Summer Block 4

Shape

Small steps

Step 1	Understand angles as turns
Step 2	Identify angles
Step 3	Compare and order angles
Step 4	Triangles
Step 5	Quadrilaterals
Step 6	Polygons
Step 7	Lines of symmetry
Step 8	Complete a symmetric figure

Understand angles as turns

Notes and guidance

In Year 3, children explored full, half and quarter turns, using the language of clockwise and anticlockwise. This small step is an opportunity for children to revisit that learning.

Begin by recapping full, half and quarter turns. Ask children to stand up and turn as instructed, including a variety of different turns both clockwise and anticlockwise. Discuss the significance of clockwise and anticlockwise in this context, using the hands of a clock to demonstrate if needed. Children explore different turns from different starting points, including using compass directions. They then work out the turn after being given a start and end position. They also consider what a pictorial representation of an angle looks like and how this relates to turns.

Things to look out for

- Children may confuse clockwise and anticlockwise.
- Children may need reminding about the meaning of half, quarter and three-quarters.
- Children may relate angles to the distance between two points on a line rather than the measure of turn between the lines.

Key questions

- What is a full turn?
- What is the difference between a half turn and a quarter turn?
- Which way do the hands move around a clock?
- What does "clockwise"/"anticlockwise" mean?
- What direction will you be facing if you complete a ______ turn clockwise/anticlockwise?
- If you were facing ______ and are now facing ______, what turn have you made? Is there more than one answer?

Possible sentence stems

- I am now facing ______
  If I make a ______ turn clockwise/anticlockwise, I will be facing ______
- To make a three-quarter turn, I could make a ______ turn followed by a ______ turn.
- A ______ turn clockwise is the same as a ______ turn anticlockwise.

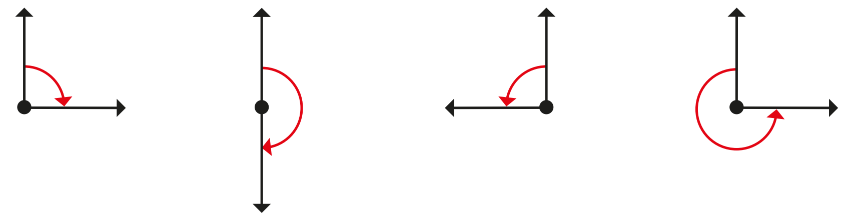
National Curriculum links

- Recognise angles as a property of shape or a description of a turn (Y3)

Understand angles as turns

Key learning

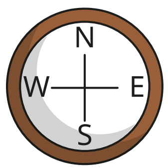
- Match the turns to the labels.



half turn clockwise	quarter turn anticlockwise	quarter turn clockwise	three-quarter turn anticlockwise

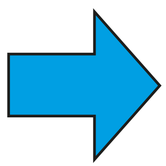
- Teddy is facing north.

  What direction will Teddy be facing if he turns:

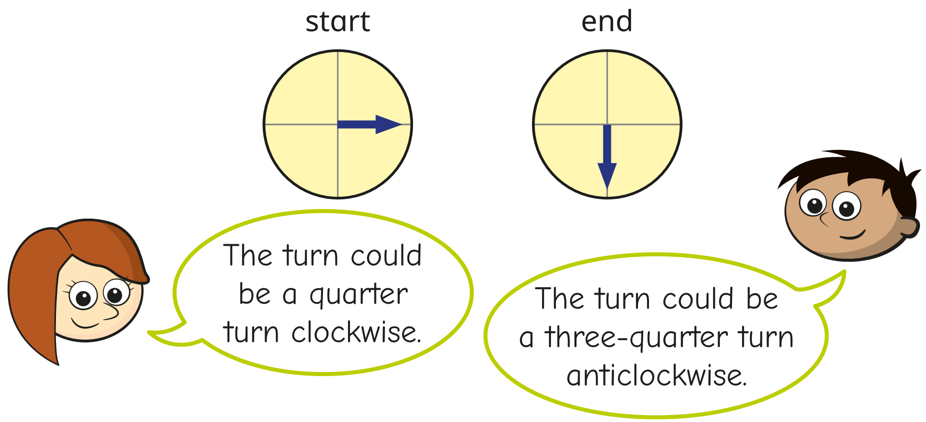


  - a quarter turn clockwise
  - a half turn anticlockwise
  - a three-quarter turn clockwise?

- Draw what this arrow will look like after:
  - a quarter turn clockwise
  - a half turn
  - a three-quarter turn clockwise.

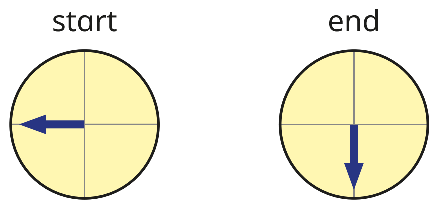


- Rosie and Amir spin an arrow on a spinner.



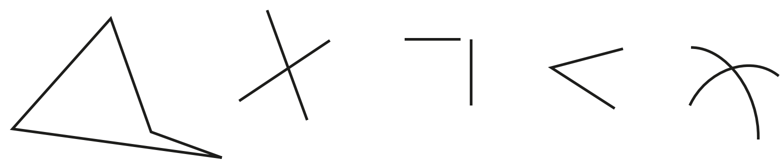
  Why are both children correct?

  Describe this turn.



  Is there more than one way to describe the turn?

- Which pictures show at least one angle?



Understand angles as turns

Reasoning and problem solving

Dani, Nijah and Brett are all facing the same direction.

Dani turns a half turn clockwise three times.

Nijah turns a quarter turn anticlockwise six times.

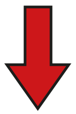
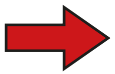
Brett turns two full turns clockwise.

Do you agree with Tiny?

Explain your answer.

