White Rose Maths

Summer - Block 5

Properties of Shapes

Overview

Small Steps

- Identify angles
- Compare and order angles
- Triangles
- Quadrilaterals
- Lines of symmetry
- Complete a symmetric figure

NC Objectives

Identify acute and obtuse angles and compare and order angles up to two right angles by size.

Compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes.

Identify lines of symmetry in 2-D shapes presented in different orientations.

Complete a simple symmetric figure with respect to a specific line of symmetry.

Identify Angles

Notes and Guidance

Children develop their understanding of obtuse and acute angles by comparing with a right angle. They use an angle tester to check whether angles are larger or smaller than a right angle.

Children learn that an acute angle is more than 0 degrees and less than 90 degrees, a right angle is exactly 90 degrees and an obtuse angle is more than 90 degrees but less than 180 degrees.

Mathematical Talk

How many degrees are there in a right angle?

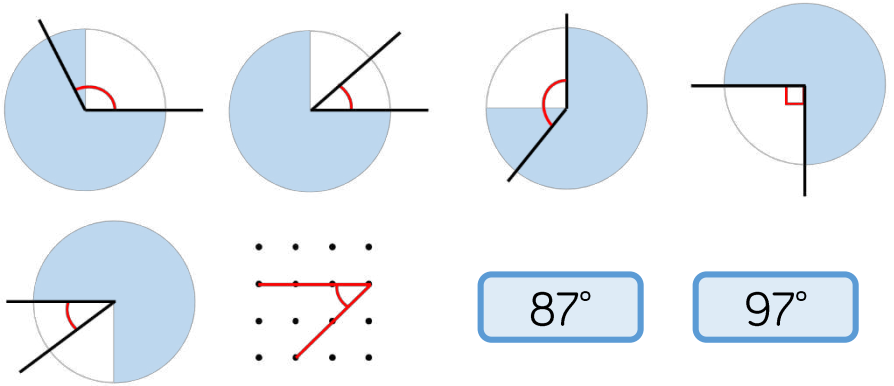
Draw an acute/obtuse angle.

Estimate the size of the angle.

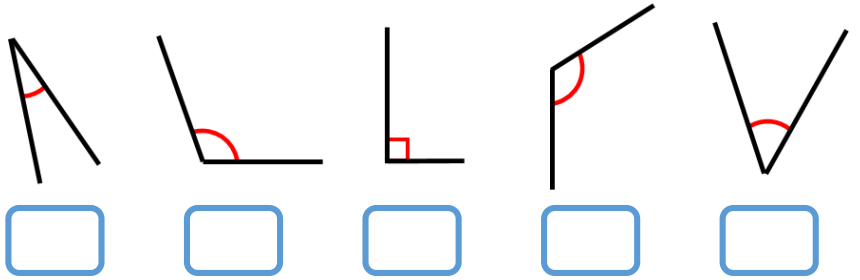
Varied Fluency

A right angle is _____ degrees.
Acute angles are _____ than a right angle.
Obtuse angles are _____ than a right angle.

Sort the angles into acute, obtuse and right angles.

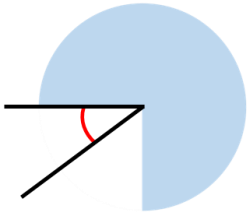


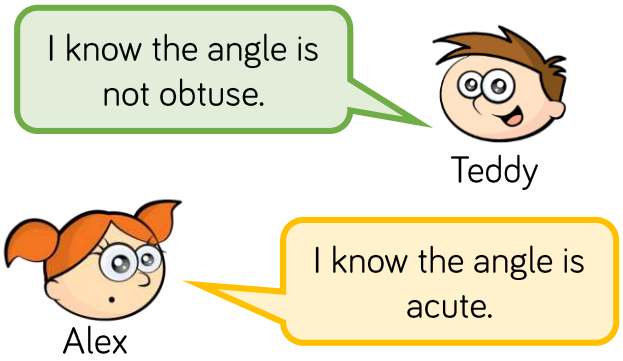
Label the angles. O for obtuse, A for acute and R for right angle.



Identify Angles

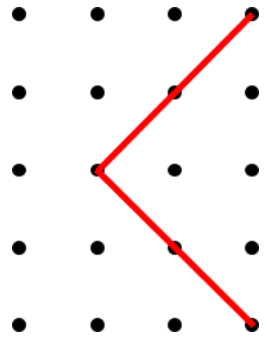
Reasoning and Problem Solving





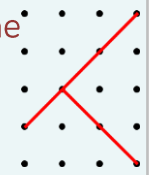
Who is correct?
Explain your reasons.

