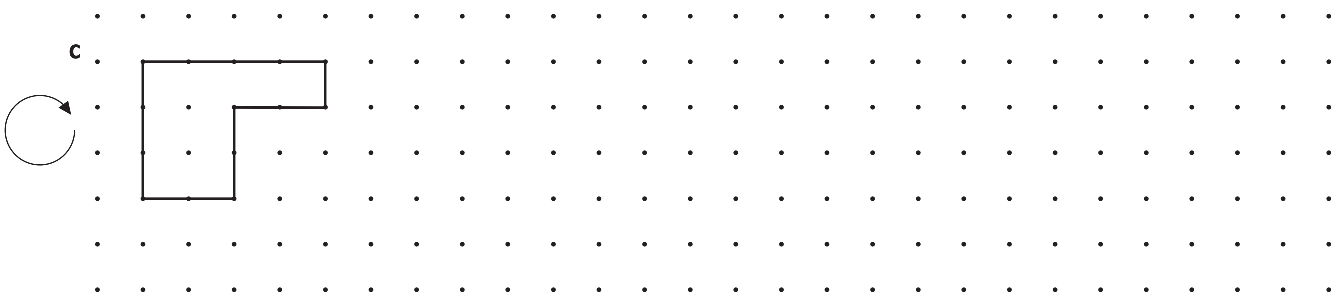
What do you notice about a full turn?

5 **Rotate each shape and record the new position. Starting from the original position each time, rotate each shape by a quarter turn, half turn, three quarter and full turn and record each new position.**

a

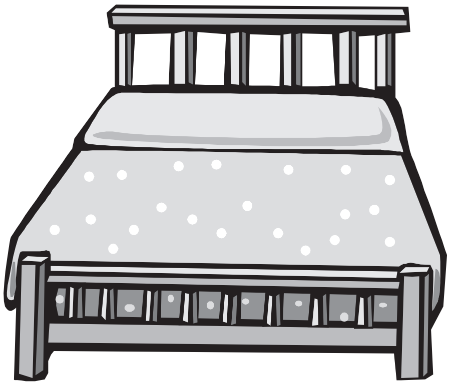
b

c



Position – point of view

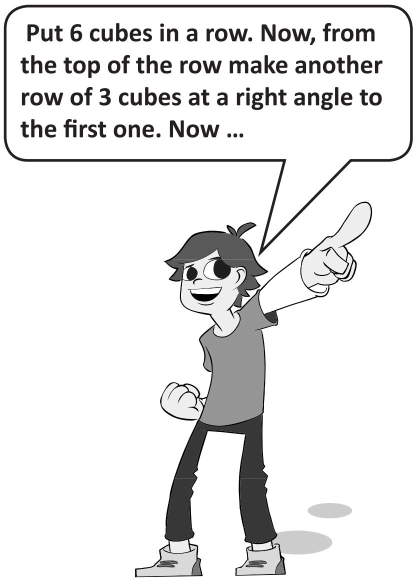
1 **Imagine you're standing at the bottom of this bed. You're facing the bed. Draw a bedside chest on the left side of the bed.**



Now draw yourself lying on the bed. From where you're lying, is the chest still on the left hand side of the bed? Explain your thinking:

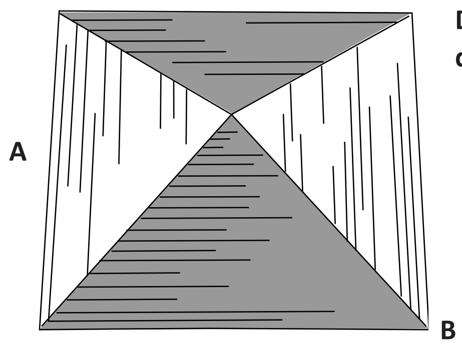
When we use terms such as left and right or above and below, where we are in relation to the object changes how we view its position.

2 **Work with a partner on this activity. You'll need some cubes or counters. Sit opposite each other. One of you will give the other instructions to create a letter (such as Z). Don't tell them which letter they'll be making!**



How easy or hard was the game?

3



Aerial view of a square pyramid

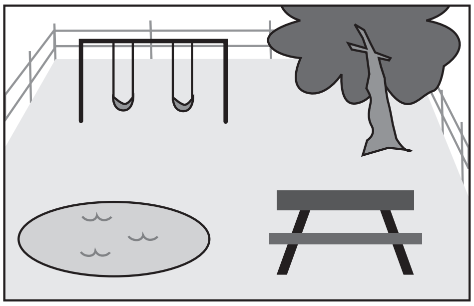
Draw what your view would be if you were standing at these different points:

Point A	Point B

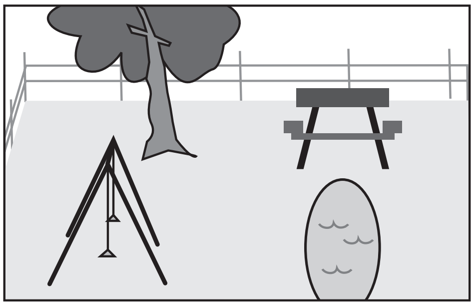
Position – point of view

4 **Look at the pictures. Each shows a different view of the same place.**

a



b



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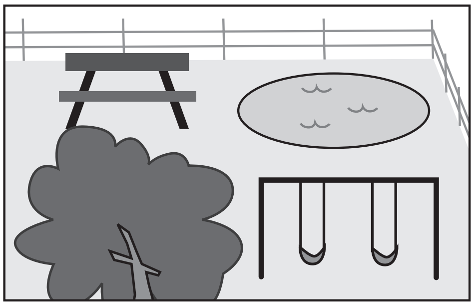

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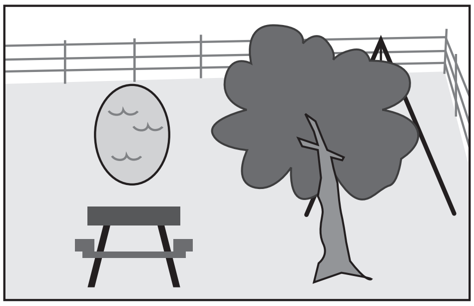
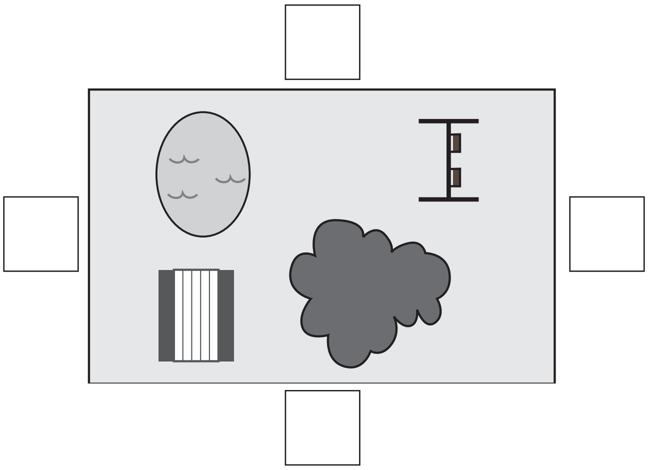


On this bird's-eye plan, write **a**, **b**, **c** and **d** to show where you'd be standing for each picture so your view matches those above.



