White Rose Maths

Summer - Block 3

Properties of Shape

Year 3

Overview

Small Steps

- Turns and angles
- Right angles in shapes
- Compare angles
- Draw accurately
- Horizontal and vertical
- Parallel and perpendicular
- Recognise and describe 2D shapes
- Recognise and describe 3-D shapes
- Make 3-D shapes

NC Objectives

Recognise angles as a property of shape or a description of a turn.

Identify right angles, recognise that two right angles make a half-turn, three make three quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle.

Identify horizontal and vertical lines and pairs of perpendicular and parallel lines.

Draw 2-D shapes and make 3-D shapes using modelling materials.

Recognise 3-D shapes in different orientations and describe them.

Turns and Angles

Notes and Guidance

Children recognise angles as a measure of a turn. They practice making $\frac{1}{2}, \frac{1}{4}, \frac{3}{4}$ and whole turns from different starting points in both clockwise and anti-clockwise directions in practical contexts. They should listen to/follow instructions and also give instructions using the correct mathematical language in different contexts. Children understand that an angle is created when 2 straight lines meet at a point.

Mathematical Talk

If we start by facing _____ and make a _____ turn, what direction will we be facing?
If we face _____ and turn to face _____, what turn have we made?
If we face north and make a quarter turn clockwise, which direction will we be facing? What if we turn anti-clockwise?
What would the time be if the minute hand started at 1, then made a quarter of a turn?
Can you see any angles around the classroom?

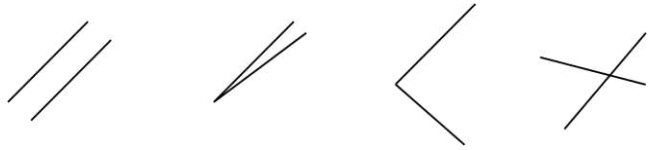
Varied Fluency

- Take children outside or into the hall where they can practice moving in turns themselves. Label 4 walls/points (for example: North, South, East, West).
  Give children instructions to encourage them to make $\frac{1}{2}, \frac{1}{4}, \frac{3}{4}$ and whole turns from different starting points. Allow children the opportunity to give instructions too.

- Look at the hands of the clock.
  Turn the minute hand one quarter of a turn clockwise.
  Where is the large hand pointing?
  What is the new time?

What turn has the minute hand made?

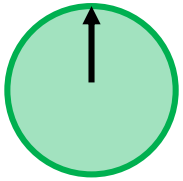
- Tick the images where you can see an angle.
  Explain your choices.



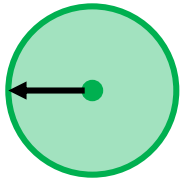
Turns and Angles

Reasoning and Problem Solving

The arrow on a spinner started in this position.



After making a turn it ended in this position.



Jack says,

The arrow has moved a quarter turn anti-clockwise.

Alex says,

The arrow has moved a three-quarter turn clockwise.

Who do you agree with?

Both children are correct.

The letter 'X' has four angles.

Write your name in capital letters.
How many angles can you see in each letter?
How many angles are there in your full name?

Answers will vary depending on the children's names.

Right Angles in Shapes

Notes and Guidance

Children recognise that a right angle is a quarter turn, 2 right angles make a half-turn, 3 right angles make three-quarters of a turn and 4 right angles make a complete turn.

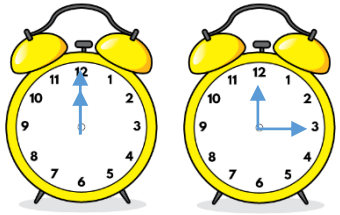
Children need to see examples in different orientations so that they understand that a right angle does not have to be made up of a horizontal and vertical line.

Mathematical Talk

How many right angles make a half turn/three-quarter turn/ full turn?
Where can you see a right angle in the classroom/ around school/ outside?
Which shapes contain right angles?
Can you think of a shape which doesn't have any right angles?
How many right angles does a _____ have?
Can you draw a shape with ____ right angles?
What headings would we place in our table?

Varied Fluency

- Give children a clock each so they can practice making turns. Start with the hands showing 12 o'clock, move the minute hand one quarter of a turn.