All are correct. Children may reason about how Whitney has come to her answer and discuss that the angle is about half a right angle. Half of 90 degrees is 45 degrees.



Is the angle acute, obtuse or a right angle?
Can you explain why?

The angle is a right angle. Children may use an angle tester to demonstrate it, or children may extend the line to show that it is a quarter turn which is the same as a right angle.



Find the sum of the largest acute angle and the smallest obtuse angle in this list:

12°	98°	87°	179°	90°	5°

$87° + 98° = 185°$

Compare & Order Angles

Notes and Guidance

Children compare and order angles in ascending and descending order.

They use an angle tester to continue to help them to decide if angles are acute or obtuse.

Children identify and order angles in different representations including in shapes and on a grid.

Mathematical Talk

How can you use an angle tester to help you order the angles?

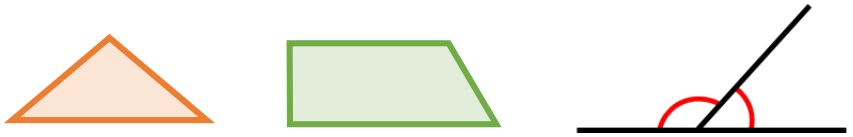
How many obtuse/acute/right angles are there in the diagrams?

Compare the angles to a right angle. Does it help you to start to order them?

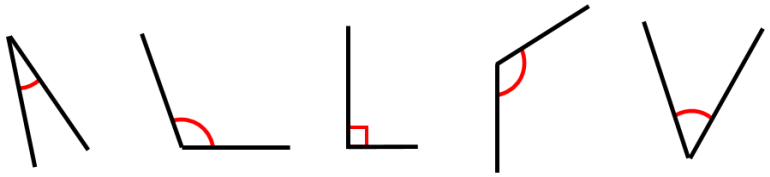
Rotate the angles so one of the lines is horizontal. Does this help you to compare them more efficiently?

Varied Fluency

- Circle the largest angle in each shape or diagram.

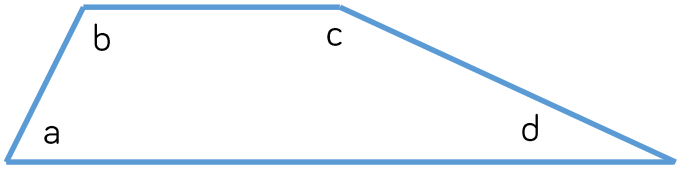


- Order the angles from largest to smallest.



Can you draw a larger obtuse angle?
Can you draw a smaller acute angle?

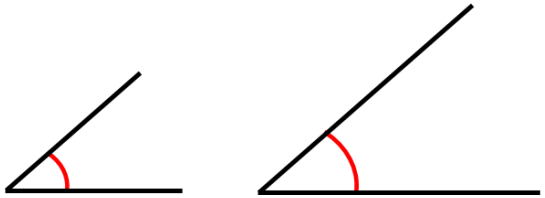
- Order the angles in the shape from smallest to largest.
Complete the sentences.



Angle _____ is smaller than angle _____.
Angle _____ is larger than angle _____.

Compare & Order Angles

Reasoning and Problem Solving



Angle A Angle B

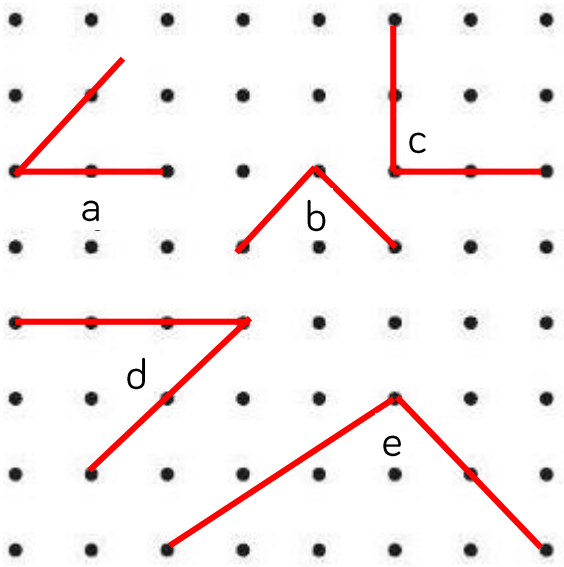
Ron

Angle B is bigger than Angle A because it has longer sides.

Do you agree with Ron? Explain your thinking.

Angle A and Angle B are the same size. Ron has mixed up the lengths of the lines with the size of the angles.

Here are five angles.
There are two pairs of identically sized angles and one odd one out.
Which angle is the odd one out?
Explain your reason.



Angle e is the odd one out.