No

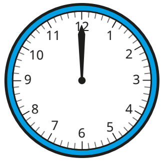
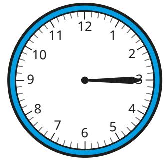
How many different ways can you describe the turn?

start  end 

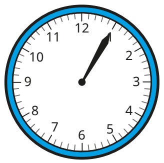
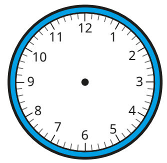
multiple possible answers

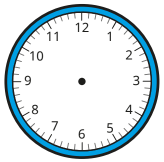
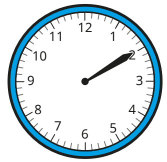
This clock has lost its hour hand.

After a quarter of an hour, the minute hand turns a quarter turn clockwise.

start  quarter of an hour later 

Draw the missing minute hands on the clocks.

start  quarter of an hour later 

start  three-quarters of an hour later 

pointing to 4

pointing to 5

Identify angles

Notes and guidance

Children learnt about right angles being quarter turns in Year 3. In this small step, they also classify angles as acute and obtuse.

This is the first time that children have encountered these words, so time should be spent exploring them fully. Show that when a turn is completed, an angle is created. For a quarter turn, this angle is called a right angle. Explain that any angle that is less than a right angle is called an acute angle. Model different examples of acute angles, the greatest of which is only slightly less than a right angle. Then show that an angle greater than a right angle, but less than a half turn, is called an obtuse angle. A right-angle finder can be a useful support for children in identifying acute and obtuse angles accurately.

At this stage, children do not need to explore reflex angles or use degrees as a measure of turn. This will be covered in Year 5

Things to look out for

- Children may initially think that there is only one acute and one obtuse angle (usually $\frac{1}{8}$ and $\frac{3}{8}$ of a turn) in the same way that there is only one right angle.
- Children may think that any angle greater than a right angle is obtuse.

Key questions

- What is an angle?
- What type of angle is created by a quarter turn?
- What type of angle is created by a turn less than a quarter turn?
- What type of angle is created by a turn that is greater than a quarter turn, but less than a half turn?
- What type of angle is made by this turn?
- Are all right/acute/obtuse angles the same amount of turn?

Possible sentence stems

- A quarter turn is called a ______ angle.
- An angle less than a quarter turn is called an ______ angle.
- An ______ angle is greater than a quarter turn, but less than a half turn.

National Curriculum links

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

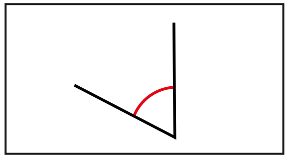
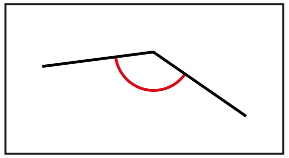
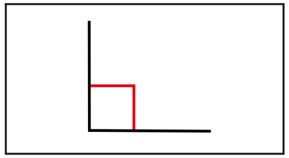
Identify angles

Key learning

- What fraction of a turn is a right angle?

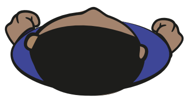
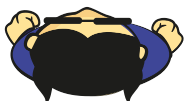
  How many right angles can you see in your classroom?

- Match the pictures, descriptions and types of angles.

less than a quarter turn	quarter turn	greater than a quarter turn, but less than a half turn
right angle	obtuse angle	acute angle

- Mo and Annie are facing the same direction.

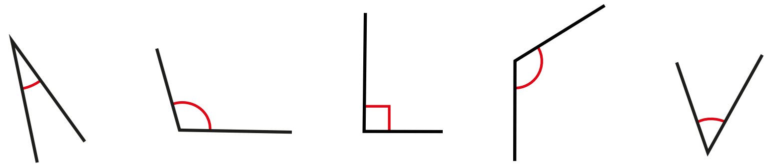
Mo   Annie

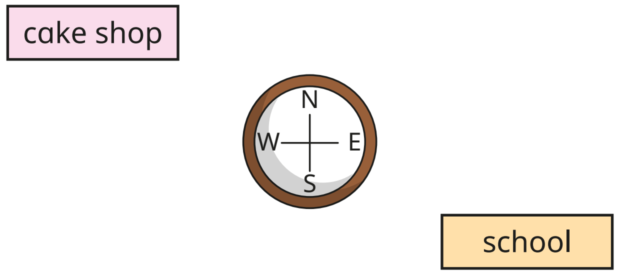
  Mo turns one-quarter turn clockwise.

  Annie turns less than Mo in the same direction.

  What type of angle has each of them turned through?

- Write **acute**, **obtuse** or **right angle** to label each angle.



- 

  - Huan is facing east.

    He turns clockwise to face the school.

    What type of angle does he turn through?

  - Esther is facing the cake shop.

    She turns anticlockwise to face south.

    What type of angle does she turn through?

  - Aisha is facing west.

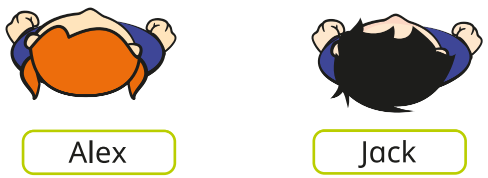
    She turns clockwise to face north.

    What type of angle does she turn through?

Identify angles

Reasoning and problem solving

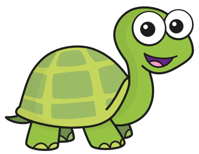
Alex and Jack are both facing the same direction.



Alex turns two acute angles clockwise.

Jack turns three acute angles clockwise.

In total, Alex has turned a quarter turn clockwise and Jack has turned an obtuse angle clockwise.



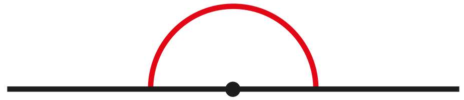
Do you agree with Tiny?

Explain your answer.

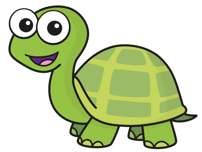
No

Both children could have turned small acute angles, still totalling an acute angle.

Tiny is labelling angles.



