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

Contents

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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

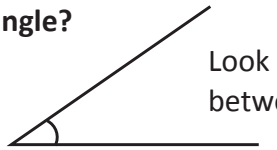
b 2 lines perpendicular to each other

c a horizontal line

d a vertical line

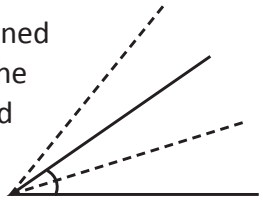
Lines and angles – lines

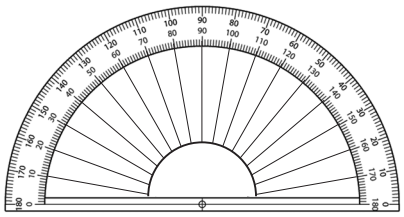
What is an angle?



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.

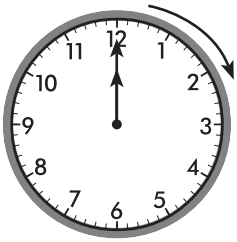
If we imagine that these two lines are joined at their meeting point, we could rotate the lines around this point. They'll stay joined but the amount of turn will change.





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

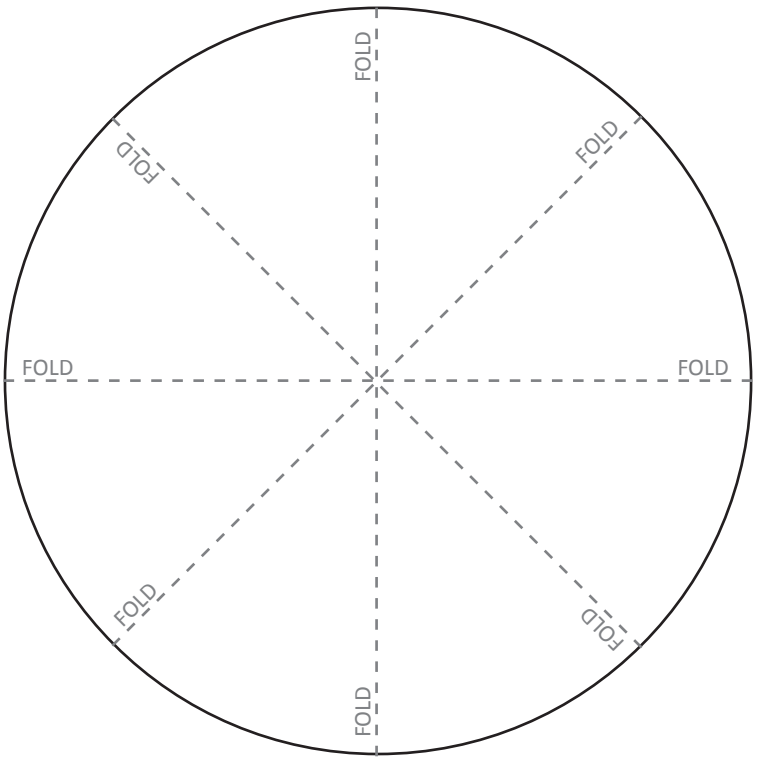
3 **A circle is a full turn and is 360°. Think of it as a clock – from 12:00 round to 12:00. Copy this page and then cut out the circle below and try the following:**



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

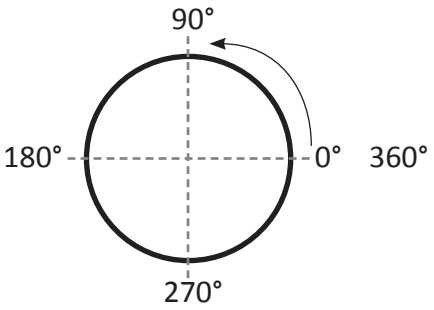
b Fold it in half again. You now have a quarter circle. How many degrees are in a quarter of a circle? _____

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



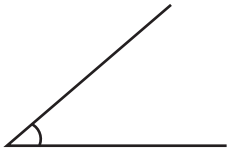
Lines and angles – introducing angles

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

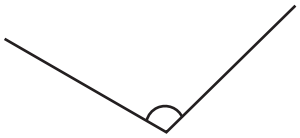
b

_____ angle

c

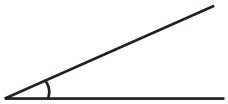
_____ angle

d



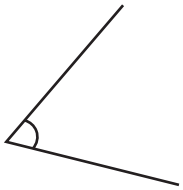
_____ angle

e



_____ angle

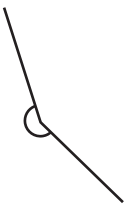
f



_____ angle

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

a

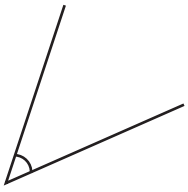


obtuse angle

b

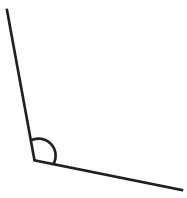
straight angle

c



reflex angle

d



acute angle

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

a

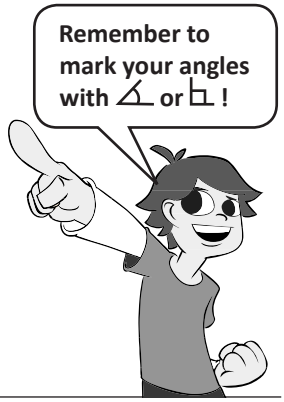
acute

b

right

c

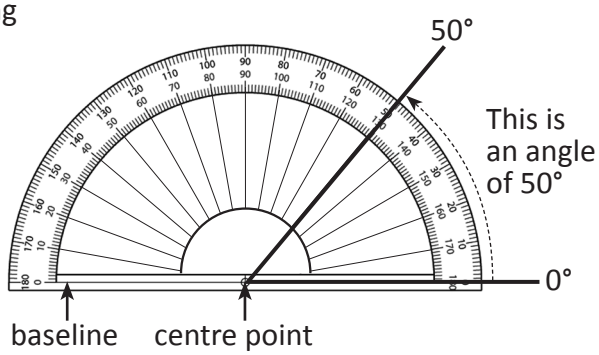
obtuse



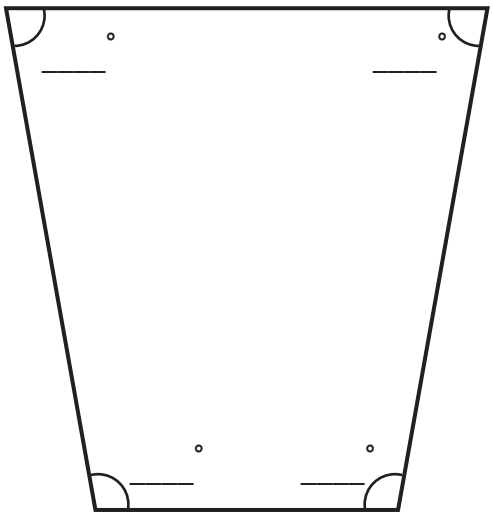
Lines and angles – measuring angles

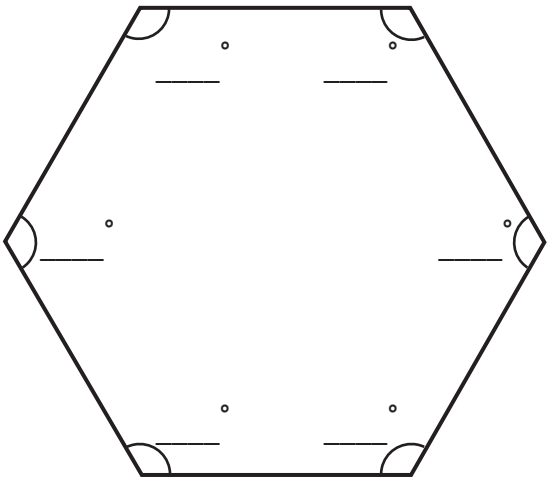
Sometimes we need to be more precise when naming angles, instead of just using terms such as acute or obtuse. This is where a protractor comes in handy.
To measure an angle using a protractor we:

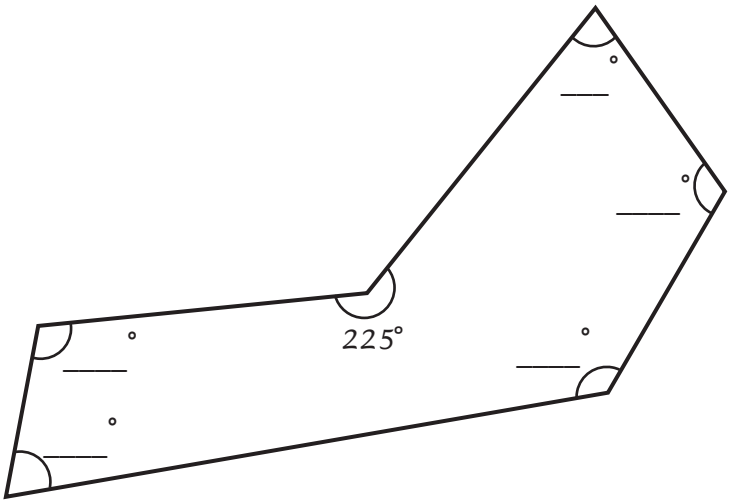
- fit the baseline of the protractor to one line of the angle, lining up the centre point of the protractor with the vertex of the angle
- look where the other line intersects the numbers, making sure we read round from 0°.



