

Properties of Shapes

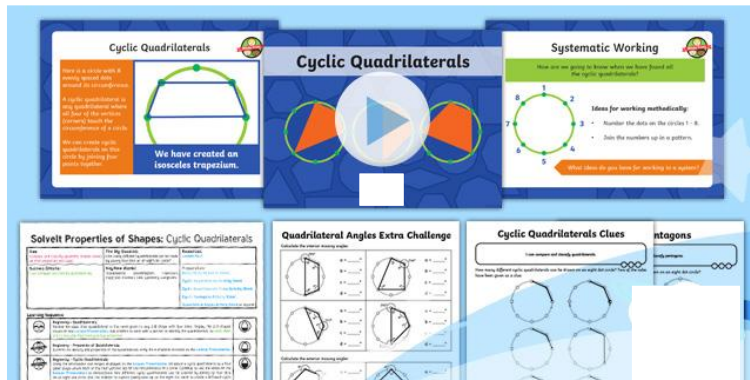
Maths | Year 6 | Area Overview

Introduction

In this unit, the children will draw 2D shapes to exact measurements, continue to find missing angles by measuring and calculating, and also compare and classify 2D shapes based on their properties. They revisit recognising, describing, comparing and classifying a range of 3D shapes and related shape nets and then further develop their skills by drawing and constructing their own shape nets including tabs. In addition, they consolidate being able to recognise and calculate angles around a point and on a straight line and are introduced to recognising vertically opposite angles. It also includes a brand new objective that has been introduced to KS2 relating to illustrating and naming the parts of a circle and knowing the relationship between radius and diameter.

Resources

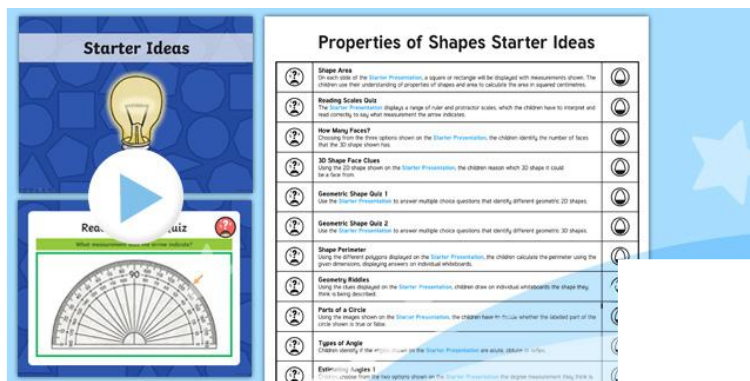
In addition to your standard maths resources, you will need protractors, pairs of compasses, scissors, and glue.



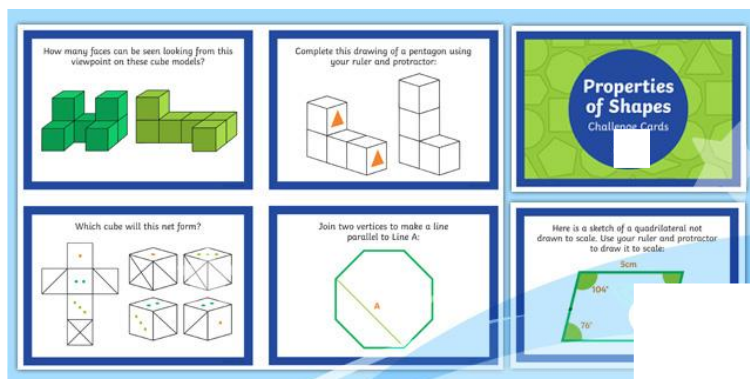
Solvett Lesson Pack: Cyclic Quadrilaterals

How many different quadrilaterals can be drawn on an eight dot circle?

In this problem-solving lesson, children explore drawing cyclic quadrilaterals (quadrilaterals where each vertex lies on the circumference of a circle), working systematically to find how many different cyclic quadrilaterals are possible (not allowing rotations and reflections.) Supporting and extending differentiated activity sheets are included.



Starter Ideas



Challenge Cards

Assessment Statements

By the end of this unit...

...all children should be able to:

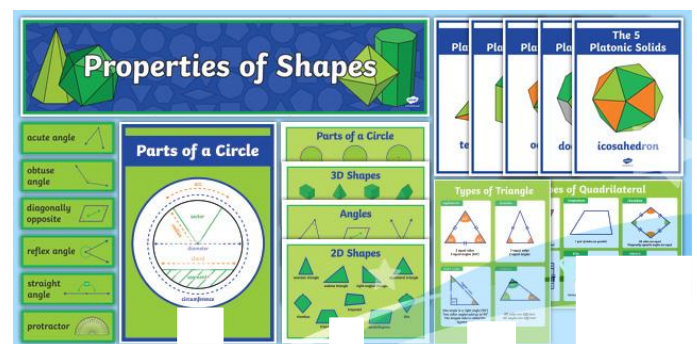
- use a ruler to draw a 2D shape to a given measurement;
- construct a 3D shape from a given shape net;
- compare and classify geometric shapes;
- recognise different types of angle;
- draw circle using a pair of compasses.

...most children will be able to:

- draw 2D shapes to given dimensions of length and angle;
- draw their own net of a simple 3D shape including construction tabs;
- measure and calculate unknown angles in 2D shapes and around a point or on a straight line;
- label the parts of a circle including radius and diameter.

...some children will be able to:

- confidently use a protractor to accurately draw 2D shapes to within 1° of the given dimension;
- draw their own net of more complex 3D shapes including construction tabs;
- use more complex reasoning to work out missing angles in 2D shapes and around a point or on a straight line;
- understand the relationship between radius and diameter using algebraic representation.



Display Pack

Lesson Breakdown

Draw 2D shapes using given dimensions and angles.

2D Shape Drawing (1): Expert 2D Shape Drawing

I can accurately draw a range of 2D shapes using the measurements given.

2D Shape Drawing (2): Champion 2D Shape Drawing

I can accurately draw a range of 2D shapes using the measurements given.

2D Shape Drawing (3): 2D Shape Reasoning

I can solve reasoning questions about drawing 2D shapes using the measurements given.

Home Learning: 2D Shape Challenge

A set of differentiated activity sheets that consolidate the skills of drawing 2D shapes to given dimensions.

Recognise, describe and build simple 3D shapes, including making nets.

3D Shapes (1): All Things 3D Shape

I can identify and describe the properties of 3D shapes and their nets.

3D Shapes (2): Drawing Shape Nets

I can draw shape nets and use them to build 3D shapes.

3D Shapes (3): 3D Shape Reasoning

I can solve reasoning questions about recognising, describing and building 3D shapes.

Home Learning: 3D Shape Challenge

A set of differentiated activity sheets that consolidate the skills of describing the properties of 3D shapes and drawing shape nets.

Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals and regular polygons.

Geometric Shapes (1): Triangles

I can compare, classify and find unknown angles in triangles.

Geometric Shapes (2): Quadrilaterals

I can compare, classify and find unknown angles in quadrilaterals.

Geometric Shapes (3): Polygons

I can compare, classify and find unknown angles in polygons.

Geometric Shapes (4): Polygon Reasoning

I can solve reasoning questions about comparing, classifying and finding unknown angles in polygons.

Home Learning: Polygons

A set of differentiated activity sheets that consolidate the skills of comparing and classifying geometric shapes based on their properties.

Lesson Breakdown

Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius.

Parts of Circles (1): Clever Circles

I can draw circles accurately using a pair of compasses and I can identify and label the parts of a circle.

Parts of Circles (2): Circle Algebra

I know that the diameter of a circle is twice the radius and can express this as algebra.

