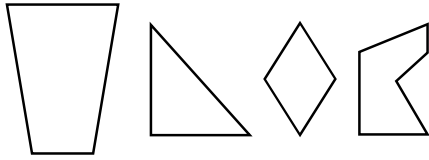


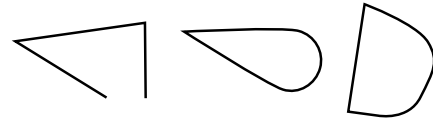
2D shapes – distinguish among polygons, regular polygons and other two-dimensional shapes

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.

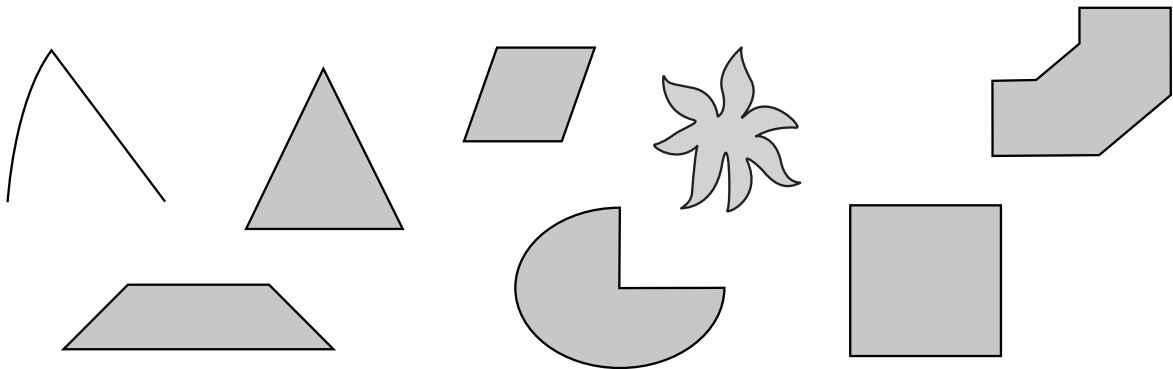


These are polygons.



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:



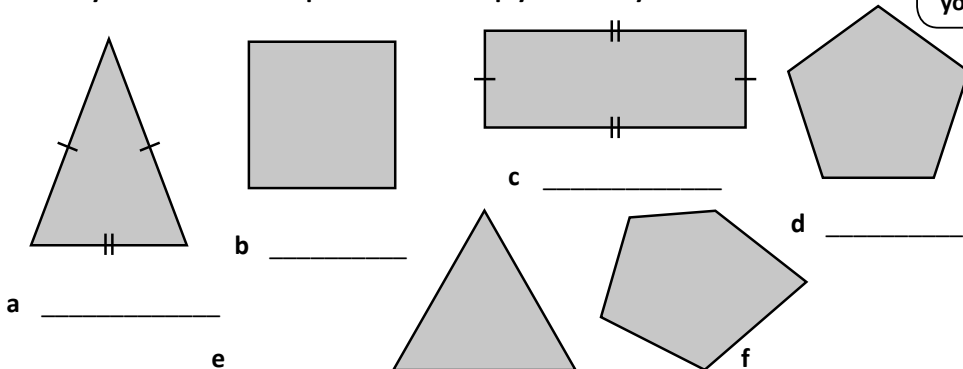
Polygons can be regular or irregular.

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.



Do any of your answers surprise you? Why do you think this is?



THINK

2D shapes – distinguish among polygons, regular polygons and other two-dimensional shapes