The angle is greater than a right angle, so it must be obtuse.



Do you agree with Tiny?

Explain your answer.

No

Compare and order angles

Notes and guidance

In this small step, children continue to explore angles as a measure of a turn by comparing and ordering angles.

Begin by recapping acute, right and obtuse angles. Children should see that a right angle is a greater angle than any acute angle, and any obtuse angle is greater than a right angle. They identify different types of angles, and use this information to compare and order the angles. They then move on to comparing two angles of the same type. Model how to show which angle between two acute angles is greater. This can be done by inspection, by adding in extra lines or by comparing each angle to a right angle to see which is closer. Children order sets of angles from smallest to greatest; they may choose to group the angles by type before making further comparisons. They also draw angles that are greater or less than given angles.

Things to look out for

- Children may confuse the terms “acute” and “obtuse”.
- Children may assume that a longer pair of lines always creates a greater angle.

Key questions

- What is the difference between an acute and an obtuse angle?
- What type of angle is this? How do you know?
- Which of these two angles is greater? How do you know?
- Are all acute angles less than obtuse angles? Why/why not?
- How can you work out which angle is the greatest/smallest?
- Does the length of the arms of the angle make a difference to the amount of turn? Why/why not?

Possible sentence stems

- All ______ angles are greater than ______ angles.
- All ______ angles are less than ______ angles.

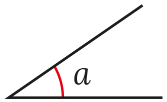
National Curriculum links

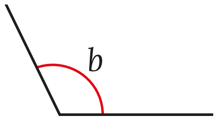
- Identify acute and obtuse angles and compare and order angles up to two right angles by size

Compare and order angles

Key learning

- Here are two angles.



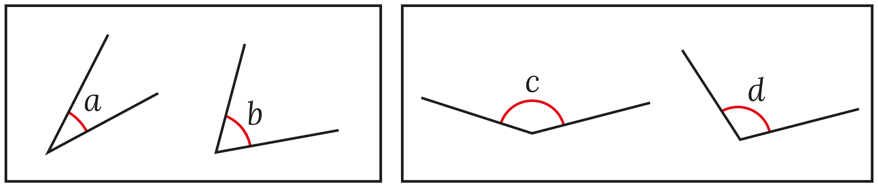


  - What type of angle is each angle?

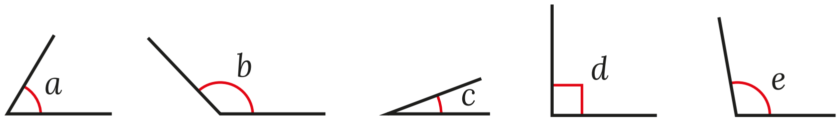
    How do you know?
  - Which angle is greater?

    How do you know?

- Which angle is greater in each pair?



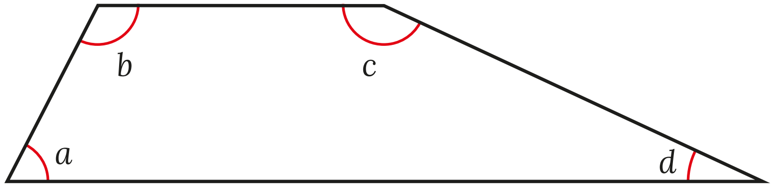
- Write **acute**, **obtuse** or **right angle** to label each angle.



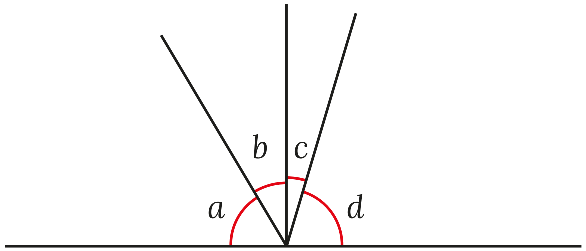
  Order the angles from smallest to greatest.

- Four angles are labelled in the quadrilateral.

  Order the angles from smallest to greatest.

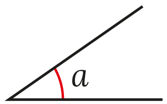


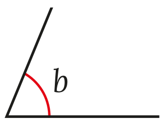
- Four angles are drawn on a straight line.



  Write the angles in order of size from greatest to smallest.

- Draw an angle that is greater than angle a, but less than angle b.





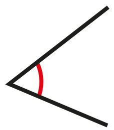
Compare and order angles

Reasoning and problem solving

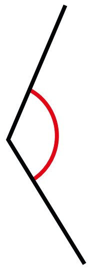
Ron and Rosie each draw an angle.

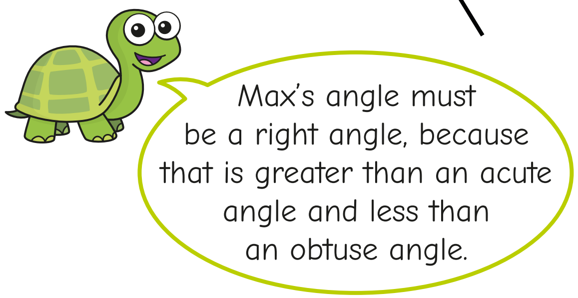
Max draws an angle that is greater than Ron's angle, but less than Rosie's angle.

Ron



Rosie





Do you agree with Tiny?

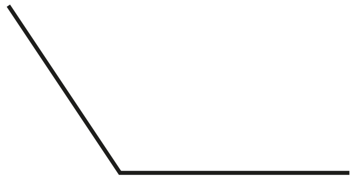
Explain your answer.

Draw what Max's angle could look like.

No

Kim is drawing a pentagon.

She has drawn these two lines.



Draw the rest of the pentagon so that it has:

- one acute angle
- three obtuse angles
- one right angle

Compare answers with a partner.

multiple possible answers

Triangles

Notes and guidance

In this small step, children explore different types of triangles.