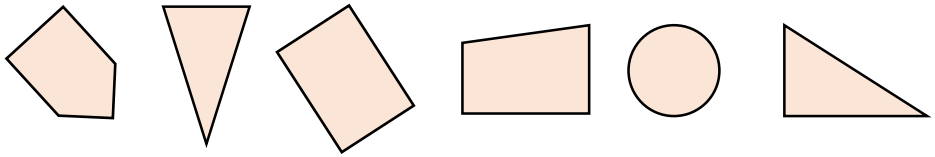


The angle between the hands is called a _____ angle.
One quarter turn is equal to a _____ angle.

- Children can create a 'Right Angle Tester' E.g.

They can then go on a right angle hunt around school.
Find and draw at least 3 right angles you have seen around your school.

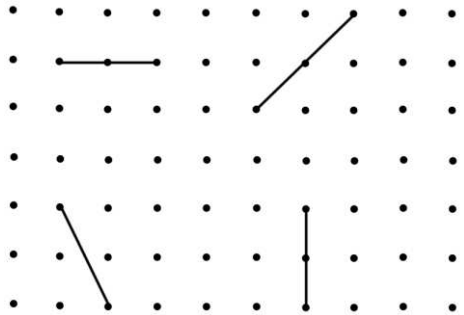
- Sort the shapes based on the number of right angles they have. Record your answer in a table.



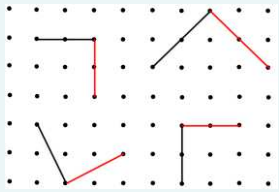
Right Angles in Shapes

Reasoning and Problem Solving

Draw a line along the dots to make a right-angle with each of these lines:

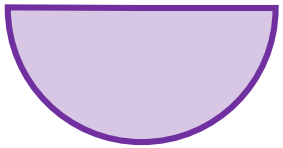


For example (see red lines):



True or False?

This shape has two right-angles.

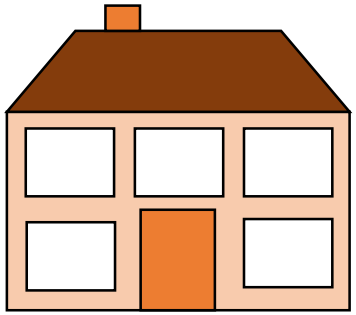


Explain your answer.

False.

Children could show this by using the corner of a page to show there aren't any right angles.

How many right angles can you see in this image?



Can you create your own image with the same number of right angles?

There are 34 right angles.

Compare Angles

Notes and Guidance

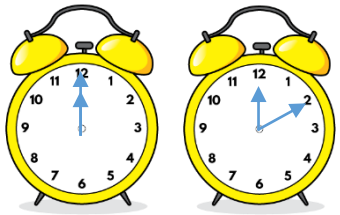
Children identify whether an angle is greater than or less than a right angle in shapes and turns, by measuring, comparing and reasoning in practical contexts.

Children are introduced to the words 'acute' and 'obtuse' as a way of describing angles.

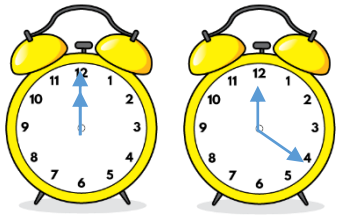
Mathematical Talk

What is an acute? (Give 3 examples of acute angles and ask them to identify what's the same about them. Draw out that they are all smaller than a right-angle).
What's an obtuse angle? (Repeat activity by giving 3 examples of obtuse angles).
Can you give me a time where the hands on the clock make an acute/obtuse angle?
Can you see an acute/obtuse angle around the classroom?
Can you draw me a shape that contains acute/obtuse angles?

Varied Fluency



The angle between the hands is _____ than a right angle.
This is called an _____ angle.



The angle between the hands is _____ than a right angle.
This is called an _____ angle.

Explore other times where the hands make an acute/obtuse angle.