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 _____

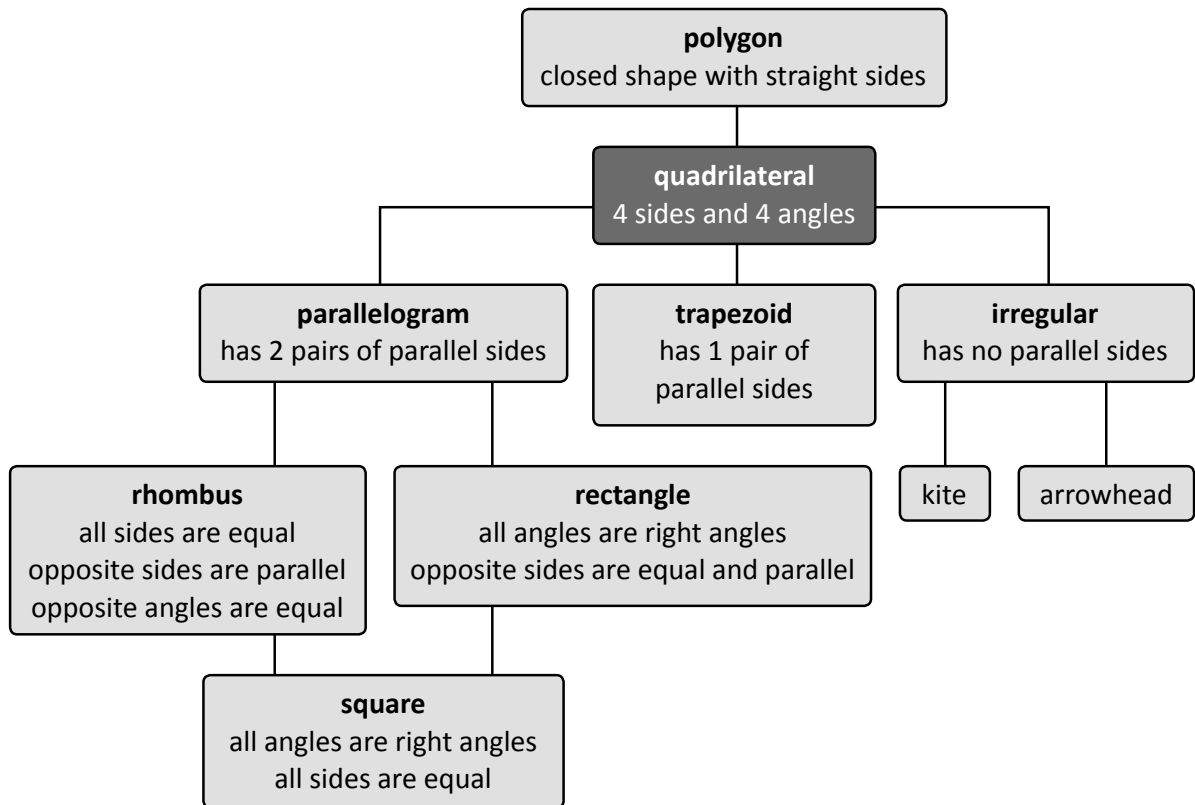
j 12 angles and 12 sides _____

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

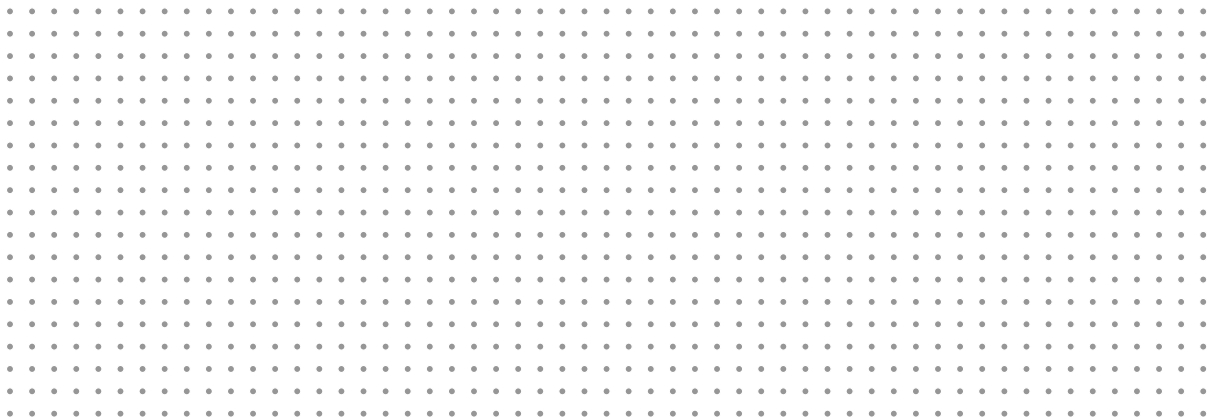
A quadrilateral is a kind of polygon. It's a closed, flat shape with 4 straight sides and 4 angles. The name comes from the Latin, *quad* and *latus*, meaning 4 sides.

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.