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







Lines and angles – measuring 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

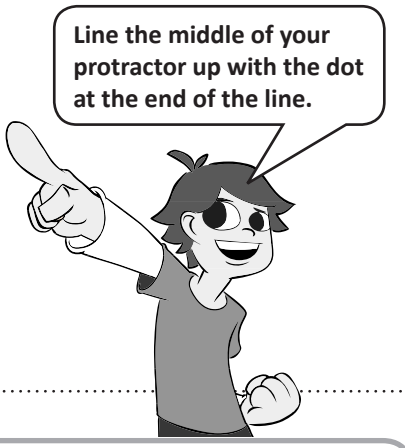
90°

d

110°

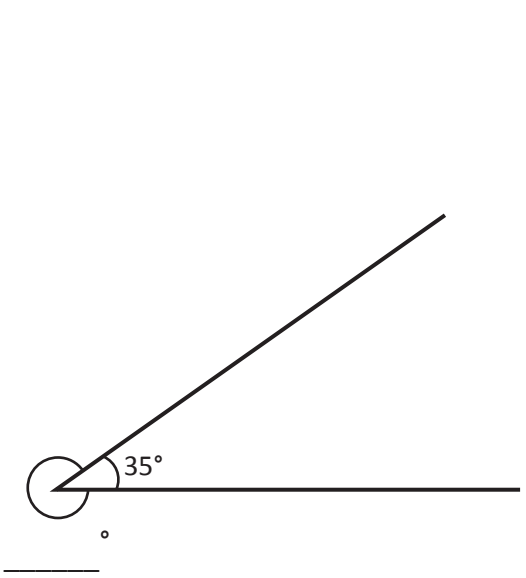
e

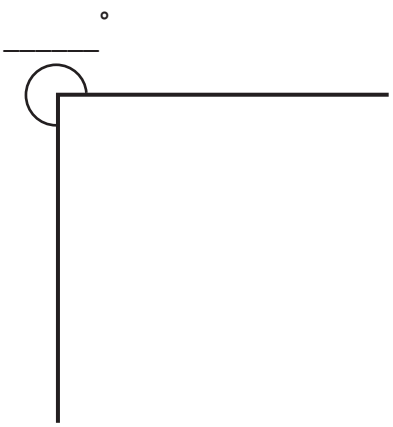
10°



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

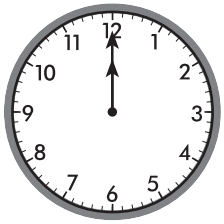
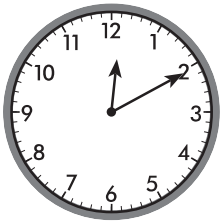
Getting ready

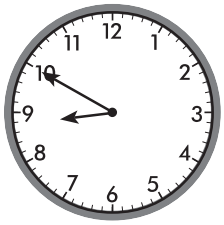
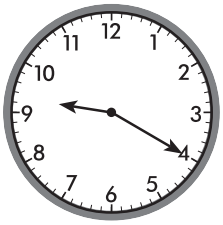
In this activity you will measure the passing of time not in minutes and hours, but in degrees.

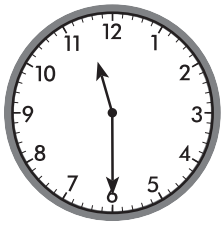
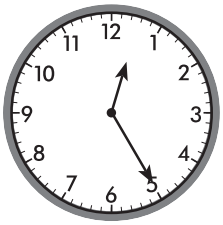
You can work with a partner and you may like to use a clockface with movable hands to help you work out the answers.

What to do

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

a   _____°

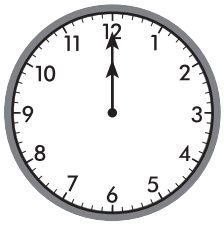
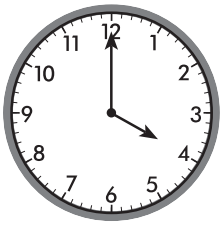
b   _____°

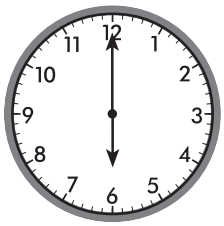
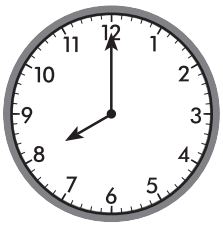
c   _____°

How many degrees are there in an hour? How many degrees are there in 5 minutes?

DISCOVER

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

a   _____°

b   _____°

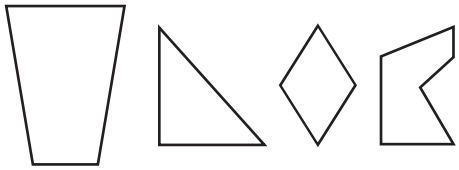
What to do next

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

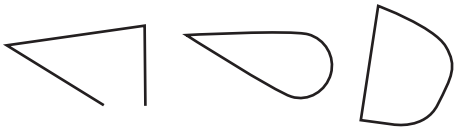
2D shapes – polygons

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.

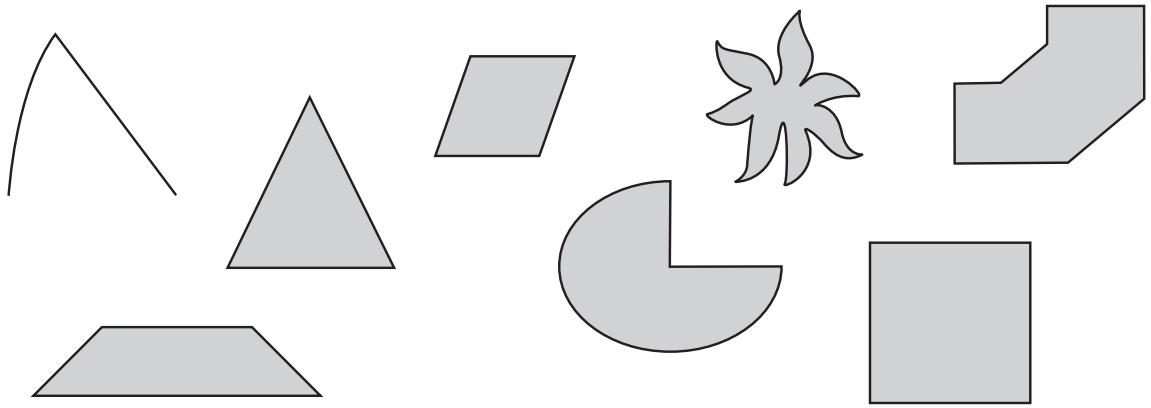


These are polygons.



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:**



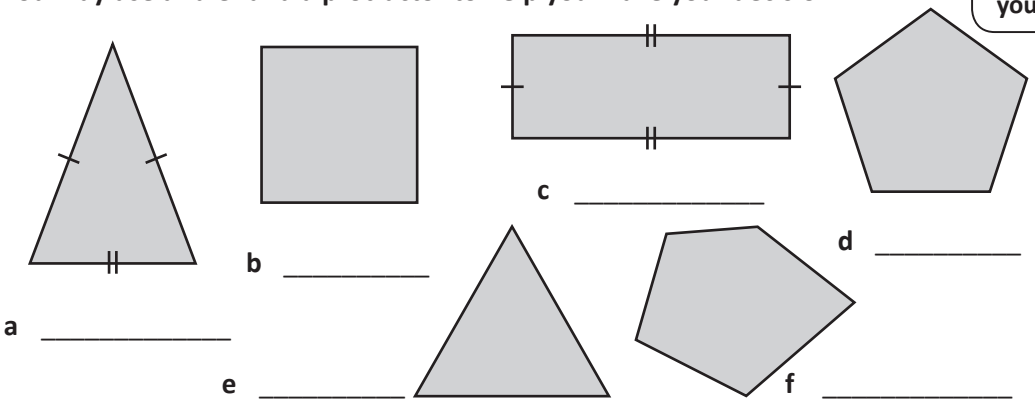
Polygons can be regular or irregular.

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.**



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 _____

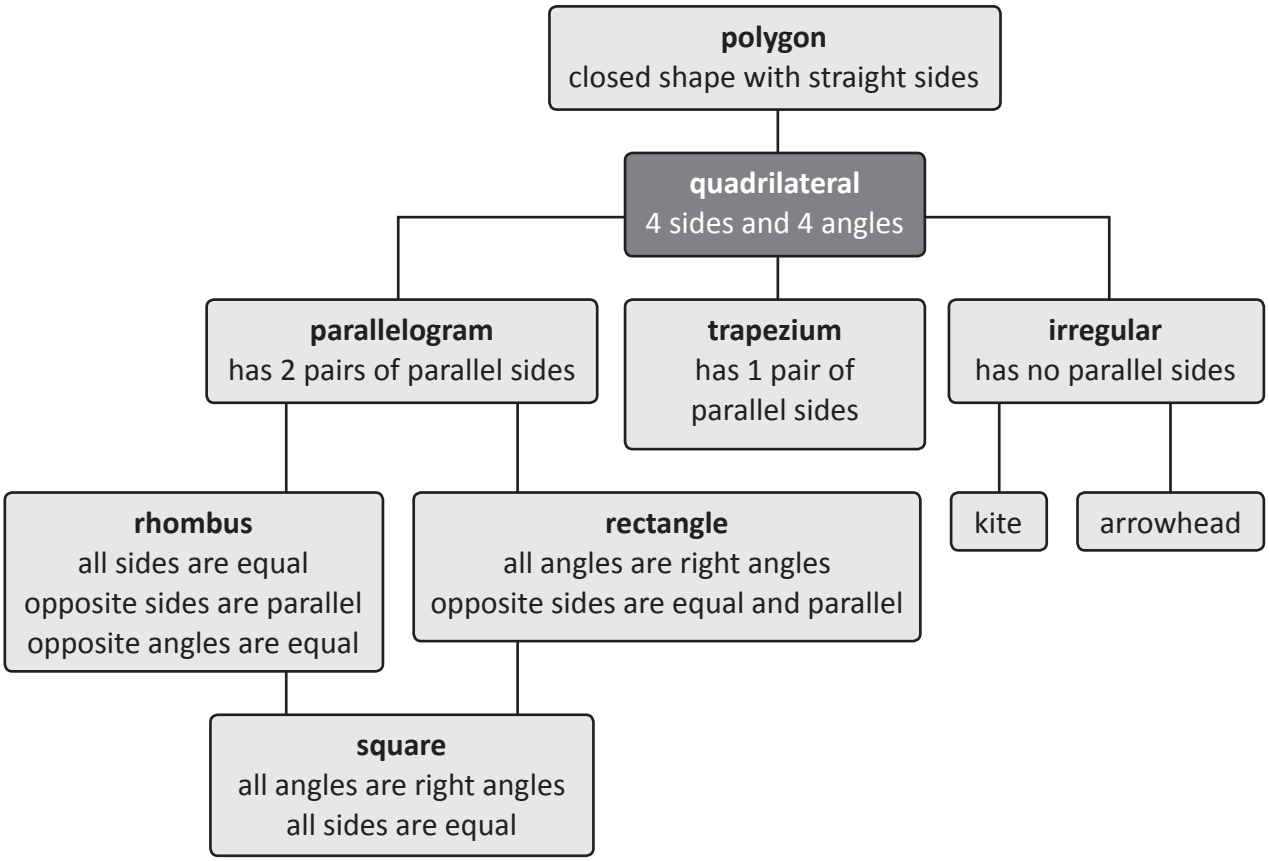
j 12 angles and 12 sides _____

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.