5 **Arrange some objects on your desk and draw the view from 2 different perspectives.**

Position – directions

Have you ever given someone directions on how to get somewhere? Providing directions requires you to create a picture in your head of the journey. You need to think of useful landmarks and explain how to navigate the path. Precise terms such as left, right, straight ahead and opposite should be used.

1 **Work with a partner. Close your eyes and take turns nominating a place or object such as the school office, netball court or the city. Both point to where you think it is. Open your eyes and check. List the places you and your partner chose.**

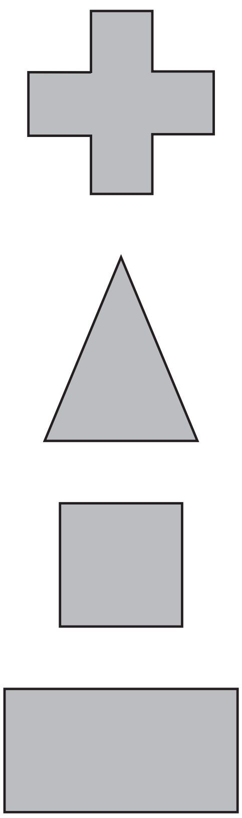
a How often did you and your partner choose the same direction?

b Was this activity harder or easier than you thought it would be?

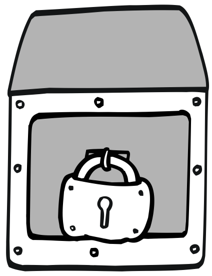
2 **Choose one of these shapes and write a set of directions below for your partner to walk out the shape. Think about how many paces each line should be. How will you direct them to make the necessary angles and turns?**

Get your partner to try out the directions. Use markers such as counters to track their path. Make any necessary changes to your instructions and try it again.

My directions:



Position – directions



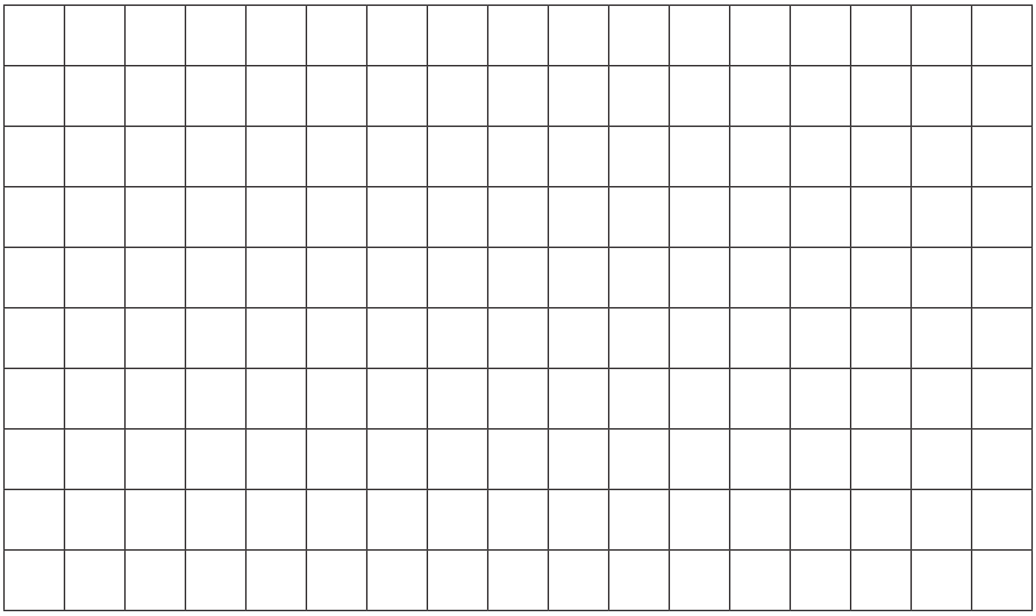
3 **In this game your partner will try to locate your hidden treasure chest.**

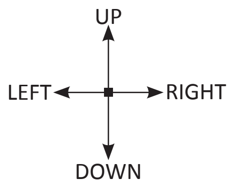
1 Colour in four squares to make one larger square. This is your chest. (Don't let your partner see your page.)

2 Your partner picks a starting square and marks it on their grid. They show you and you mark it on your grid too.

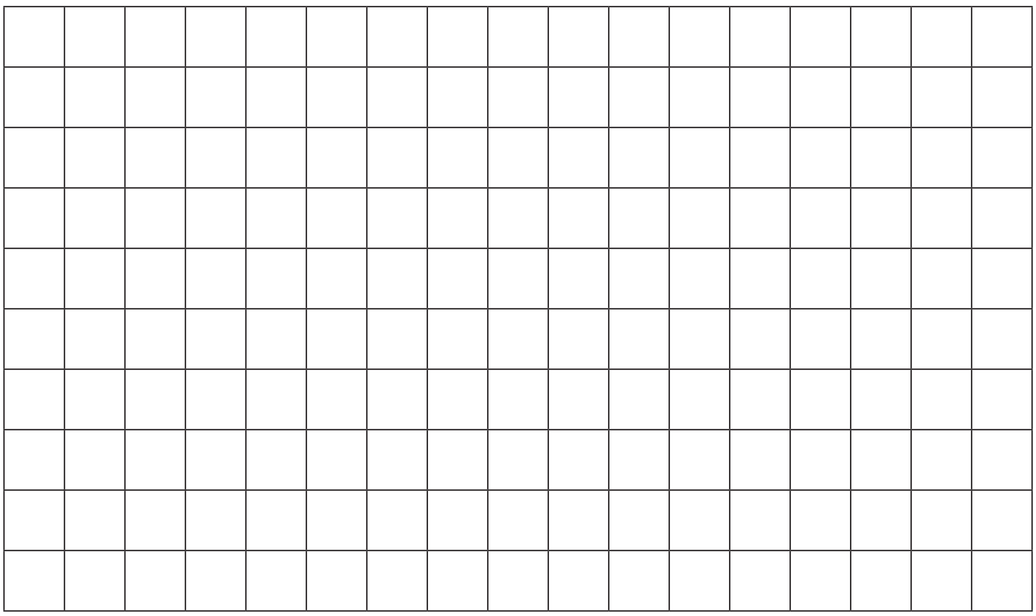
3 Your partner then suggests moves such as "4 squares up". Both of you mark the matching square with a cross, and you respond with one clue such as "too far up" or "warmer but you need to go right".

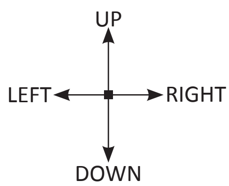
4 If they locate one part of your treasure chest you must let them know but you don't have to give a further clue. They must keep guessing till they uncover the whole chest.





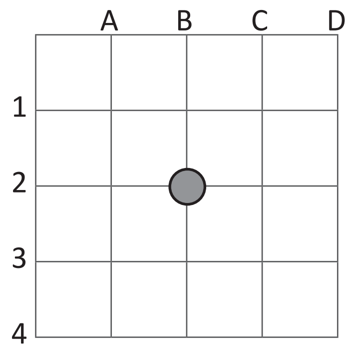
Swap roles.