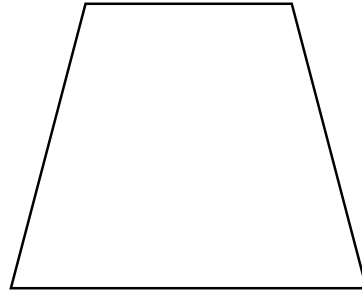
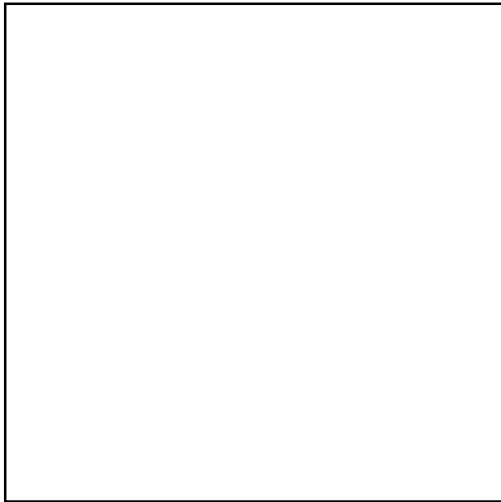
- 1 Use the information above and the dot paper below to create a square, a rectangle, a rhombus and a trapezoid. Check them against the criteria. Do they match? Swap with a partner and label each other's shapes.



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° .

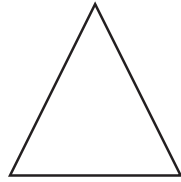
I'm a _____

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

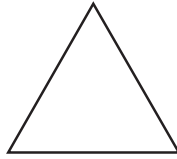
I'm a _____

2D shapes – identify triangles

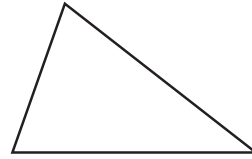
A triangle is a type of polygon. It has three sides and three angles. The three interior angles always add to 180° . Here are the 3 main types of triangles:



isosceles

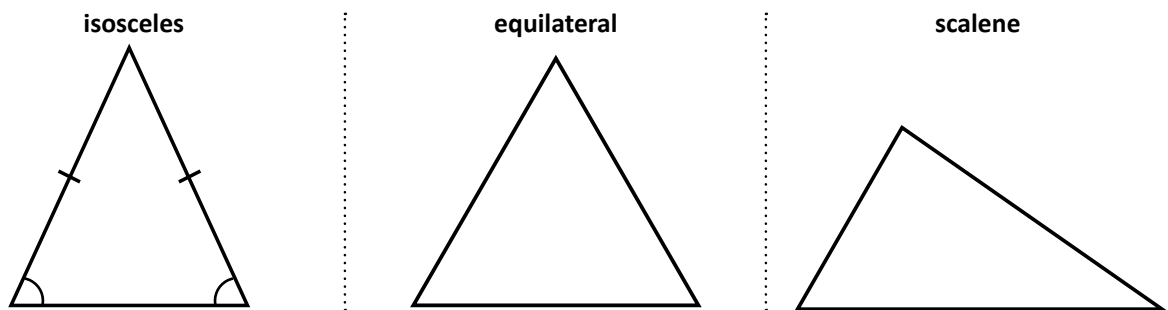


equilateral



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.



- 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:

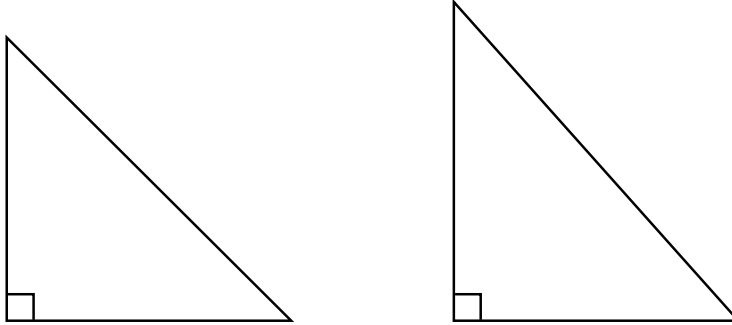
- a Isosceles triangles have _____ equal sides.
- b Equilateral triangles have _____ equal sides.
- c Scalene triangles have _____ equal sides.

- 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 – identify 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?