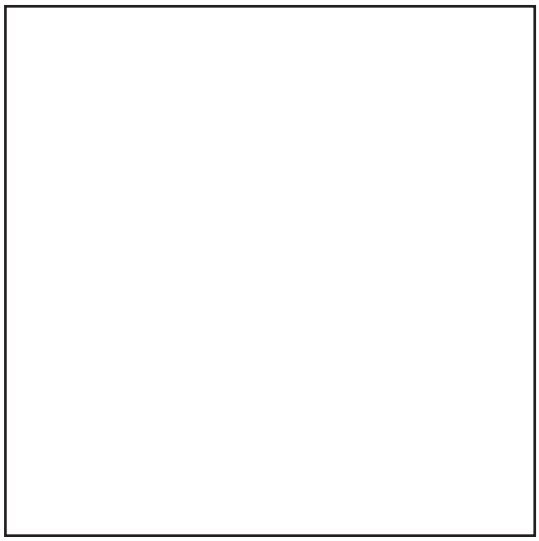
1 **Use the information above and the dot paper below to create a square, a rectangle, a rhombus and a trapezium. Check them against the criteria. Do they match? Swap with a partner and label each other's shapes.**

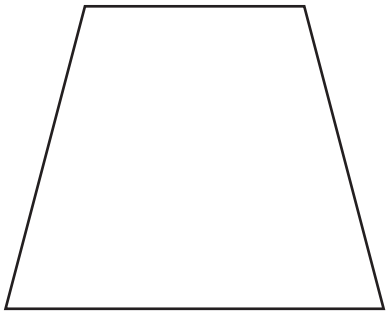
2D shapes – quadrilaterals

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 students. 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 90°.

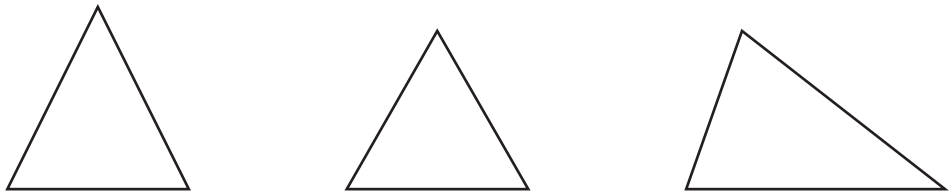
I'm a _____

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

I'm a _____

2D shapes – triangles

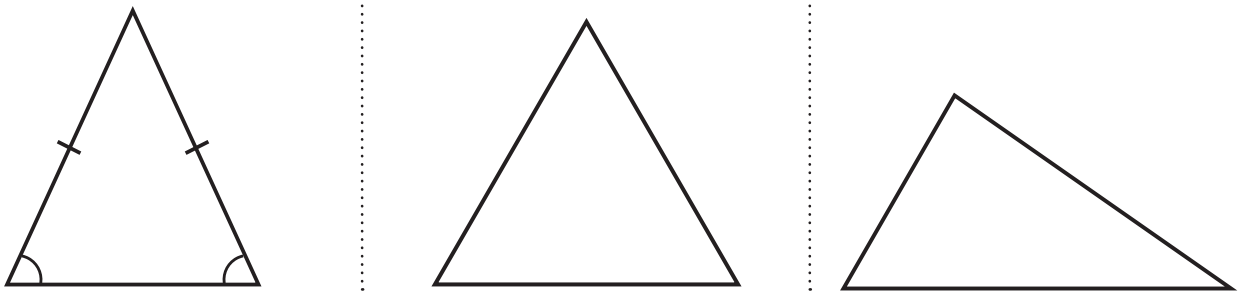
A triangle is a type of polygon. It has three sides and three angles. The three interior angles always add to 180°. Here are the 3 main types of triangles:



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.

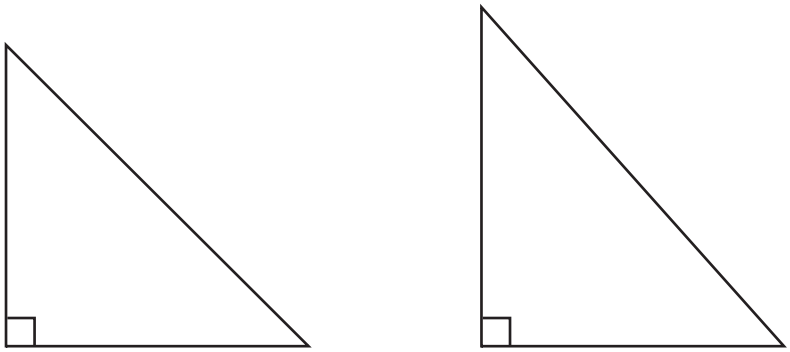
c Scalene triangles have _____ equal sides.

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.**



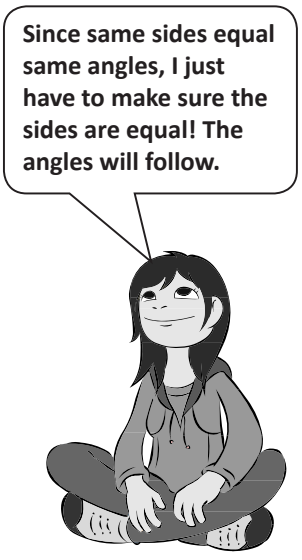
a Based on your measurements, can right angled triangles be either isosceles or scalene? _____

b Can they be equilateral? Why or why not?

_____

_____

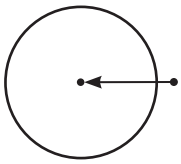
6 **Using a protractor to help you, draw an example of a right angled, equilateral, isosceles and scalene triangle below. Don't label them or mark the angles or sides as equal. Switch papers with a partner and measure and label each other's triangles. Switch back and check.**



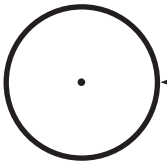
2D shapes – circles

A circle is also a 2D shape. It's a closed curve that has all of its points a fixed distance from the **centre**.

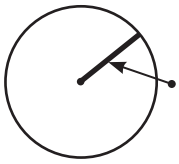
Later on, you will learn about the formal maths of circles – they're more complex than they look! Right now, it's important to recognise the different parts and to explore the relationships between the parts.



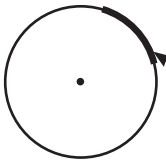
centre – this is the point in the middle



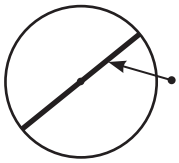
circumference – the distance around the circle



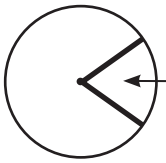
radius – the distance from the centre to the circle's edge



arc – part of the circumference



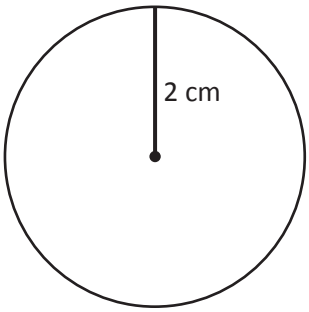
diameter – the distance from the edge of a circle through the middle to the opposite edge



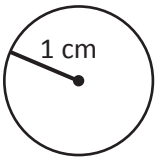
sector – a 'slice' of the circle

1 **Below are some circles. Each radius is marked.**

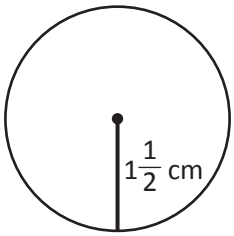
a Extend the radius through the midpoint to the opposite edge of each circle. You have now marked the **diameters**.



diameter ☐



diameter ☐



diameter ☐

b The diameter of each circle is twice its radius. Write the diameter of each circle in the boxes above.

Circle sense — apply

Getting ready

You'll play this game with a partner. You'll each need a copy of this page and it may pay to study the information on the previous page. The aim is to score the highest number of points you can by answering 10 questions. The harder questions score more points but of course, there is a greater risk of getting them wrong!

What to do

Read the questions below and choose the 10 questions you think will score you the highest number of points. Once you've decided on your questions, tick them. They're now locked in.

Once you and your partner have both finished, ask your teacher or the designated checker to check your answers. As Game Master, their decision is final. Who won?

FOR 5 POINTS

What is the distance around a circle called? ..... _____

What is the name given to a small part of the distance around a circle? ..... _____

Name the distance from the centre of a circle to its edge. ..... _____

What is the distance from the edge of a circle through the middle to the opposite edge called? ..... _____

What is the point in the middle of a circle called? ..... _____

What do we call a slice of a circle? ..... _____

Name a 3D object that is circular. ..... _____

FOR 10 POINTS

Is the radius of a circle twice its diameter? ..... _____

Every part of a circle's circumference is an equal distance from its centre. Is this statement correct? ..... _____

Name a 3D object that wouldn't work if it wasn't circular and explain why. _____

Is a circle a polygon? Why or why not? _____

Another name for the circumference of a circle is its perimeter. Is this statement correct?.. _____

A circle belongs to the quadrilateral family. Is this statement correct? ..... _____

If a circle has a diameter of 10 cm, what is its radius? ..... _____

The circumference of a circle is twice its radius. Is this statement correct? ..... _____

If a circle has a radius of 15 cm, what is its diameter? ..... _____

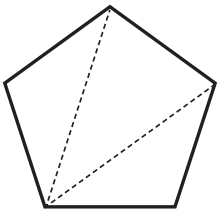
What to do next

Play again choosing different questions. You can reuse a question if you got it wrong but not if you answered it correctly the first time. If you run out of questions, design some of your own.