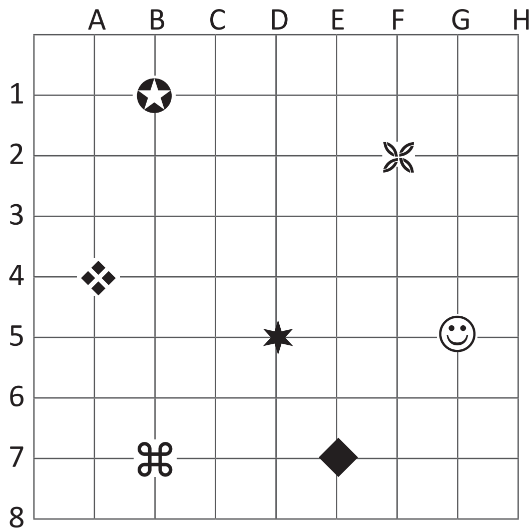


Position – coordinates

We use coordinates to give us a reference to show where something is on a grid. It's where two lines intersect. The letter comes first. This example shows coordinate B2.



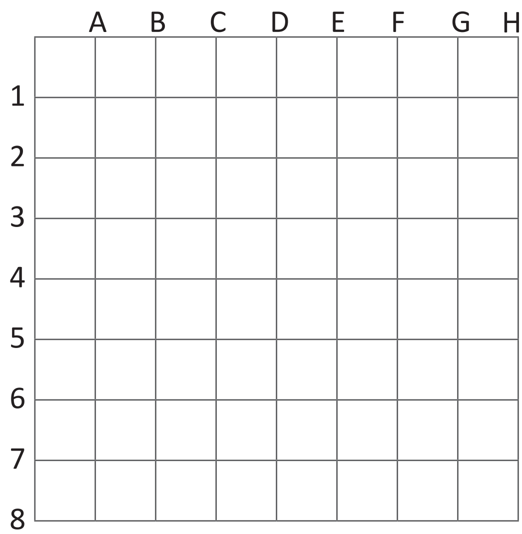
1 **For each symbol on the grid, write the coordinates.**



☺	
◆	
⌘	
✶	
✾	
✪	
❖	

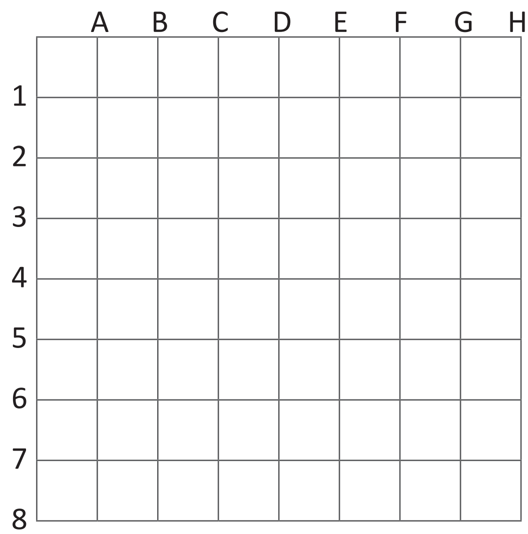
2 **Plot then connect the set of points for each grid:**

a D1 to F4, F4 to B6, B6 to D1



What 2D shape do you see? ________________

b A4 to D7, D7 to G4, G4 to D1, D1 to A4



What 2D shape do you see? ________________

Position – coordinates

3 **Plot and join the following points. When you've done that, make each design symmetrical.**

a D1 to A4, A4 to D4, D4 to A6, A6 to C8

	A	B	C	D	E	F	G	H
1								
2								
3								
4								
5								
6								
7								
8								

b D1 to B1, B1 to D3, D3 to A3, A3 to D7, D7 to B8

	A	B	C	D	E	F	G	H
1								
2								
3								
4								
5								
6								
7								
8								

4 **Complete the design according to the instructions.**

a Plot and join the following points:

B1 to B7

B7 to H7

H7 to H1

H1 to B1

B1 to H7

B7 to H1

E1 to E7

B4 to H4

	A	B	C	D	E	F	G	H	I	J
1										
2										
3										
4										
5										
6										
7										
8										

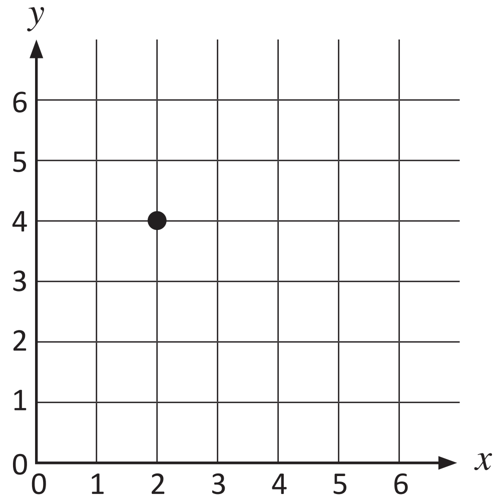
b How many triangles can you find? ___________

Position – coordinates

In maths we often use grids like this. The horizontal and vertical lines at the edges are called the **axes**. The horizontal line is the ***x* axis** and the vertical line is the ***y* axis**. Each axis is labelled with numbers. These sit on a line.

Coordinates are a way of describing a specific point on a grid. They will always refer to a point where two lines cross.

If we want to describe a particular point we always write the x coordinate first, followed by the y coordinate. So, the point shown above is (2,4).



5 **Mark the following coordinates on the grid below:**

a (4, 1)

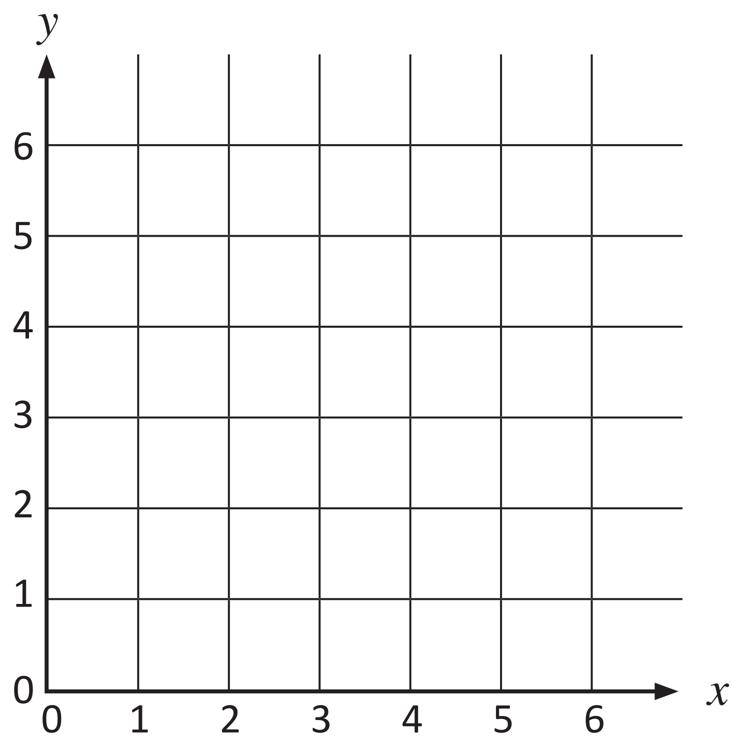
b (6, 6)

c (1, 5)

d (3, 4)

e (5, 2)

f (0, 0)