Children begin by looking at examples and non-examples of triangles to help them summarise the characteristics of a triangle: a closed, 2-D shape with three straight sides. Children then consider the properties of different types of triangles: if all three sides have different lengths, the triangle is scalene; if two sides are the same length, the triangle is isosceles; if all three sides are equal, the triangle is equilateral. This is the first time that children will have encountered these words, so it is important to revisit them regularly. They could also explore right-angled triangles as another type of triangle. Children also learn that the number of equal angles in a triangle is the same as the number of equal sides.

Things to look out for

- Children may think that shapes with "curved corners" are triangles.
- Children may not identify triangles in different orientations, for example "upside-down" triangles.
- Children may find it hard to sketch equilateral/isosceles triangles before they have learnt how to use a protractor.

Key questions

- What are the properties of a triangle?
- How many equal sides/angles does this triangle have?
- Why is this a triangle?
  Why is this not a triangle?
- What type of triangle is this?
- What is the difference between a(n) ______ triangle and a(n) ______ triangle?
- If one side of an equilateral triangle is ______ long, what is the perimeter of the triangle?

Possible sentence stems

- An equilateral/isosceles/scalene triangle has ______ equal sides and ______ equal angles.
- A ______ triangle has one angle that is a ______

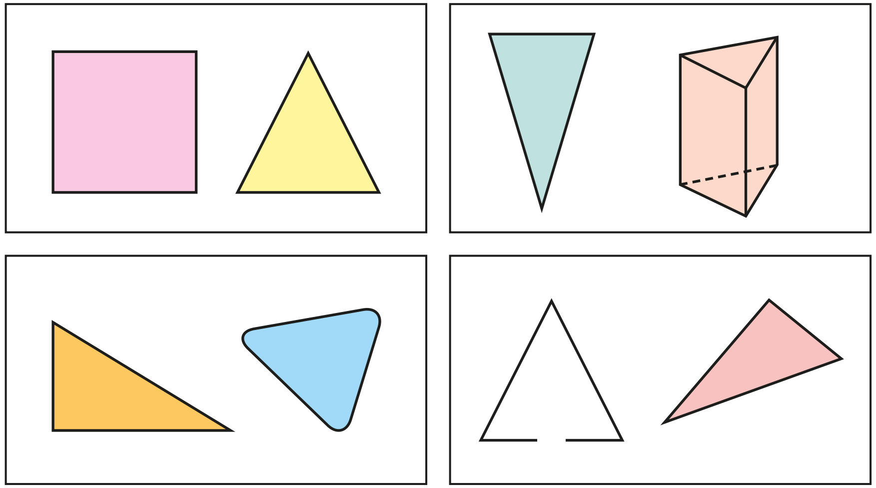
National Curriculum links

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

Triangles

Key learning

- For each pair of shapes, decide which is a triangle.



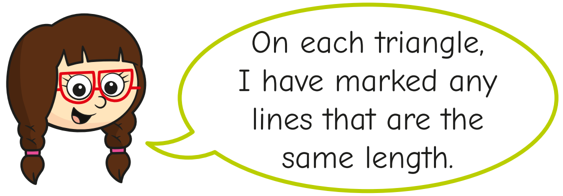
Why are the others not triangles?

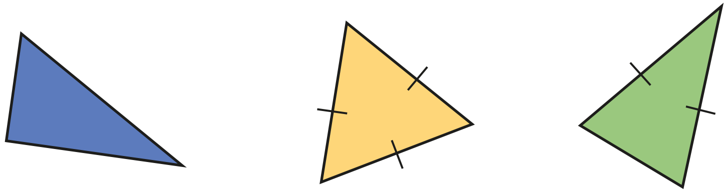
- Here are two triangles.

What is the same and what is different about the triangles?

- Draw five different triangles.

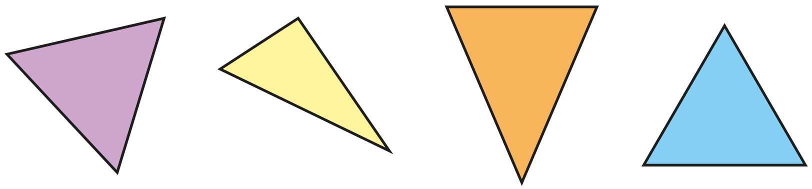
Describe your triangles to a partner.

- 



Decide if each triangle is scalene, equilateral or isosceles.

- Measure and label the equal sides on the triangles.



Decide if each triangle is scalene, equilateral or isosceles.

- Tom draws an equilateral triangle.

Each side is 11 cm.

What is the perimeter of Tom's triangle?

Triangles

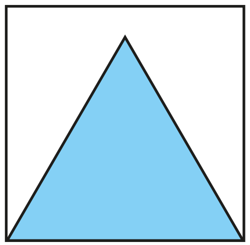
Reasoning and problem solving

Here is a square.

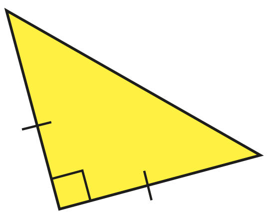
Inside the square is an equilateral triangle.

The perimeter of the square is 60 cm.

Find the perimeter of the **triangle**.



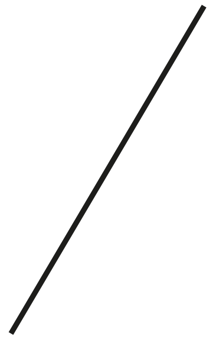
45 cm



Describe the triangle as fully as you can.

right-angled and isosceles

The line is one side of a triangle.



Draw two more sides to create:

- an equilateral triangle
- a scalene triangle
- an isosceles triangle

Which is the hardest to draw?

Compare answers as a class.

Quadrilaterals

Notes and guidance

In this small step, children explore different types of quadrilaterals.

Children identify quadrilaterals from a selection of shapes. Initially, they may only see squares and rectangles as quadrilaterals, so explore a range of different quadrilaterals with different properties.