Angle b and c are both right angles.

Angle a and d are both half of a right angle or 45 degrees.

Angle e is an obtuse angle.

Triangles

Notes and Guidance

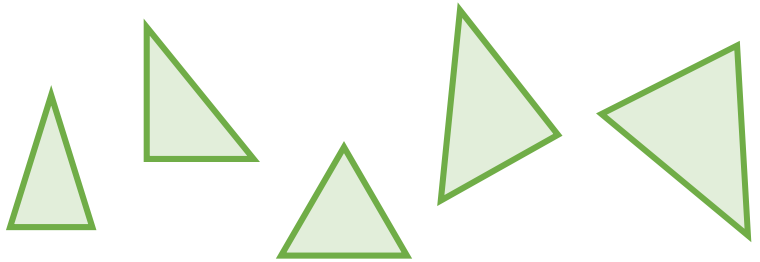
Teachers might start this small step by recapping the definition of a polygon. An activity might be to sort shapes into examples and non-examples of polygons.
Children will classify triangles for the first time using the names 'isosceles', 'scalene' and 'equilateral'. Children will use rulers to measure the sides in order to classify them correctly.
Children will compare the similarities and differences between triangles and use these to help them identify, sort and draw.

Mathematical Talk

What is a polygon? What isn't a polygon?
What are the names of the different types of triangles?
What are the properties of an isosceles triangles?
What are the properties of a scalene triangle?
What are the properties of an equilateral triangle?
Which types of triangle can also be right-angled?
How are the triangles different?
Do any of the sides need to be the same length?

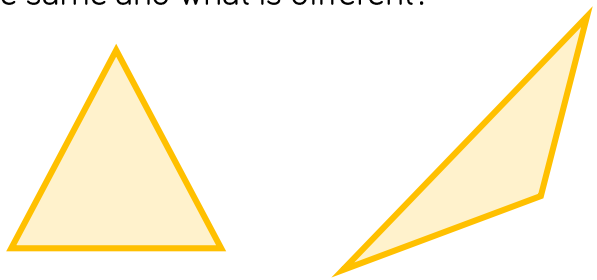
Varied Fluency

- Label each of these triangles: isosceles, scalene or equilateral.



Are any of these triangles also right-angled?

- Look at these triangles.
What is the same and what is different?

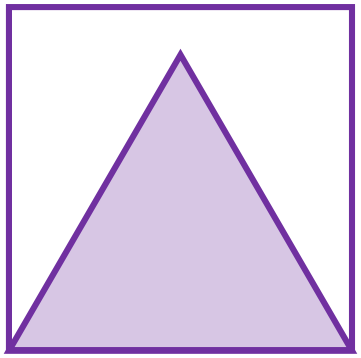


- Using a ruler, draw:
  - An isosceles triangle
  - A scalene triangle

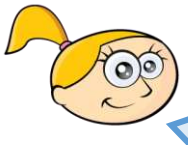
Triangles

Reasoning and Problem Solving

Here is a square.
Inside the square is an equilateral triangle.
The perimeter of the square is 60 cm.
Find the perimeter of the triangle.



The perimeter of the triangle is 45 cm.



Eva

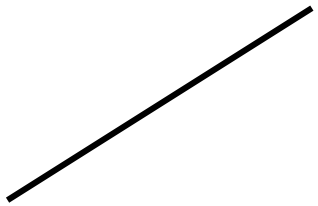
If I use 6 straws to make a triangle, I can only make an equilateral triangle.

Investigate whether Eva is correct.

Eva is correct.
2, 2, 2 is the only possible construction. 1, 1, 4 and 1, 2, 3 are not possible.

Draw two more sides to create:

- An equilateral triangle
- A scalene triangle
- An isosceles triangle



Which is the hardest to draw?

Children will draw a range of triangles. Get them to use a ruler to check their answers.
Equilateral will be difficult to draw accurately because the angle between the first two sides drawn, must be 60°

Quadrilaterals

Notes and Guidance

Children name quadrilaterals including a square, rectangle, rhombus, parallelogram and trapezium. They describe their properties and highlight the similarities and differences between different quadrilaterals.
Children draw quadrilaterals accurately using knowledge of their properties.
Teachers could use a Frayer Model with the children to explore the concept of quadrilaterals further.

Mathematical Talk

What's the same about the quadrilaterals?