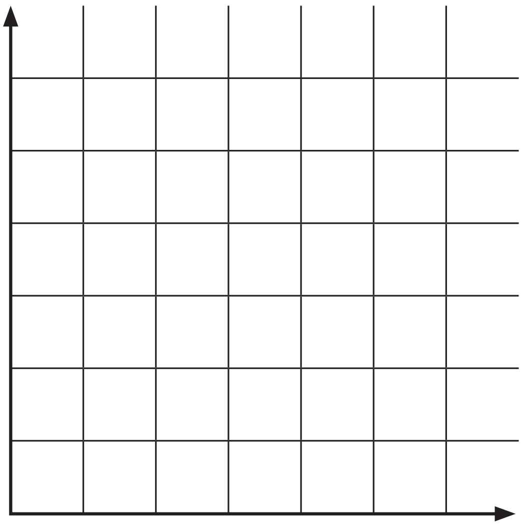
Position – coordinates

6. **Draw straight lines between these coordinates to create a capital letter.**

   (1, 1) to (1, 6)

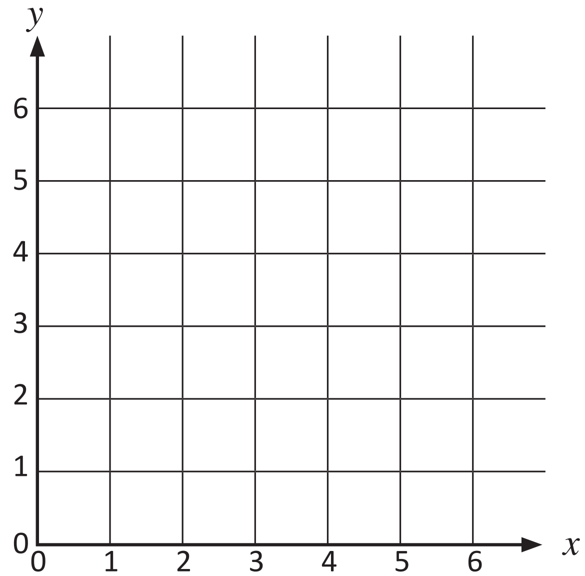
   (1, 6) to (5, 1)

   (5, 1) to (5, 6)

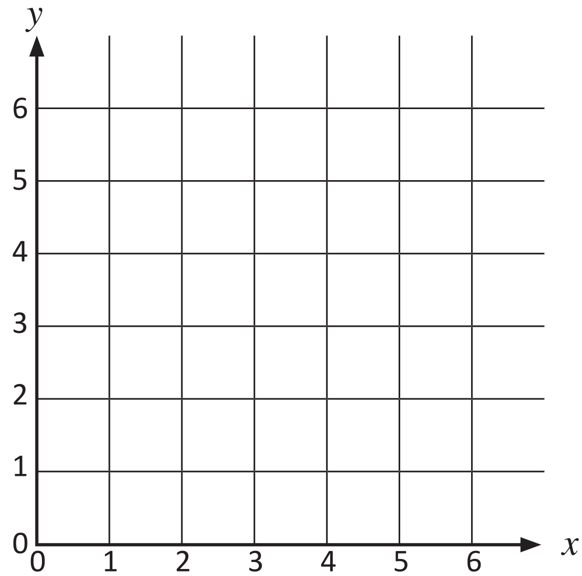


7. **Draw a different capital letter on each of the grids below (be sure that each line begins and ends at a coordinate point), and then write instructions to draw these letters in the same form as in question 2 above.**

Instructions:



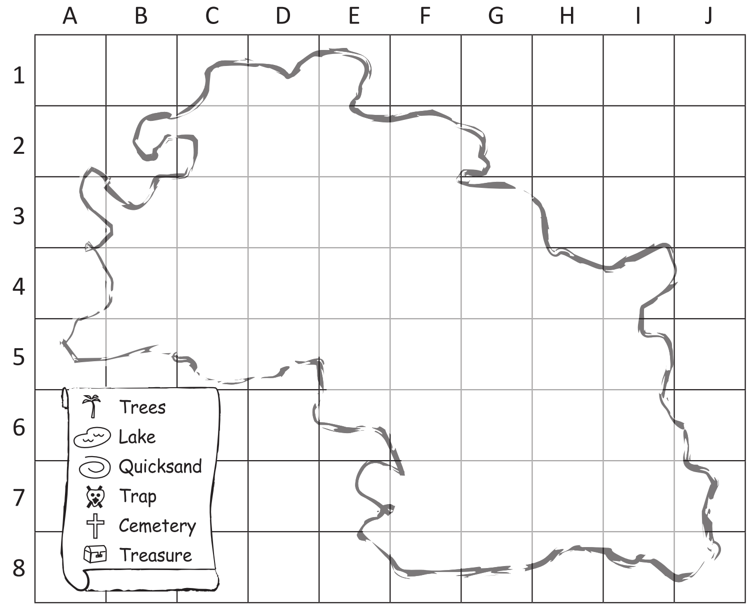
Instructions:



Position – coordinates

Maps and street directories use coordinates to help up find places and follow routes. They use letters on one axis and numbers on the other, which usually they sit between lines, marking a particular row or column of squares. Thus, the mountain on the map below is at H7.

8 **Complete this treasure map by adding the symbols from the key at the correct spot.**



a Trees in the area of E3, F3

b Lake Grant to cover B4, C3, C4

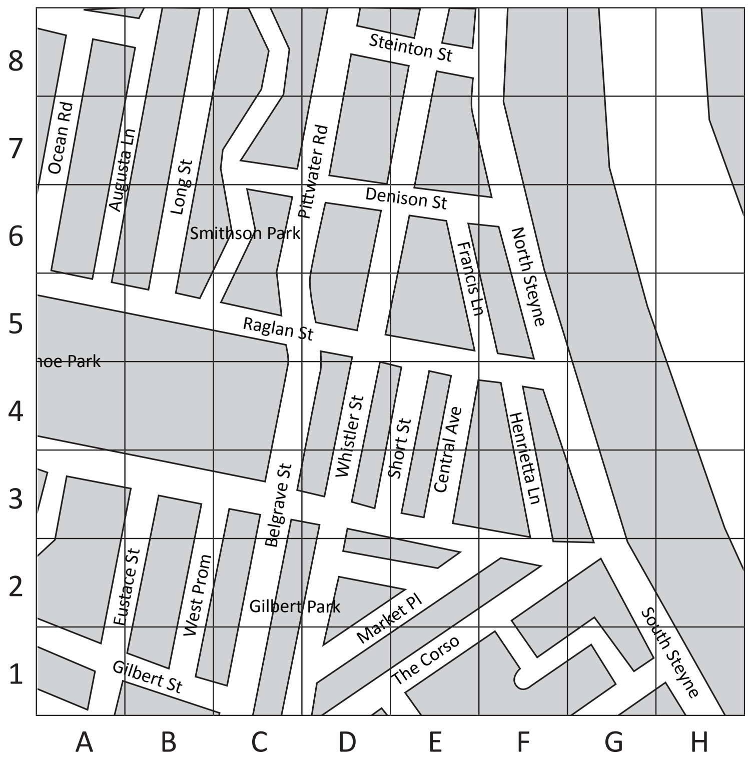
c Quicksand at H6

d Trap at D4

e Cemetery to cover F5, F6, F7

f Treasure at G4

9 **Look carefully at this map. Use the coordinates to answer the questions.**



a Which two streets intersect at E8?