Children may need to recap Year 3 learning about parallel and perpendicular lines. The names for the different quadrilaterals will need revisiting to become firmly embedded, so whenever possible use them in other areas of the curriculum or in other subjects. By the end of this step, children should be able to distinguish between a trapezium, a rhombus and a parallelogram as well as the familiar square and rectangle. Using geoboards or squared paper and drawing the shapes in different orientations will help children to identify what the shapes have in common and what is different about them.

Things to look out for

- Children may not recognise quadrilaterals in non-standard orientations, for example calling a rotated square a "diamond".
- Children may confuse the mathematical names of different quadrilaterals.

Key questions

- What is a polygon?
- What does "quad" mean? What is a quadrilateral?
- What is the difference between these two quadrilaterals?
- How many right angles are there?
- Does the quadrilateral have any pairs of equal/parallel sides?
- What are the properties of this quadrilateral?
- What is the same/different about a rectangle and a square?
- What is the difference between a rhombus and a parallelogram?

Possible sentence stems

- A quadrilateral is a ______ with ______ sides.
- The shape has ______ pairs of parallel lines and ______ pairs of equal sides.

  It is a ______

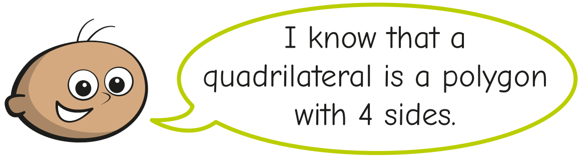
National Curriculum links

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

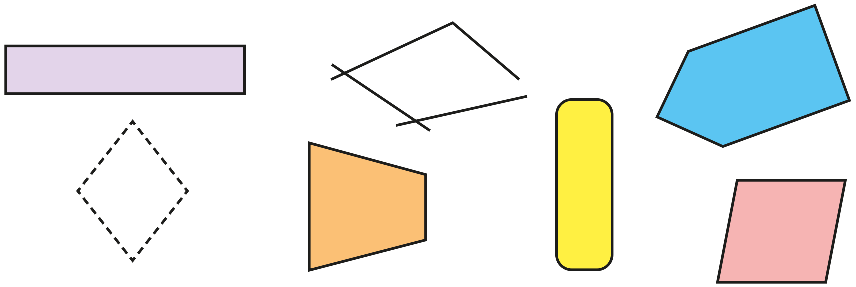
Quadrilaterals

Key learning

- Tommy is sorting these shapes.

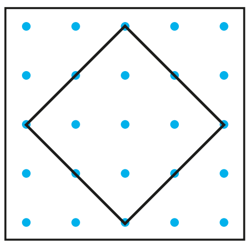


Which of these shapes are quadrilaterals?



- Use a 5 × 5 geoboard or dotted paper.

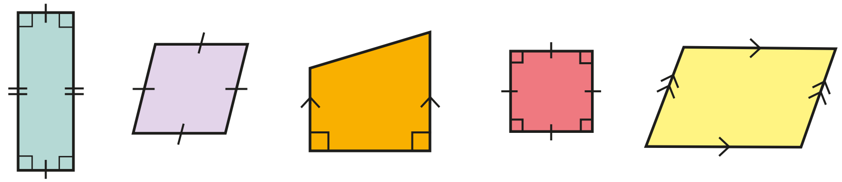
How many different quadrilaterals can you make/draw?



Can you name each quadrilateral?

Compare answers with a partner.

- Use the labels to describe the properties of the shapes.



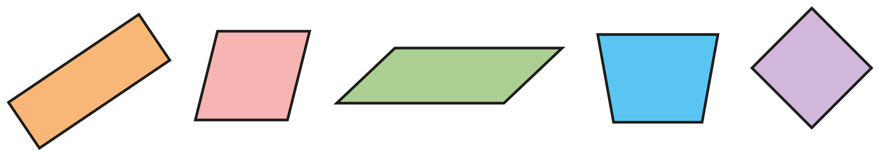
4 sides | 2 pairs of parallel sides | 4 equal sides

polygon | 1 pair of parallel sides | 4 right angles

Which labels can be used more than once?

Which shapes have the same properties?

- Use the word bank to label each quadrilateral.



trapezium | square | rhombus

rectangle | parallelogram

Describe the properties of each shape.

Quadrilaterals

Reasoning and problem solving

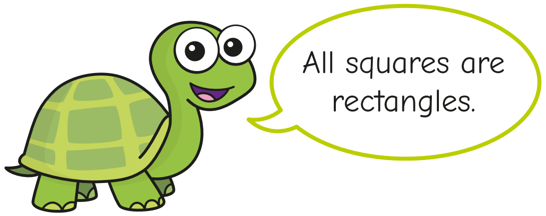
You will need:

- some 4 cm straws
- some 6 cm straws

How many different quadrilaterals can you make using the straws?

Work out the perimeter of each shape.

multiple possible answers, e.g.
parallelogram (20 cm)
trapezium (18 cm)



Tiny is correct.

What other statements can you make describing special quadrilaterals?

multiple possible answers, e.g.
All rhombuses are parallelograms.

Draw a different shape in each section of the table.

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

In which section can no quadrilateral be drawn?

Explain why.

top row: square, rectangle, blank

bottom row: rhombus, parallelogram, trapezium

4 right angles and 1 pair of parallel sides

Polygons

Notes and guidance

Children first encountered 2-D shapes with more than four sides in Key Stage 1. In this small step, they revisit and extend their knowledge of the names of polygons.

Explain that "gon" means "angled" and the different prefixes relate to the number of angles; for example, "pent" means five, so a pentagon has five angles and therefore five sides. Discuss other words that children can use to help them with the meanings of the prefixes, such as pentathlon and octopus.

Children then explore the meanings of "regular" and "irregular" in the context of polygons, learning that in a regular polygon, the sides are all equal in length and the angles are all equal in size. They are often surprised that, for example, a rectangle is irregular. By making shapes with straws or lolly sticks, children can easily create their own polygons and decide if they are regular or irregular.