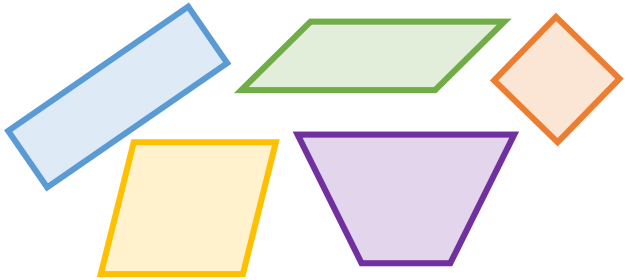
What's different about the quadrilaterals?

Why is a square a special type of rectangle?

Why is a rhombus a special type of parallelogram?

Varied Fluency

Label the quadrilaterals using the word bank.



trapezium
square
rhombus
rectangle
parallelogram

Use the criteria to describe the shapes.

four sides	2 pairs of parallel sides	four equal sides
polygon	1 pair of parallel sides	4 right angles

Which criteria can be used more than once?
Which shapes share the same criteria?

Draw and label:
- a rhombus.
- a parallelogram.
- 3 different trapeziums

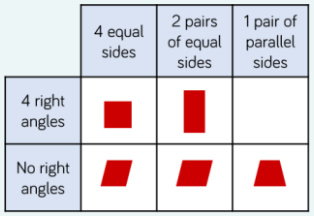
Quadrilaterals

Reasoning and Problem Solving

Complete each of the boxes in the table with a different quadrilateral.

	4 equal sides	2 pairs of equal sides	1 pair of parallel sides
4 right angles			
No right angles			

Which box cannot be completed? Explain why.



Children can discuss if there are any shapes that can go in the top right corner. Some children may justify it could be a square or a rectangle however these have 2 pairs of parallel sides.

You will need:

Some 4 centimetre straws
Some 6 centimetre straws

How many different quadrilaterals can you make using the straws?

Calculate the perimeter of each shape.

Square: Four 4 cm - perimeter is 16 cm or four 6 cm- perimeter is 24 cm
Rectangle: Two 4 cm and two 6 cm- perimeter is 20 cm
Rhombus: Four 4 cm - perimeter is 16 cm
Four 6 cm straws- perimeter is 24 cm
Parallelogram: Two 4 cm and two 6 cm - perimeter is 20 cm
Trapezium: Three 4 cm and one 6 cm- perimeter is 18 cm

Lines of Symmetry

Notes and Guidance

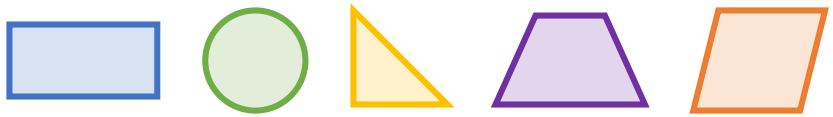
Children find and identify lines of symmetry within 2-D shapes. Children explore symmetry in shapes of different sizes and orientations. To help find lines of symmetry children may use mirrors and tracing paper.
The key aspect of symmetry can be taught through paper folding activities. It is important for children to understand that a shape may be symmetrical, but if the pattern on the shape isn't symmetrical, then the diagram isn't symmetrical.

Mathematical Talk

Explain what you understand by the term 'symmetrical'.
Can you give any real-life examples?
How can you tell if something is symmetrical?
Are lines of symmetry always vertical?
Does the orientation of the shape affect the lines of symmetry?
What equipment could you use to help you find and identify lines of symmetry?
What would the rest of the shape look like?

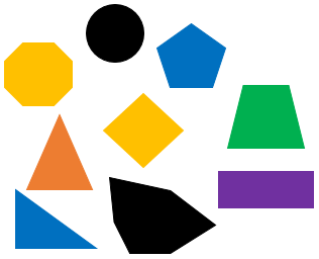
Varied Fluency

- Using folding, find the lines of symmetry in these shapes.

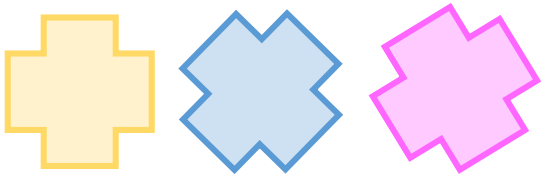


- Sort the shapes into the table.

	1 line of symmetry	More than 1 line of symmetry
Up to 4 sides		
More than 4 sides		



- Draw the lines of symmetry in these shapes (you could use folding to help you).

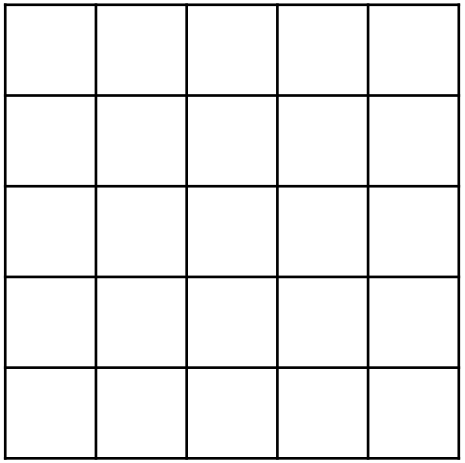


What do you notice?