Parts of Circles (3): Circle Reasoning

I can solve reasoning questions about knowing that the diameter of a circle is twice the radius.

Home Learning: Circles

A set of differentiated activity sheets that consolidate the skills of labelling and calculating the radius and diameter of circles.

Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.

Angles (1): Angles at a Point

I can recognise angles where they meet at a point and find missing angles.

Angles (2): Angles on a Straight Line

I can recognise angles on a straight line and find missing angles.

Angles (3): Opposite Angles

I can recognise angles that are vertically opposite and find missing angles.

Angles (4): Angle Reasoning

I can solve reasoning questions about recognising and finding missing angles where they meet at a point, are on a straight line, or are vertically opposite.

Home Learning: Amazing Angles

A set of differentiated activity sheets that consolidate the skills of recognising and describing angles.

Properties of Shapes: Clever Circles

<p>Aim: Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius.</p> <p>I can draw circles accurately using a pair of compasses and I can identify and label the parts of a circle.</p>	<p>Success Criteria: I can use a pair of compasses to draw a circle. I can label the radius, diameter and circumference of a circle.</p>	<p>Resources: Lesson Pack Pair of compasses – one per child</p>
	<p>Key/New Words: Radius, diameter, circumference, pair of compasses.</p>	<p>Preparation: Circle Riddles Resource Sheet – 1 per pair Differentiated Drawing Circles Activity Sheets – 1 per child Extra Challenge Activity Sheet – as required</p>

Prior Learning: It will be helpful, but not essential, if the children have had experience using a pair of compasses to draw circles.

Learning Sequence

	<p>Geometry Riddles: Using the clues displayed on the Lesson Presentation, children draw the shape they think is being described on individual whiteboards.</p>	
	<p>All About the Circle: Using the text and images displayed on the Lesson Presentation discuss the properties of a circle, including labelling the radius, diameter and circumference.</p>	
	<p>Circle Riddles: Children work in pairs to complete the Circle Riddles Resource Sheet, matching the riddle descriptions to the correct circle using the properties of radius, diameter and circumference.</p>	
	<p>Using a Pair of Compasses: Using the text and images displayed on the Lesson Presentation, demonstrate how to correctly secure a pencil into a pair of compasses, align it with the needle and move it correctly to draw a circle. Allow time for the children to experiment with the pair of compasses to draw their own circles.</p>	
	<p>Drawing Circles to a Measurement: Using the information shown on the Lesson Presentation, explain how to set the pair of compasses to a given radius length.</p>	
	<p>Drawing Circles: Children complete the differentiated Drawing Circles Activity Sheets to show that they can use a pair of compasses to draw and label circles.</p> <p> Draw and label circles using a given radius (whole cm measurements). Draw and label circles using a given radius (half cm measurements). Draw and label circles using a given radius (mm). An Extra Challenge Activity Sheet is provided as an extension activity if required. </p>	
	<p>Parts of a Circle: Children have to identify whether the dimension of the circle displayed on the Lesson Presentation is the radius, diameter or circumference.</p>	

Masterit

Artit: Children create their own Kandinsky-inspired concentric circle artwork.

Natureit: Explore the occurrence of circles in nature and create a display.

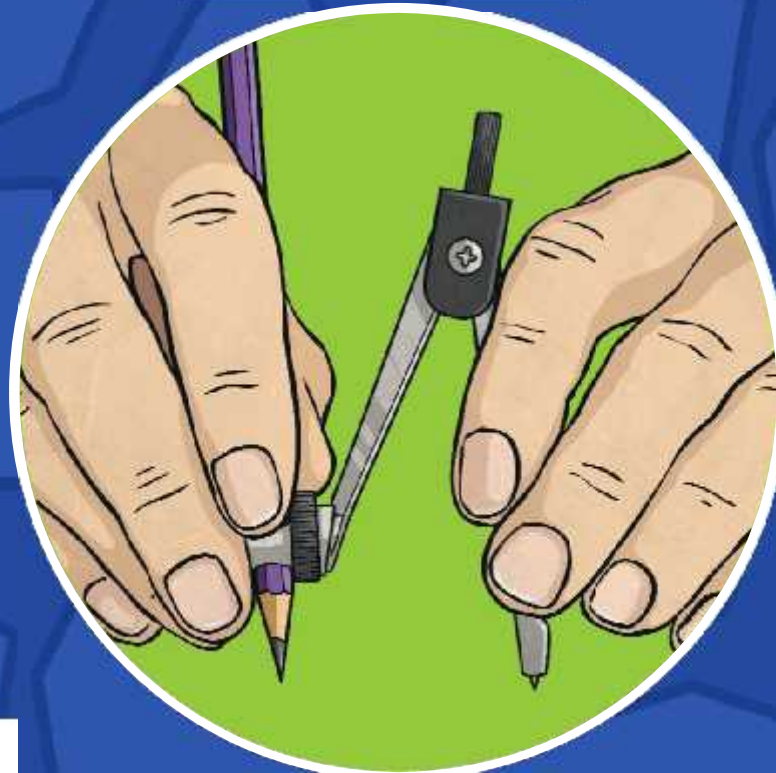
Exploreit: Use a flexible tape measure to measure the circumference of large circular objects and look for relationships with the diameter and radius.



Maths

Properties of Shapes

Clever Circles



Aim

- I can draw circles accurately using a pair of compasses and I can identify and label the parts of a circle.

Success Criteria

- I can use a pair of compasses to draw a circle.
- I can label the radius, diameter and circumference of a circle.

Geometry Riddles



Clue 1: My interior angles total 540° .

Clue 2: I am regular.

Clue 1: I have 5 straight sides.

a regular pentagon

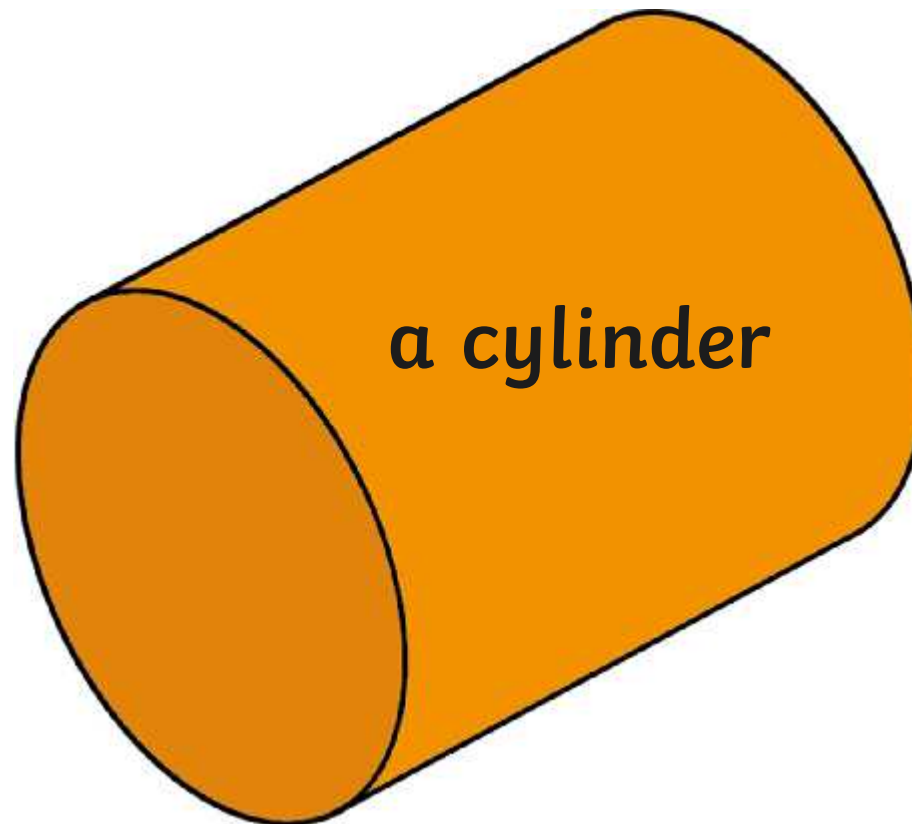
Geometry Riddles



Clue 1:
I have three faces.