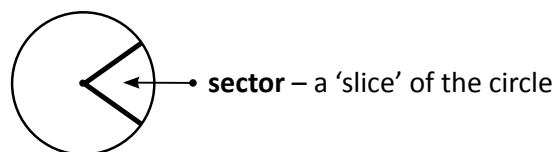
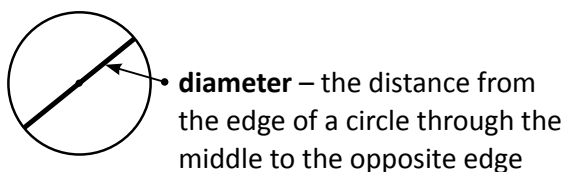
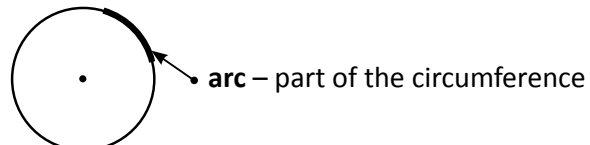
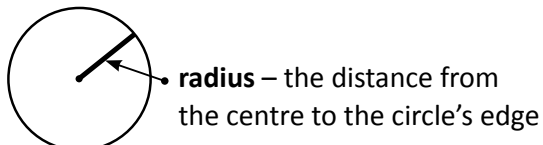
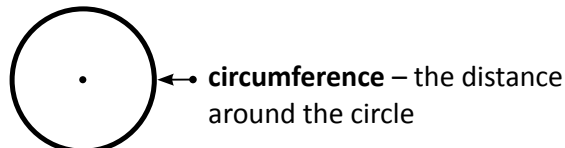
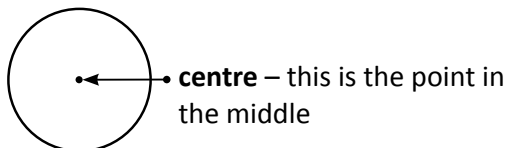
- 6 Using a protractor to help you, draw an example of a right angled, equilateral, isosceles and scalene triangle below. Don't label them or mark the angles or sides as equal. Switch papers with a partner and measure and label each other's triangles. Switch back and check.

Since same sides equal same angles, I just have to make sure the sides are equal! The angles will follow.



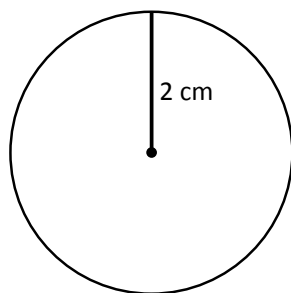
2D shapes – circles

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 math 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.

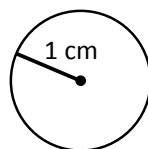


1 Below are some circles. Each radius is marked.

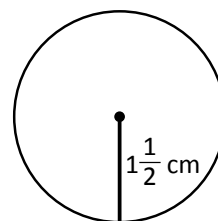
a Extend the radius through the midpoint to the opposite edge of each circle. You have now marked the **diameters**.



diameter



diameter



diameter

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



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?

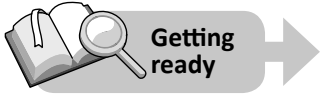


What to do next

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.

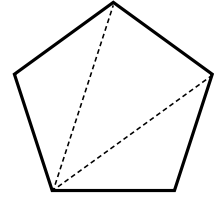
How many triangles?

investigate



Getting ready

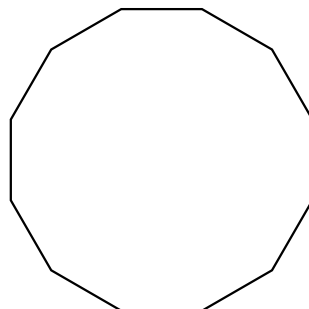
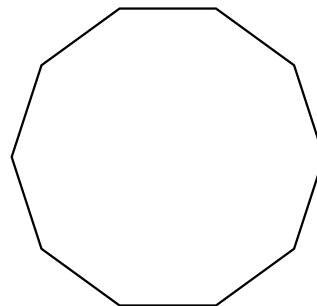
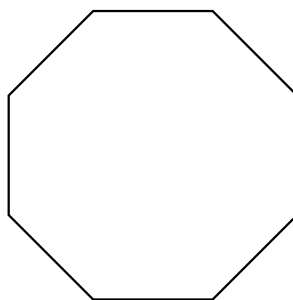
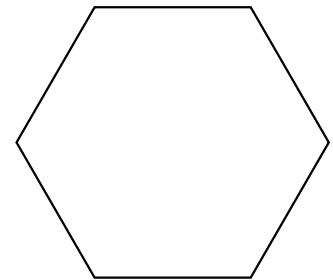
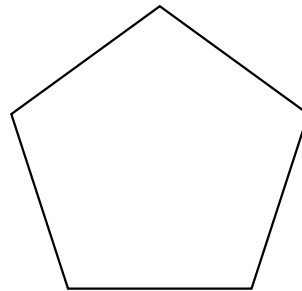
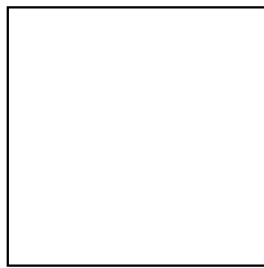
Use the shapes below. Your task is to section each shape into triangles. Your lines must go from corner (vertex) to corner and can't cross over each other.



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