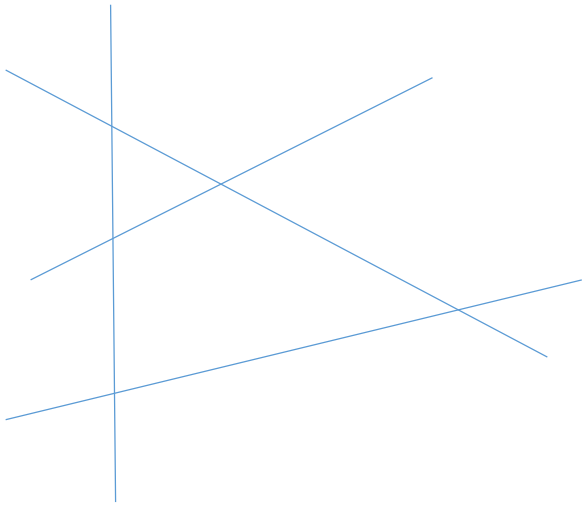
Find 3 acute angles and 3 obtuse angles in your classroom.
Use your 'Right Angle Tester' to check.

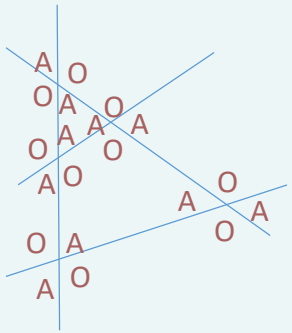
Label any acute or obtuse angles in these images.

Compare Angles

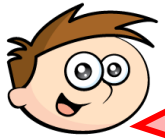
Reasoning and Problem Solving

Label the acute angles (A) and obtuse angles (O) on the diagram below





Teddy describes a shape.

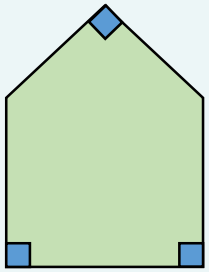


My shape has 3 right angles and 2 obtuse angles.

What could Jack's shape look like?

Describe a shape in terms of it's angles for a friend to draw.

Possible answer:



Draw Accurately

Notes and Guidance

Children measure and draw straight lines accurately in centimetres and millimetres. They also practice rounding measurements to the nearest centimetre.
Make sure the children correctly position the ruler when measuring/drawing the line, by lining up the 0 with the start of the line.

Mathematical Talk

Where should we position the ruler when measuring each line? Why?

How long is each line in millimetres?

Why does 9 cm and 9 mm round to 10 cm and not 9 cm? Look at the ruler/number line to explain your answer.

Do we round 10 cm and 5 mm to 10 cm or 11 cm? Why?

Varied Fluency

- Measure these lines. Record your measurements in cm and mm.

_____ cm and _____ mm

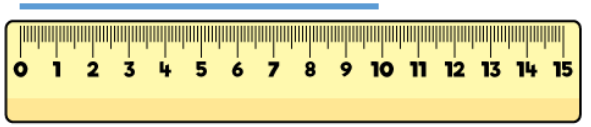
_____ cm and _____ mm

_____ cm and _____ mm

- Draw straight lines that measure exactly:

12 cm 8 cm and 5 mm

9 cm and 8 mm 14 cm and 2 mm

- 

This line measures 9 cm and 9 mm

It measures ____ cm to the nearest centimetre.
Draw a line for each of the measurements.

5 cm and 2 mm 13 cm and 8 mm

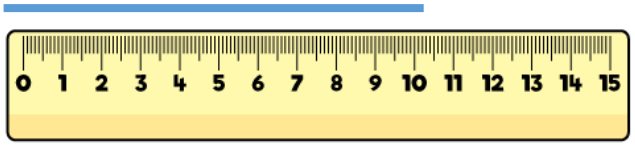
0 cm and 9 mm 10 cm and 3 mm

What would each line measure to the nearest centimetre?

Draw Accurately

Reasoning and Problem Solving

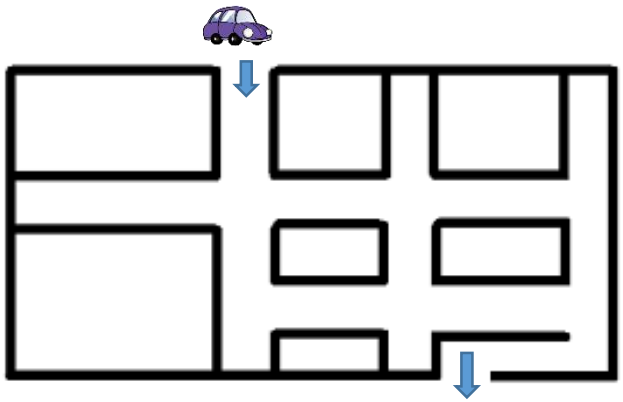
Alex measures the line.



She says it is 10 cm 4 mm

Is Alex correct?
Explain why.

Alex is not correct because she has started measuring the line from the end of the ruler instead of from '0'

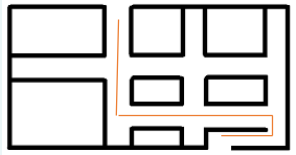


Use straight lines to show the route the car could take to get out of the maze.

Work out the length of the route to the nearest cm

Is this the shortest route?

Possible answer:



The length of the route will depend on the size of the maze used.

Horizontal & Vertical

Notes and Guidance

Children identify and find horizontal and vertical lines in a range of contexts.

They identify horizontal and vertical lines of symmetry in shapes and symbols.

Mathematical Talk

What can you use to help you remember what a horizontal line looks like? (The horizon)
Can you see horizontal and vertical lines around the classroom?
What do we call a line that is not horizontal or vertical?
Which shapes/symbols/letters have a horizontal/vertical line of symmetry?
Which have both?
Can you draw your own shape that has a horizontal and vertical line of symmetry?

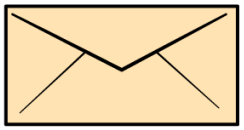
Varied Fluency

A line that runs from left to right across the page is called a _____ line.

A line that runs straight up and down the page is called a _____ line.

Find 3 horizontal and 3 vertical lines in the classroom.

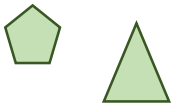
Label the horizontal and vertical lines in each of these images.



Sort the shapes/symbols/letters depending on whether they have a horizontal line of symmetry, a vertical line of symmetry or both.

Horizontal & Vertical

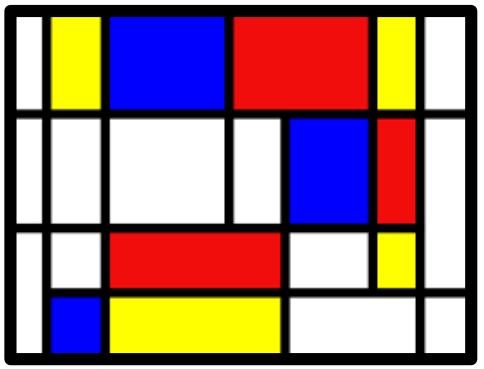
Reasoning and Problem Solving

Horizontal line of symmetry	Vertical line of symmetry	Horizontal and vertical lines of symmetry
		

Eva completes the table by drawing shapes.

Can you spot and correct her mistake?

Eva thinks the star has both lines of symmetry, but it only has a vertical line of symmetry.



How many horizontal and vertical lines can you spot in this image by Mondrian?

Create your own piece of art work using only horizontal and vertical lines.

There are 5 horizontal lines and 8 vertical lines.

Parallel & Perpendicular

Notes and Guidance

Children identify and find parallel and perpendicular lines in a range of practical contexts.
They use the arrow notation to represent parallel lines and the right angle notation for perpendicular lines.
Ensure that children are presented with lines that are not horizontal and vertical.
Children may need to use their right-angle tester to help them check that lines are perpendicular.

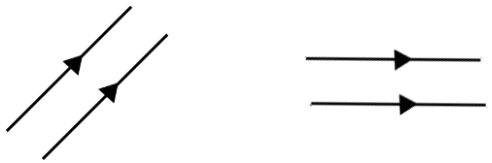
Mathematical Talk

Where might you see sets of parallel lines in the environment?

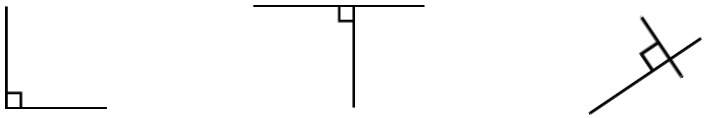
Can you see sets of parallel and perpendicular lines around the classroom?

Which shapes have only parallel lines?
Which shapes have perpendicular lines?
Which shapes have both parallel and perpendicular lines?

Varied Fluency



Lines that never meet are called _____ lines.



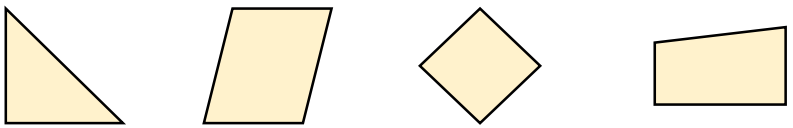
Straight lines that meet at a right angle are called _____ lines.

Find 3 sets of parallel and perpendicular lines in the classroom.

Draw a line that is parallel to this one.

Draw a line that is perpendicular to this one.

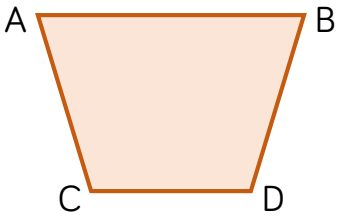
Use arrows to show the parallel lines in these shapes.
Use the right angle notation to show the perpendicular lines.



Parallel & Perpendicular

Reasoning and Problem Solving

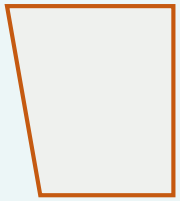
True or False?



Line AB is parallel to line CD.
Line AC is parallel to line BD.
Line AC is perpendicular to line CD.

Redraw the shape so that line BD is perpendicular to line CD.

True
False
False



These lines are NOT parallel.

Convince me.

Children can draw and continue the lines to show that they will eventually meet so are not parallel.

Mark 3 sets of parallel lines and 3 sets of perpendicular lines in this flag.

Design your own flag containing parallel and perpendicular lines.

For example.

2-D Shapes

Notes and Guidance

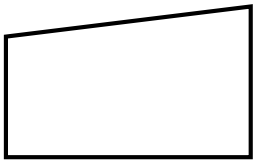
Children recognise, describe and draw 2-D shapes accurately. They use properties including types of angles, lines, symmetry and lengths of sides to describe the shape.
They could be given opportunities to identify/draw a hidden shape from a description given and also describe a shape for a friend to identify/draw.

Mathematical Talk

How many angles does a _____ have?
What types of angles does a _____ have?
How many lines of symmetry does a _____ have?
What kind of lines of symmetry does a _____ have? (vertical/horizontal)
What types of lines can you spot in a _____? (perpendicular/parallel)
Can you guess the shape from the description given?
Can you draw a shape from the description given?

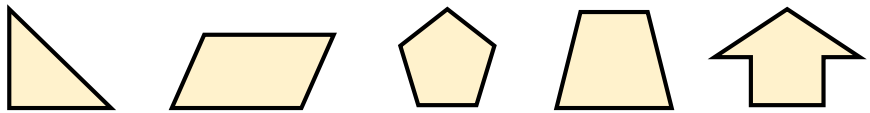
Varied Fluency

Describe this quadrilateral.



It has _____ angles.
It has _____ right angles.
It has _____ obtuse angle.
It has _____ acute angle.
It has _____ lines of symmetry.

Choose one of these 2-D shapes and describe it to a friend thinking about the angles, types of lines it is made up of and whether it has any lines of symmetry. Can your friend identify the shape from your description?



Draw the following shapes.

- A square with sides measuring 2 cm
- A square that is larger the one you have just drawn
- A rectangle with sides measuring 4 cm and 6 cm
- A triangle with two sides of equal length

2-D Shapes

Reasoning and Problem Solving

Rosie describes a 2-D shape.

My shape has 2 pairs of parallel sides. The lengths of the sides are not all equal.

Draw the shape that Rosie is describing.

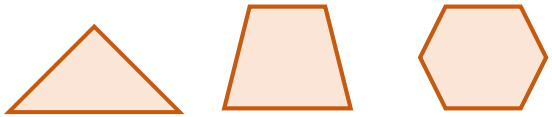
Children could draw:

Could this square be Rosie's shape?

No this can't be Rosie's shape, because the lengths of the sides are equal.

Explain why.

What is the same and what is different about these shapes?



Possible answers: All have at least 1 line of symmetry. They have different number of sides/angles. Only the triangle has a pair of perpendicular sides.

Draw at least one shape in each section of the diagram.

	At least one right angle	No right angles
4 sided		
Not 4 sided		

Many possible answers.

3-D Shapes

Notes and Guidance

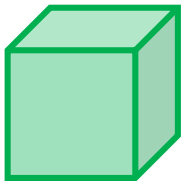
Children recognise and describe 3-D shapes in different orientations. They use properties including the number of faces, edges and vertices to describe the shape. Where a shape has a curved surface, children should know that this is not called a face. e.g. a cylinder has 2 circular faces and a curved surface. Teachers should explore the difference between a prism, which has the same shape all the way through, and a pyramid, which tapers to a point.

Mathematical Talk

How many faces/edges/vertices/curved surfaces does a _____ have?
What shape are the faces of a _____?
What types of lines can you see on a _____?
Can you spot objects around the classroom that are cubes/cuboids etc.?
Can you guess the shape from the description given?

Varied Fluency

- Describe this 3-D shape.



This shape is a _____.
It has _____ faces.
It has _____ edges.
It has _____ vertices.

- Choose one of these 3-D shapes and describe it to a friend thinking about the number and shape of faces it has and the number of edges and vertices. Can your friend identify the shape from your description?

- What is the same and what is different about these two shapes?

Choose two other shapes and say what is the same and what is different about them.

3-D Shapes

Reasoning and Problem Solving

Mo has a 3-D shape, he says,

One face of my 3-D shape is a square.

What could Mo's shape be?

Possible answers:
Cube
Cuboid
Square based pyramid

Alex says,

All 3-D shapes are prisms.

Do you agree with Alex?
Explain why.

I do not agree with Alex e.g. cones pyramids, spheres are not prisms.

Sort a selection of 3-D shapes using the criteria in the table.

	At least one triangular face	No triangular faces
Prism		
Not a prism		

Change the headings of the table and re-sort your shapes.

Various possibilities depending on the shapes used.

Construct 3-D Shapes

Notes and Guidance

Children make 3-D shapes (cubes, cuboids, prisms, cylinders, pyramids, cones, spheres) using construction materials.

They use correct mathematical language to describe the shapes they have made (edges, faces, vertices, curved surfaces).

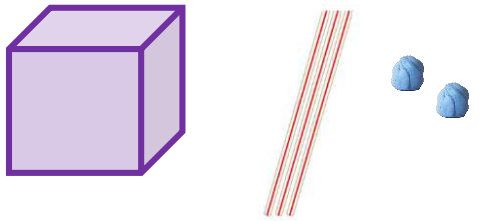
Mathematical Talk

Can you describe your shape using edges, faces, vertices, curved surfaces?
What is the same and what is different about your shape compared to your partner's?
What do the straws represent?
What does the Play-Doh represent?
How many straws/balls of Play-Doh do you need to create a _____?
Why can't you create a sphere or cylinder using this technique?

Varied Fluency

- Children make a 3-D shape using Play-Doh/clay/plasticine/ polydron.
  Ask them to make a different one to their partner.
  Write down the similarities and differences between them.
  Discuss what the properties of each shape are.

- Use straws and Play-Doh to create a model of a cube.



  What other 3-D shapes can you create?

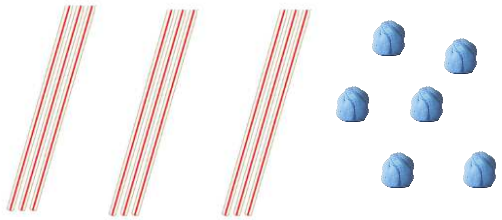
- Cut and fold these into 3-D shapes.

  What shapes have you created?

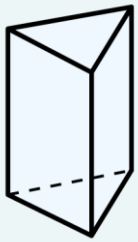
Construct 3-D Shapes

Reasoning and Problem Solving

I have 9 straws and 6 balls of Play-Doh.



What 3-D shape can I create using all of the straws and Play-Doh? Have a go at making it.



True or false?

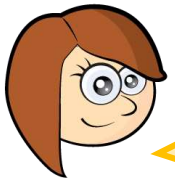
- You can cut out lots of equal squares and make a 3-D shape from them.

True – for example a cube.

- You can cut out some circles and rectangles and make a 3-D shape from them.

True – a cylinder.

Rosie says,



I can create a model of a square-based pyramid using 3 straws and 3 balls of Play-Doh.

Explain the mistake Rosie has made.

How many straws and balls of Play-Doh would you need to create a pyramid?

Rosie thinks that because a pyramid has some triangular faces she will only need 3 straws/balls of Play-Doh.

You would need 8 straws and 5 balls of Play-Doh to make a square-based pyramid, and 6 straws and 4 balls of Play-Doh to make a triangle based pyramid.