Clue 2: Two of my
faces are circles.

Clue 1: My other face
is a rectangle.



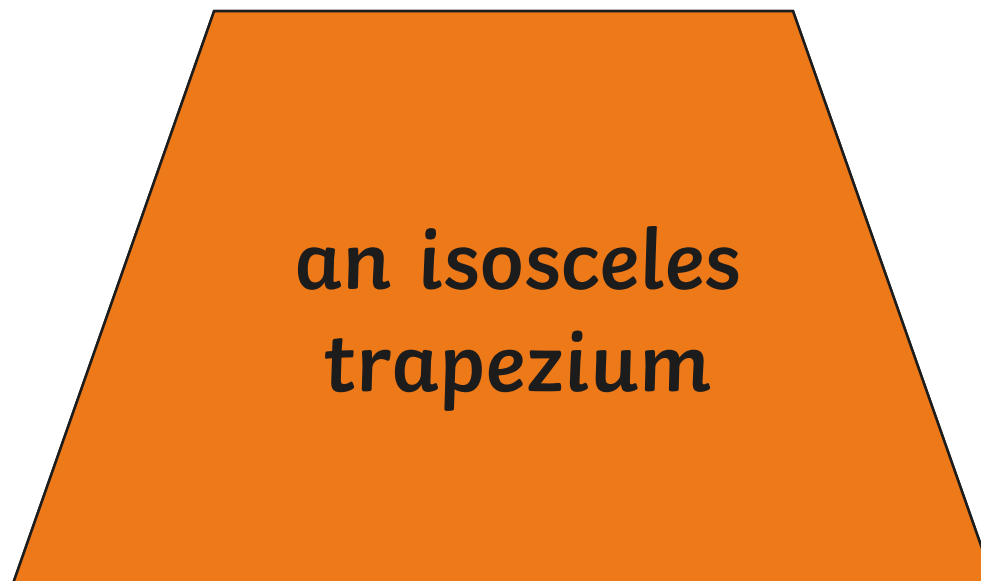
Geometry Riddles



Clue 1:
I am a quadrilateral.

Clue 2: I have one
pair of parallel sides.

Clue 1: I have two
pairs of equal angles.



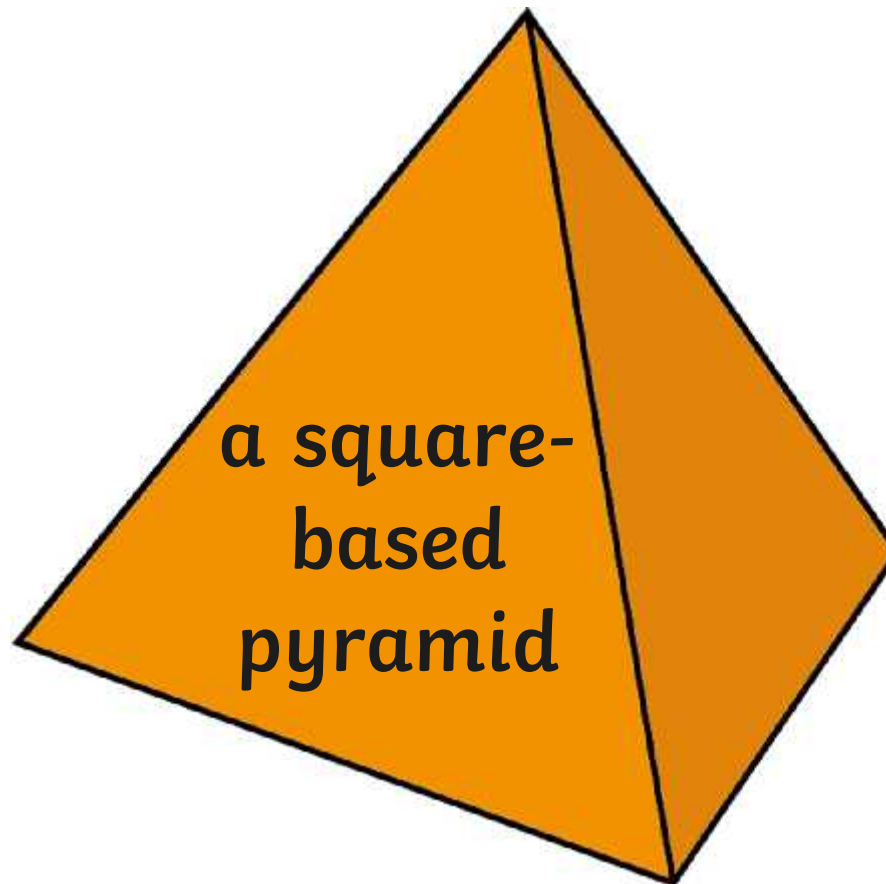
Geometry Riddles



Clue 1: I have 5 faces and 5 vertices.

Clue 2: Four of my faces are triangles.

Clue 1: My fifth face is a square.



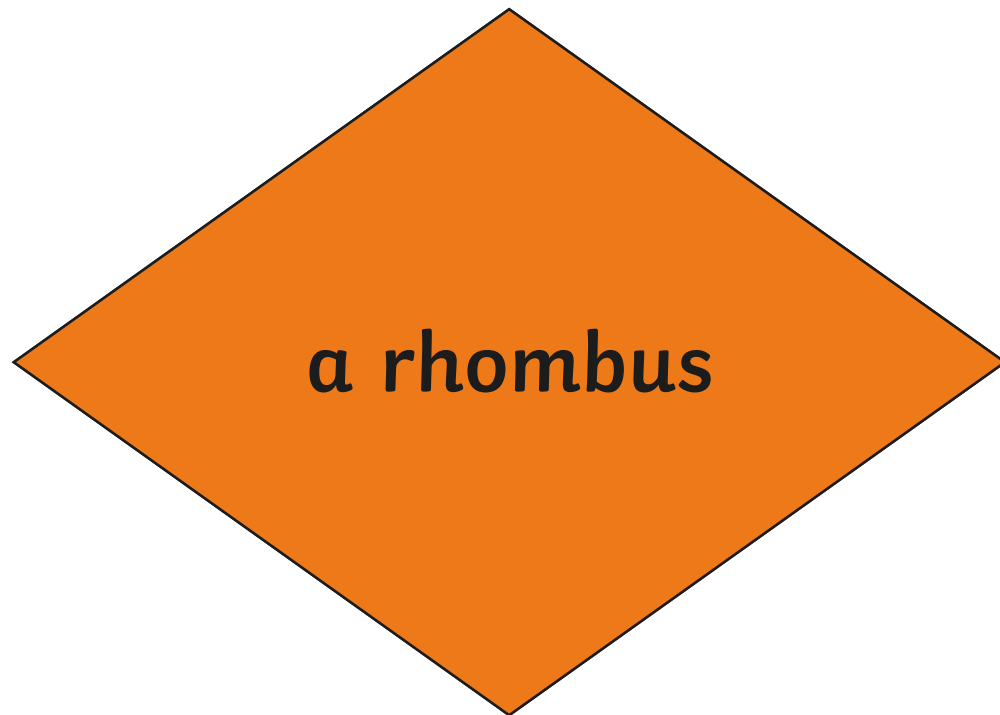
Geometry Riddles



Clue 1:
I am a quadrilateral.