Things to look out for

- Children may see a polygon with all equal sides and think that it is regular without considering the angles. They may also think that, for example, a rectangle is regular.
- Children may mix up the meanings of the prefixes.

Key questions

- What is a polygon?
- What is a polygon with ______ sides called?
- How many angles/sides does an octagon have? What other words do you know that start with "oct"?
- What is the same and what is different about these polygons?
- When talking about polygons, what does "regular"/"irregular" mean?
- If one side of a regular ______ is ______ cm, what is its perimeter?

Possible sentence stems

- In a regular polygon, all ______ are equal in length and all ______ are equal in size.
- The shape has ______ sides, so it is a ______
- A regular triangle/quadrilateral is called a(n) ______

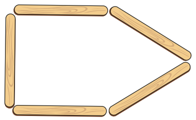
National Curriculum links

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

Polygons

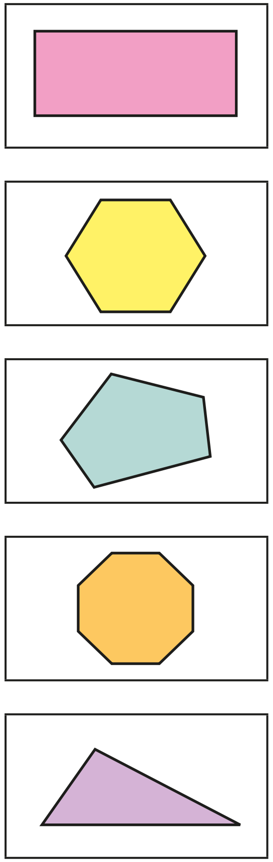
Key learning

- Use lolly sticks to make polygons with different numbers of sides.



  Which polygons do you know the names of already?

- Match the polygons to the labels.



triangle

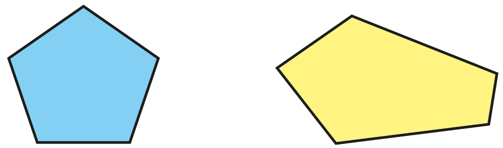
quadrilateral

pentagon

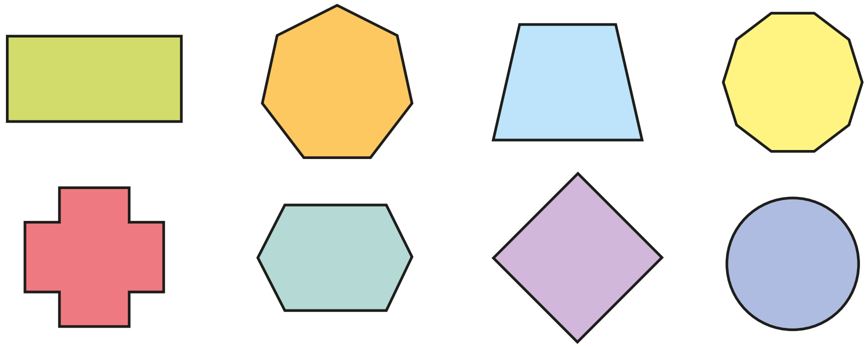
hexagon

octagon

- What is the same and what is different about the polygons?



- Which shapes are regular polygons?



  Mark the equal sides on each polygon.

- Each side of a regular pentagon is 9 cm.

  What is the perimeter of the pentagon?

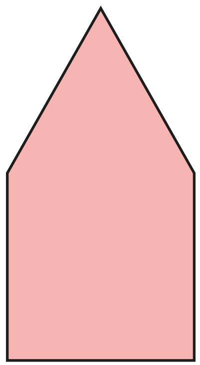
- The perimeter of a regular octagon is 48 m.

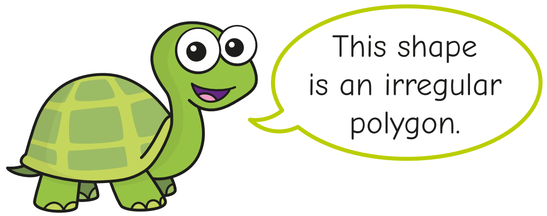
  What is the length of each side of the octagon?

Polygons

Reasoning and problem solving

All sides of the shape are equal in length.





Do you agree with Tiny?

Explain your answer.

Yes

Mo and Filip are making regular polygons with straws.

Each straw is 8 cm long.

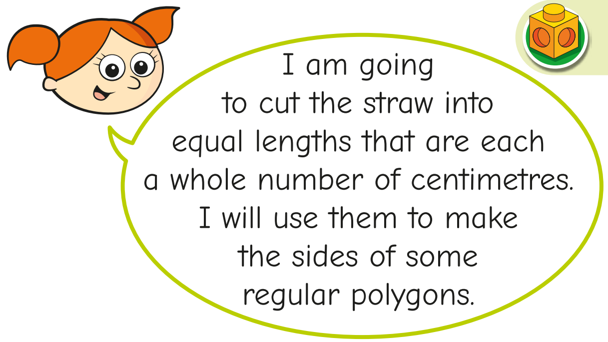
Mo uses 7 straws for his polygon.

Filip uses 10 straws for his polygon.

What is the difference between the perimeters of the shapes?

24 cm

Alex has a straw that is 24 cm long.



Describe the regular polygons that Alex could make.

equilateral triangle: sides 8 cm

square: sides 6 cm

hexagon: sides 4 cm

octagon: sides 3 cm

dodecagon (12 sides): sides 2 cm

Lines of symmetry

Notes and guidance

Children first found vertical lines of symmetry within a shape in Year 2. In Year 3, this was extended to horizontal and vertical lines of symmetry. In this small step, that learning is extended further to include any line of symmetry in any direction.

Begin by recapping what a line of symmetry is. The use of mirrors is helpful to reinforce this understanding, as is cutting out shapes and folding them. Another useful activity is putting two congruent shapes together to form symmetrical shapes.