____

____

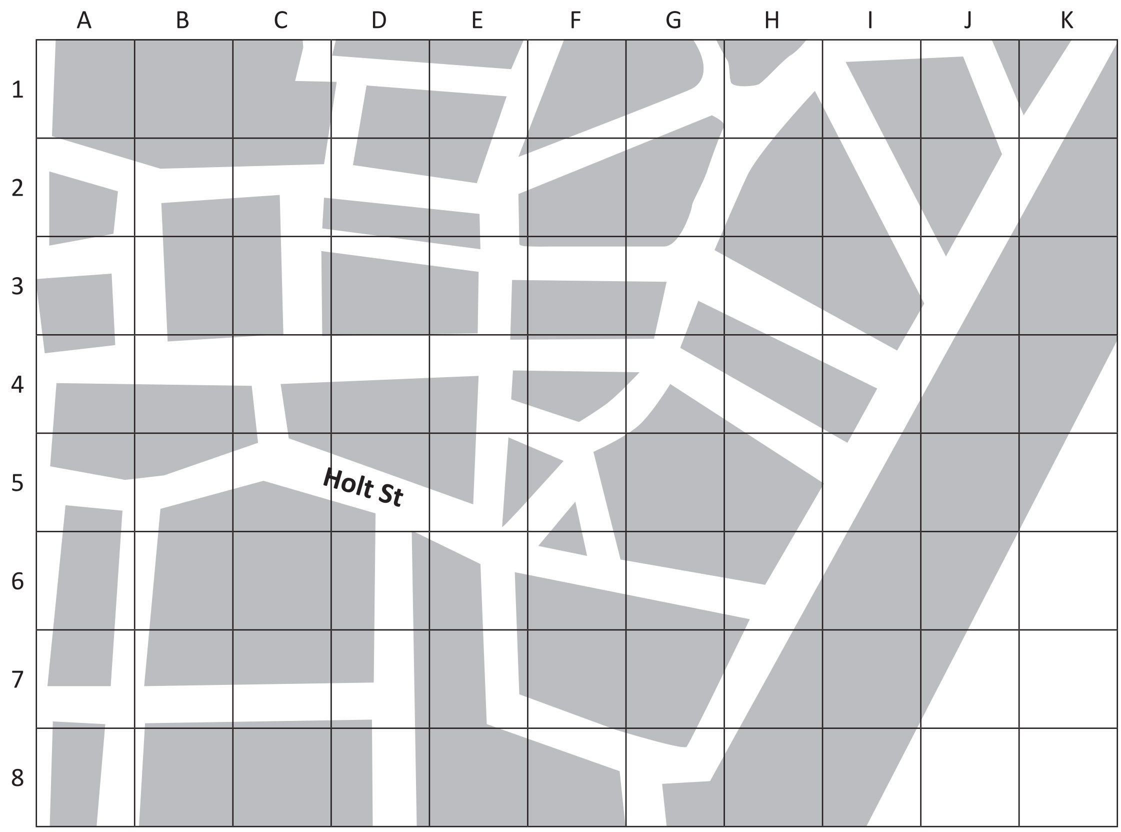
b Where am I if I'm standing at H1?

____

____

c If I ran from A1 and finished at F5, draw the route I could've taken on the map.

10 **This map is incomplete. There is only one street labelled.**



a Complete the map by labelling all the streets from the table below:

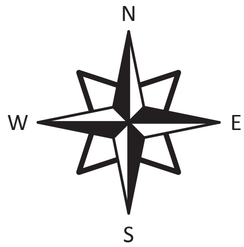
Label	Clue 1	Clue 2
Rollstone Street	A4	F4
Wood Street	A2	E2
Pearl Street	G8	K1
North Street	E3	G3
Ebor Street	D8	D5
West Street	E5	F1
Blue Street	E7	G8
Jessie Street	G3	H1
Cuba Street	I1	J3
Wigan Street	A7	D7

b You live on Wigan Street and your friend lives on North Street. Draw your houses on the map. Write a set of directions for your friend to visit you.

Position – using a compass

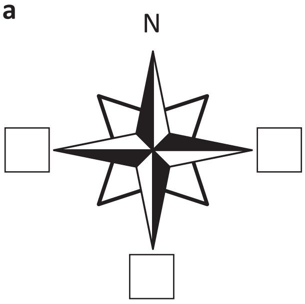
We can use a compass to help us with direction. There are four main points on a compass – north, south, east and west.

If the compass points exactly to the north, we say the direction is due north. The same applies to south, east and west.

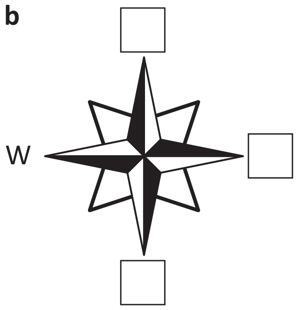


1 **On each compass, some directions are missing. Fill in the missing ones:**

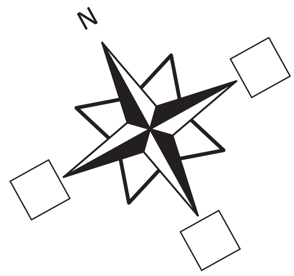
a



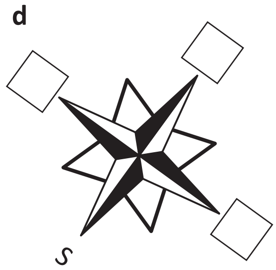
b



c

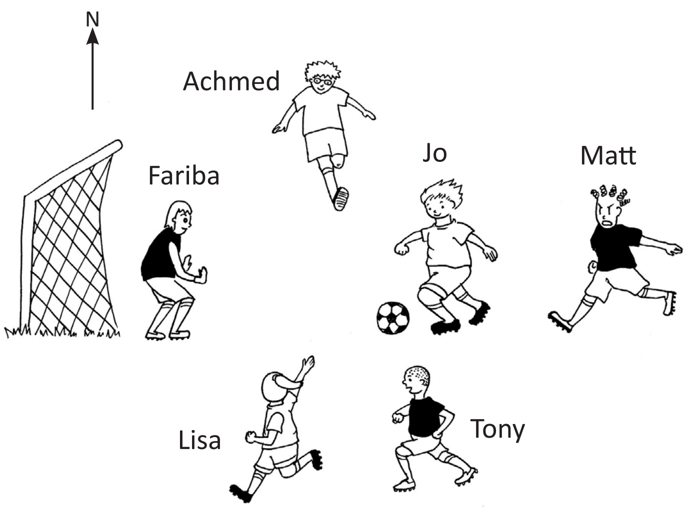


d



2 **List some times people might use compasses:**

3 **Note where north is in this scene below. Use the compass in the top box to help you answer the following questions:**