How many triangles? investigate

Getting ready

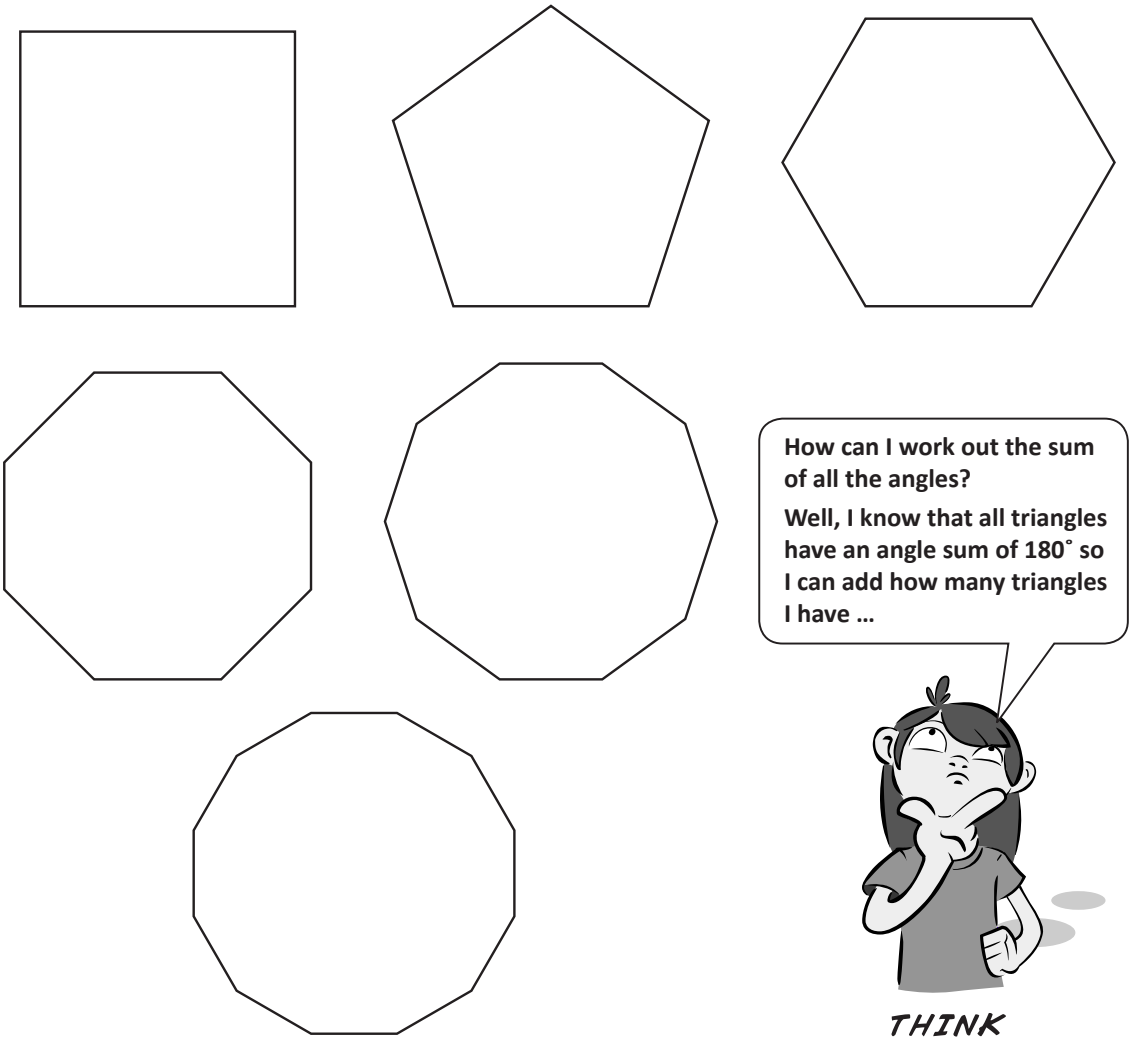
Use the shapes below. Your task is to section each shape into triangles. Your lines must go from corner (vertex) to corner and can't cross over each other.



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			



How can I work out the sum of all the angles?

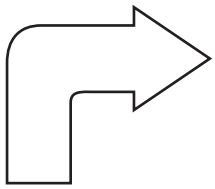
Well, I know that all triangles have an angle sum of 180˚ so I can add how many triangles I have …

THINK

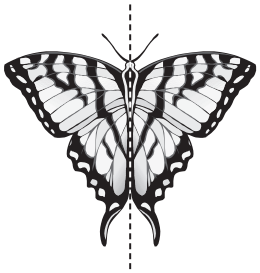
Transformation, tessellation and symmetry – symmetry

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:

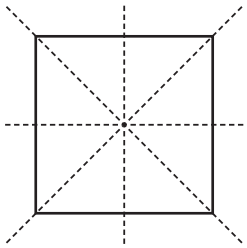
no line of symmetry



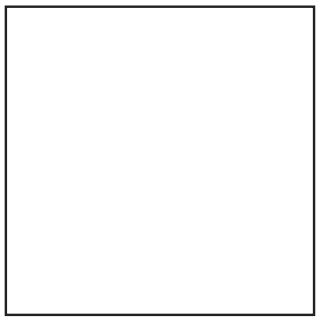
one line of symmetry



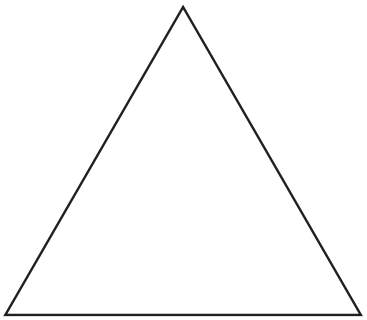
more than one line of symmetry



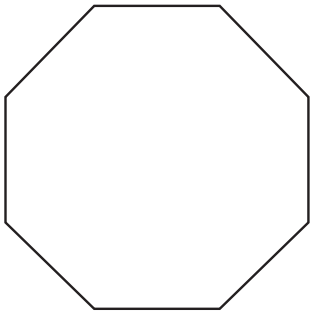
1 **Find and mark any lines of symmetry on these regular polygons. These can be vertical, horizontal or diagonal. If it's easier, cut out copies of the shapes and fold them to test them.**



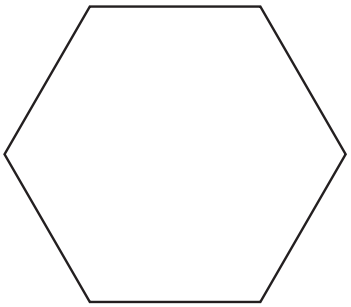
a A square has _____ lines of symmetry.



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

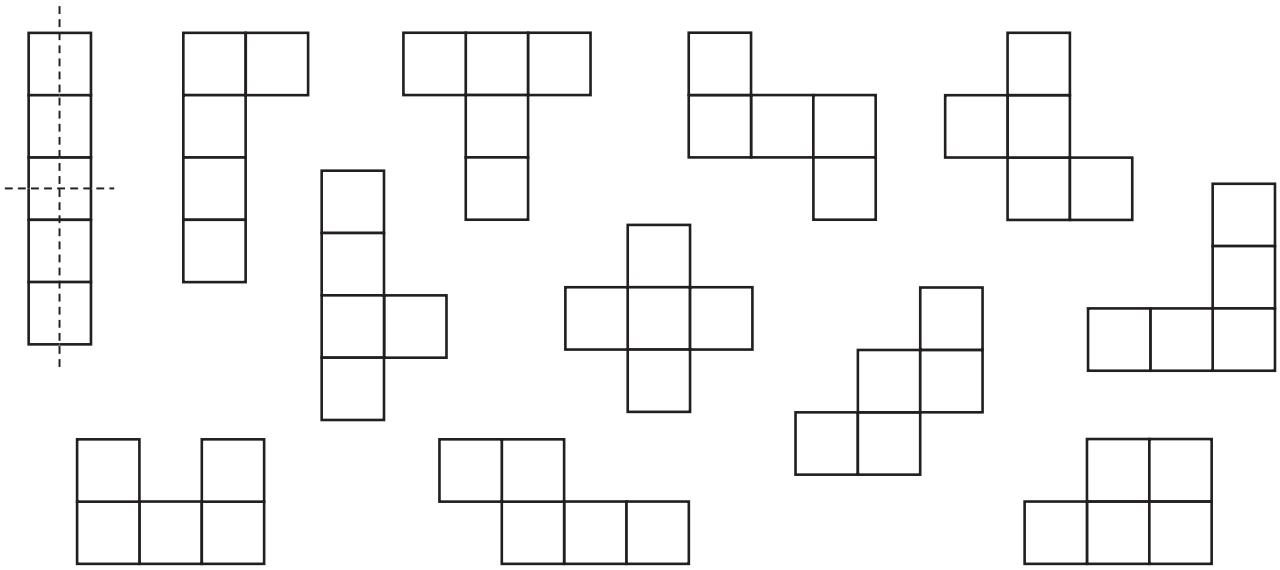
J K L M N O P Q R

S T U V W X Y Z

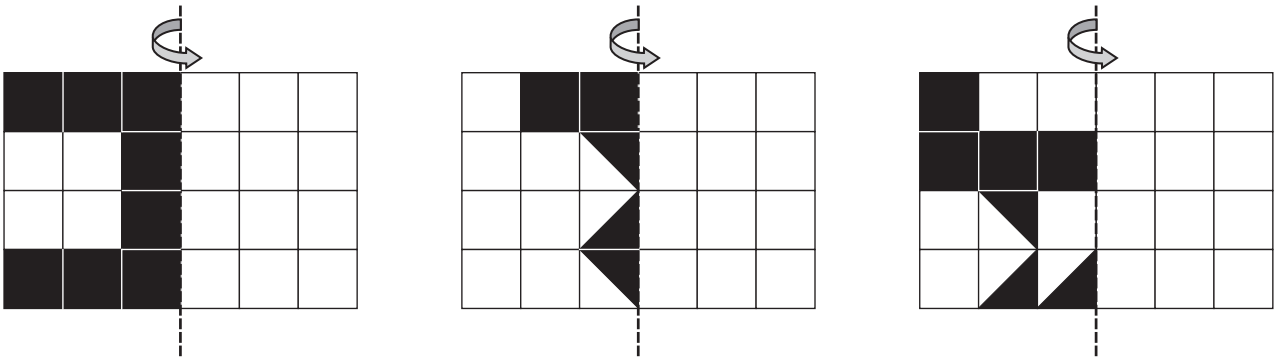
Vertical line of symmetry	Horizontal line of symmetry	More than one line of symmetry	No lines of symmetry

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.**

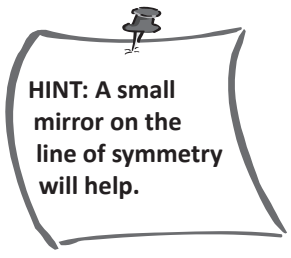
5 **These shapes are called pentominoes. Some have lines of symmetry. Draw them in. The first one has been done for you.**

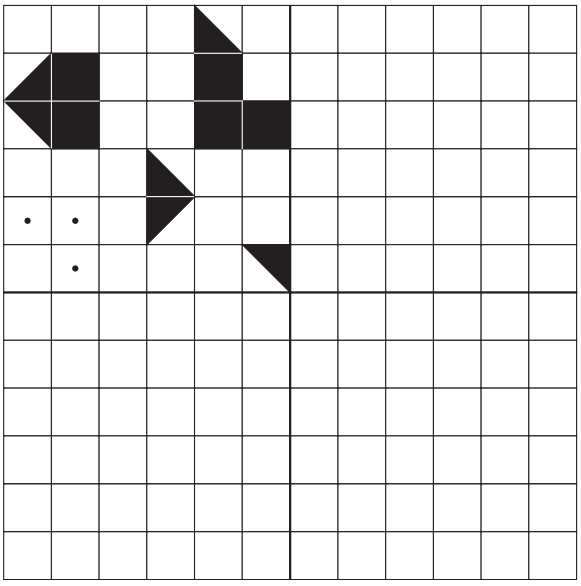


6 **Colour the other half of these pictures so that they're symmetrical:**



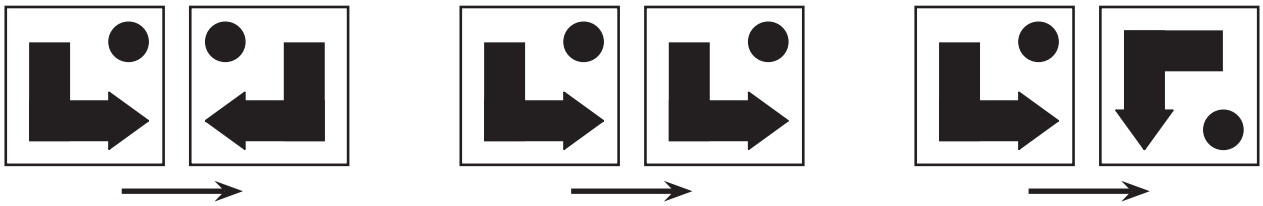
7 **Using the vertical line as the line of symmetry, draw the mirror image in the top right square. Now reflect the picture on the other side of the horizontal line of symmetry.**





Transformation, tessellation and symmetry – transformation

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



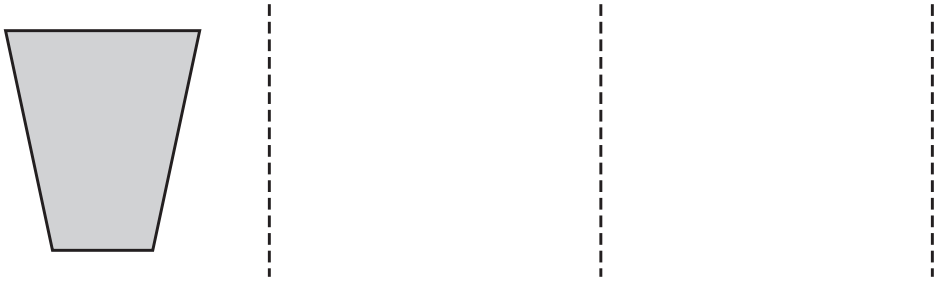
reflect (flip)

translate (slide)

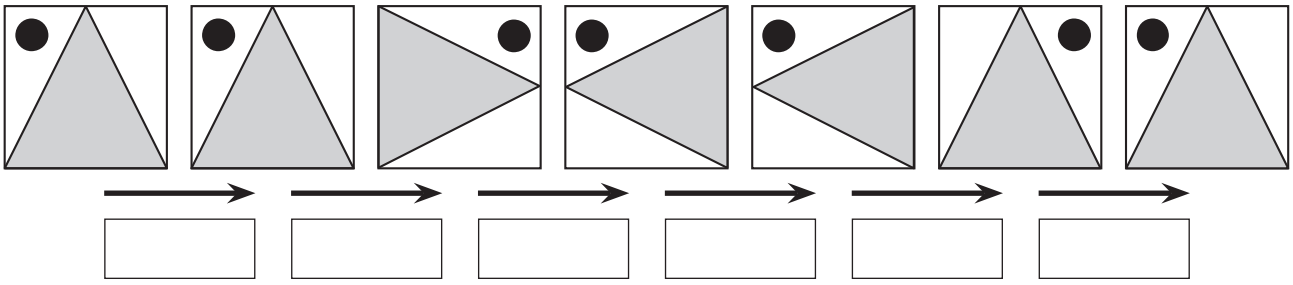
rotate (turn)

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

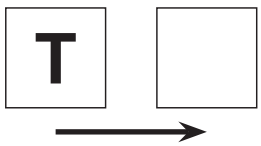
1 **Look at this trapezium. Flip it in your head and then record what it looks like. Then turn it 180˚ clockwise (a half turn) in your head and record what it looks like now. Turn it another 90˚ clockwise (a quarter turn) and record.**



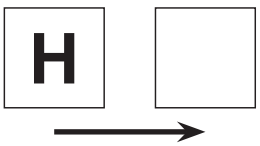
2 **What has been done to this tile? Describe each transformation as either a flip, slide or turn:**



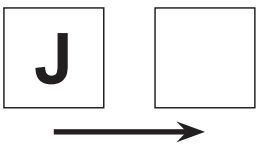
3 **Transform these letters:**

a 

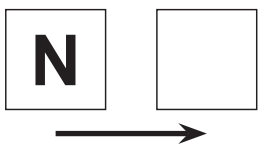
turn 90° clockwise

b 

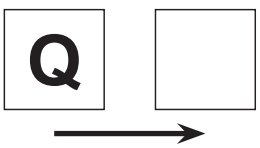
flip

c 

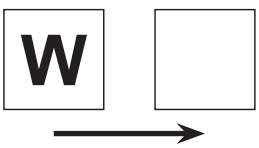
slide

d 

flip

e 

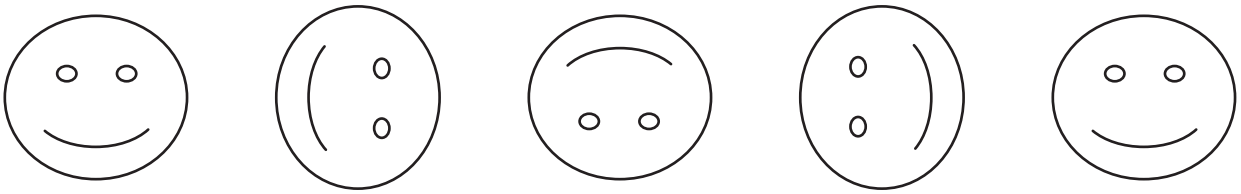
flip

f 

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 ꟼⅅЯIS.**

These are common rotations:

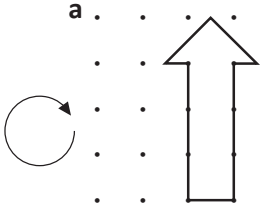


original position | quarter turn 90˚ | half turn 180˚ | three quarter turn 270˚ | full turn 360˚

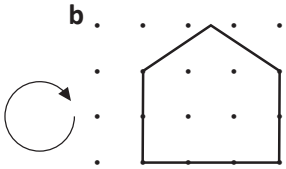
What do you notice about a full turn?

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.**

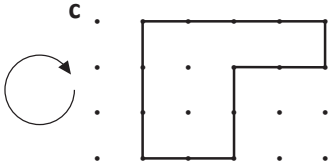
a



b



c



Transformation, tessellation and symmetry – tessellation

Tessellation comes from the Greek word, *tessere*, which means square tablet. It means covering a surface with a pattern of 2D shapes with no gaps or spaces. When we tessellate a shape, we often flip or turn the shapes so that they fit together.

Some shapes will tessellate on their own. We call this regular tessellation.

Some shapes tessellate when you use 2 shapes in the pattern. We call this semi-regular tessellation.

Tessellation is closely linked with art. Mosaics, patchwork and paving use tessellation. Can you think of others?

1 **We bet you've been tessellating with pattern blocks since you were a little kid. Now we want you to work out which shapes tessellate and which don't.**

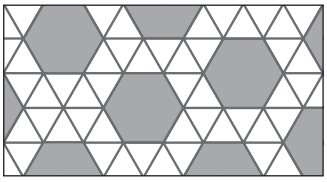
a Work with a partner and use pattern blocks to find 3 regular polygons that tessellate on their own. Remember, a regular polygon has sides of equal length. Record your proof below:

b Which of the 3 regular polygons tessellated without flipping or turning? _____

c Which regular polygons do you need to flip or turn to get them to tessellate?

_____

2 **Use pattern blocks to find shape pairs that tessellate. Record them here. How many can you find? Here's one to get you started:**

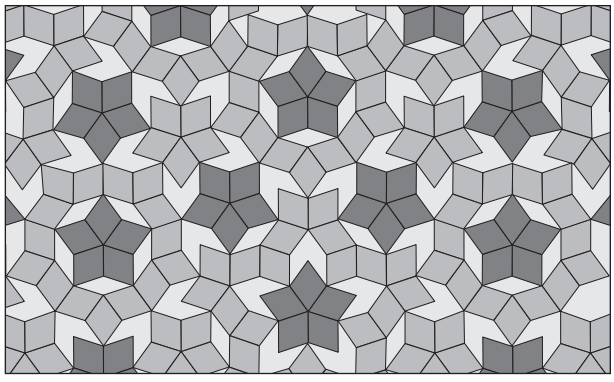


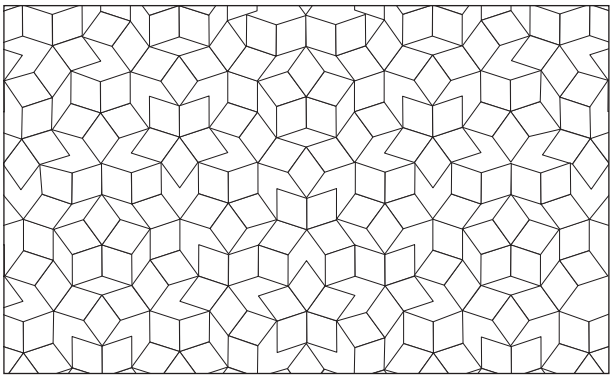
3 **It's said that all quadrilaterals tessellate. Is this true? Work with a partner to test this theory out. Use blocks or tessellation shapes such as those below. Record your findings below then tick the ones that tessellate once you know:**

4 **Do you agree with the statement that all quadrilaterals tessellate? Why or why not?**

5 **Tessellations usually involve creating a pattern and repeating it over and over. A famous mathematician named Roger Penrose was obsessed with finding a tessellation that was created without repeating any large patterns. It took him a while but he got there. It's often called "Kites and Darts" as the two parallelograms in the pattern resemble these.**

Colour the pattern in colours of your choice on the right to recreate his discovery. While you're doing that, check – can you see any large repeated patterns?



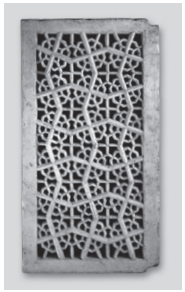


Tessellate and create

create

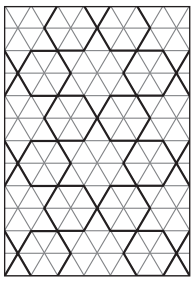
Getting ready

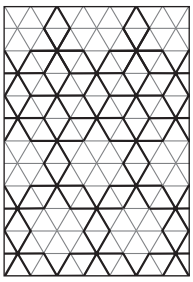
Many cultures and art styles use tessellations as a basis for creating intricate and beautiful patterns. Islamic art is one such art form. Look at the examples below.

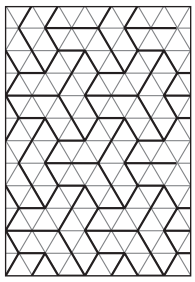


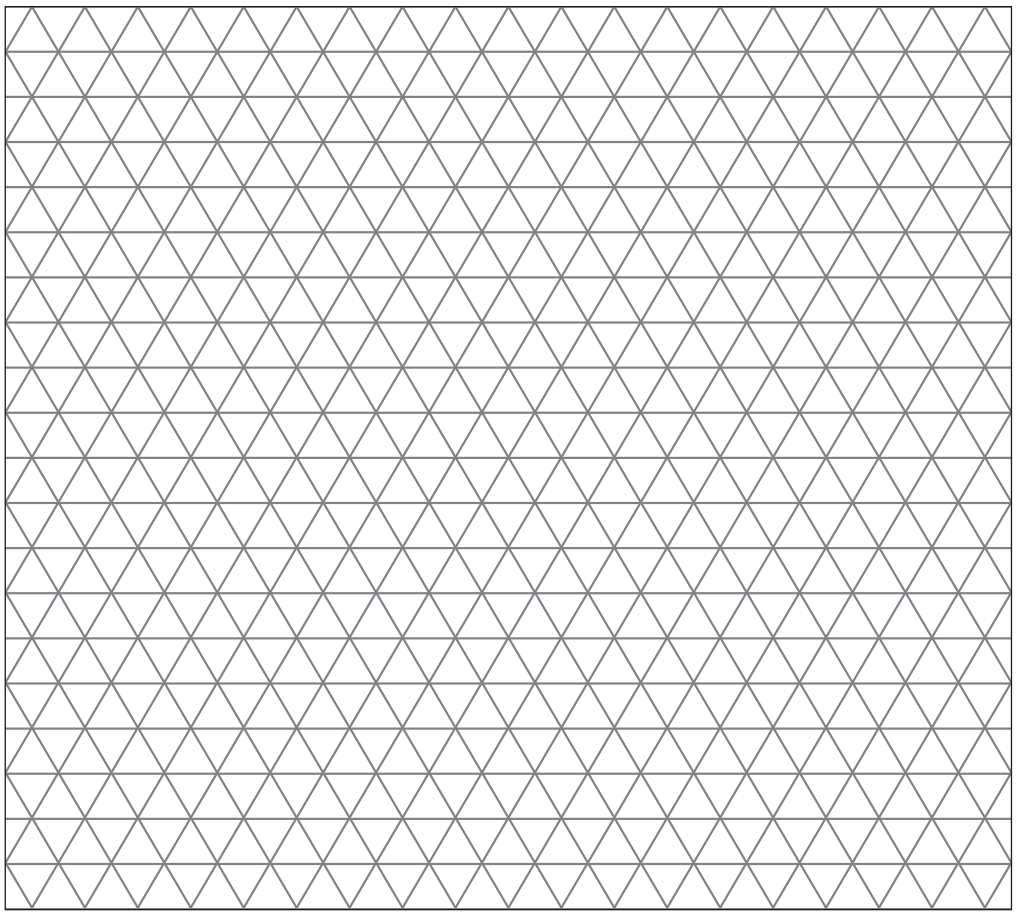
What to do

Recreate one of the designs below by ruling over certain lines. Pick a colour scheme and complete your design.









Dig it, Dr Jones

create

Getting ready

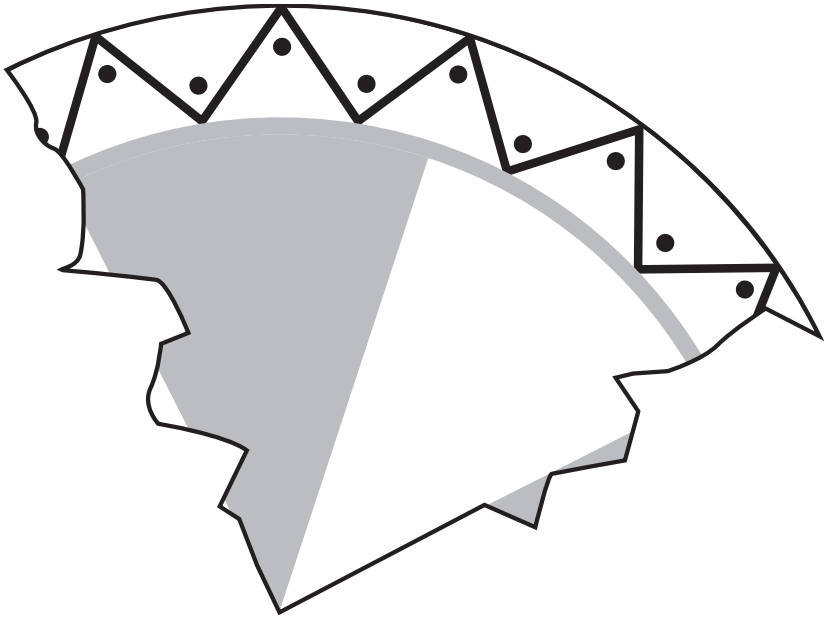
While working on an archaeological dig with the famous Dr Jones, you come across a portion of a beautiful old plate.

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

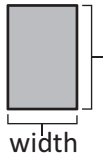
You have $\frac{1}{4}$ of the plate. You need to find a way to recreate the rest of it. How will you do this? Would a compass help? How will you find the right centre point?

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

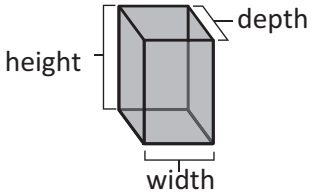


3D shapes – introduction

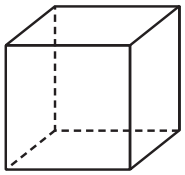
2D shapes have 2 dimensions – width and height. They're flat.



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

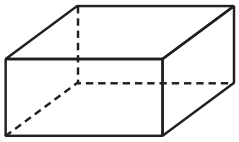


1 **Look at these 3D shapes. Which 2D shapes form their sides? If it helps, find the solids in your classroom and study them.**



a This is made of:

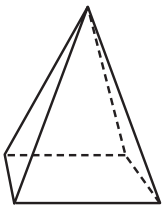
____ squares



b This is made of:

2 _____

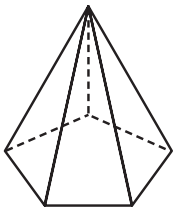
4 _____



c This is made of:

1 _____

____ _____



d This is made of:

____ _____

____ triangles

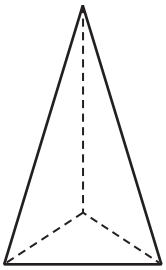
The 2D shapes are the **surfaces** of a 3D shape. The **edge** is where 2 surfaces meet. The **point** where 2 or more surfaces meet is called the **vertex**. If we're talking about more than one vertex, we call them **vertices**.

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

a How many surfaces does this shape have? [ ]

b How many vertices? [ ]

c How many edges? [ ]

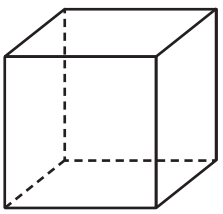


3 **Have these questions been answered correctly? Correct any mistakes:**

a How many surfaces does this shape have? [*6*]

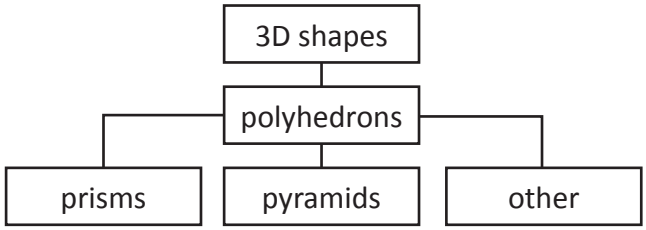
b How many vertices? [*12*]

c How many edges? [*8*]



3D shapes – polyhedrons

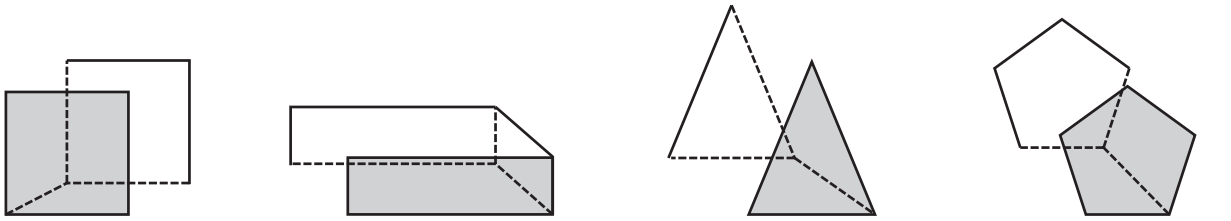
Some 3D shapes are polyhedrons. This means each surface is a polygon. The polyhedrons we most commonly come across are pyramids and prisms.



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. rectangular 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 **c** _____ prism **d** _____ prism

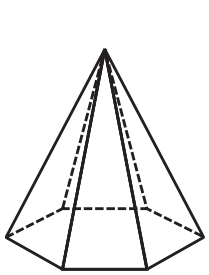
2 **Count the number of sides on each grey face. Now count the number of rectangular faces each shape has. What do you notice?**

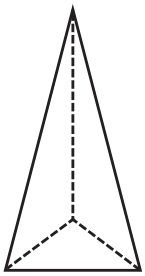
3 **Use classroom equipment such as geo shapes, polydrons or straws and plasticine to create 2 different prisms. Name them here and record how many vertices, edges and surfaces they have.**

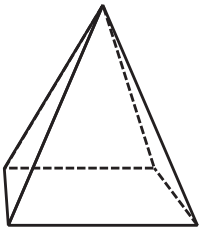
3D shapes – polyhedrons

Pyramids have a base with 3 or more straight sides. They have triangular faces which meet at a point. They're named after their bases.

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







a _____ pyramid **b** _____ pyramid **c** _____ pyramid

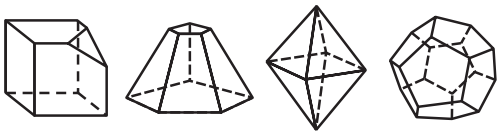
5 **What do you notice about the number of sides on the base and the number of triangular faces?**

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?**

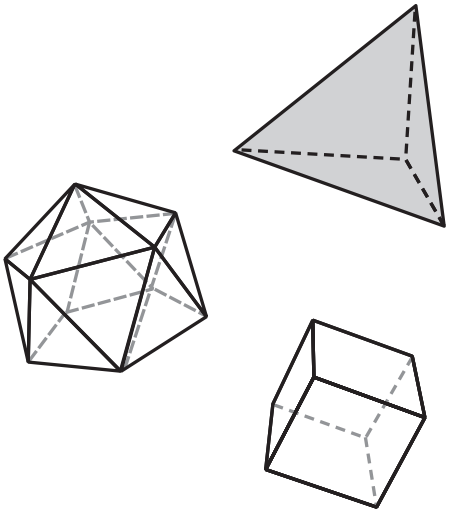
7 **What are 3 things pyramids and prisms have in common? What is something that makes them different?**

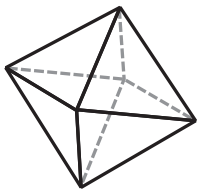
3D shapes – polyhedrons

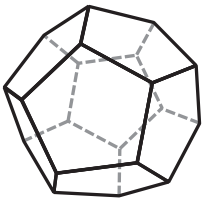
There are other kinds of polyhedrons. They're also made up of polygons and have straight sides, but they don't fit the rules for pyramids and prisms. Here are some examples:



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

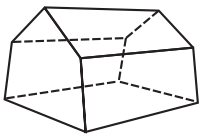
cube or hexahedron

6 faces, 12 edges, 8 vertices

20 faces, 30 edges, 12 vertices

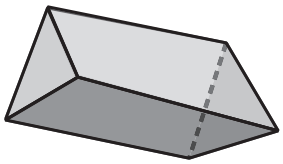
3D shapes don't have to be regular. They can be made up of different shapes and have angles and sides of different sizes.