Clue 2: All my sides
are congruent.

Clue 1: I have two
pairs of opposite,
congruent angles.



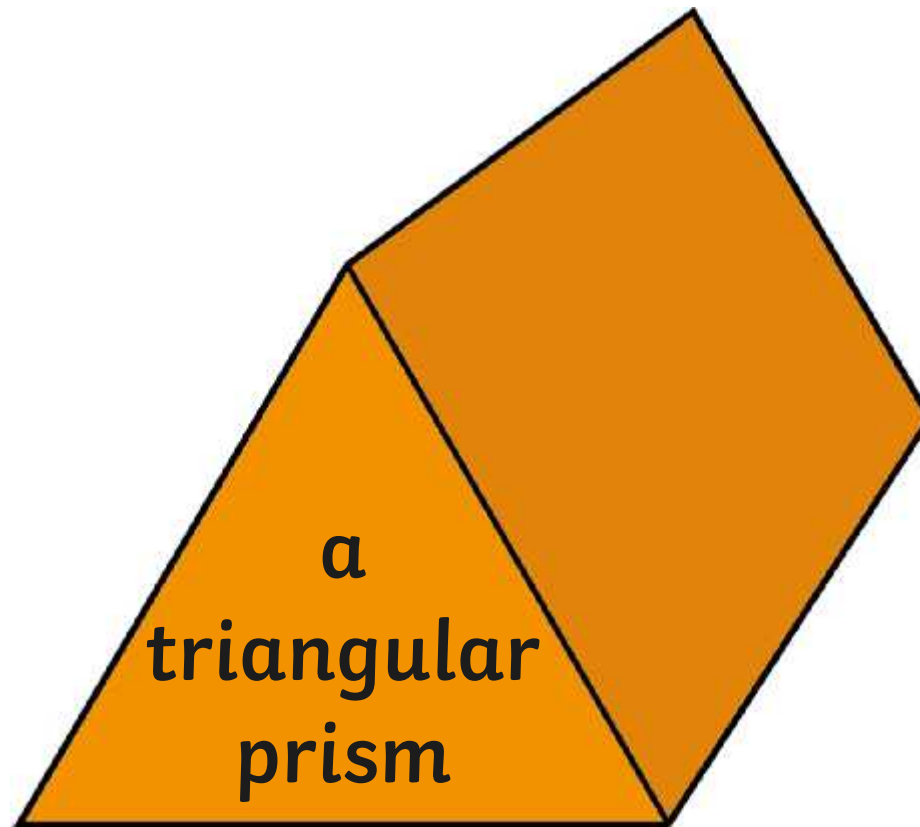
Geometry Riddles



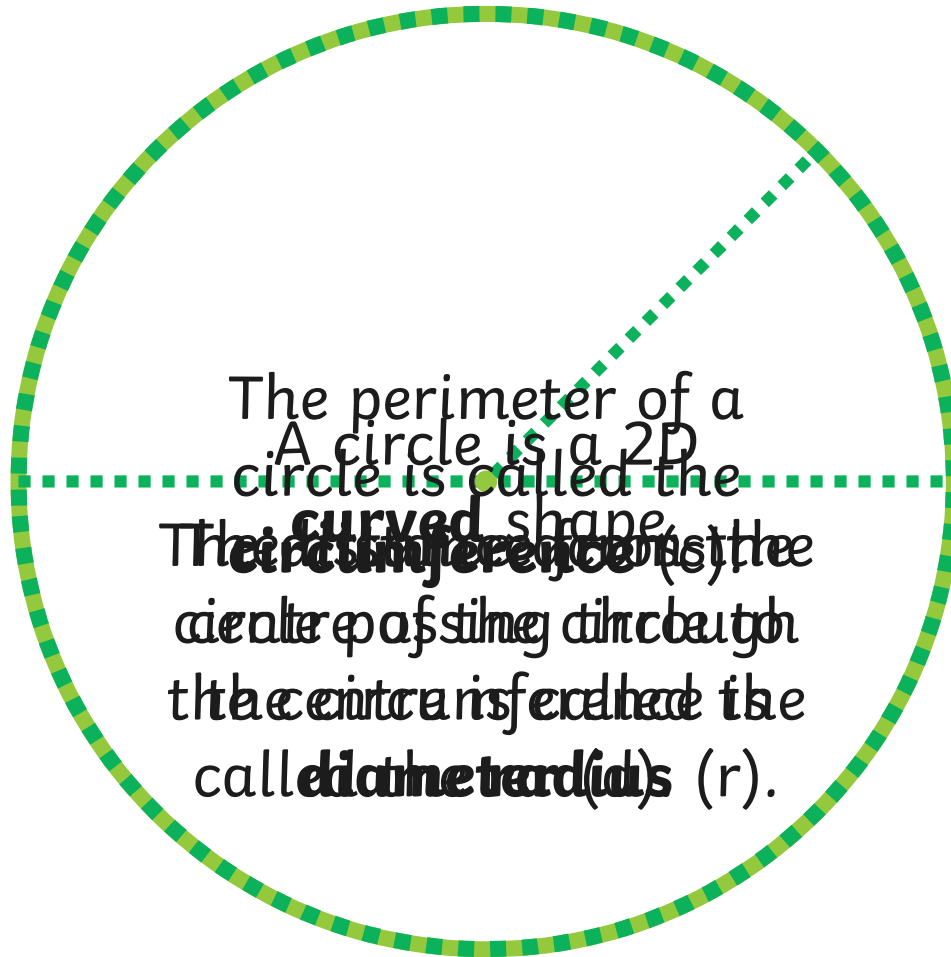
Clue 1:
I am a prism.

Clue 2:
I have five faces.

Clue 1: Three of my
faces are rectangular.

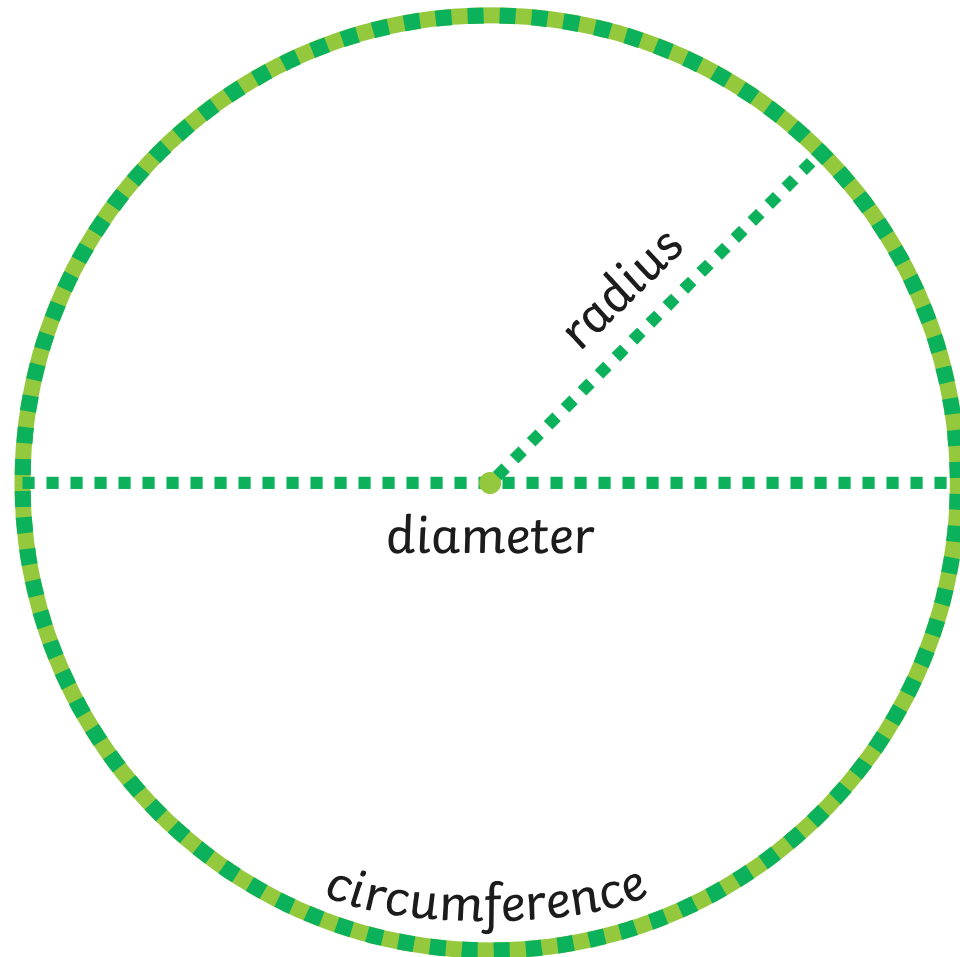


All About the Circle



All About the Circle


Here are the **circumference** (c), **radius** (r) and **diameter** (d) labelled on the same circle.



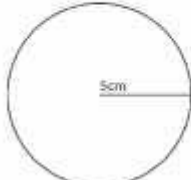

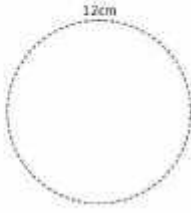
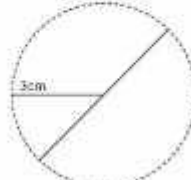
Circle Riddles



Work with your partner to match the riddle descriptions to the correct labelled circle.



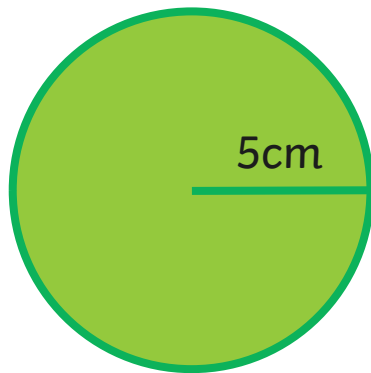
Circle Riddles
Match the circles to the correct riddle.

			
My radius is 3cm. Which circle am I?	My diameter is 10cm. Which circle am I?	My diameter is 8cm. Which circle am I?	My circumference is 12cm. Which circle am I?

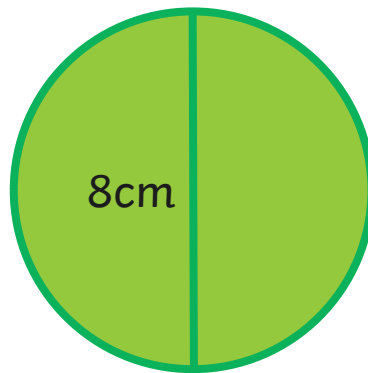
Circle Riddles



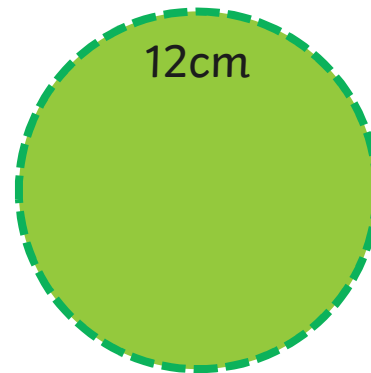
Did you match the riddle descriptions to the correct labelled circle?