a In which direction is Jo kicking? ______________

b In which direction is Fariba facing? ______________

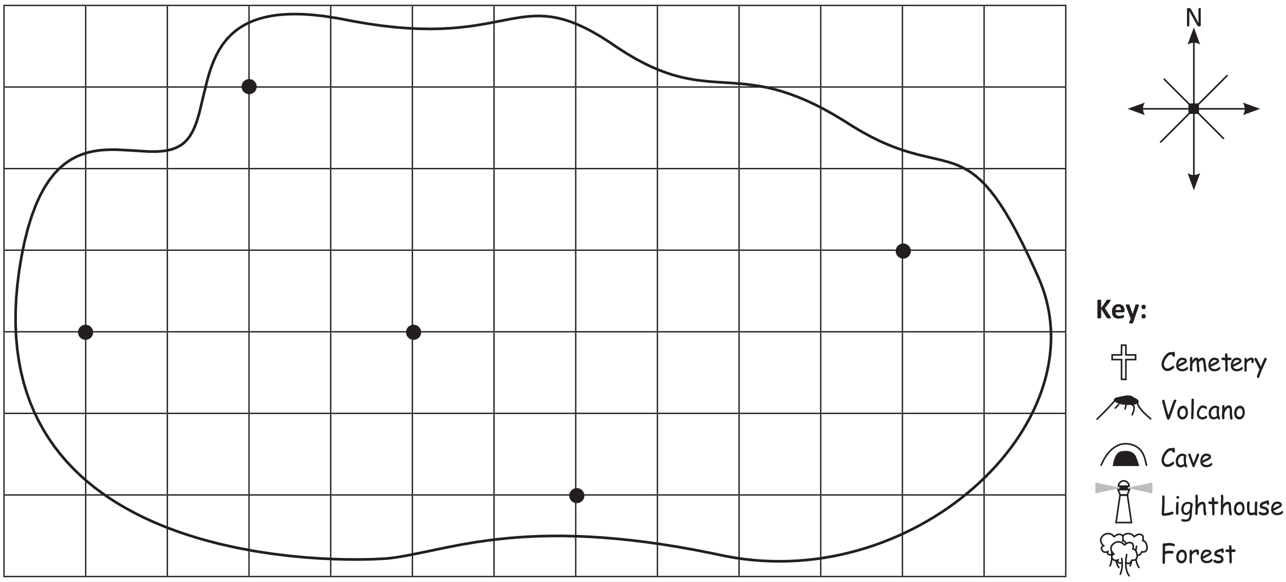
c If Jo passes off to Tony, in which direction will she kick? ______________

d If you were Jo, would you shoot for goal? If not, who would you pass to and why?

Position – using a compass

4 **On the grid, create a simple treasure map:**

a At each marked point, add a place of interest that treasure hunters might go past on their search. Use the symbols in the key. Decide where you'll hide the treasure but don't mark it on the map.



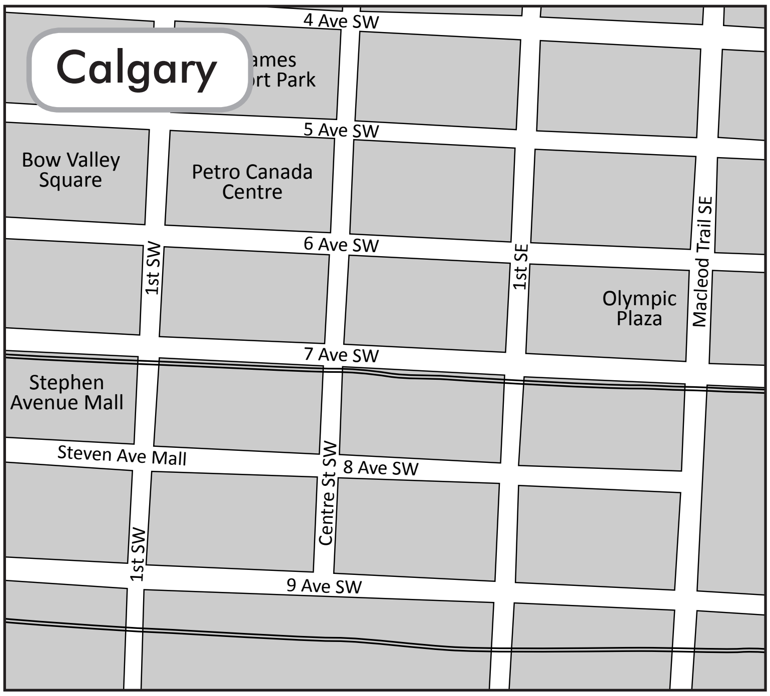
b Now write a set of directions for your treasure hunters to follow – using north, south, east or west and the number of squares they should travel. You need to decide where to start. Get them to mark their trail and put an X where they think the treasure is. Are they right? If not, what went wrong – your directions or their following of the directions?

My directions:

Position – maps

Knowing how to read maps is an essential skill when you're in unfamiliar territory. One of the keys is to visualise yourself and where you're headed on the map. Remember left and right can change depending on your direction!

1 **You'll be travelling to two cities. In each city, you'll follow directions to locate a secret spot. Mark your travels on the map. Some clues are cryptic and require thought. To add excitement, challenge friends to a race – the first to locate the secret spots and mark their travels correctly wins. Ready? Let's do it.**



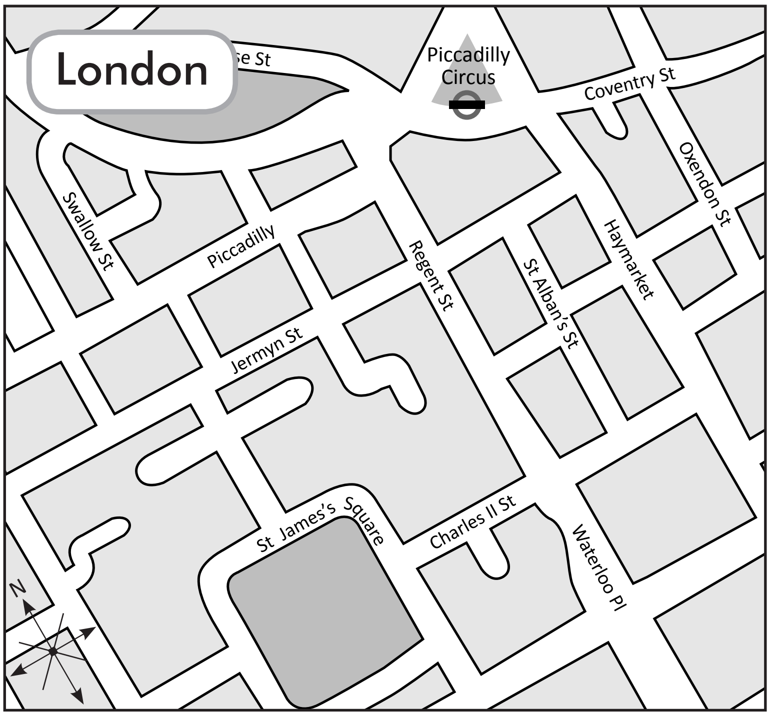
Calgary (Canada), is laid out in an easy to follow grid system. The streets are numbered with their direction.

You start off in Bow Valley Square at the intersection of 1st SW and 6 Ave SW. Head 2 blocks south down 1St SW then turn left.

Walk for 2 blocks then turn right and then right again. One block's walk should take you to a famous monument. Use the internet to find out the name of the monument and write it at this spot.

What was added to the top of the monument in 1987?

____



In **London** (UK), start at Piccadilly Circus Station.

Head east on Coventry St then south onto Oxendon St.

Take your second right and then your first right.

Head north on Haymarket, then turn left onto Jermyn St.

Turn left onto Regent St and right at a street named after a king. Follow that till you reach a square. Where are you?

____

In the middle of the real life area is a statue of King William lll on a horse. Draw a crown to mark this.