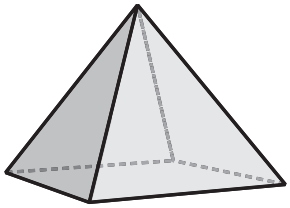
This is still a polyhedron: 

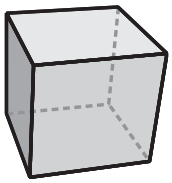
This is still a pentagonal prism: 

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.**



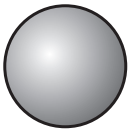


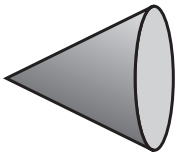


3D shapes – spheres, cones and cylinders

Another group of 3D shapes has one or more curved surfaces. Examples include spheres, cones and cylinders.

1 **Pretend you have to describe these shapes to someone who can't see or feel them. Make sure you talk about their surfaces, their vertices and their edges and anything else you think would help them build a picture.**

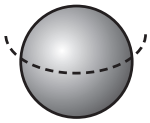
a 

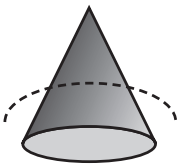
b 

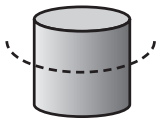
c 

2 **When we cut through a solid parallel to the base, we make a cross section.**

a Draw how these shapes would look like in 2 pieces:







b How has this changed the sphere? Explain this in terms of surfaces, edges and vertices.

3 **What am I? Use the clues to decide which shape I am:**

a I have 1 curved surface. That's it, I like to keep things simple. _____

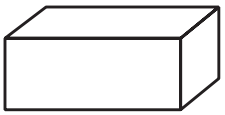
b When you cut a cross section from me, both parts keep the same number of edges and surfaces. _____

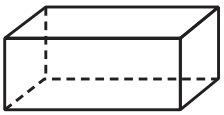
c I have no vertices and 3 surfaces. _____

d I have 1 edge and 2 surfaces. _____

3D shapes – drawing 3D shapes

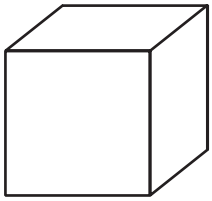
When we draw 3D shapes, we can draw dotted lines to show the surfaces, edges and vertices we can't see.



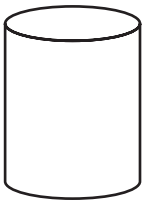


1 **Draw dotted lines to reveal missing edges, surfaces or vertices:**

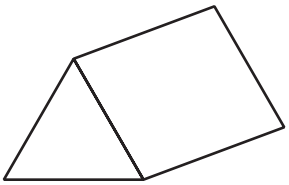
a



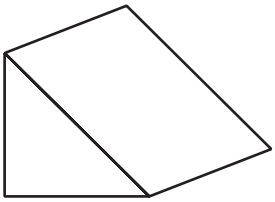
b



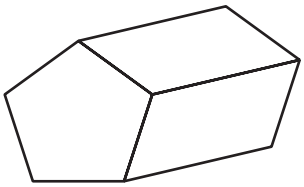
c



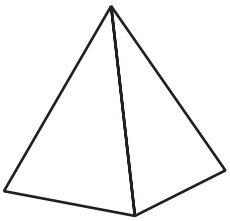
d



e

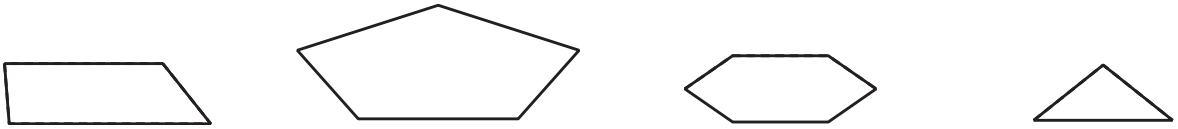


f



2 **Use a ruler to join the bases of these pyramids with their points:**

a **b** **c** **d**

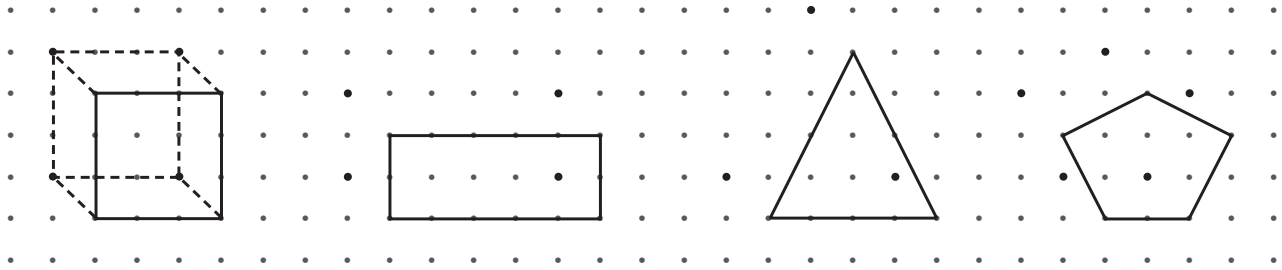


3 **Draw some 3D shapes:**

3D shapes – drawing 3D shapes

We can use dot paper or hexagonal grids to guide us when we draw 3D shapes.

4 **Use the dot paper to help you finish these shapes. We have helped you with the first one.**