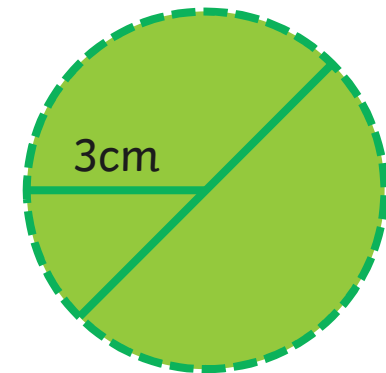
**My
diameter
is 10cm.**



**My
diameter
is 8cm.**



**My
circumference
is 12cm.**

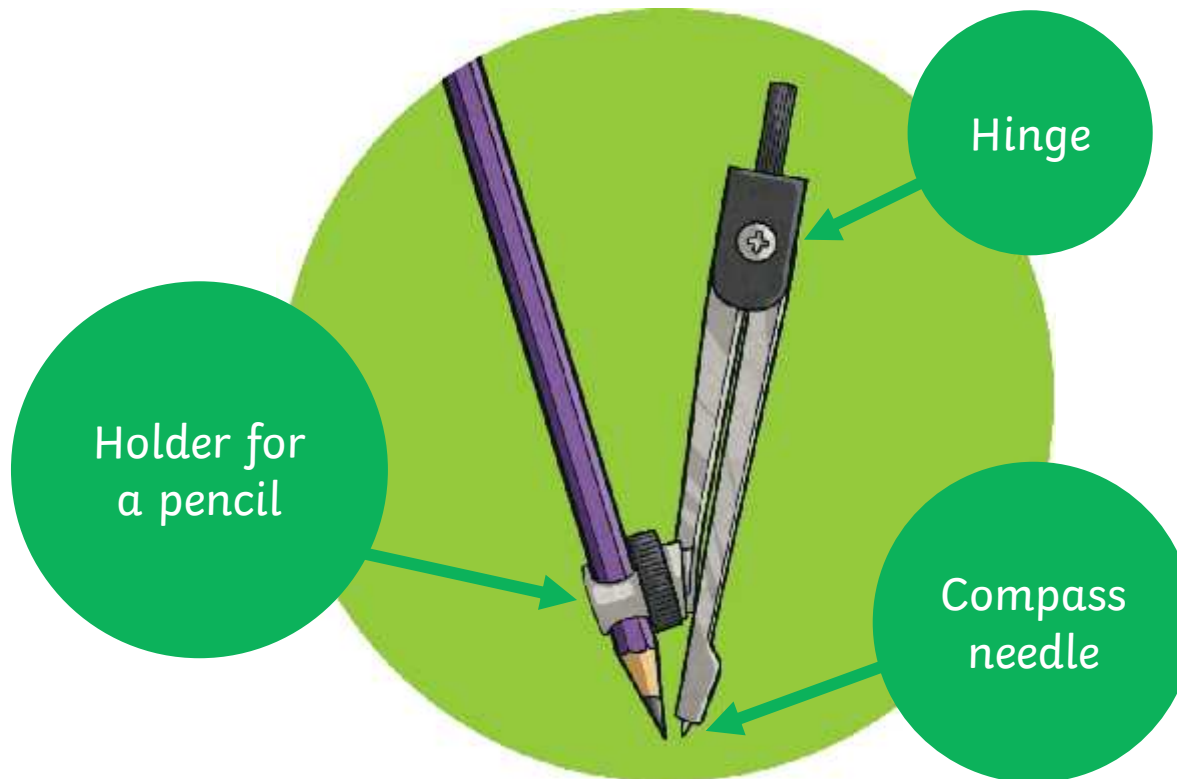


**My
radius is
3cm.**

Using a Pair of Compasses



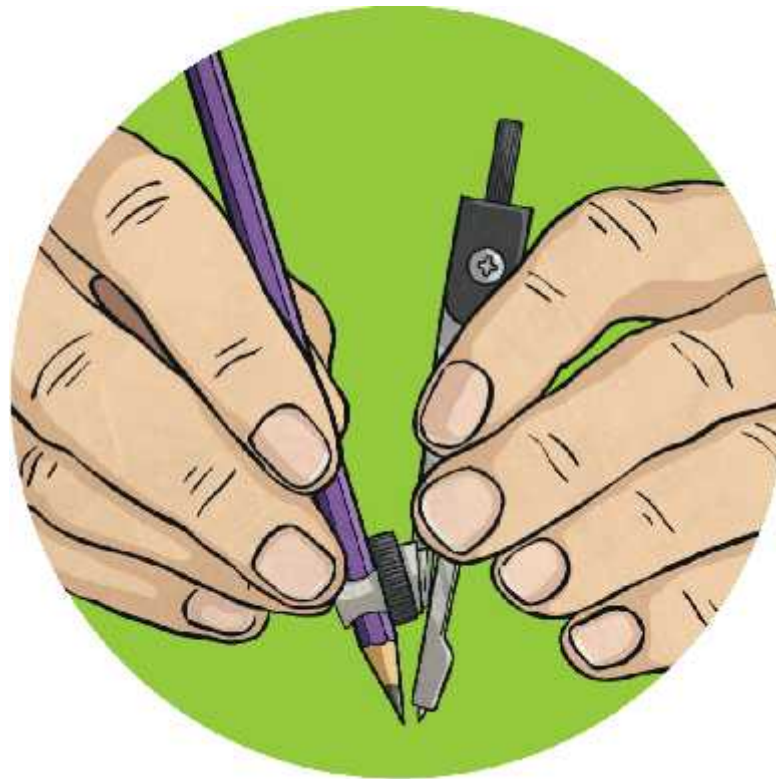
When we need to draw a circle we use a mathematical tool called a **pair of compasses**.



Using a Pair of Compasses



First we place our pencil in the holder and make sure the tip of the pencil and the needle are level. Then, we tighten the pencil holder grip so the pencil won't move around.



Using a Pair of Compasses



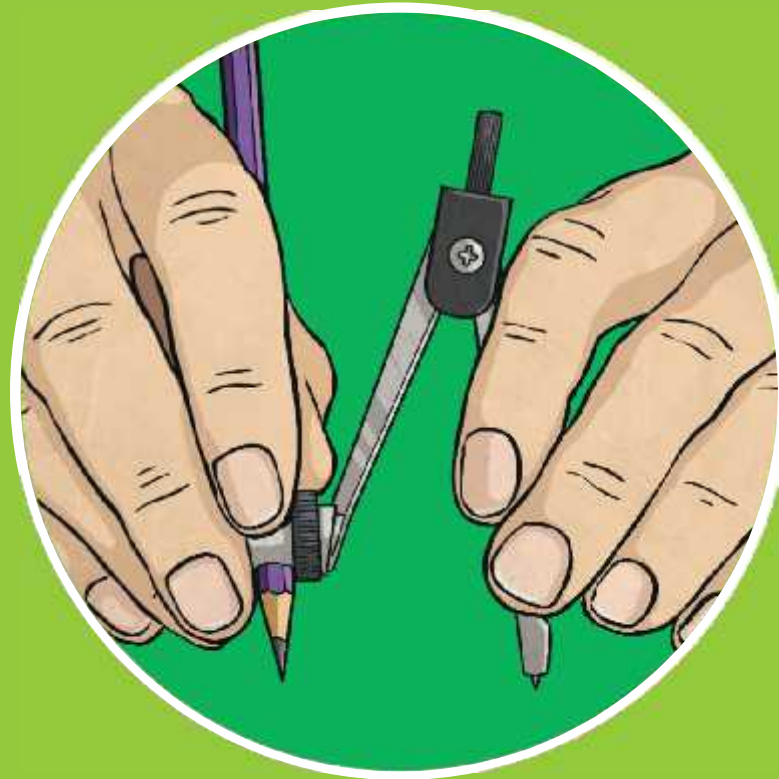
Hold the top of the pair of compasses with your thumb and first finger. Place the needle onto the paper and gently spin the pencil around the needle, keeping the needle completely still.



Using a Pair of Compasses



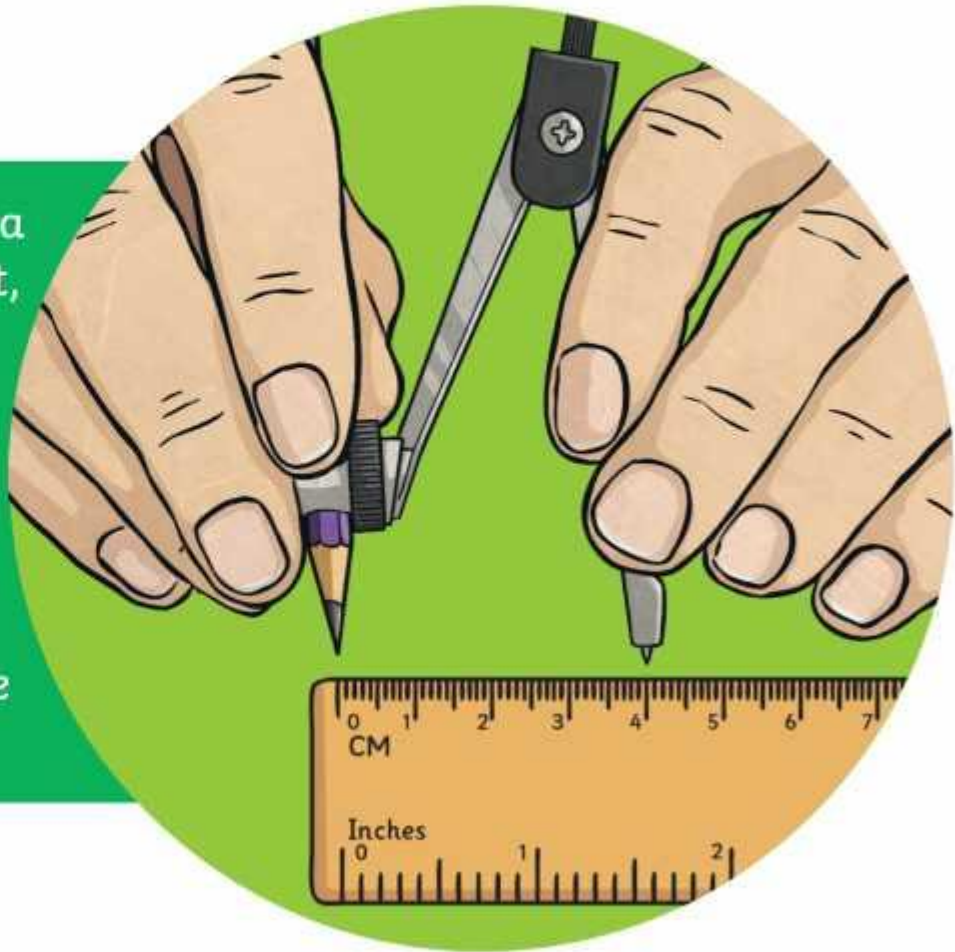
Have a go at drawing some of your own circles using your pair of compasses.



Drawing Circles to a Measurement

When you are asked to draw a circle to a given measurement, you have to adjust the arms of the pair of compasses to the correct length.

For example, to draw a circle with the radius of 4cm, you have to set the distance of the arms to 4cm using a ruler.



Drawing Circles



Drawing Circles

I can draw and label circles.

