Planning Overview
Year 5 Geometry

Identify 3-D shapes, including cubes and other cuboids, from 2-D representations
Know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles
Draw given angles, and measure them in degrees (°)
Identify:

- angles at a point and one whole turn (total 360°)
- angles at a point on a straight line and ½ a turn (total 180°)
- other multiples of 90°

Use the properties of rectangles to deduce related facts and find missing lengths and angles
Distinguish between regular and irregular polygons based on reasoning about equal sides and angles.
Identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed.

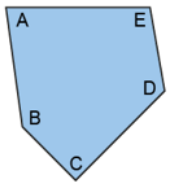
G–1 Compare angles, estimate and measure angles in degrees (°) and draw angles of a given size.

Objective	Teaching and Learning
Introduction and recap of previous learning (2D shapes)	Recap 2D shapes and properties. Classify shapes into quadrilaterals and types of triangles Sort shapes using a Venn or a Carroll diagram. Which shapes have the same properties? What is the same and what is different about the shapes in the Venn and Carroll diagrams?
Know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles	Discuss what an angle is (the measure of where two straight lines meet) Recap what we measure these angles in – degrees. Define angles – acute (less than 90 degrees) Right angle (90 degrees) Obtuse (91 degrees – 180 degrees) Reflex (180 degrees to 360 degrees) Children to estimate what type of angle an image is representing. Children to identify types of angles in shapes, letter and numbers. Can children write their name in block writing and identify the angles in their name? Odd One Out 180° 45° 79° 225°

Ready to progress questions 5-G1

Do not use a protractor for questions 1, 2 and 3.

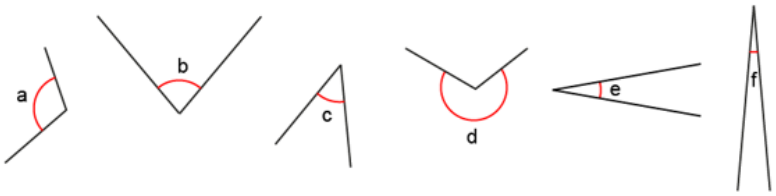
1. Here is an irregular pentagon.



a. Which is the largest angle in this pentagon?

b. Which is the smallest angle?

c. Which angle is 100°?



a. Which is the largest angle?

b. Which is the smallest angle?

c. Which angle is 45°?

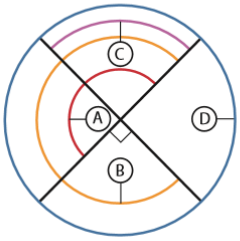
Mastery

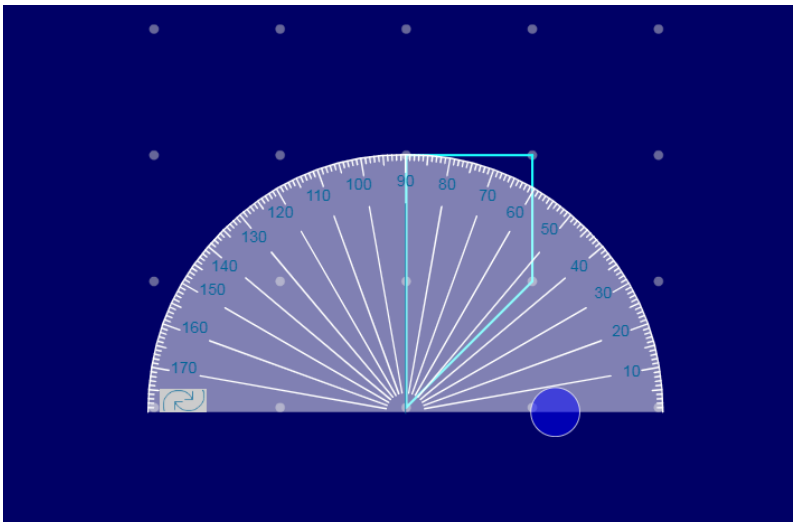
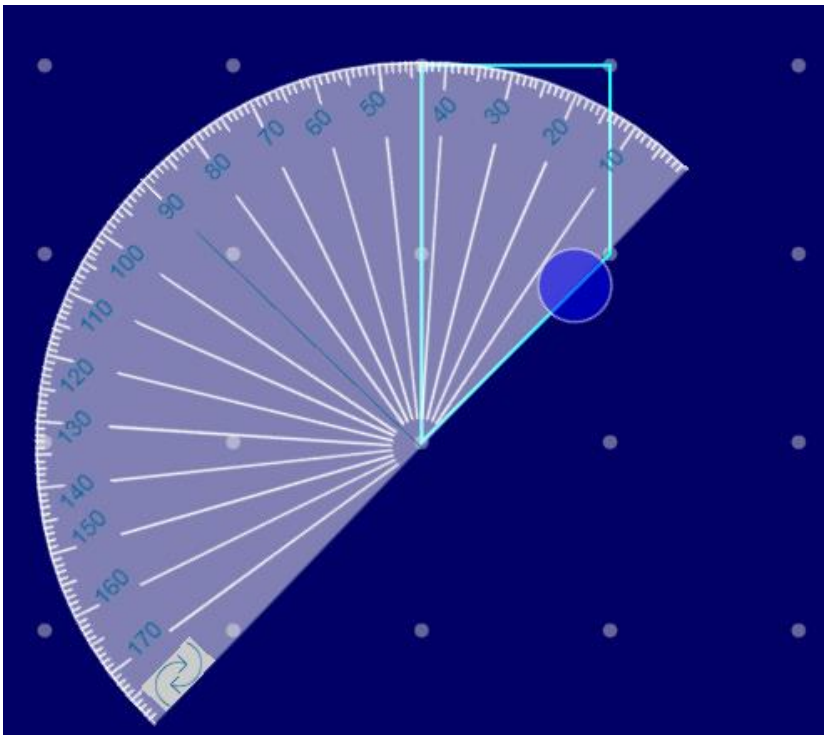
The circle is divided into quarters by the two diameter lines and four angles A, B, C and D are marked.

Are the statements below true or false?

- Angle C is the smallest angle.
- Angle D is the largest angle.
- All the angles are the same size.
- Angle B is a right angle.
- Angle B is an obtuse angle.

Explain your reasoning.



Draw given angles, and measure them in degrees (°)	Teach children the conventions for using a protractor to measure angles using Protractor ITP or similar (mathsframe.co.uk) Position the central semicircle of the protractor over the angle you wish to measure  Turn the protractor round so that one on the straight lines of the angle is resting on the 0 degrees line.  Look at the other straight line of the angle and follow that up to the scale on the protractor. What number is this line resting on? That is how large that angle is in degrees. This angle is 44°

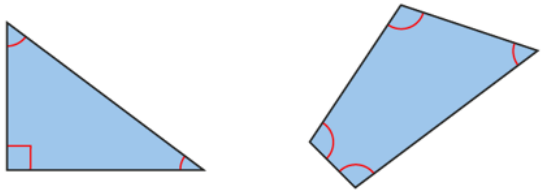
Links to time

What is the angle between the hands of a clock at 3 o'clock? 6 o'clock? 9 o'clock? 12 o'clock?

What is the angle between the hands of a clock at 4pm? What other times in a day have the same angle?

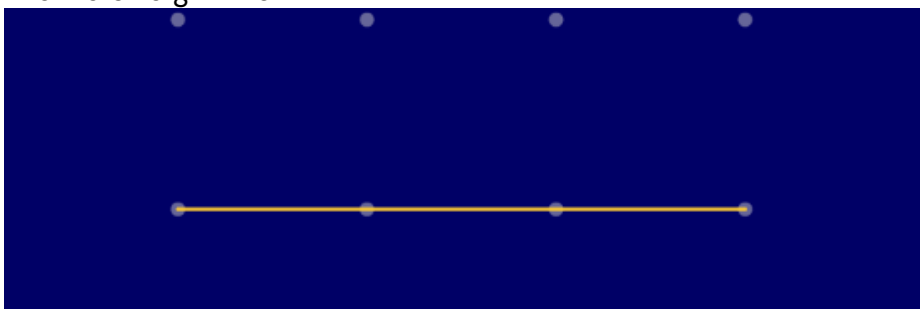
Ready to progress questions 5-G1

4. Measure and label each of the angles in these shapes using a protractor.

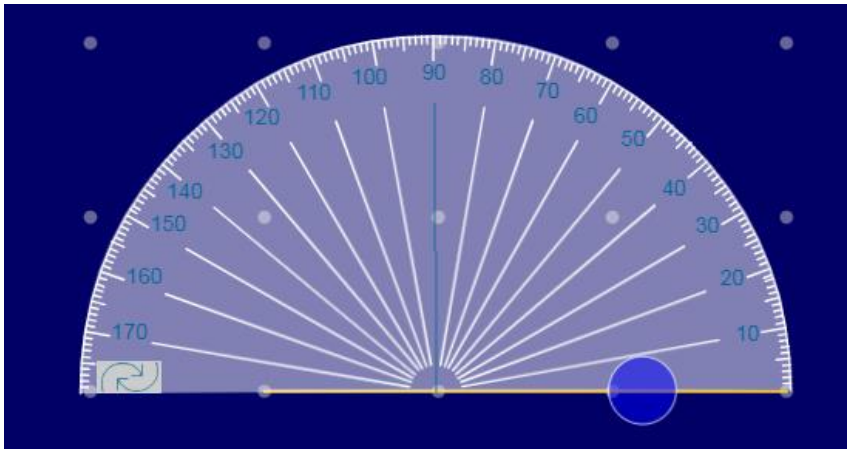


Model drawing angles using a resource such as Protractor ITP available on mathsframe.co.uk

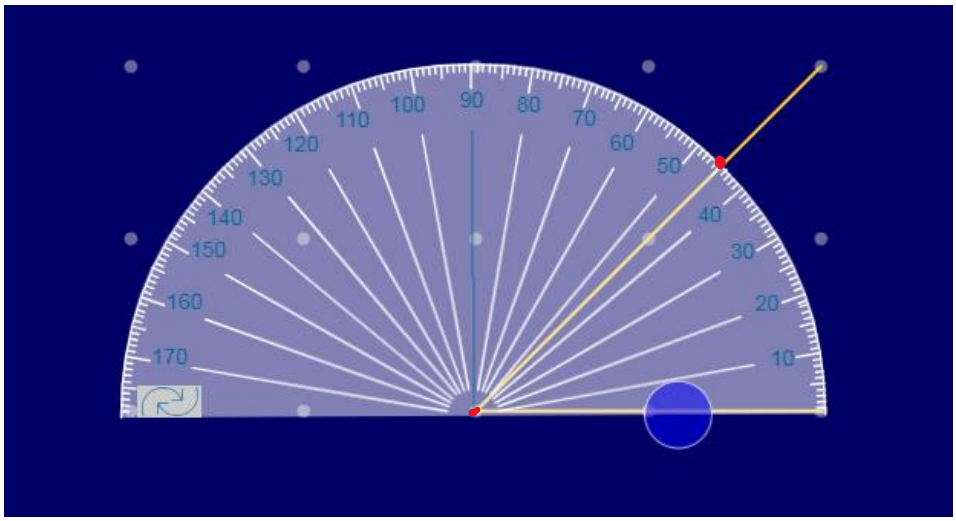
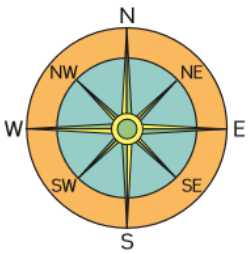
Draw a straight line



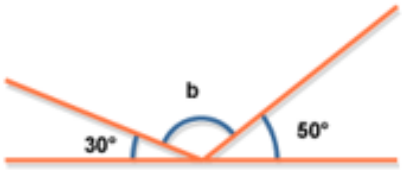
Place the protractor on this straight line so that the 0 degrees line is resting exactly over the straight line.



Decide what size angle you wish to draw. I would like to draw a 45° angle.

	Mark a point on the straight line at 0° and on the protractor at 45 ° and then join these points up with a straight line.  When you remove the protractor then you will have drawn a 45° angle. Children to draw a range of angles.
Identify: angles at a point and one whole turn (total 360°) angles at a point on a straight line and ½ a turn (total 180°) other multiples of 90°	Recap previous learning of 90 degrees being a quarter turn, 180 degrees being a half turn, etc. Children to practically turn through a range of angles, clockwise and anti-clockwise. Children to solve problems relating to this and then extend to the Greater Depth question below. **Mastery with Greater Depth** In the questions, below all of Harry's movement is in a clockwise direction. If Harry is facing North and turns through 180 degrees, in which direction will he be facing? If Harry is facing South and turns through 180 degrees, in which direction will he be facing? What do you notice? If Harry is facing North and wants to face SW how many degrees must he turn? From this position how many degrees must he travel through to face North again? 

Relate this to angles on a straight line and angles in a circle.
Teach children strategies for identifying a missing angle on a straight line – possibly a bar model
180 degrees – known angle = missing angle



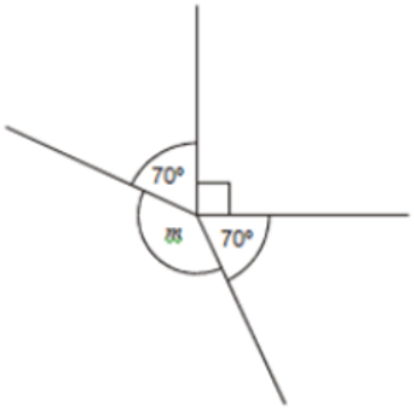
30° + 50° = 80°

180° – 80° = 100°

Angle b is 100°

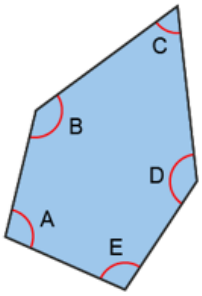
Teach children strategies for looking at known information to calculate missing angles in a whole turn

This diagram is not drawn accurately. Calculate the size of angle m

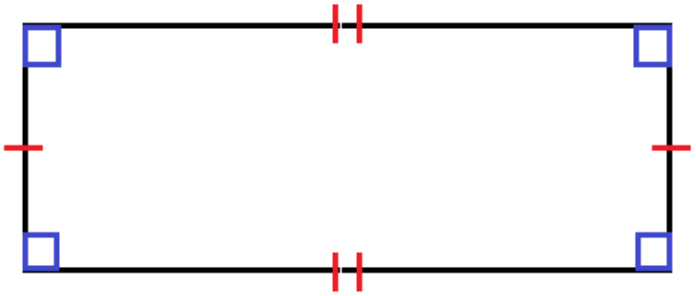


Ready to progress questions 5-G1

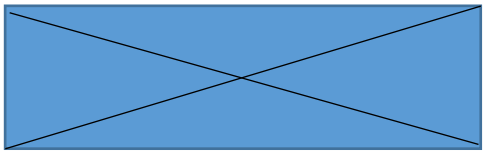
3. This pentagon has a line of symmetry. Estimate the size of each angle.

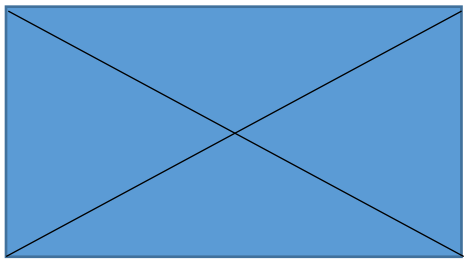


A ☐ B ☐ C ☐ D ☐ E ☐

	NRICH problem solving **Olympic Turns** **Age 7 to 11** ★★★ Here are some photos of some Olympic sports that involve turns and angles in different ways. Explore your favourite photo and see what angles you can see. Can you estimate them? Can you measure them for angles and turns? How do the athletes or players use angles to succeed in their sport? 
Use the properties of rectangles to deduce related facts and find missing lengths and angles	Teach the children the mathematical conventions of a rectangle - Opposite sides of a rectangle are the same length (congruent). The angles of a rectangle are all congruent (the same size and measure.) Remember that a 90-degree angle is called a "right angle." So, a rectangle has four right angles. Opposite angles of a rectangle are congruent. Opposite sides of a rectangle are parallel. Children to create a diagram like the one below to put the statements above into context on a shape.  Can the explain why a square is a type of rectangle? Children to draw a diagram to explain their reasoning. Can the children use given information to find missing lengths of rectangles based on the conventions above?

Discuss with children the term diagonal. Where would these lines be in a rectangle?





As you can see from the pictures the diagonals of a rectangle do not intersect in a right angle, they are not perpendicular. (Unless the rectangle is a square.)

The angles formed by the intersection are not always the same measure (size). Opposite central angles are the same size (they are congruent.) Teach children about the size of angles formed between the parallel sides of a rectangle and its diagonals

Discuss with the children that the angle sum of a quadrilateral is 360°. How will this help to make suggestions about the size of the angles formed between the sides of quadrilaterals

Find angle d.

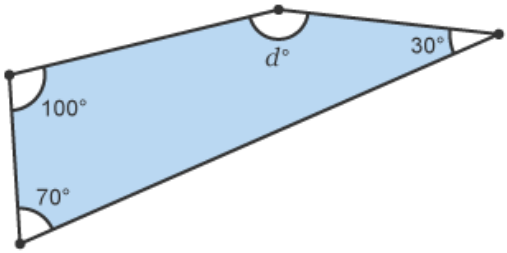


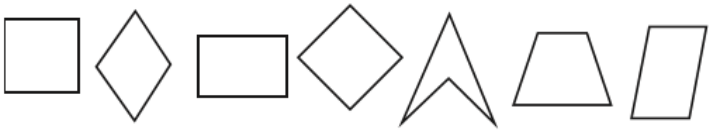
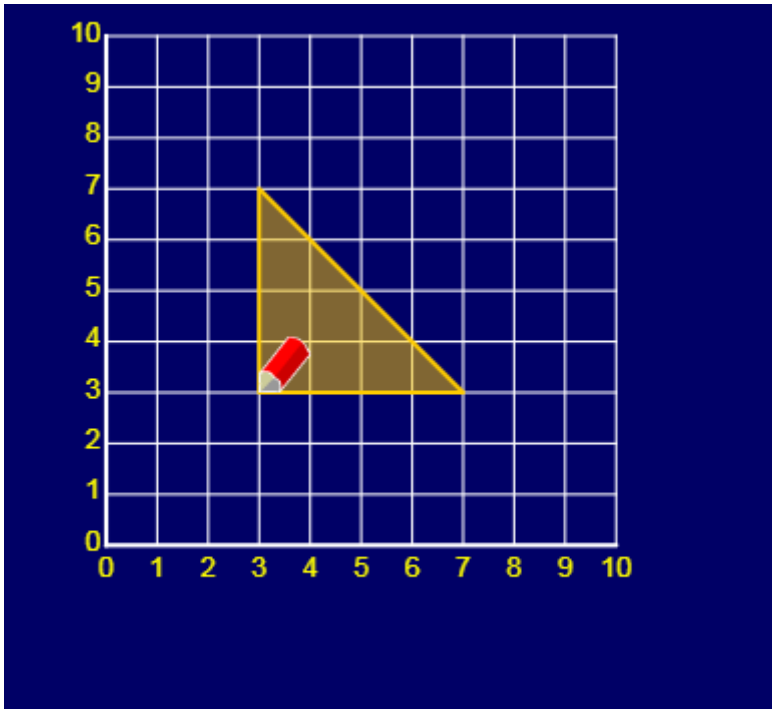
Image taken from BBC bitesize

Mastery with Greater Depth

Which of these statements are correct?

- A square is a rectangle.
- A rectangle is a square.
- A rectangle is a parallelogram.
- A rhombus is a parallelogram.

Explain your reasoning.

Distinguish between regular and irregular polygons based on reasoning about equal sides and angles.	Discuss with children the difference between regular and irregular shapes. Regular shapes have **sides that are all equal and interior (inside) angles that are all equal**. Irregular shapes have **sides and angles of any length and size**. Ask children to sort regular and irregular polygons. **Mastery** Identify the regular and irregular quadrilaterals.  *Pupils should recognise that a square is the only regular quadrilateral and there are two within this set.* Ask the children to draw a regular and irregular polygon with the same number of sides. What's the same, what's different about what they have drawn? Draw me an irregular octagon, and another, and another…
Identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed.	Revise coordinates – ensure children can read and represent points on an x and y axis. Can the children identify the position of a shapes vertices when it has been drawn on a grid?  Mathsframe.co.uk – Coordinates ITP

Show children a grid where an irregular shape has been reflected on the grid. Can the children describe what has happened to the shape? What are the coordinates of the first shape and the reflected shape?

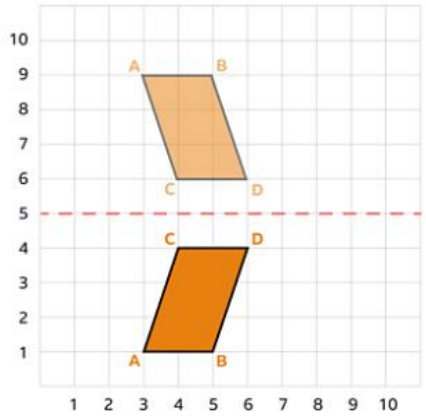


Image taken from BBC bitesize

Teach the children the concept of translation. Discuss how a shape can be moved around a grid and that this can be described by stating which direction it has been moved in and by how many squares.

How has the desk been translated in this representation of a room?

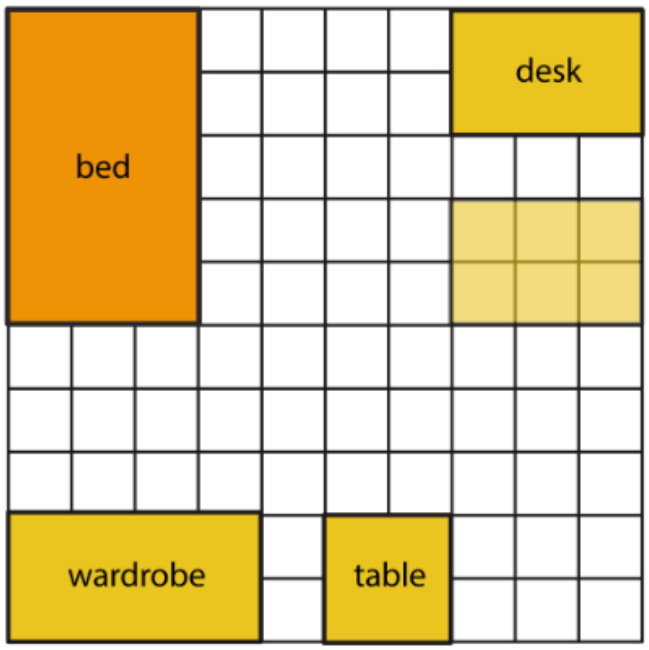
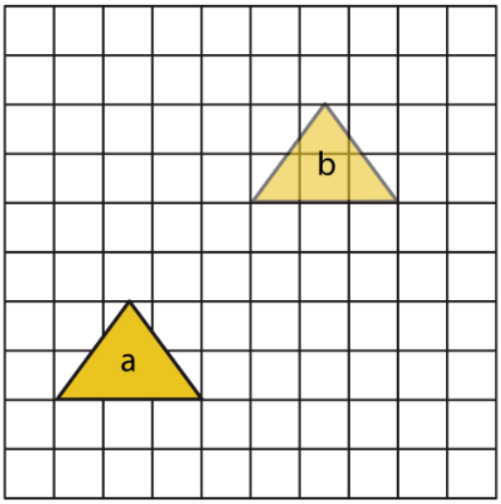


Image from BBC bitesize

The desk has moved down 3 squares. It has not changed, it has just been moved.

Ensure children can accurately identify how a chape has been translated by focusing on one vertices of the shape. If they can identify how that one of the vertices has been translated then they know how the whole shape has been translated.



Triangle a has been translated 4 squares right and 4 squares up.

Children to describe the position of a shape after it has been translated across and up.

Teach the children to look at the coordinates of a shape and how the shape will be translated, can the children use maths to establish what the coordinates of the new shape will be?

Working Backwards
A square is translated 3 squares down and one square to the right.
Three on the coordinates of the translated square are
(3,6)
(8, 11)
(8, 6)

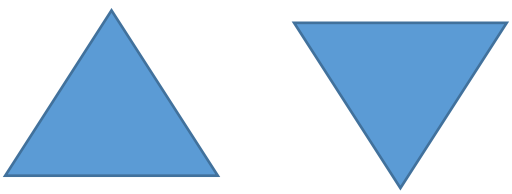
What are the coordinates of the original square?

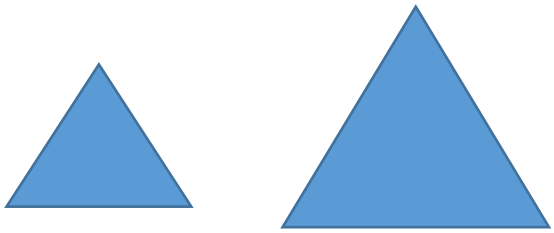
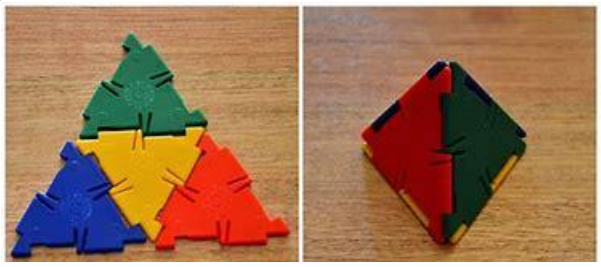
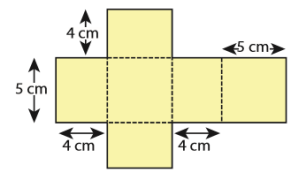
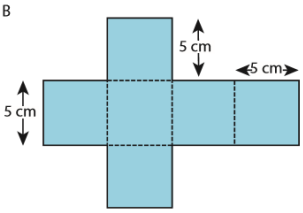
Understand the difference between a congruent and similar shape.

Congruent shapes are the same size, have the same angle and the same length sides.

Similar shapes are the same shape, but their sizes are different.

Congruant – same shape and same size.



	Similar – same shape but different size.  Ask children to sort similar and congruent shapes. **Always, sometimes, never** Cut out congruent shapes will fit exactly on top of each other The perimeters of 2 congruent shapes will be the same Shapes which have the same area are congruent If the angles of 2 shapes are the same, then they will be congruent If 2 shapes have the same area, then they will be congruent
Identify 3-D shapes, including cubes and other cuboids, from 2-D representations	Recap 2D and 3D shapes. Revise the vocabulary of shape (faces, edges, vertices, quadrilateral) and properties of 2D and 3D shapes. Children can start to investigate the concept of a 3D shape having a 2D net. Ask children to start by unfolding shapes that have been premade with interlocking tiles. What 2D shapes can they see?  Children to investigate making nets of shapes using interlocking tiles Move on to constructing 3D shapes from nets printed out on card or paper. **Mastery** What shapes do you make when these 2-D representations (nets) are cut out and folded up to make 3-D shapes? A  B 

	What the same, what's different? What is the same and what is different about the net of a cube and the net of a cuboid? Give children a 3D cube or cuboid. Ask them to draw around this shape to create a net that that when cut out and folded up with make an exact replica of their starting shape. Can they think of more than one way to create this net? Were there any nets that they created that didn't work? Why not? **Mastery with Greater Depth** Draw the 2-D representation (net) that will make this cuboid when cut out and folded up.