Children look for lines of symmetry in any orientation within any 2-D shape. They then sort shapes by the number of lines of symmetry. They can also explore regular polygons, discovering that the number of lines of symmetry in a regular polygon is the same as the number of sides.

Things to look out for

- Children may only look for horizontal and vertical lines of symmetry.
- Children may become reliant on the use of mirrors or folding paper.
- Children may think that shapes “look symmetrical” when they are not. For example, a parallelogram has no lines of symmetry.

Key questions

- What is a line of symmetry?
- How can you arrange these two shapes to make a symmetrical image?
- Does this shape have any lines of symmetry? How can you find out?
- Are lines of symmetry always horizontal or vertical?
- How can you use a mirror to check if there is a line of symmetry?
- How many lines of symmetry does this shape have?
- How many lines of symmetry does a regular ______ have? How do you know?

Possible sentence stems

- Shape A has ______ lines of symmetry.
- A regular polygon with ______ sides has ______ lines of symmetry.

National Curriculum links

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

Lines of symmetry

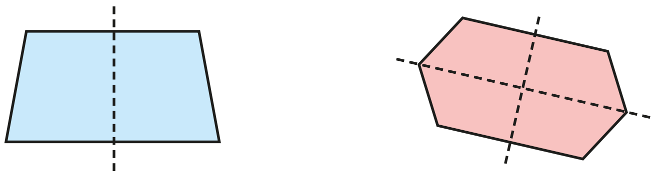
Key learning

- Eva and Jack each have two identical triangles.

  They are arranging them to create a line of symmetry.

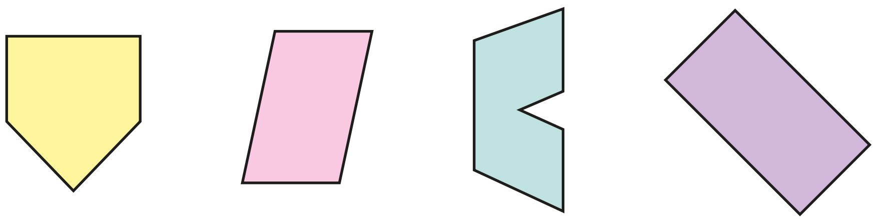
  Work with a partner to find as many ways as you can of arranging two triangles to create a line of symmetry.

- Dani has found lines of symmetry in these two shapes.

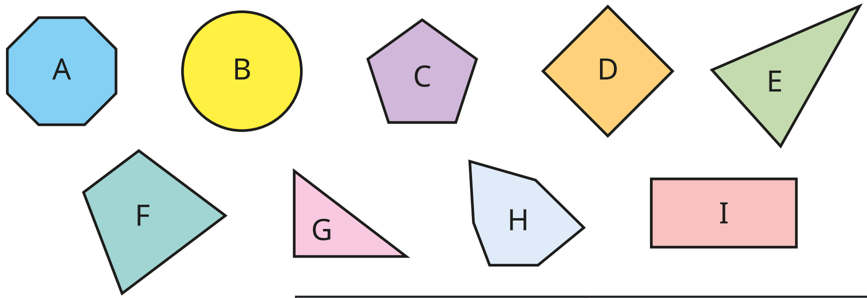


  How many lines of symmetry can you find in these shapes?

  You may wish to use a mirror to help you.



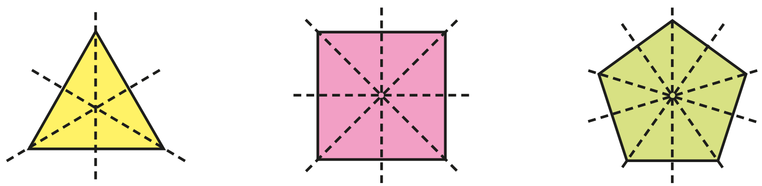
- Sort the shapes into the table.



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

  Are there any shapes that cannot go in the table?

- Annie is finding lines of symmetry in regular shapes.

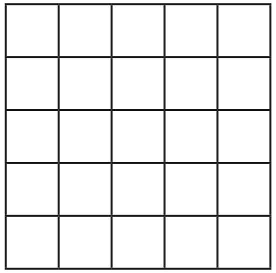


  What do you notice about the number of lines of symmetry compared to the number of sides each shape has?

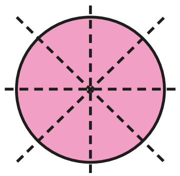
Lines of symmetry

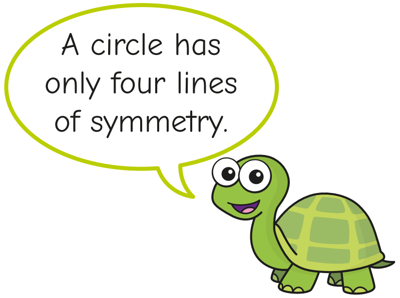
Reasoning and problem solving

Shade up to six squares to make as many symmetrical shapes as you can.



Compare answers as a class.





Do you agree with Tiny?

Explain your answer.

No

Are the statements always true, sometimes true or never true?

Four-sided polygons have four lines of symmetry.
An isosceles triangle has two lines of symmetry.
All regular polygons have at least one line of symmetry.
Irregular pentagons have one line of symmetry.
The number of lines of symmetry in a polygon is equal to the number of sides.

Explain your answers.

sometimes true

never true

always true

sometimes true

sometimes true

Complete a symmetric figure

Notes and guidance

In this small step, children build on their understanding of lines of symmetry from the previous step by completing symmetric figures.

Children begin by considering squares on a grid shaded with a horizontal or vertical line of symmetry. They may choose to use a mirror or to count how far away each square is from the line of symmetry to complete this. When children are secure with vertical and horizontal lines of symmetry, they can look at diagonal lines of symmetry. Model examples where there are squares shaded on both sides of the line of symmetry. Children then move on to completing simple 2-D shapes. Again, they can use a mirror to draw the reflection they see, or reflect one vertex at a time by counting how far it is from the line of symmetry. Finally, they look at examples of grids where there are multiple lines of symmetry.