A picture tells a thousand words — apply

Getting ready

In this activity, you'll practise translating the pictures in your head into reality. You do not have to be great at drawing – just good at listening carefully to the description of the positions. You'll need a partner, paper and a pencil.

What to do

Take turns reading the following information to each other. If you're being read to, close your eyes and build a picture of the scene in your head. Once the descriptions are finished, draw the picture you have in your head on paper. Check it against the written information. It does not have to be a bird's-eye view.

Reader 1

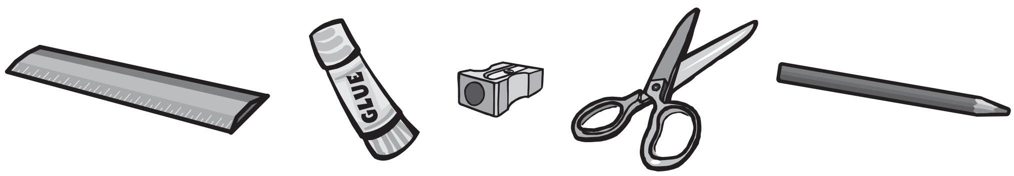
1. You're in a square-shaped park. In the top right hand corner is a large tree.
2. In the centre of the park is a pond. This pond has a rock in the middle and some weeds around the edges.
3. In the bottom right hand corner of the park is a picnic table. On the table are 2 cups, 2 plates and an orange.
4. On the opposite side of the park is a slide. It's about halfway between the top and the bottom of the park. One child is at the top and two are waiting at the bottom.

Reader 2

1. You're creating a bird's-eye view of a square bedroom. There's a window in the centre of the top wall and a door in the centre of the opposite wall. Place a 'W' where the window is and a 'D' for the door.
2. You put a bed in the top left hand corner of the room. It runs along the wall with the window.
3. On the right hand side of the bed is a chest of drawers.
4. Opposite the chest of drawers on the other side of the room, is a bookcase.
5. A desk with a computer is next to the door, on the left hand side of the door.
6. A rug runs down the centre of the room from the bed to the door.

What to do next

This is like the party game 'Memory'. Arrange a few items on your table top. Give your partner time to make a picture in their head of the arrangement, then get them to turn their back. Make one change to the arrangement. Your partner has to guess what you've done. Swap.



Tell me where to go … create

Getting ready

In this activity you're going to plan and create a set of directions for a journey around the school using the pictures in your head as your guide. A partner will then follow your directions without knowing where they are going.

You'll need some paper and pencils.

What to do

1. Close your eyes and map a route within the school in your head, such as from the library to the classroom or from the office to a specific drinking fountain.
2. Now write the directions using the pictures in your head as a guide. Make sure you don't reveal what the target location actually is.
3. Give the directions to a partner and walk with them as they follow your instructions. You can't clarify or change anything!
4. How do they go? Do they get there?
5. If any of your instructions were misleading, circle the ones you need to change and then make the alterations.
6. Give your amended directions to another person and see how they go this time.

What to do next

Create a map of your route.

Expressions you can use:

straight ahead

turn left or right

diagonally

opposite

adjacent

take your 3rd left

go down

until

approximately

Coordinate line up

apply

Getting ready

For this game, you'll need:

- a partner
- the grid below
- 1 normal die
- 1 die with letters A, B, C, D, E, F written on paper taped over each side
- 2 different coloured pens

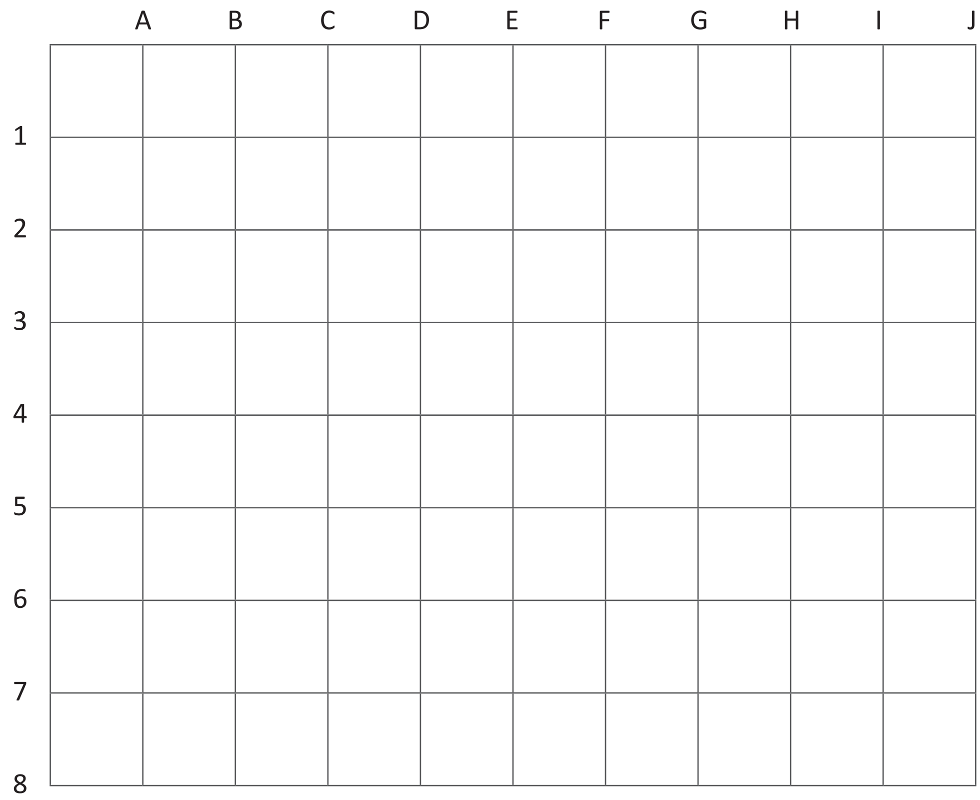
What to do

Instructions:

1 Player 1 rolls both dice and marks the coordinate with their coloured pen.

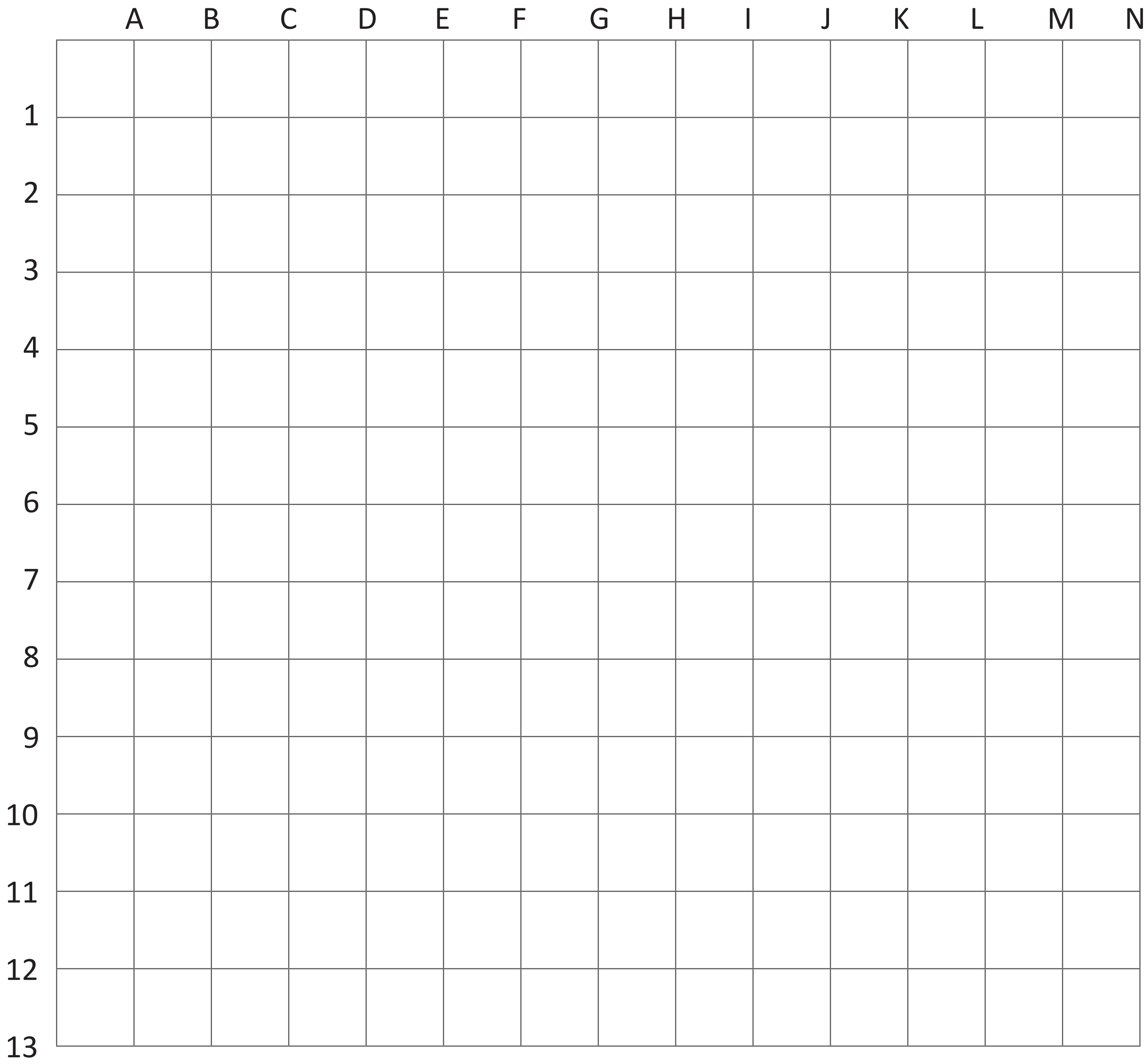
2 Player 2 rolls the dice. If the point is already taken, they miss their turn. If not, they mark the coordinate with their coloured pen.

3 The first player who can draw a line through 3 points in a row (horizontally, vertically or diagonally) wins.



What to do next

Play again so the winner is the person who completes a square around one of the other player's points.



Connect these coordinates	
G1 to B4	G13 to L4
B4 to L4	L4 to B10
L4 to G1	B10 to G13
G1 to G13	L10 to B10
G13 to B4	B10 to B4
B4 to L10	L4 to L10
L10 to G13	

North, south, east, west! apply

Getting ready

This is a game for 5 or more players. It's fun as a whole class activity as well.

You'll need to make 4 cards, each labelled with a different main compass direction. You will also need a blindfold.

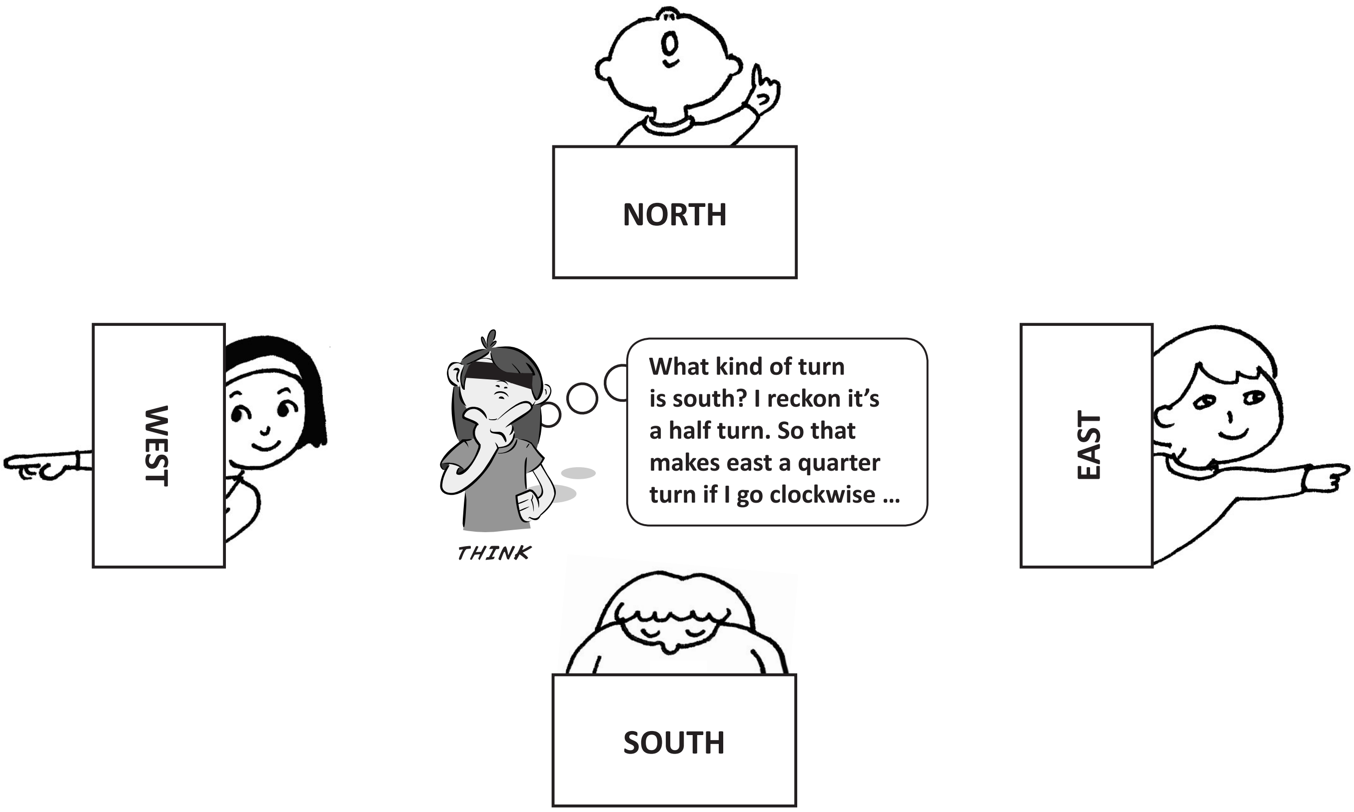
What to do

1 Place the cards in their correct positions. Choose a caller.

2 The caller stands in the middle facing north, with their eyes closed or wearing a blindfold.

3 The other players choose a direction to stand at. Once everyone's in postion, all call out, 'North, south, east, west! Which direction do you like best?'

4 The caller names a direction and turns to face it. They then open their eyes.
If they are facing the right way, any student at that point is out.
If they are facing the wrong way or if no one is at that point, the caller swaps places with another player and everyone is back in.



What to do next

Too easy? Add north east, north west, south east and south west for an extra challenge.