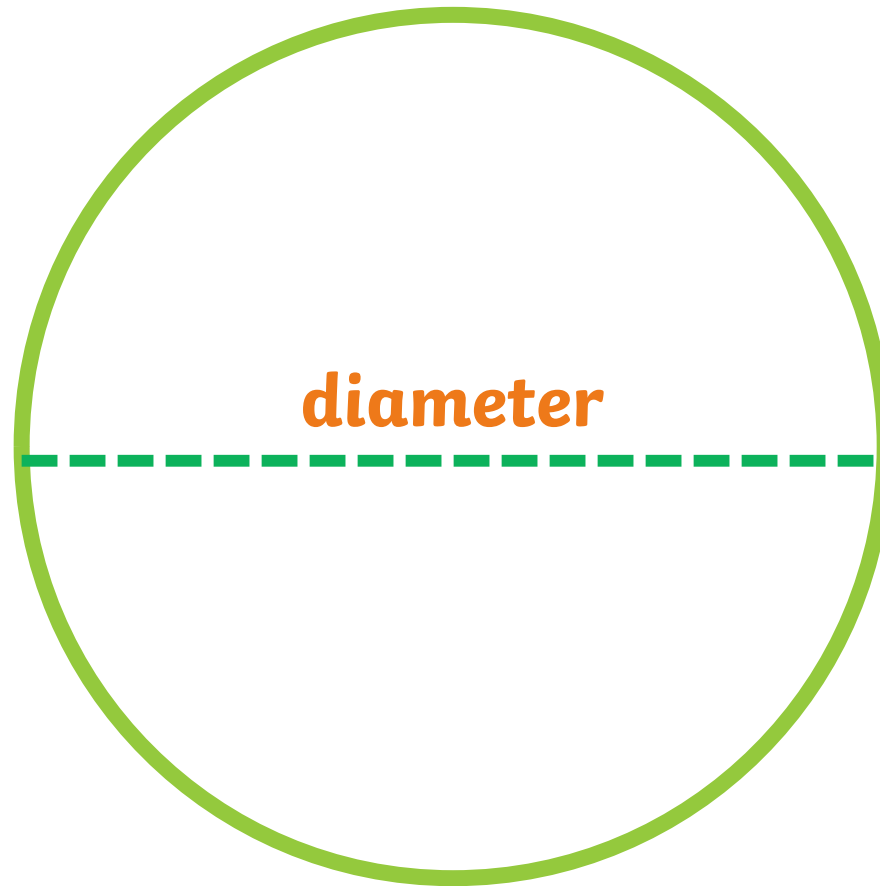
Draw and label a circle with a radius of 3.5cm.

Draw and label a circle with a radius of 5.5cm.

Draw and label

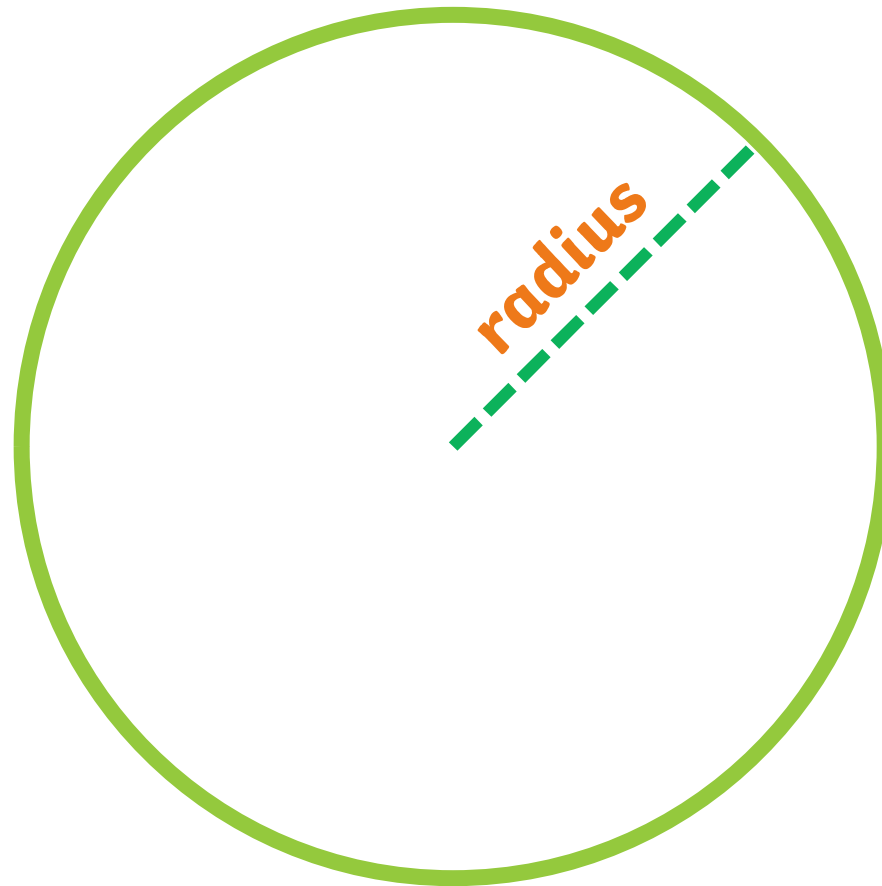
Parts of a Circle

Which part of the circle is labelled?



Parts of a Circle

Which part of the circle is labelled?



Parts of a Circle

Which part of the circle is labelled?



circumference

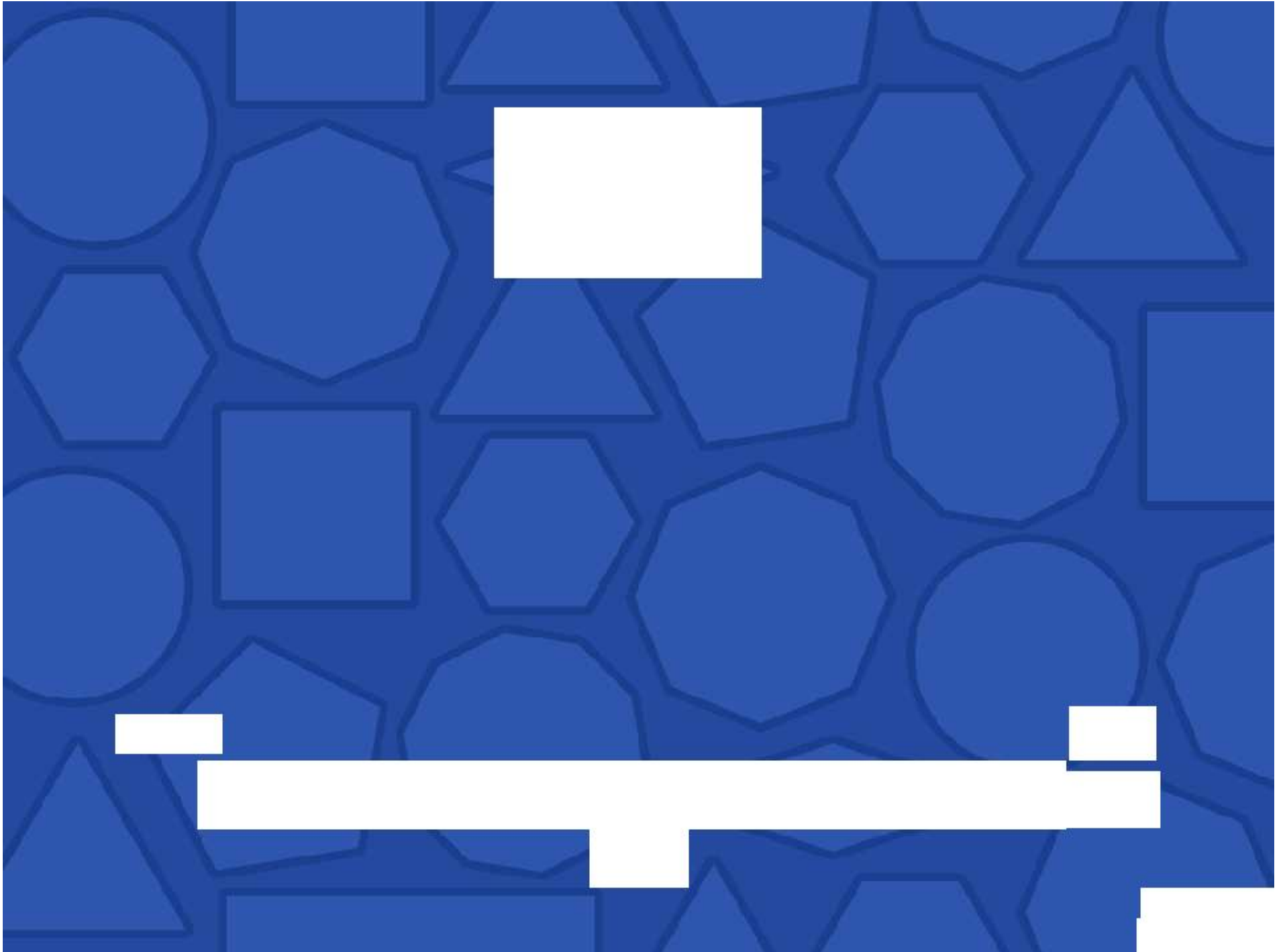
Aim



- I can draw circles accurately using a pair of compasses and I can identify and label the parts of a circle.

Success Criteria

- I can use a pair of compasses to draw a circle.
- I can label the radius, diameter and circumference of a circle.



Maths | Clever Cicles

I can draw circles accurately using a pair of compasses and I can identify and label the parts of a circle.		
I can use a pair of compasses to draw a circle.		
I can label the radius, diameter and circumference of a circle.		

Maths | Clever Cicles

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Maths | Clever Cicles

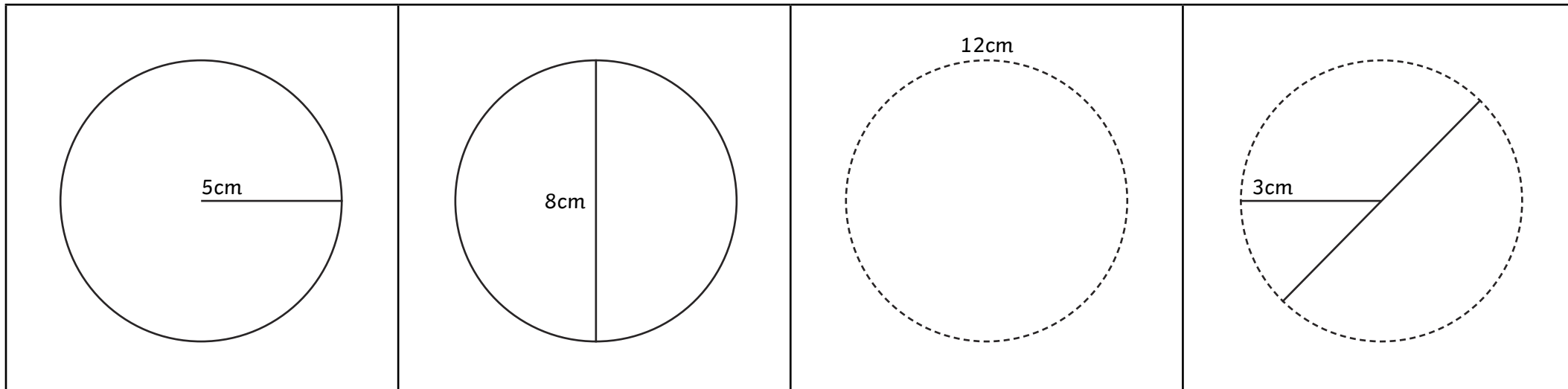
I can draw circles accurately using a pair of compasses and I can identify and label the parts of a circle.		
I can use a pair of compasses to draw a circle.		
I can label the radius, diameter and circumference of a circle.		

Maths | Clever Cicles

I can draw circles accurately using a pair of compasses and I can identify and label the parts of a circle.		
I can use a pair of compasses to draw a circle.		
I can label the radius, diameter and circumference of a circle.		

Circle Riddles

Match the circles to the correct riddle.



<p>My radius is 3cm Which circle am I?</p>	<p>My diameter is 10cm. Which circle am I?</p>	<p>My diameter is 8cm Which circle am I?</p>	<p>My circumference is 12cm. Which circle am I?</p>
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Clever Circles Extra Challenge

I can draw and label circles.

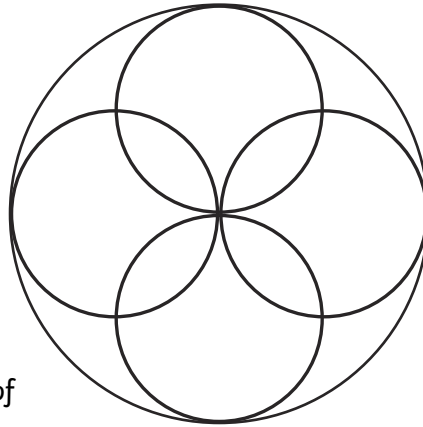


Use your pair of compasses to create these stunning circle designs using the instructions.

Design 1

Step by step drawing instructions:

1. Draw a circle with a diameter of 10cm.
2. Draw a faint horizontal and vertical line which both intersect the centre point of this circle.
3. Make a small mark 2.5cm from the outside edge on each side of these lines.
4. Set your pair of compasses to a distance of 2.5cm.
5. Place the needle of the pair of compasses on the marks made previously and draw 4 intersecting circles.
6. Carefully rub out the horizontal and vertical lines.
7. Add colour and pattern to your circle design.



Design 2

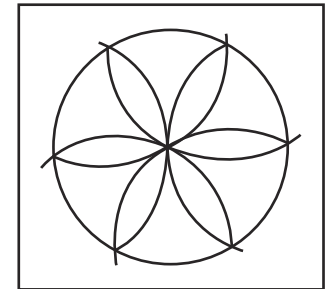
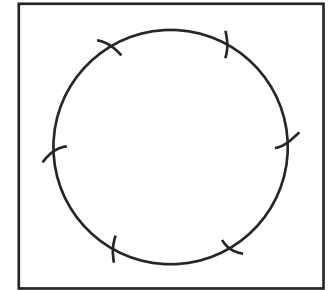
Step by step drawing instructions:

Draw a circle with a radius of 4cm.

Keep your pair of compasses set at 4cm. Place the needle anywhere on the edge of the circle and make a small arc where the pencil meets the edge of the circle.

Repeat by placing your needle on the arc just made and creating a second arc. Continue this process around the edge of the circle.

Next, place the needle on each arc in turn and draw larger arcs.



Extra challenge: Invent your own circle pattern and write a set of instructions for it.



Drawing Circles

I can draw and label circles.



Draw and label a circle with a radius of 3cm.

Draw and label a circle with a radius of 5cm.



Drawing Circles

Draw and label a circle with a radius of 8cm.



Drawing Circles

I can draw and label circles.



Draw and label a circle with a radius of 3.5cm.

Draw and label a circle with a radius of 5.5cm.



Drawing Circles

Draw and label a circle with a radius of 8.5cm.



Drawing Circles

I can draw and label circles.



Draw and label a circle with a radius of 38mm.

Draw and label a circle with a radius of 53mm.



Drawing Circles

Draw and label a circle with a radius of 89mm.