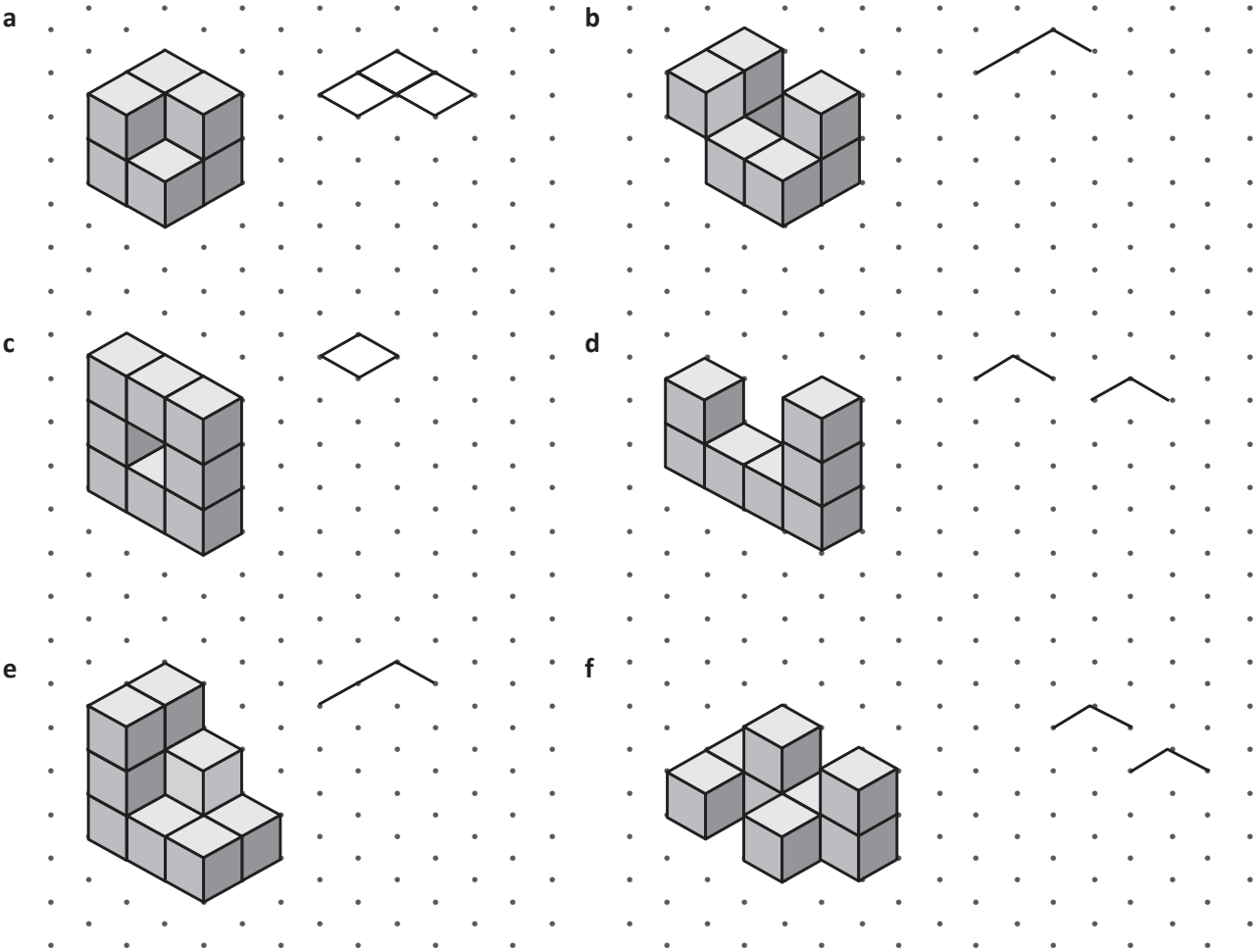
a cube

b rectangular prism

c triangular prism

d pentagonal prism

5 **Copy these irregular 3D shapes:**



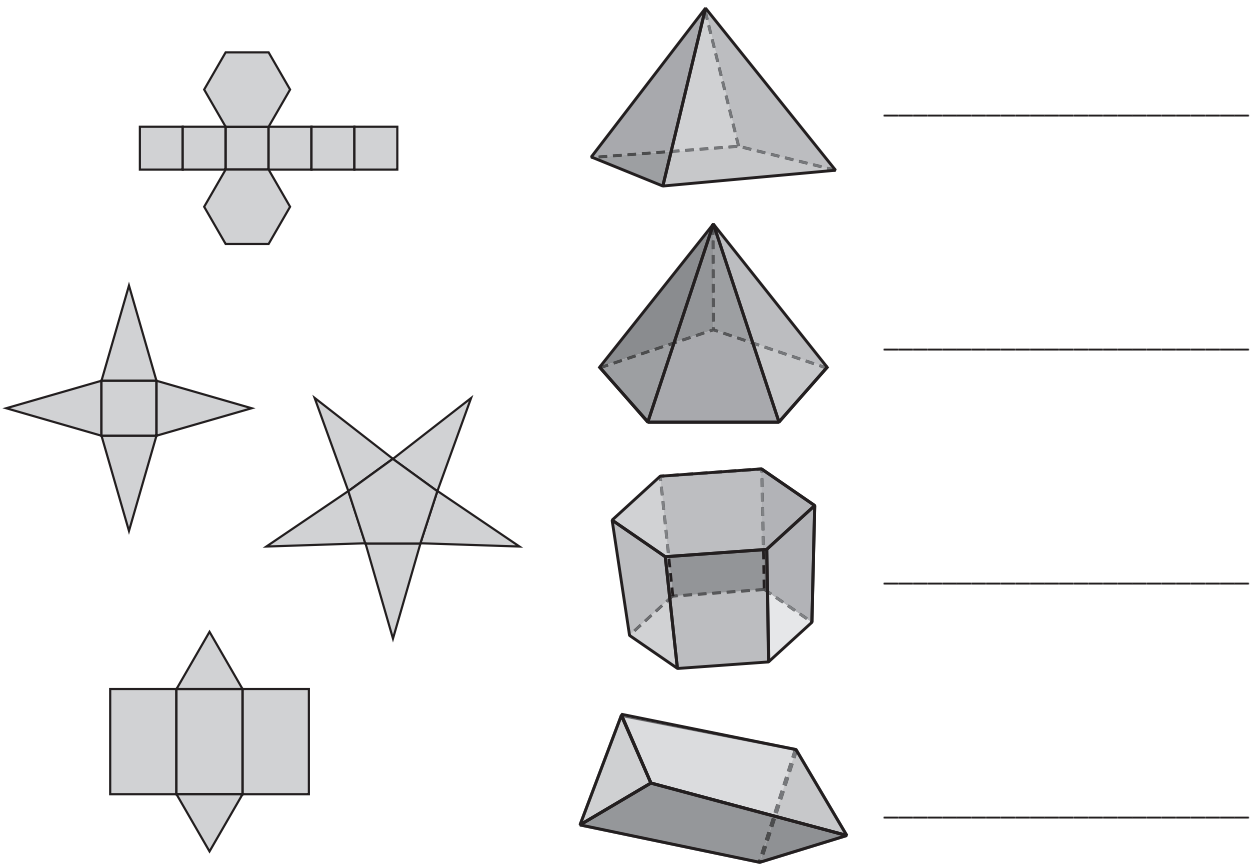
3D shapes – nets

A net is the pattern of a 3D shape, unfolded and laid flat. You may have already assembled a few during your schooling!

It also helps if you can fold and unfold them in your head.

copy

1 **Fold these nets in your head, join them to their shapes with a line and name them:**



_____

_____

_____

_____

2 **Create a net for a cube. Cut it out and test it. Does it work?**

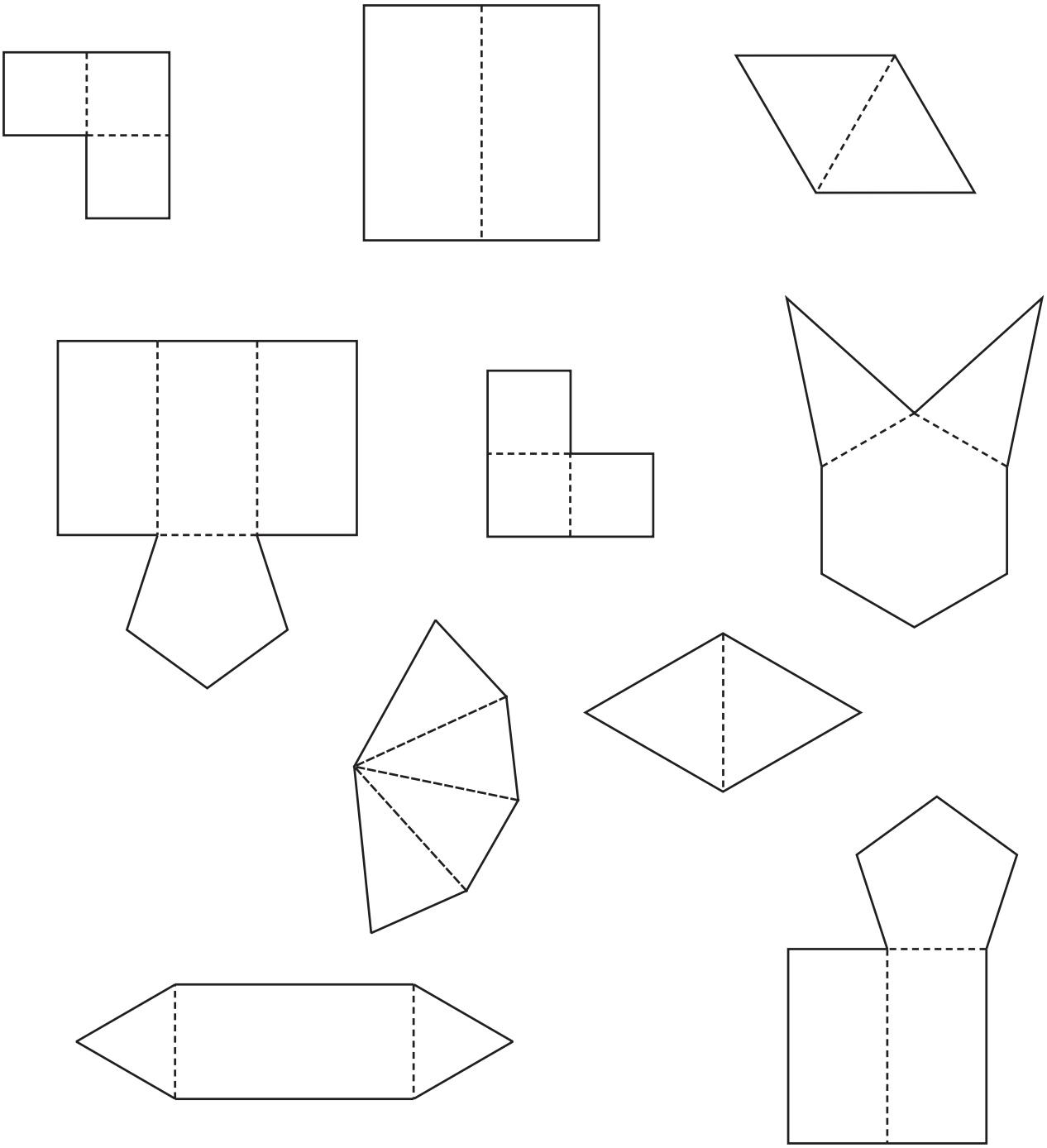
2 halves make a whole … apply

Getting ready

The nets of 5 solids are below – the problem is that they've been separated into two parts. Your job is to match the parts correctly. See if you can do it in your head. If this proves too difficult, you can cut the nets out and physically join them to form the solid.

What to do

Colour match the correct parts. Your teacher has a list of the shapes if it would help to know which shapes you're looking for.



Tomb Raider

investigate

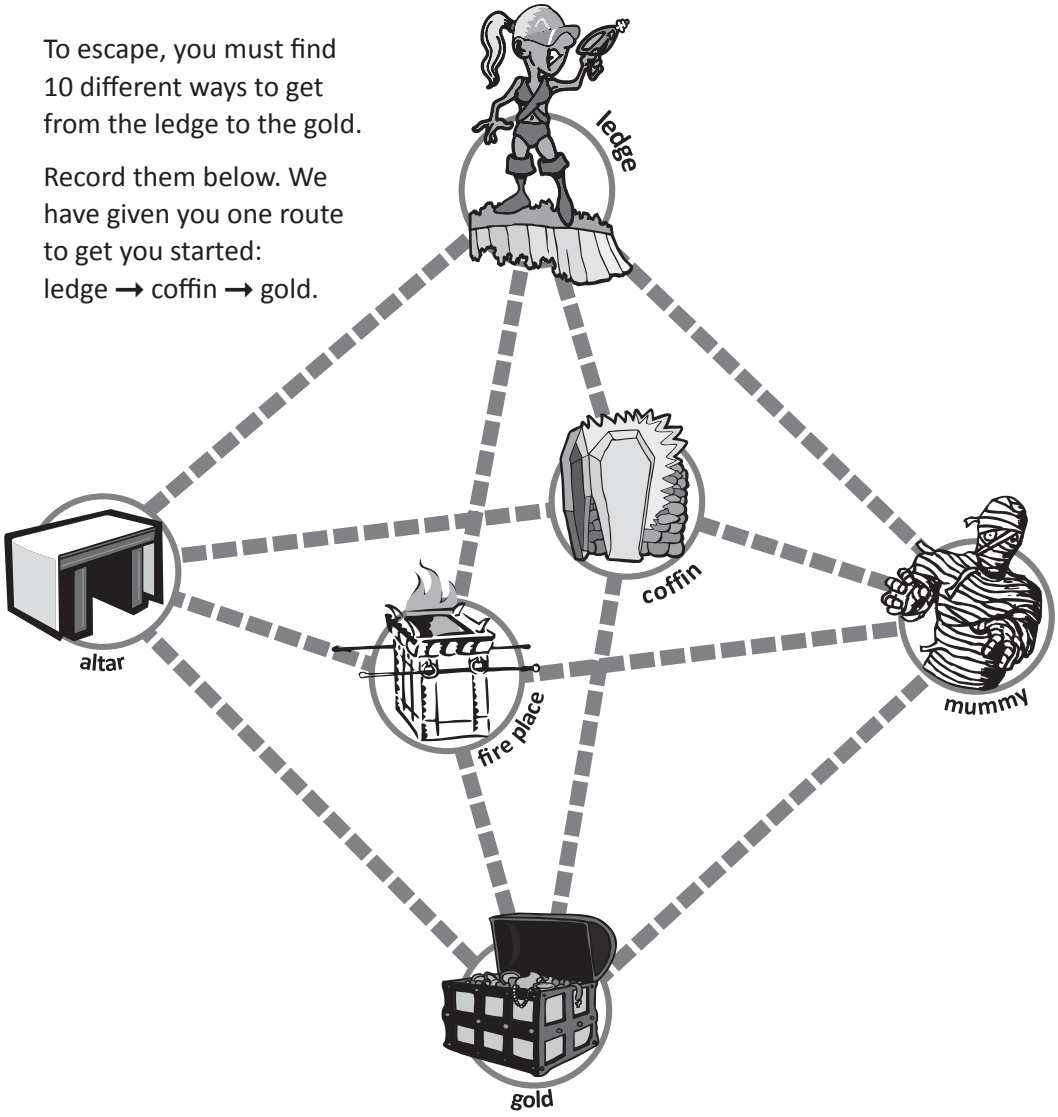
Getting ready

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.