Things to look out for

- Children may need the support of a mirror when looking at lines that are not horizontal or vertical.
- Children may miscount the lengths of lines or the distance of points/squares from the line of symmetry.

Key questions

- What is a line of symmetry?
- What do you think the shape will look like after it has been reflected?
- How far away from the mirror line is each square/vertex? How far away does the reflected square/vertex need to be?
- Can there be more than one line of symmetry?
- How could turning your paper help you to complete the shape?

Possible sentence stems

- The vertex is ______ squares from the line of symmetry, so the vertex of the reflected image will be ______ squares from the line of symmetry.

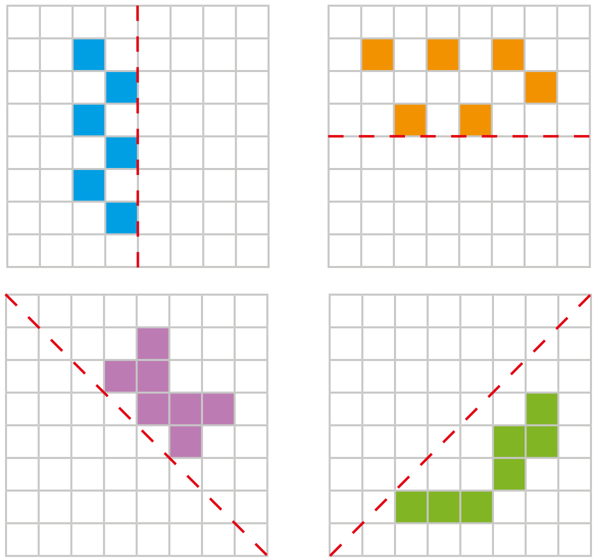
National Curriculum links

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

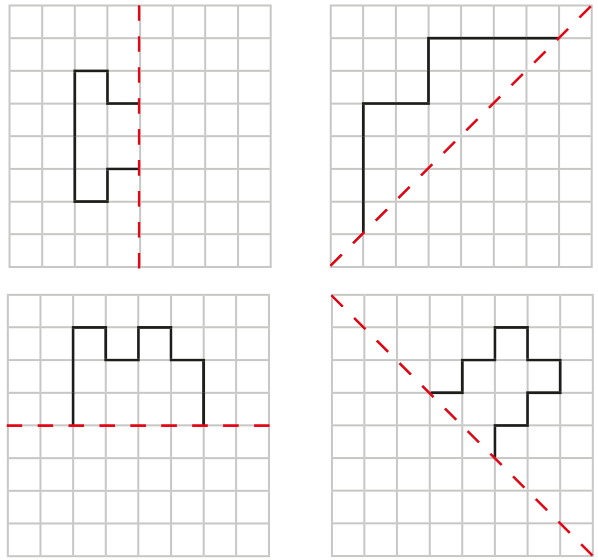
Complete a symmetric figure

Key learning

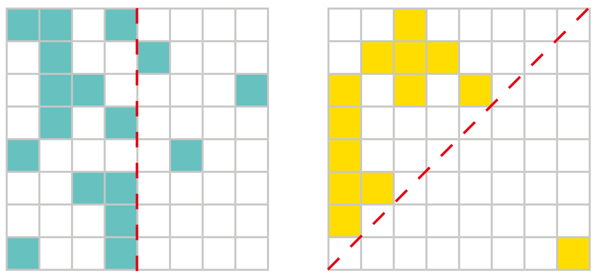
- Shade squares to make the patterns symmetrical.



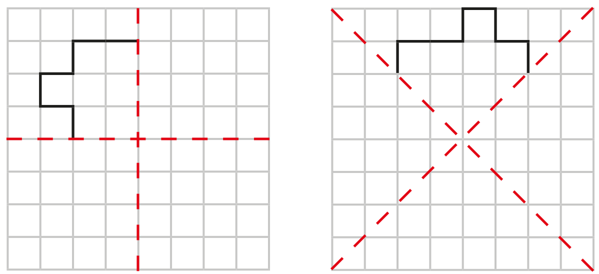
- Complete the shapes according to the lines of symmetry.



- Shade squares to make the patterns symmetrical.

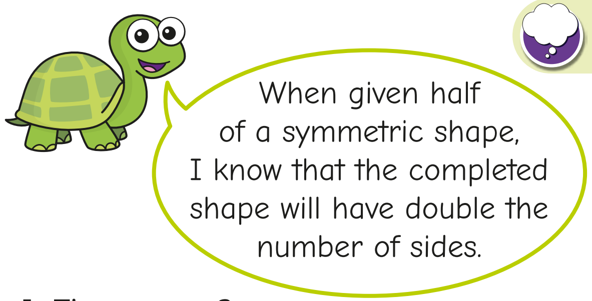


- Complete the symmetric figures.



Complete a symmetric figure

Reasoning and problem solving

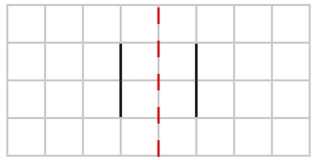


Is Tiny correct?

Explain your answer.

sometimes

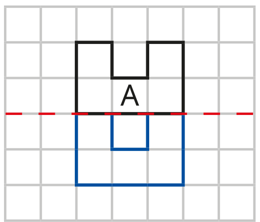
How many different symmetric shapes can you create using the given lines?



Compare answers with a partner.

Compare answers as a class.

Sam completes the shape according to the line of symmetry.

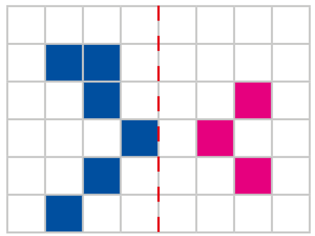


Is Sam correct?

Explain your answer.

No

Dexter starts to complete the symmetrical pattern.



Is Dexter correct so far?

Explain your answer.

No