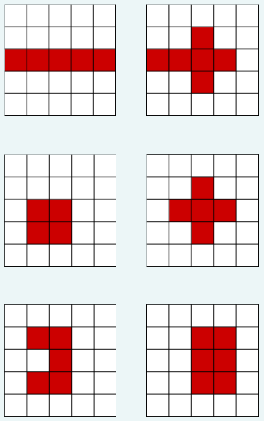
Lines of Symmetry

Reasoning and Problem Solving

How many symmetrical shapes can you make by colouring in a maximum of 6 squares?



There are a variety of options. Some examples include:



Jack

A triangle has 1 line of symmetry unless you change the orientation.

Is Jack correct? Prove it.

Jack is incorrect. Changing the orientation does not change the lines of symmetry. Children should prove this by drawing shapes in different orientations and identifying the same number of lines of symmetry.

Always, Sometimes, Never.

A four-sided shape has four lines of symmetry.

Sometimes, provided the shape is a square.

Symmetric Figures

Notes and Guidance

Children use their knowledge of symmetry to complete 2-D shapes and patterns.

Children could use squared paper, mirrors or tracing paper to help them accurately complete figures.

Mathematical Talk

What will the rest of the shape look like?

How can you check?

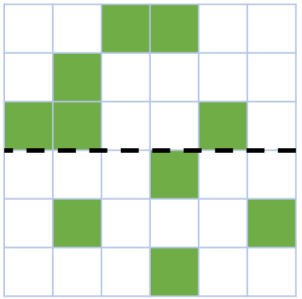
How can you use the squares to help you?

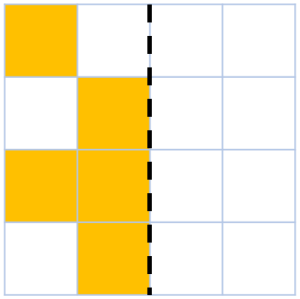
Does each side need to be the same or different?

Which lines need to be extended?

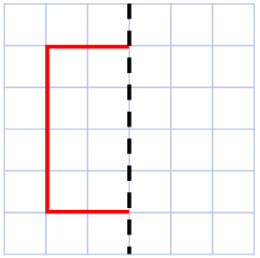
Varied Fluency

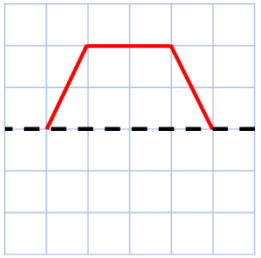
- Colour the squares to make the patterns symmetrical.

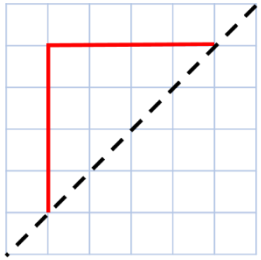




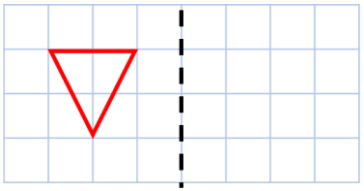
- Complete the shapes according to the line of symmetry.

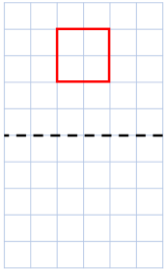






- Reflect the shapes in the mirror line.





Symmetric Figures

Reasoning and Problem Solving

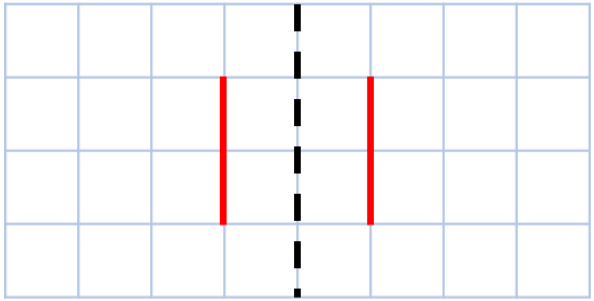
Dora

When given half of a symmetrical shape I know the original shape will have double the amount of sides.

Do you agree with Dora?
Convince me.

Dora is sometimes correct. This depends on where the mirror line is. Encourage children to draw examples of times where Dora is correct, and to draw examples of times when Dora isn't correct.

How many different symmetrical shapes can you create using the given sides?



Children will find a variety of shapes. For example: