How can we ensure our oceans stay amazing?

Geometry teaching pack

GEOMETRY ACTIVITIES

ENQUIRY OF LEARNING How can we ensure our oceans stay amazing?

The six activities in this pack have been developed to explore with students the beauty and wonder of our oceans.

They can use used as part of the enquiry of learning *How can we ensure our oceans stay amazing?* to introduce the wider learning each week, to support learning about shape, tessellation and rotational symmetry in maths, as a stimulus for learning in art or to teach geometry as a standalone activity. They could also be used to introduce students to the principle of Interdependence, which is the Harmony principle linked to our oceans enquiry of learning, or to explore the principle of Geometry itself. You can find out more about Nature's principles of Harmony onThe Harmony Project website.

For each activity, step-by-step instructions are provided as a guide for teachers, with accompanying diagrams and lists of the resources students will need. There are also photocopiable templates – where these are used, each student will need a copy to complete the activity.

CONTENTS

COMPASSES

The activities in this pack can be adapted so that there is no need to use a compass to complete them by using the templates provided at the end of each activity. However, if you would like your students to engage in more of the geometric construction, Jakar compasses will help ensure accuracy and are easy to use. They can be purchased at a discount through The Harmony Project website.

WHY GEOMETRY?

Learning the geometry of Nature provides students with a new way of looking at the world. The observational skills and careful drawings that are required to recreate this geometry can have a powerful impact on students' understanding of Nature and their place in it. If we are to create a sustainable future, we need to see the world through a different lens, to understand that the patterns of life that exist around us also exist in us. This way of seeing the world means we view everything from a place of connection, rather than separation. This sense of connection is an essential part of learning to live sustainably. After all, the word 'Harmony' means joined or connected.

GEOMETRY ACTIVITY 1

ENQUIRY OF LEARNING How can we ensure our oceans stay amazing?

LEARNING QUESTION How can I draw a wave?

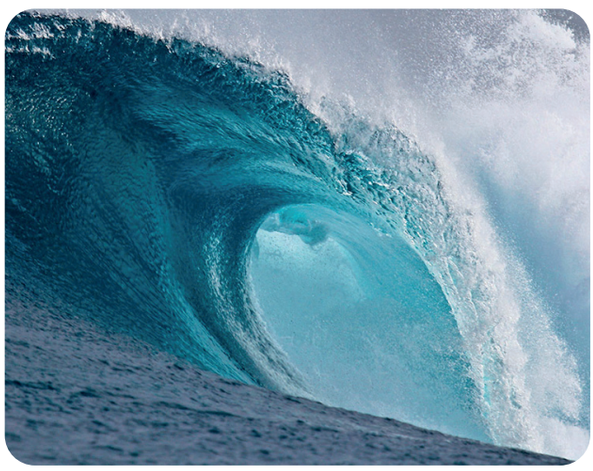
Waves in the ocean often have a complex shape that is determined by factors such as wind speed, ocean currents and the shape of the ocean floor beneath them. Some wave patterns can look like parts of a spiral when viewed from the side. A special kind of spiral called a logarithmic spiral can be found in waves and elsewhere in Nature – in seashells and in the shape of galaxies, for example.

In this activity, students use a simple logarithmic spiral template based on diminishing squares to draw a wave design, taking inspiration from *The Great Wave Off Kanagawa* by the artist Katsushika Hokusai, one of the most famous works of Japanese art. It shows a large wave towering over three fishing boats with Mount Fuji in the background. It is often interpreted as an image of the power of Nature over humans.

To adapt the activity for students requiring additional support, use the template on Resource 1B and follow the instructions from Step 7.

YOU WILL NEED

Copies of Resource 1A
Ruler
HB pencil
Good-quality eraser
Coloured pencils
Optional copies of Resource 1B



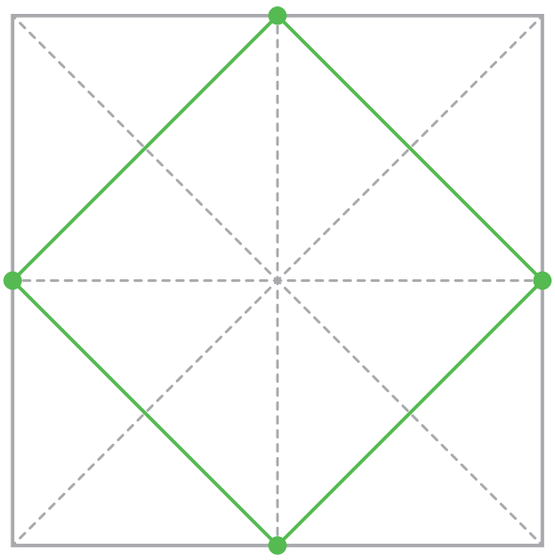
DID YOU KNOW?

Deep ocean waves can be taller than buildings. These massive waves are caused by underwater events such as earthquakes or strong storms. When these events occur, they create powerful waves that can travel across the ocean, sometimes causing damage when they hit land. This type of wave is called a **tsunami**. Scientists study them to understand how they happen and how to keep people safe from them.

ACTIVITY 1

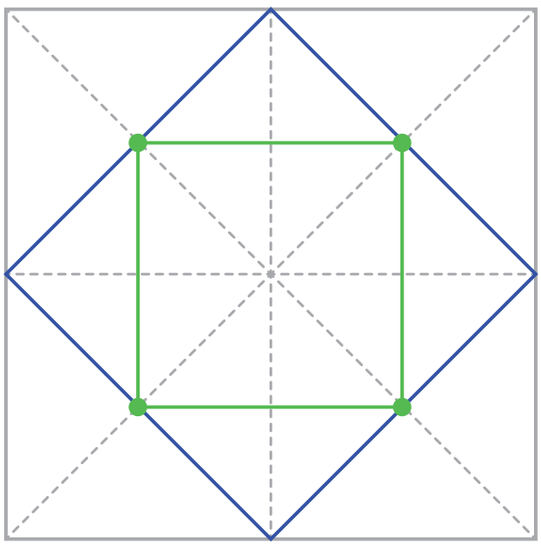
STEP 1 Draw the first dynamic square

Use a dot to mark the midpoint of each of the sides of the square on Resource 1A. This is the point at which the horizontal and vertical dashed lines on the template touch the sides of the square. Use a ruler to draw four lines joining these four dots to create a dynamic square (a square resting on one of its vertices).



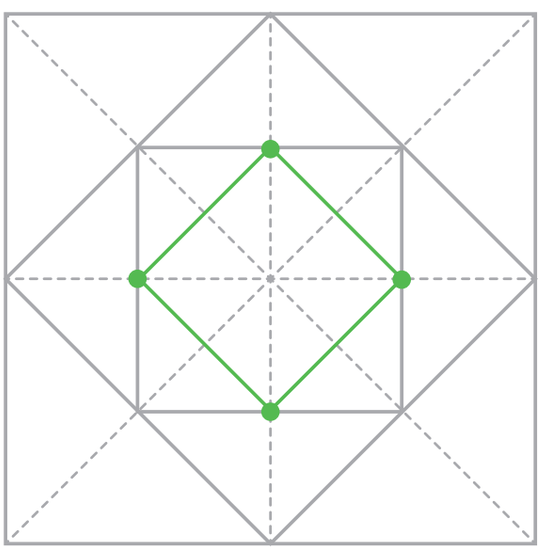
STEP 2 Draw the first static square

Use a dot to mark the point at which each of the sides of the dynamic square you drew in Step 1 are intersected by the diagonal dashed lines on the template. Use a ruler to draw four lines joining these four dots to create a static square (a square resting on one of its sides).



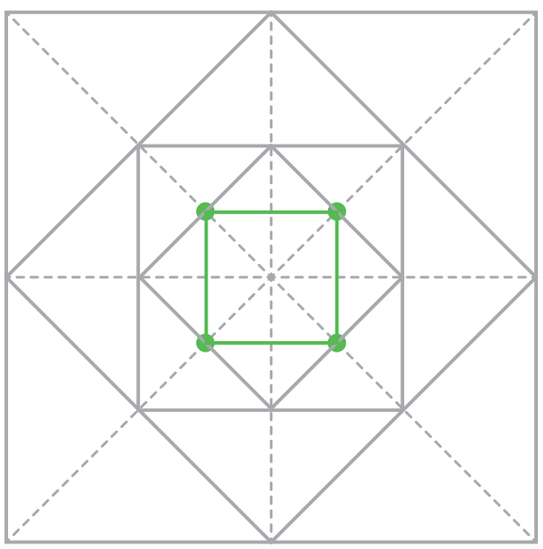
STEP 3 Draw the second dynamic square

Next, use a dot to mark the point at which each of the sides of the static square you drew in Step 2 are intersected by the horizontal or vertical dashed lines on the template. Use a ruler to draw four lines joining these four dots to create another, smaller dynamic square.



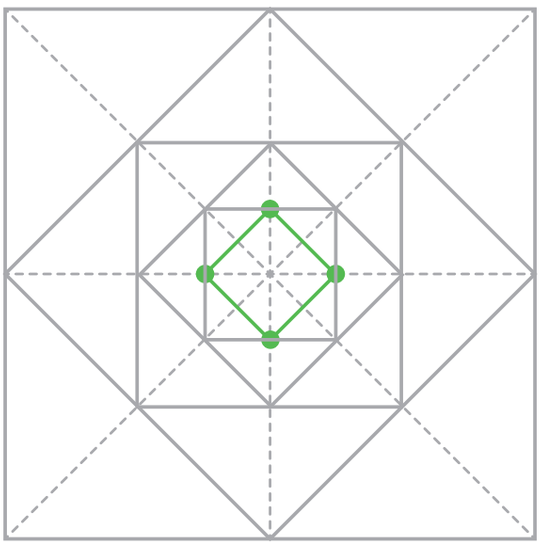
STEP 4 Draw the second static square

Repeat the process outlined in Step 2 to draw another, smaller static square inside the dynamic square you drew in Step 3.



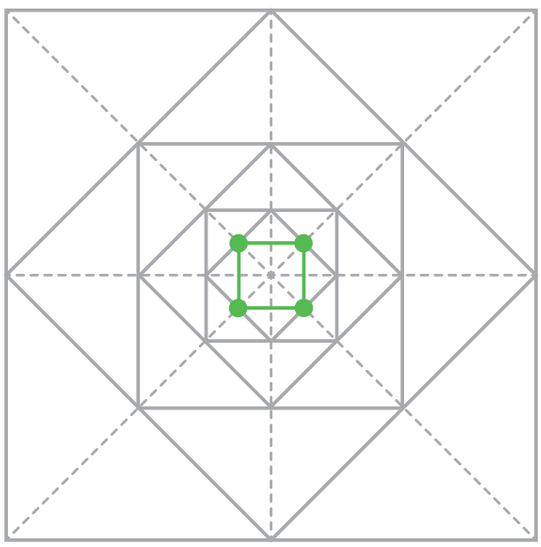
STEP 5 Draw the third dynamic square

Repeat the process outlined in Step 3 to draw another, smaller dynamic square inside the static square you drew in Step 4.



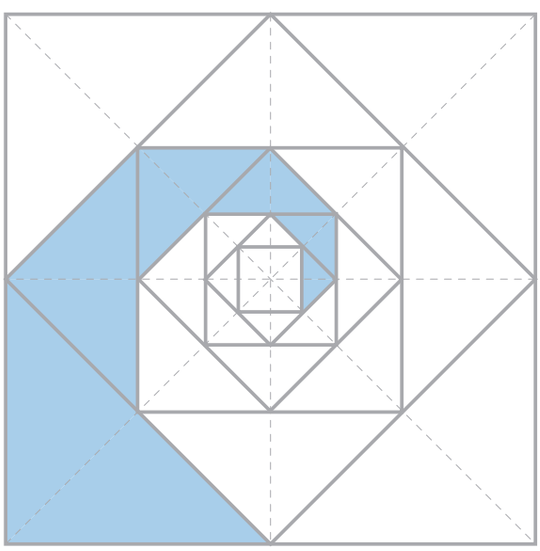
STEP 6 Draw the third static square

Repeat the process outlined in Steps 2 and 4 to draw another, smaller static square inside the dynamic square you drew in Step 5.



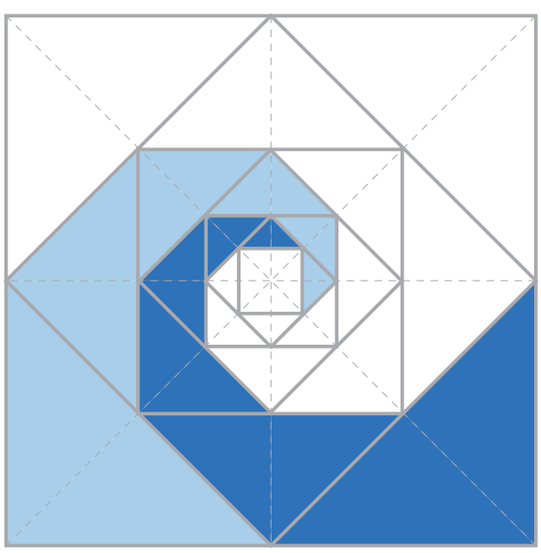
STEP 7 Colour the cresting wave

Colour the pattern you have drawn to create a spiral. Start by using a light blue coloured pencil to colour one of the smallest triangles – the one directly to the right of the central square. Continue colouring the triangles shown below, turning 45º anti-clockwise and moving out from the central square each time. Each triangle you colour will be slightly bigger than the last. Continue until you reach one of the largest triangles – the one in the bottom left corner of the original square.



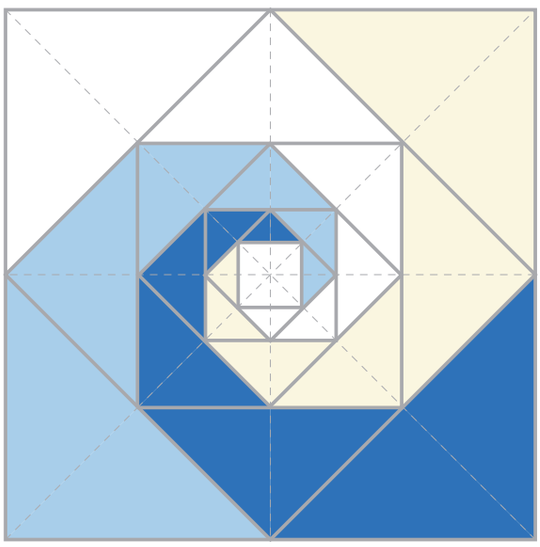
STEP 8 Colour the underside of the wave

Choose a darker blue to colour the underside of the wave, starting with one of the smallest triangles – this time the one directly above the central square. Continue colouring the triangles, repeating the process outlined in Step 7, until you reach one of the largest triangles – the one in the bottom right corner of the original square.



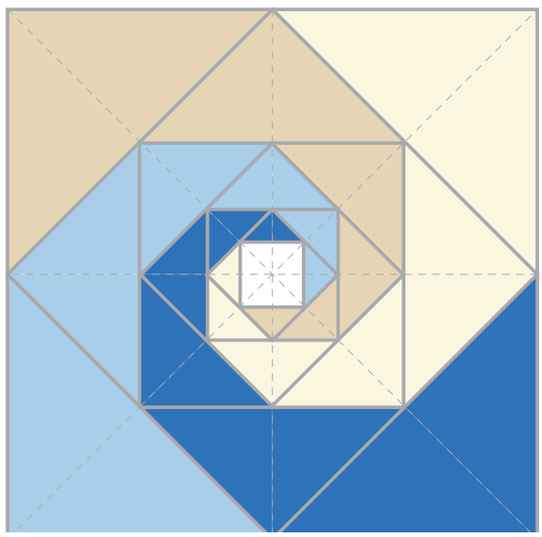
STEP 9 Colour the light sky

Looking at the original woodblock print of *The Great Wave Off Kanagawa* (shown on the first page of this activity), we can see the sky has sandy-coloured storm clouds. Pick a lighter cream shade for the next spiral, as shown below, which represents part of the sky.



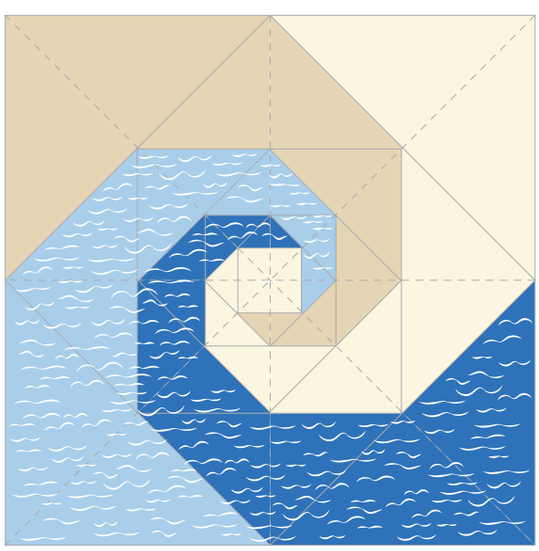
STEP 10 Colour the dark sky

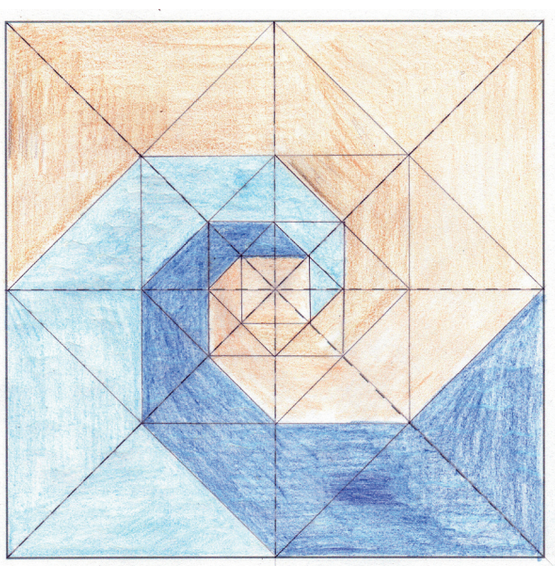
The final spiral represents the darker storm clouds. Colour this in a dusty beige tone.



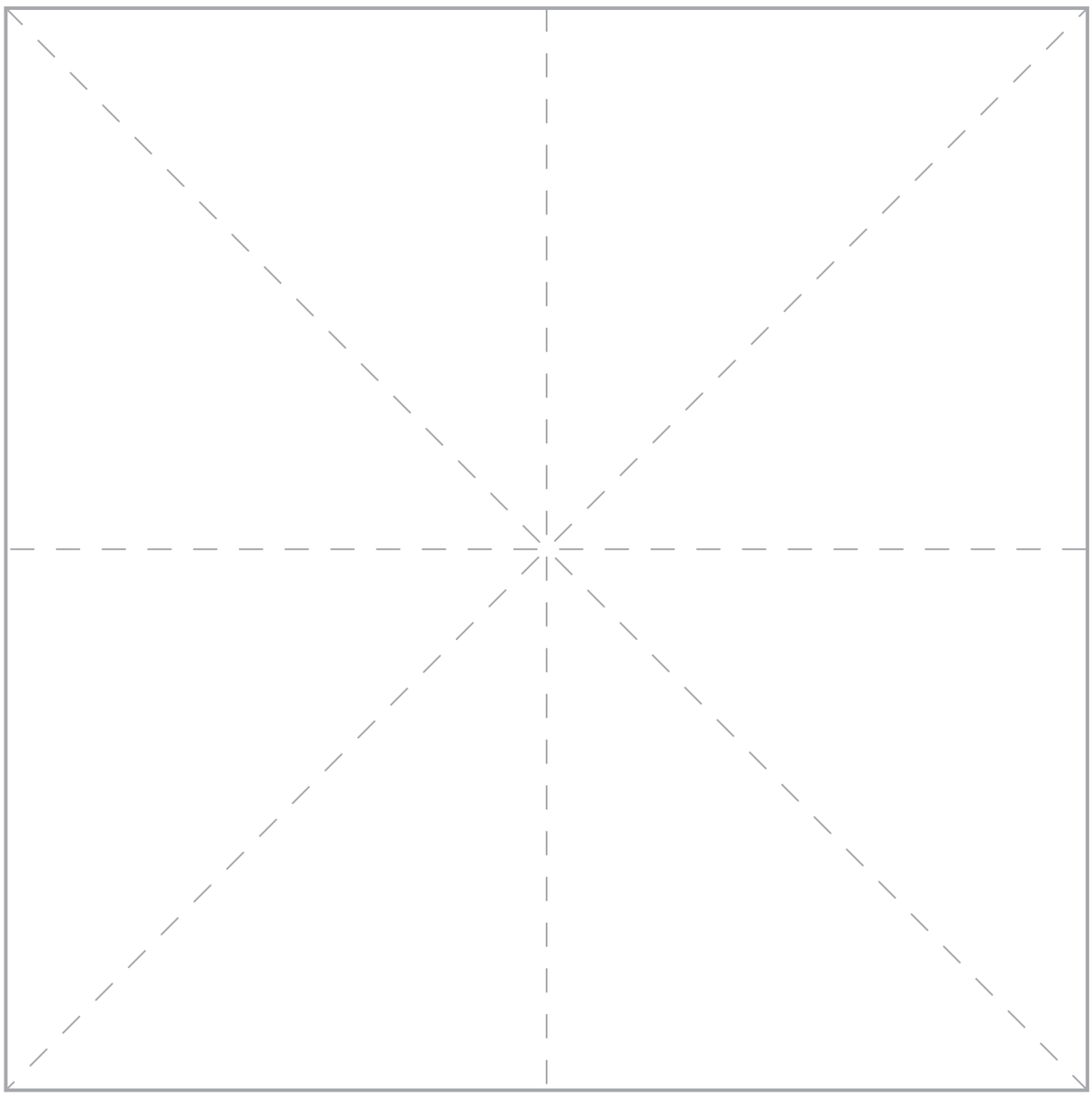
STEP 11 Add details

At this stage, you could add detail to represent the light reflecting on the waves, as shown below.

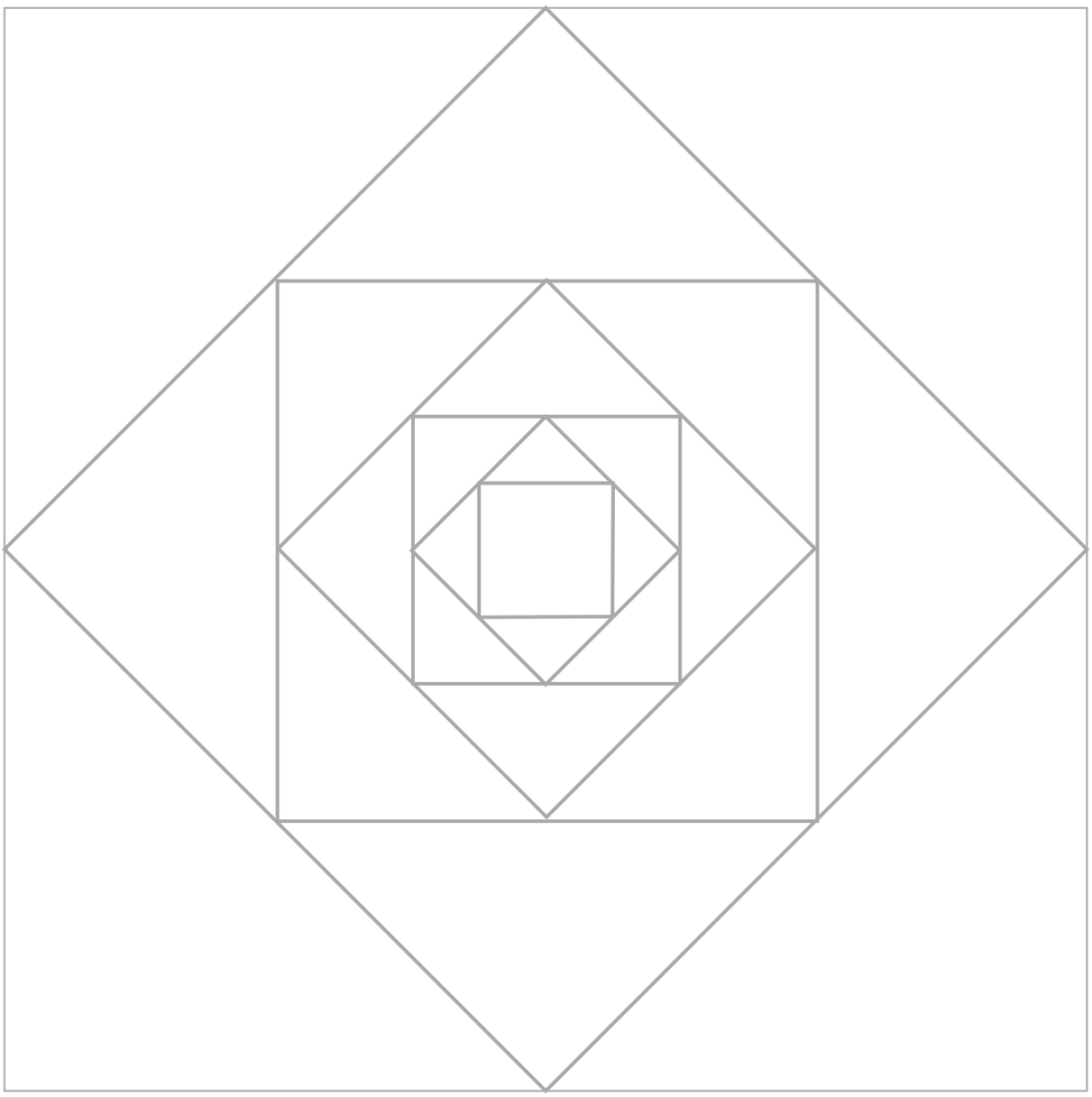




PHOTOCOPIABLE RESOURCE 1A



PHOTOCOPIABLE RESOURCE 1B



GEOMETRY ACTIVITY 2

ENQUIRY OF LEARNING How can we ensure our oceans stay amazing?

LEARNING QUESTION How can I recreate the shape of a seashell?

Shells offer protection to the creatures that live inside them, shielding the animal from predators and the harsh marine environment. Many different sea creatures, such as molluscs, crustaceans and turtles, have shells.

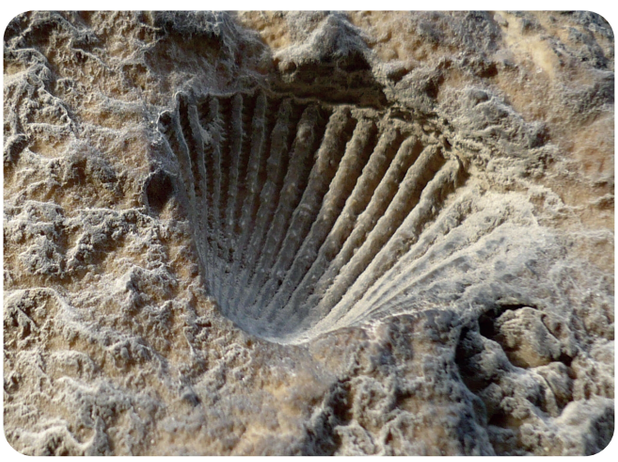
In this activity, students will focus on one of these, the shell of the scallop, using the template on Resource 2A as a guide to support their design. Scallop shells are shaped like a fan with crimped edges. They are made up of two pieces that open and close.

YOU WILL NEED

Copies of Resource 2A
Ruler
HB pencil
Good-quality eraser
Protractor
Coloured pencils

DID YOU KNOW?

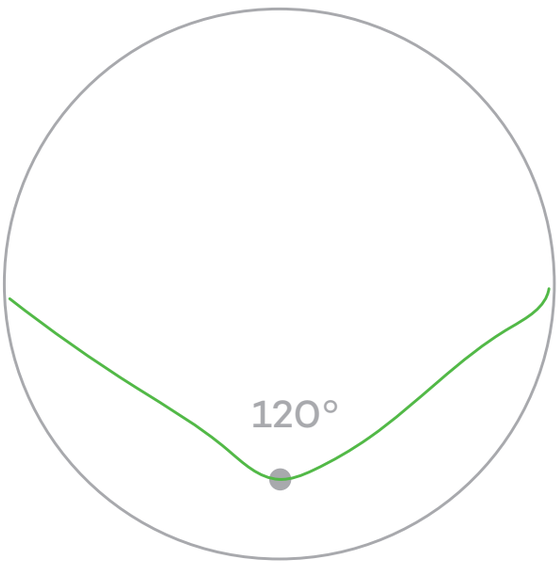
Most shells are made of calcium carbonate, which is also found in chalk and limestone. The animal creates its shell by extracting calcium from the water around it. Shells can tell us about the health of an ecosystem: changes in shell thickness or shape may indicate environmental changes or pollution. Shells are commonly found as fossils, providing valuable clues about ancient marine life and past environments. Fossilised shells help scientists discover more about the Earth's history and evolution.



ACTIVITY 2

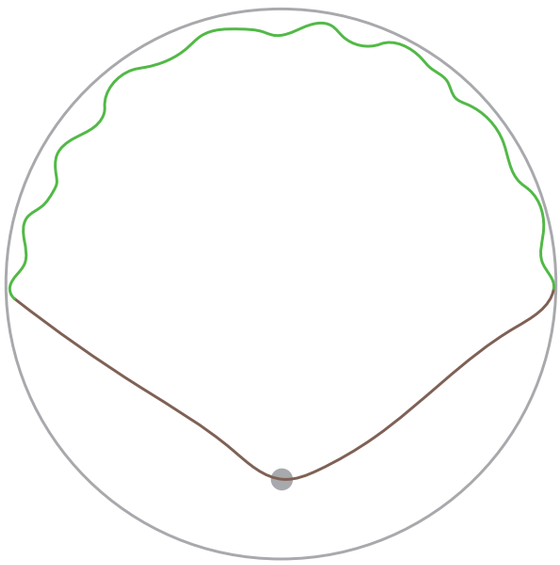
STEP 1 Draw the angled edge

Start with a printout of Resource 2A. Working freehand, draw two lines, each connecting the dot towards the bottom of the circle to the circumference of the circle, as shown below. Use a protractor to ensure there is roughly 120º between the two lines.



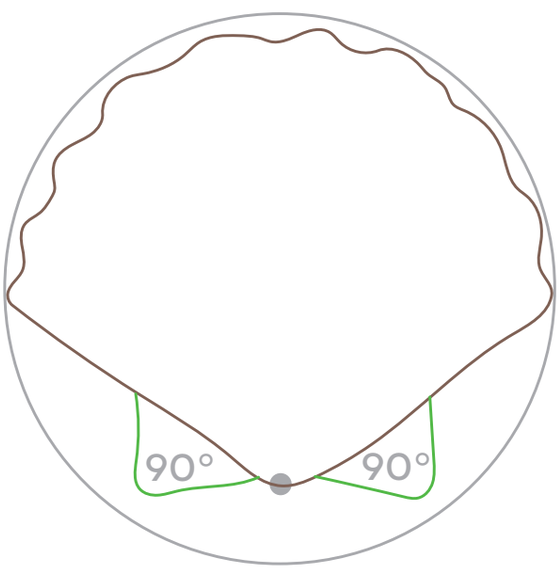
STEP 2 Draw the crimped edge

Draw a wavy line just inside the circumference of the circle from the end of one of the lines you drew in Step 1 to the other. This completes the outline of the scallop shell.



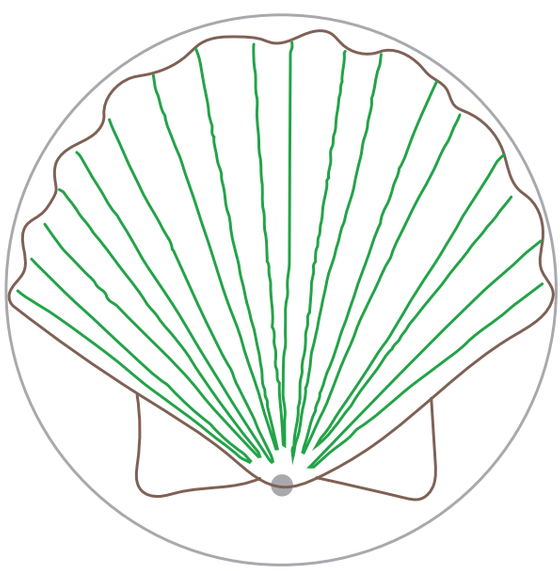
STEP 3 Draw two wedge shapes

Add two roughly right-angled triangular wedge shapes at the bottom of the scallop shell, as shown below.



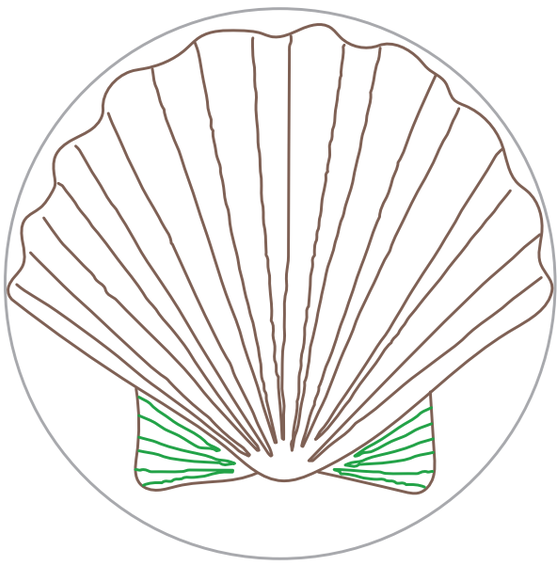
STEP 4 Add radial lines to the shell

The pattern and texture of the scallop shell is based on radial lines that converge at a central point at the bottom of the shell. These represent grooves in the shell's surface. If you look closely at a scallop shell, you will notice that these grooves line up with the 'waves' along the shell's edge.



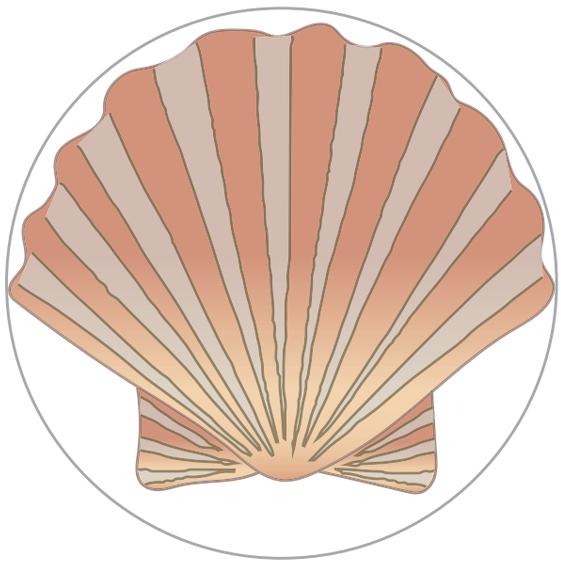
STEP 5 Add radial lines to the wedges

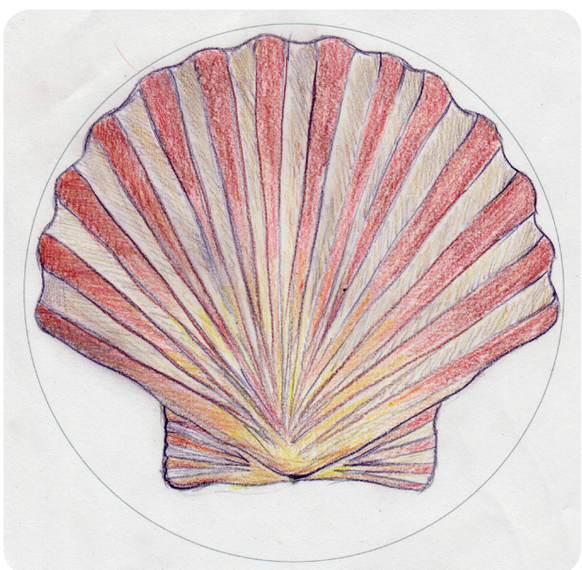
Add radial lines to the two triangular shapes on either side of the bottom of the shell, as shown below in green.



STEP 6 Add colour

Colour the scallop as shown below, using pink, light brown and yellow pencils. Pay particular attention to the changes in colour towards the centre of the shell and along its ridges.





PHOTOCOPIABLE RESOURCE 2A

GEOMETRY ACTIVITY 3

ENQUIRY OF LEARNING How can we ensure our oceans stay amazing?

LEARNING QUESTION What symmetry can I find in starfish?

Starfish, also known as sea stars, come in various shapes and sizes depending on their species. Some species are very small, measuring just a few centimetres across, while others can grow to be quite large.

The variation in the appearance of starfish species reflects the diversity of life in the ocean. However, many – like the ones that are the focus of these activities – are based on a pentagonal shape, with five arms radiating from a central disc. This gives them a star-like appearance. Examples that you can find along the UK coast include the common five-armed starfish (Activity 3A), the cushion star (Activity 3B) and the Bloody Henry starfish with its long, thin arms (Activity 3C).

YOU WILL NEED

Copies of Resource 3A or 3B
Ruler
HB pencil
Good-quality eraser
Tracing paper
Coloured pencils

Above: Cushion star
Below left: Bloody Henry starfish
Below right: Common five-armed starfish

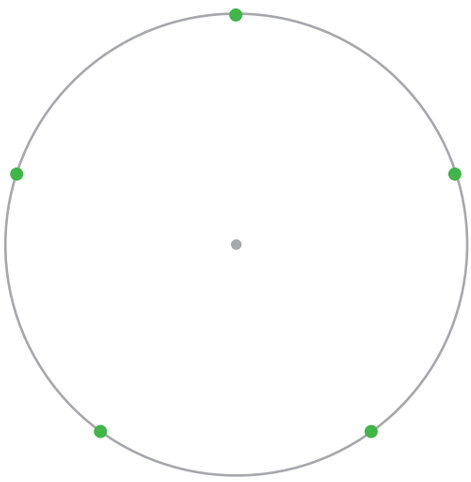
DID YOU KNOW?

Starfish tend to have five symmetrical arms and this arrangement is called radial symmetry because everything is centred around one point. Radial symmetry enables starfish to move easily in any direction, which helps them catch their food and makes them effective predators.

ACTIVITY 3A

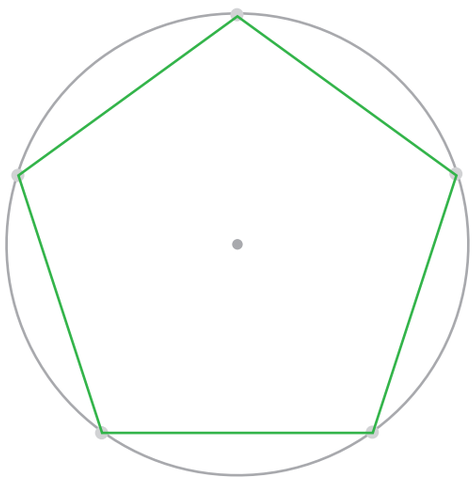
STEP 1 Familiarise yourself with the template

In this activity, students draw a common starfish. Start with a printout of Resource 3A. The circle has five dots spaced equally around its circumference.



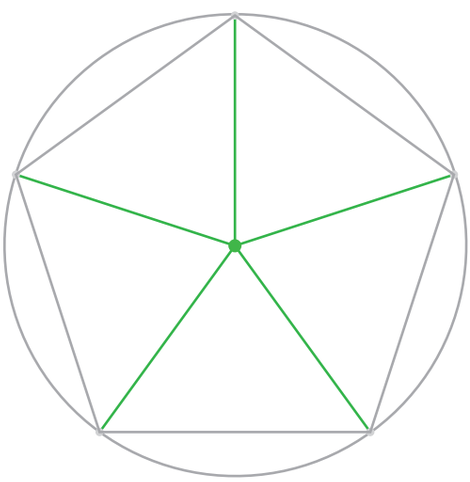
STEP 2 Draw a pentagon

Use a ruler to connect these five dots to create a pentagon.



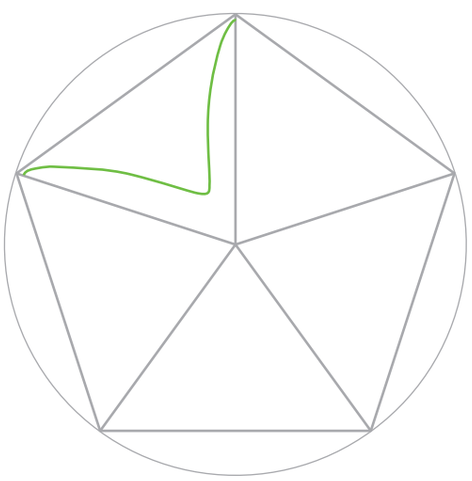
STEP 3 Divide it into five sections

Draw five lines, each joining one of the vertices of the pentagon to the point at the centre of the circle. This divides the template into five equal triangles.



STEP 4 Draw a V-shape

Start to draw the outline of the arms of the starfish by drawing a V-shape in one of the triangles created in Step 3, as shown below.



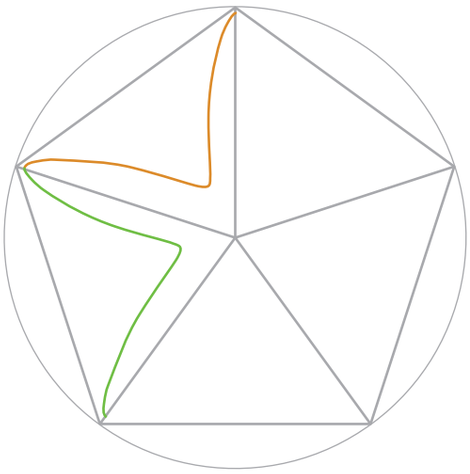
TEACHER TIP

Once the students have completed Step 3, you could challenge them to calculate the angle inside the vertex of each of the triangles at the centre of the diagram, and to give reasons for their thinking.

$360^{o} \div 5 =$

STEP 5 Draw a second V-shape

Either repeat the V-shape you drew in Step 4 by hand in the next triangle, or use tracing paper to copy it for greater accuracy.



STEP 6 Complete the outline

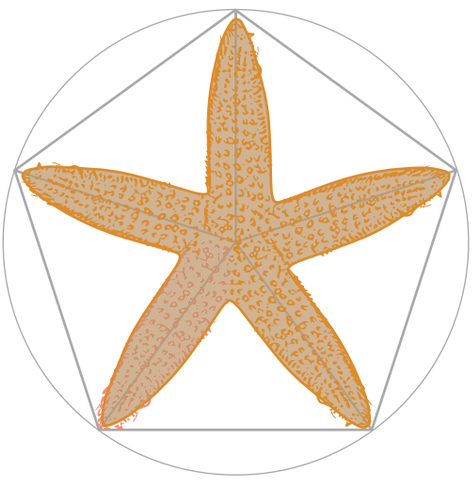
Repeat Step 5 in each of the remaining triangles to complete the outline of the starfish.

STEP 7 Add colour

Fill the outline of your starfish with an appropriate background colour. The colour of the common starfish ranges from orange and yellow to a sandy beige.

STEP 8 Add detail

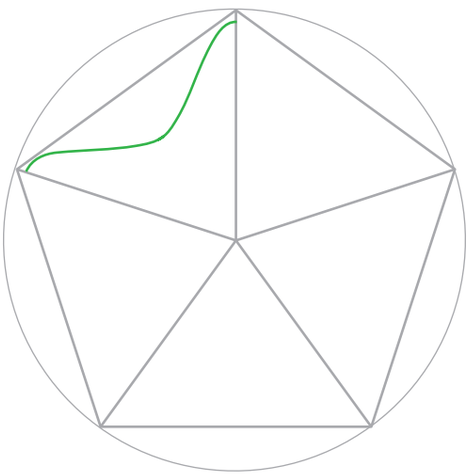
Examine photos of the common starfish to get an idea of the type of texture and pattern you will find on them. Add these to your drawing.



ACTIVITY 3B

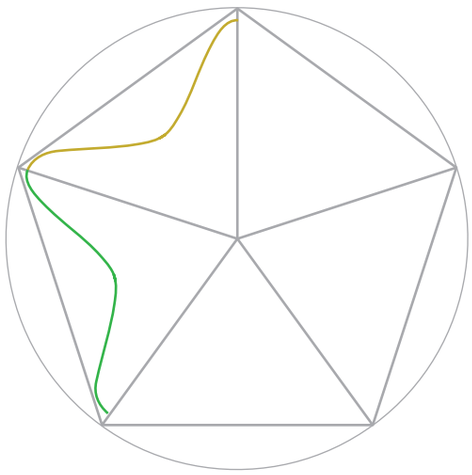
STEP 1 Draw a shallow curve

In this activity, students draw a cushion starfish. Start with a printout of Resource 3B. Begin by drawing a very shallow V-shape in one of the triangles, as shown below.



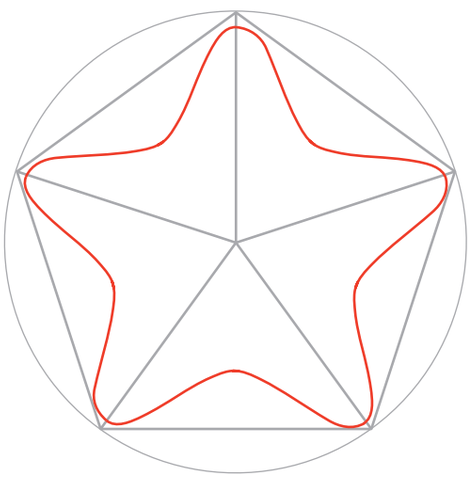
STEP 2 Draw a second curve

Either repeat the V-shape you drew in Step 1 by hand in the next triangle, or use tracing paper to copy it for greater accuracy.



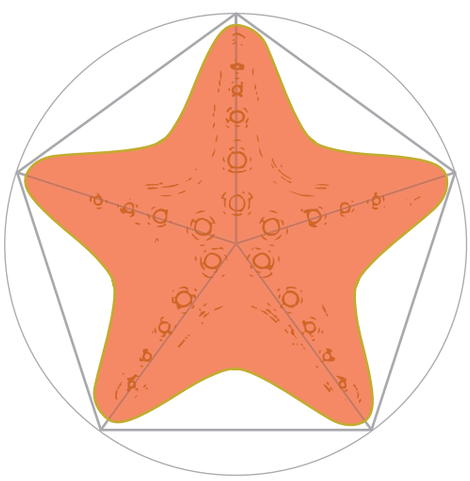
STEP 3 Complete the outline

Repeat Step 2 in each of the remaining triangles to complete the outline of the starfish.



STEP 4 Add colour and details

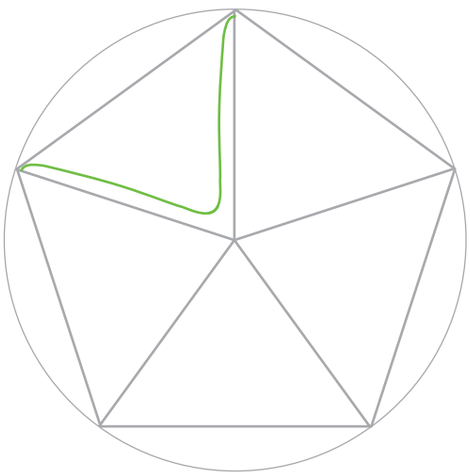
Examine photos of the cushion star to get an idea of the typical colours, textures and patterns you will find on them. Add these to your drawing.



ACTIVITY 3C

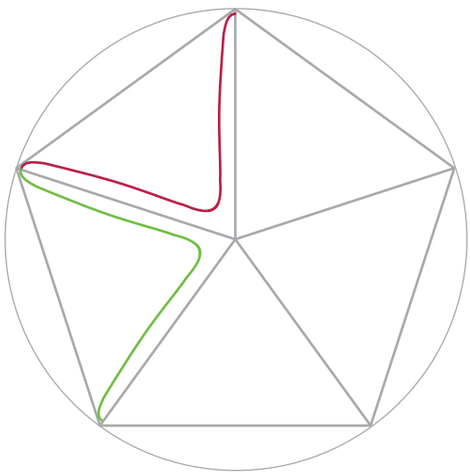
STEP 1 Draw a deep curve

In this activity, students draw a Bloody Henry starfish. Start with a printout of Resource 3B. Begin by drawing a very deep V-shape in one of the triangles, as shown below.



STEP 2 Draw a second curve

Either repeat the V-shape you drew in Step 1 by hand in the next triangle, or use tracing paper to copy it for greater accuracy.

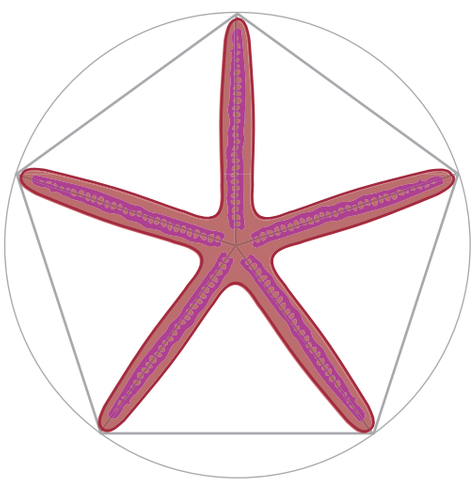


STEP 3 Complete the outline

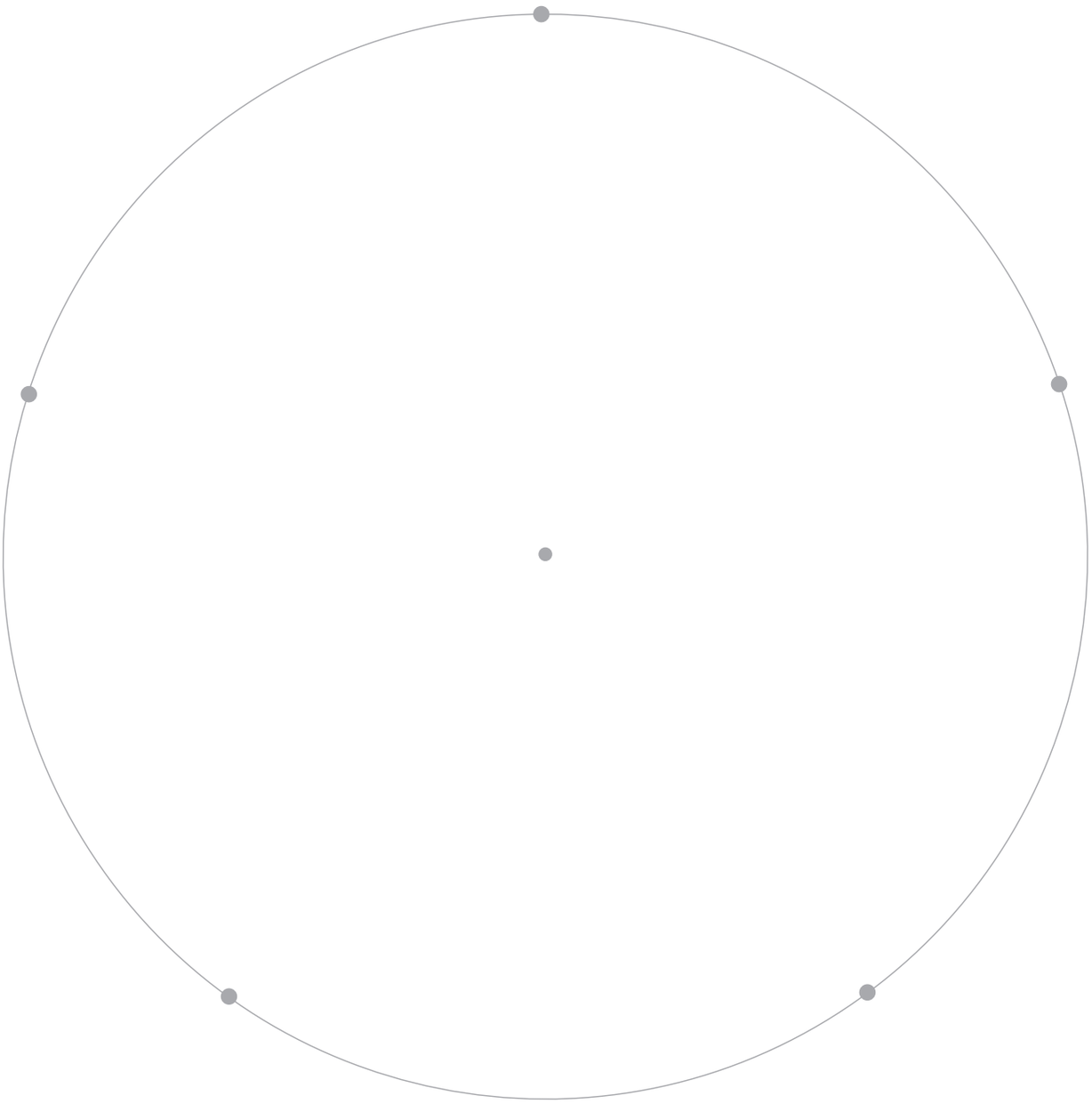
Repeat Step 2 in each of the remaining triangles to complete the outline of the starfish.

STEP 4 Add colour and details

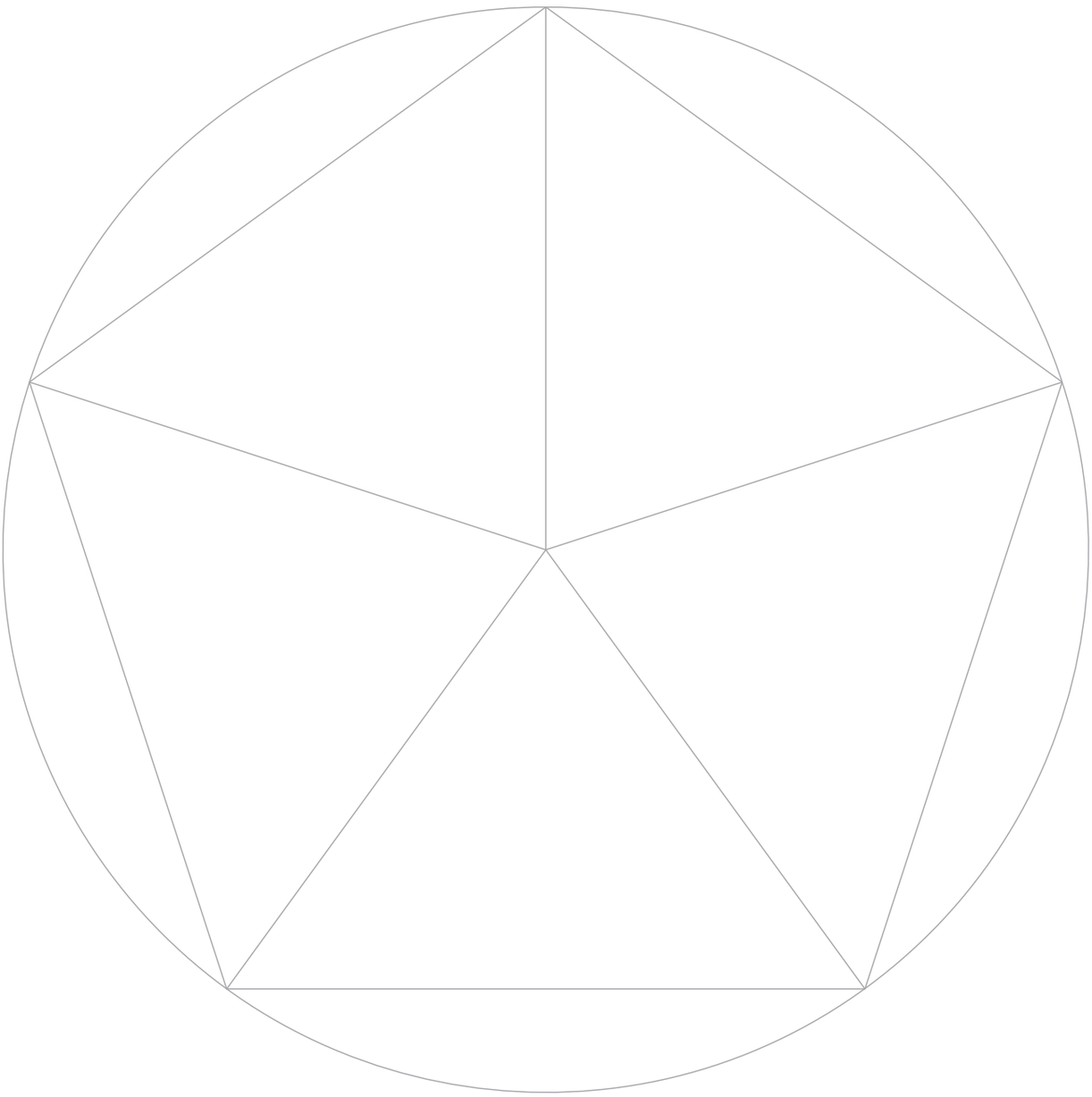
Examine photos of the Bloody Henry starfish to get an idea of the type of colour, texture and pattern you will find on them. Add these to your drawing.

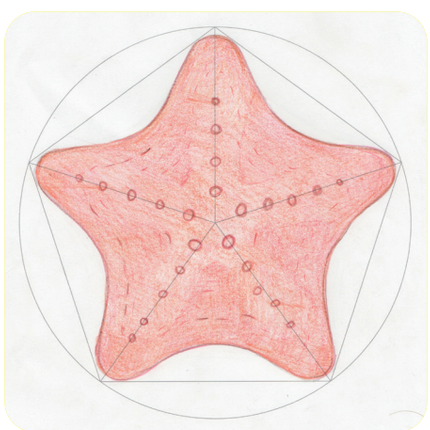


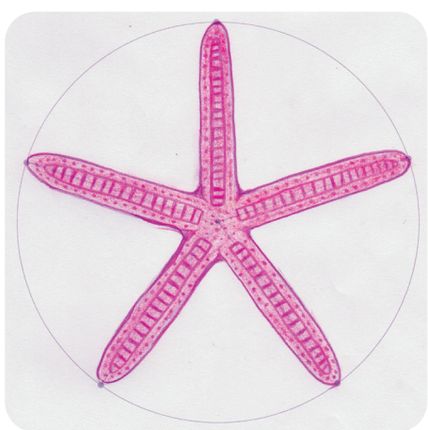
PHOTOCOPIABLE RESOURCE 3A



PHOTOCOPIABLE RESOURCE 3B







GEOMETRY ACTIVITY 4

ENQUIRY OF LEARNING How can we ensure our oceans stay amazing?

LEARNING QUESTION How can I draw different fish shapes?

Off the coast of the UK, round fish and flatfish are two of the most commonly found types of fish. As their name suggests, round fish such as cod, haddock, mackerel and bream have round-shaped bodies. They are frequently found swimming in open waters and are popular commercial catches, so these species are often overfished. Flatfish have flattened bodies with both eyes on the same side. Common examples include plaice, sole, flounder and turbot. Flatfish are well adapted for life on the seabed, where they camouflage themselves by blending in with the sand or mud.

Flatfish are the focus for this activity in which students draw a plaice. Plaice is a popular fish in the UK that you might see served in fish and chip shops. It has an unusual face and distinctive reddish or orange spots on its side, which helps to identify it.

YOU WILL NEED

Copies of Resource 4A
Ruler
Compass
HB pencil
Good-quality eraser
Coloured pencils

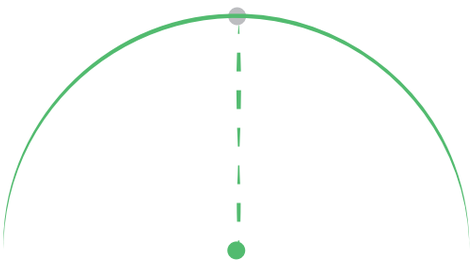
DID YOU KNOW?

Plaice are usually found in the north-eastern Atlantic Ocean and the North Sea. They prefer sandy or muddy sea floors in shallow coastal waters, although they can also be found at depths of up to several hundred meters. When plaice are born, they have a symmetrical body like most other fish, but as they mature, one eye migrates to the other side of their head and their bodies flatten out into their characteristic shape. They can grow to be quite large – up to 1m in length when fully grown.

ACTIVITY 4

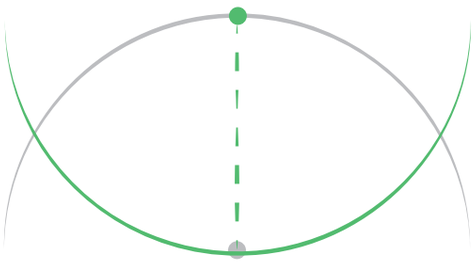
STEP 1 Draw a semi-circle

Start with a printout of Resource 4A. Arrange it in landscape orientation and place the compass needle on the bottom dot. Extend the arms so that the pencil point rests on the upper dot (the radius of the compass should now be set to 9cm). Draw a large arc, as shown below.



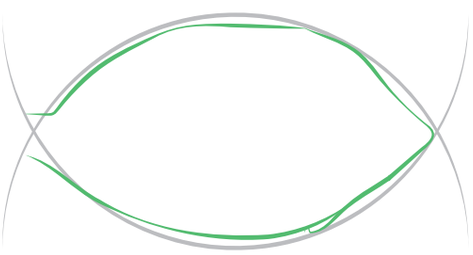
STEP 2 Draw a second semi-circle

Place the compass needle on the upper dot and draw another large semi-circle, as shown below. You will notice that you have created a shape between the two arcs. This is called a vesica piscis.



STEP 3 Draw the outline of the fish

Using one of the images on the previous page to help you, draw the outline of the plaice using the vesica piscis as a guide. One end of the outline should be slightly pointier; this is where the face will be. Leave a small gap at the opposite end, where the tail will be.

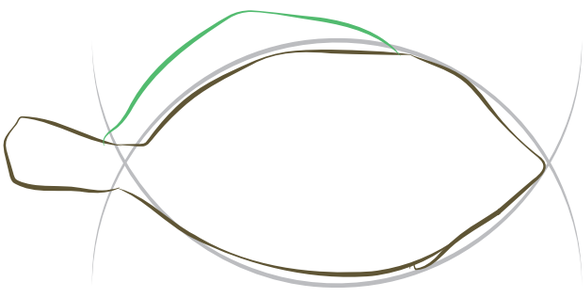


STEP 4 Draw the tail

Add the tail of the plaice, as shown below in green.

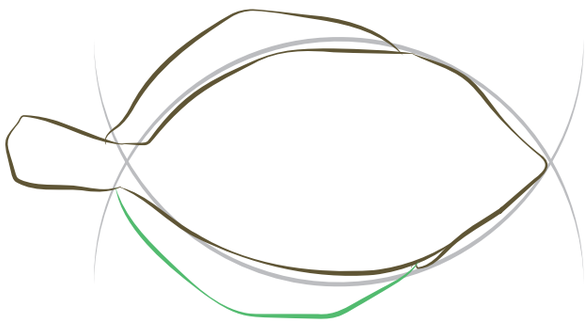
STEP 5 Draw the dorsal fin

Draw the fin that runs along the top side of the plaice, as shown below. This is called the dorsal fin.



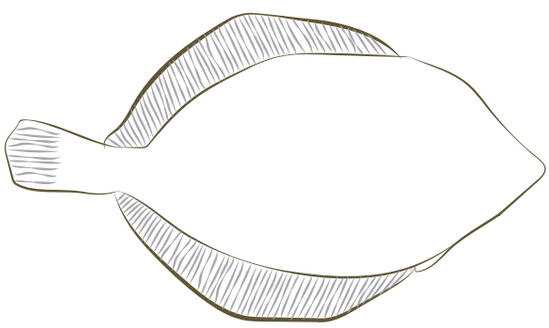
STEP 6 Draw the lower fin

Add another fin on the underside of the plaice outline that is about the same size and shape as the dorsal fin.



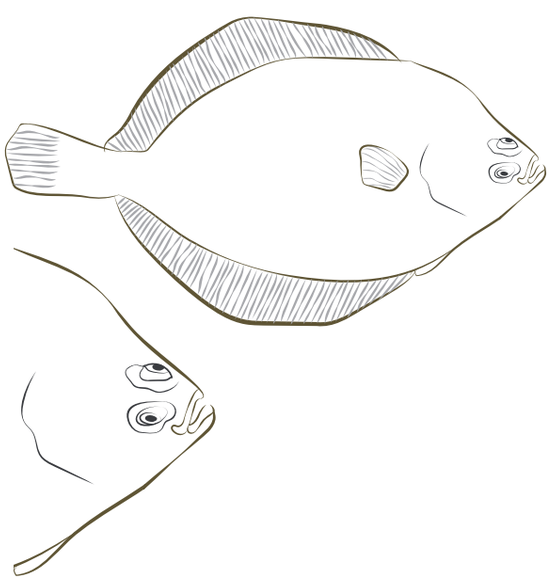
STEP 7 Draw the fin rays

The fins have fine bony structures in them called fin rays. Draw these rays of bone as thin straight lines running away from the body of the fish through the dorsal and lower fins, as shown below. Also add these rays to the tail.



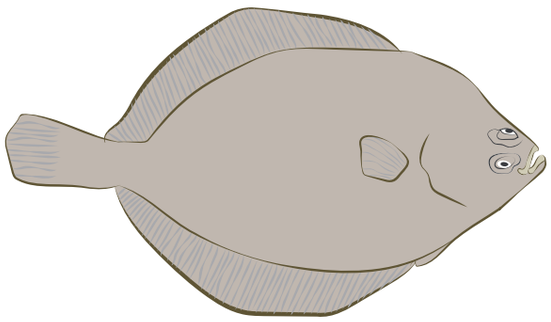
STEP 8 Draw the face and pectoral fin

A flat fish has its face slightly squashed on to the upper side of its body, rather than balanced in the centre like most other fish and animals. Add this in, along with a small fin just behind the face.



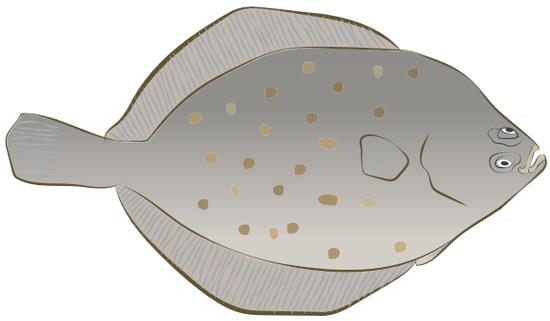
STEP 9 Add colour

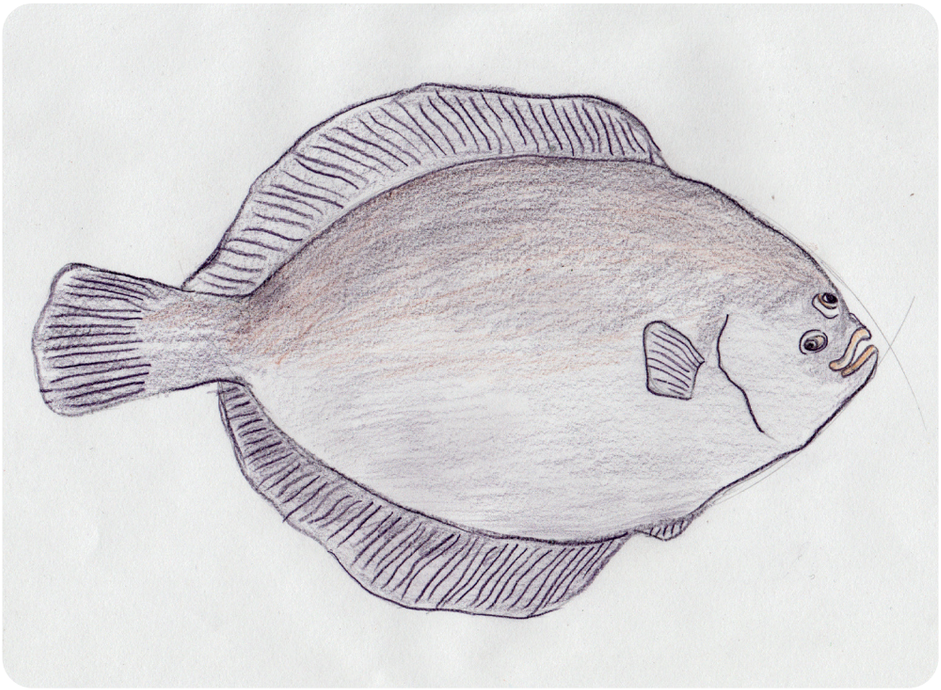
Plaice are usually brown and grey in colour, which allows them to camouflage themselves on the sea floor. Colour in the plaice you have drawn.



STEP 10 Add pattern

The plaice has reddish brown and orange coloured spots on its body. Add these to complete your drawing.





PHOTOCOPIABLE RESOURCE 4A

GEOMETRY ACTIVITY 5

ENQUIRY OF LEARNING How can we ensure our oceans stay amazing?

LEARNING QUESTION How can I draw the face of a seal?

There are two main species of seals found in the UK: the common seal (also known as the harbour seal) and the grey seal. The grey seal is the larger of the two and is more commonly seen around the coasts of the UK. They often inhabit rocky shores, sandbanks and coastal islands. Seals in the UK typically give birth to their pups during the autumn and winter months, and like to raise them on remote islands or quiet beaches. Some well-known breeding colonies are found on the Farne Islands and the Isle of May in Scotland.

Seals are carnivorous and mostly feed on fish such as cod, herring and sand eels. They are skilled hunters and can dive to great depths in search of food. However, they face various threats in the wild, including habitat degradation, pollution, entanglement in fishing gear and disturbance from human activities. Climate change also poses a threat to their habitats and food sources. Seals have long been part of British folklore and culture, featuring in stories, myths and legends. In this activity, students use a compass to draw the face of a seal.

YOU WILL NEED

Copies of Resource 5A
Ruler
Compass
HB pencil
Good-quality eraser
Coloured pencils

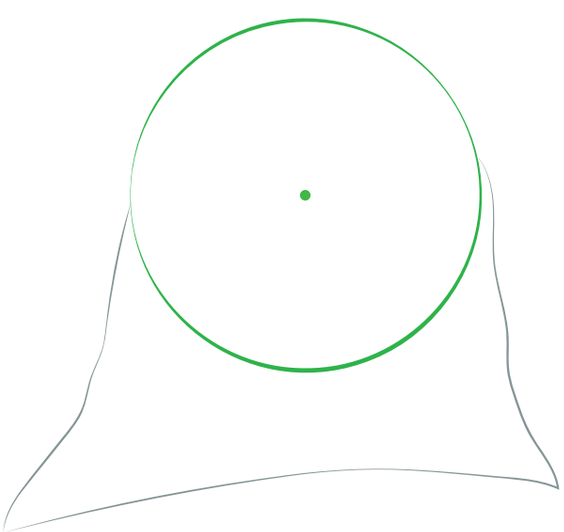
DID YOU KNOW?

The nose of the seal, known as its 'muzzle', is an amazing adaptation of these marine mammals. Seals come to the surface to breathe and have nostrils that can close tightly to prevent water from entering when they dive underwater. This adaptation allows seals to stay submerged for extended periods while hunting for food. Seals also have very sensitive whiskers, called vibrissae, surrounding their nose. These vibrissae detect vibrations and movements in the water, helping seals to locate prey in dark and murky conditions.

ACTIVITY 5

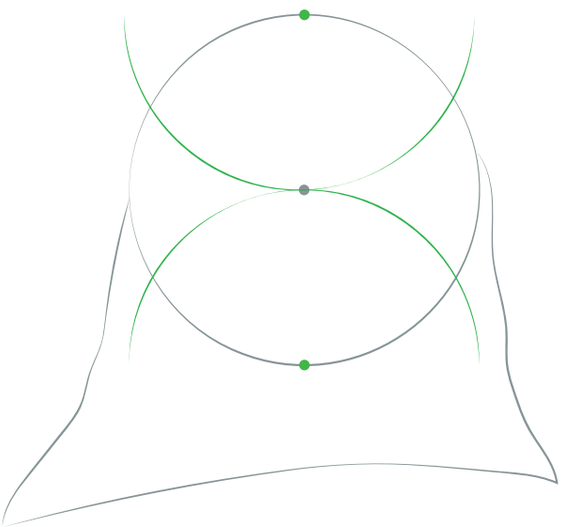
STEP 1 Draw a circle

Start with a printout of Resource 5A. Place the compass needle on the dot in the centre of the template and extend the compass arms so that the pencil point rests on the top left or right edge of the template outline (the radius of the compass should now be set to 5.5cm). Draw a circle.



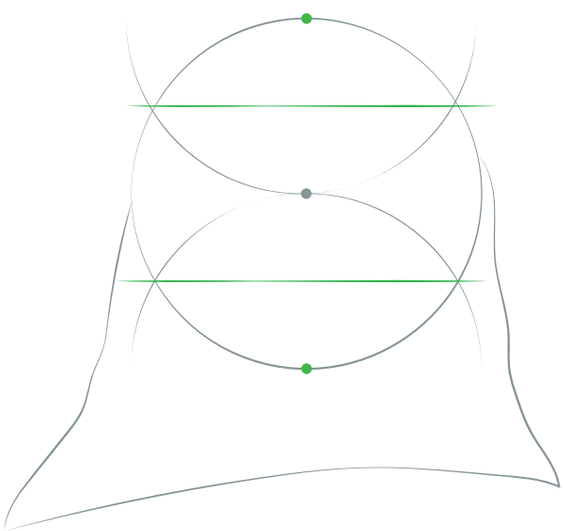
STEP 2 Draw two semi-circles

With the compass radius still set to 5.5cm, place the compass needle at the top of the circle you drew in Step 1 and draw a semi-circle, as shown below. You will notice that you have created a shape between the two arcs. This is called a vesica piscis. Repeat at the bottom of the circle. You will now have two vesica piscis shapes within the circle.



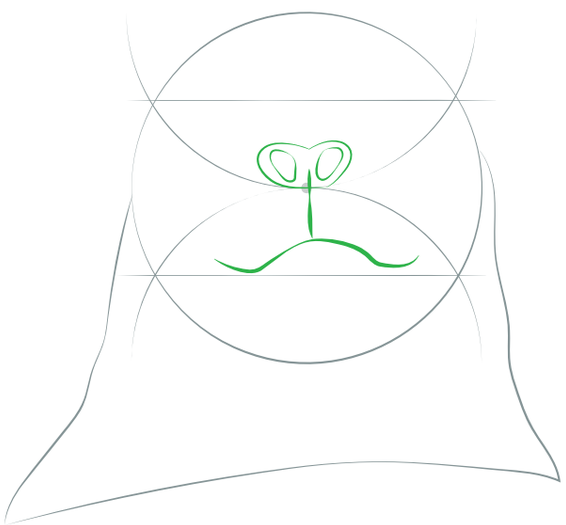
STEP 3 Draw two straight lines

Using a ruler, draw two straight lines through the centre of the two vesica piscis shapes, as shown below. These lines divide the circle you drew in Step 1 into the proportions that will help you to draw the seal's face.



STEP 4 Draw the muzzle

A seal's face has bilateral symmetry, meaning one side of the face mirrors the other. Find the centre point where the two semi-circles you drew in Step 2 meet, and draw a heart-shaped nose just above it and a short vertical line and mouth below it, as shown below in green. The muzzle sits between the two straight lines you drew in Step 3.

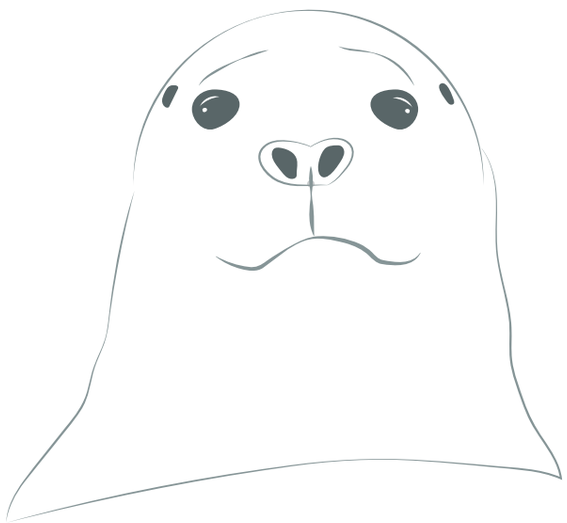


STEP 5 Draw the eyes and ears

The eyes of the seal sit just on and below the top line you drew in Step 3, with curved brows above them and ears at the ends of the vesica piscis. Add these, as shown below in green.

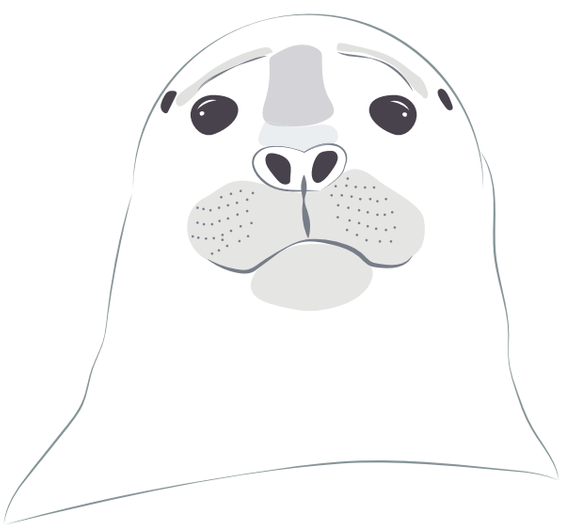
STEP 6 Colour the eyes, ears and nose

Use a dark grey coloured pencil to colour the eyes, ears and nostrils of the seal.



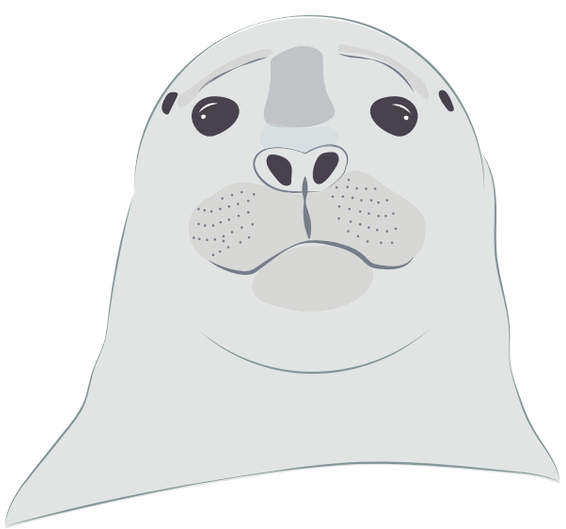
STEP 7 Colour the features

Use two medium grey coloured pencils to colour the other features of the seal, including the muzzle and whiskers, the area above the nostrils and the brows, as shown below.



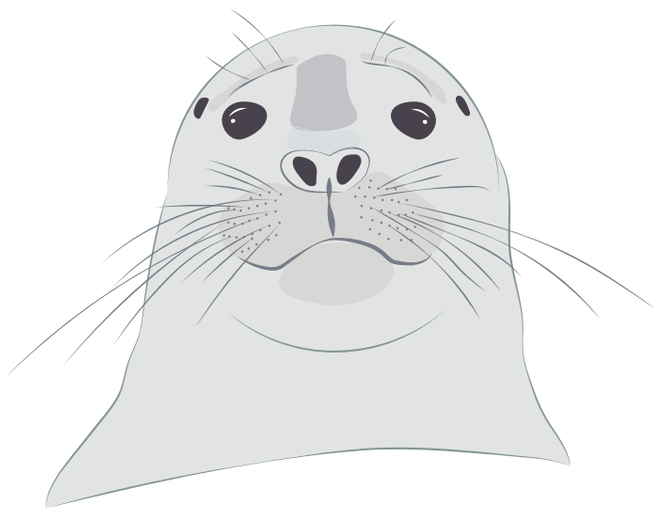
STEP 8 Colour the rest of the seal's head

Use a light grey coloured pencil to colour the rest of the seal's head and add a small arc below the muzzle in a darker pencil to define the chin.



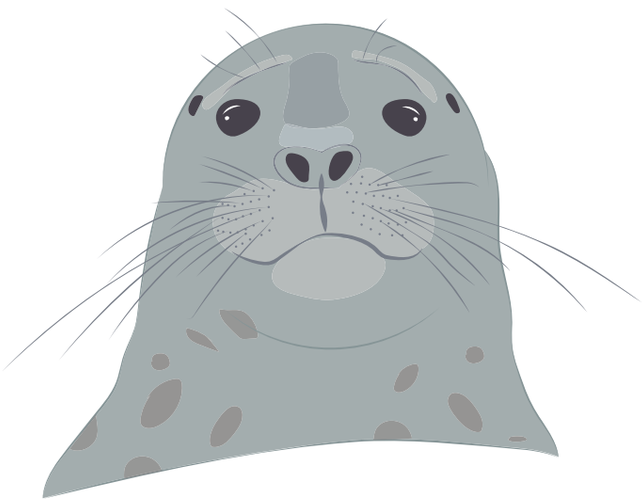
STEP 9 Draw the vibrissae

Add long whiskers to the muzzle, as shown below.



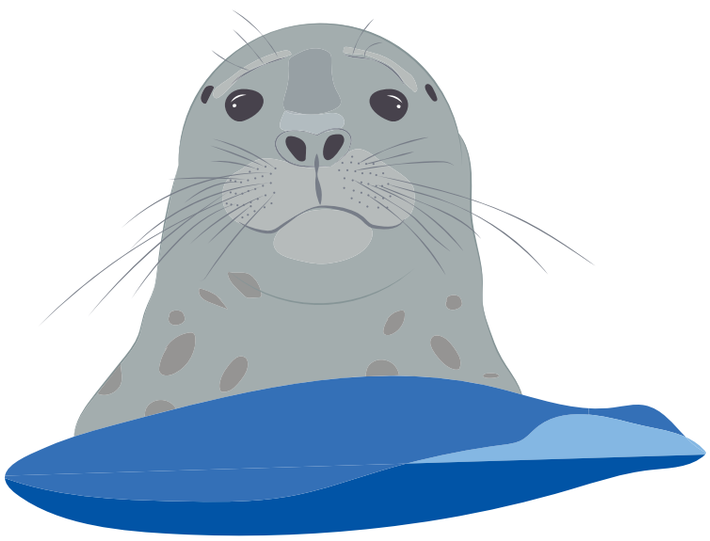
STEP 10 Add pattern

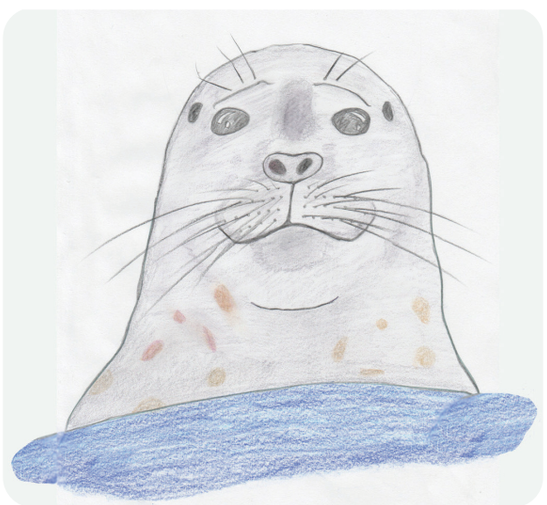
The seal has brown-grey spots on its body. Add these to complete your drawing.



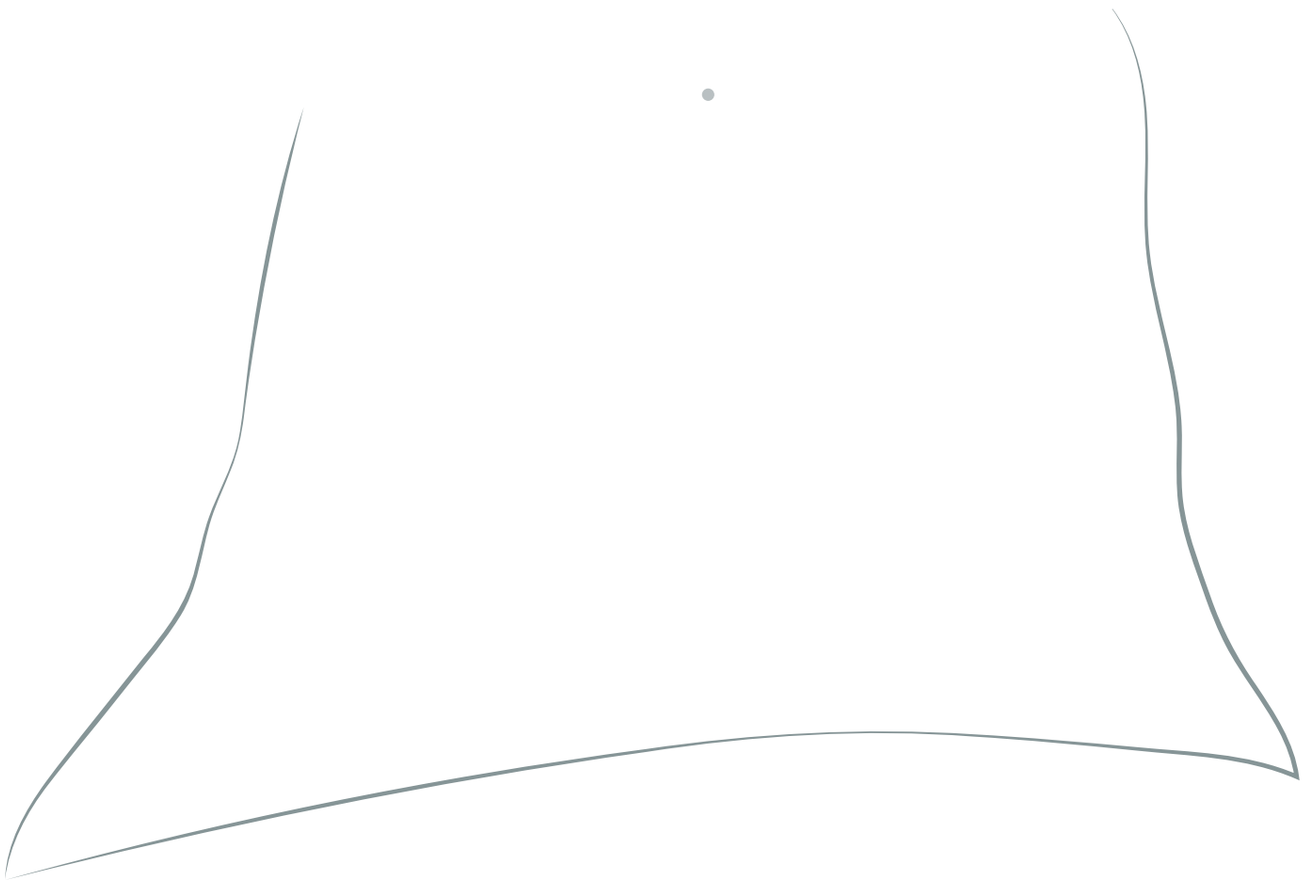
STEP 11 Draw the sea

Use blue coloured pencils in different shades to draw water, as shown below, so the seal appears to be bobbing in the sea.





PHOTOCOPIABLE RESOURCE 5A



GEOMETRY ACTIVITY 6

ENQUIRY OF LEARNING How can we ensure our oceans stay amazing?

LEARNING QUESTION How can I draw a nautilus shell?

In this activity, students draw the spiral-shaped, chambered shell of a nautilus, which is a type of marine creature belonging to the cephalopod family (this also includes squids and octopuses). Nautiluses are the only living cephalopods with an external shell; they inhabit the largest chamber in their shell and use the other gas-filled chambers to control how they float, allowing them to move up and down.

Nautilus shells are prized by collectors and have inspired many works of art and literature because of their symmetry and geometric beauty. The shape of the shell is a logarithmic spiral – a curve that maintains a constant angle and grows progressively larger as it spirals out from the central point. The chambers inside the nautilus shell get correspondingly bigger as they spiral outward. The logarithmic spiral is often seen in seashells and in galaxies.

In this activity, students draw a spiral based on the Fibonacci sequence, a series of numbers where the next number is found by adding the two numbers before it (0, 1, 1, 2, 3, 5, 8, 13 and so on).

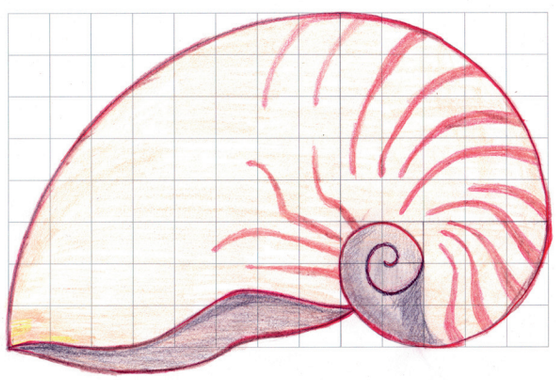
This activity can be adapted for students requiring additional support by using the template on Resource 6B and following the instructions from Step 10.

YOU WILL NEED

Copies of Resource 6A
Ruler
Compass
HB pencil
Good-quality eraser
Coloured pencils
Optional copies of Resource 6B

DID YOU KNOW?

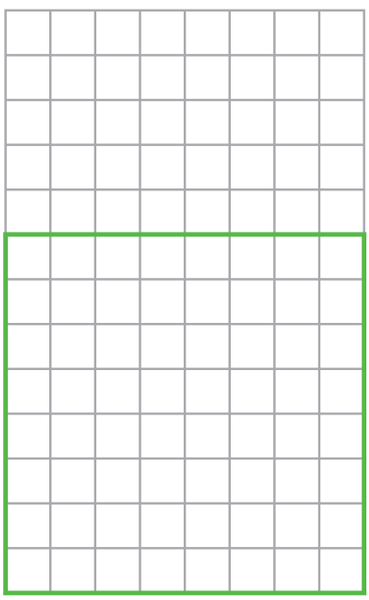
Unlike their relatives the octopus and squid, which have complex camera-like eyes, nautiluses have simple pinhole eyes. They can detect light and movement but have limited vision compared with other cephalopods. Nautiluses are nocturnal so are most active at night. During the day, they typically hide in deep water or seek shelter in caves and crevices to avoid predators. They are said to be 'living fossils' because they have changed very little over millions of years.



ACTIVITY 6

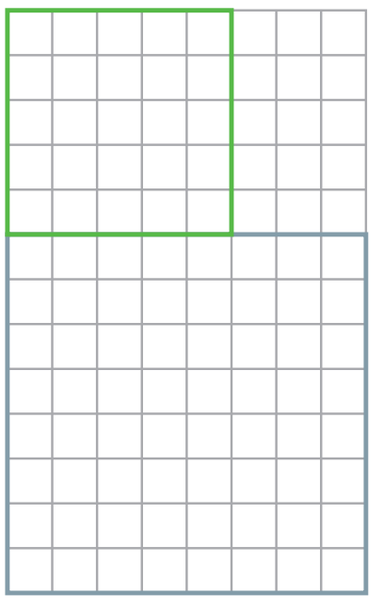
STEP 1 Draw the first square

Start with a printout of Resource 6A. It is an 8 x 13 square grid in which you will draw a Fibonacci spiral. Begin by using a ruler to outline an 8 x 8 square at the bottom of the grid, as shown below in green.



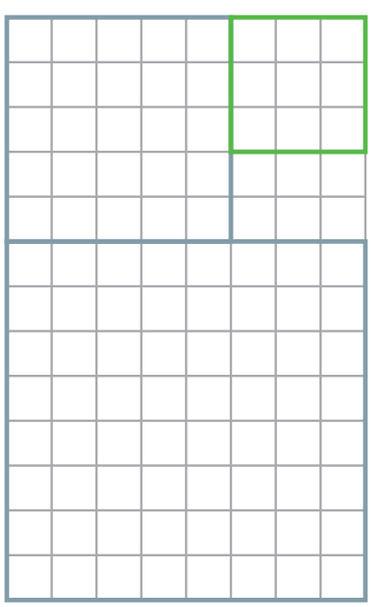
STEP 2 Draw the second square

Draw a 5 x 5 square in the top left corner.



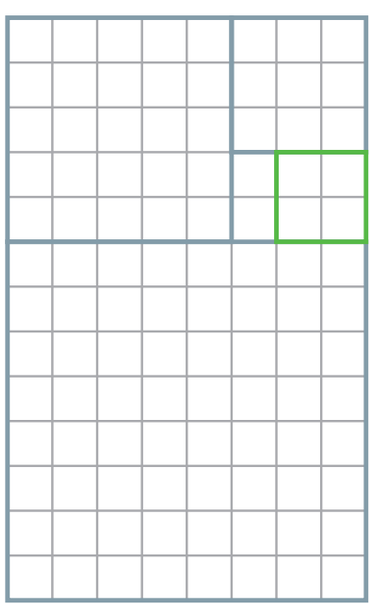
STEP 3 Draw the third square

Draw a 3 x 3 square in the top right corner.



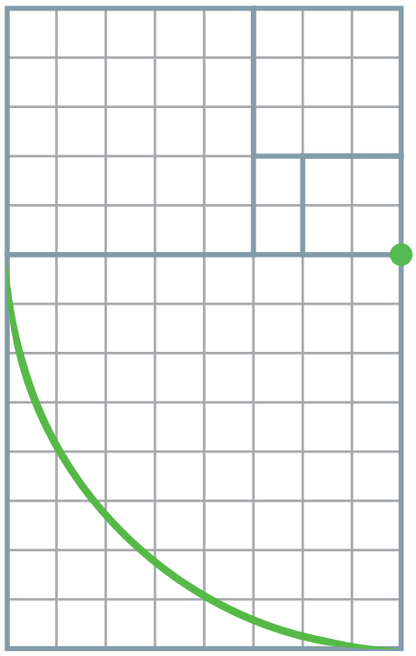
STEP 4 Draw the fourth square

Draw a 2 x 2 square underneath the square you drew in Step 3, as shown below in green. You will be left with two single squares to the left of it. Read from smallest to largest, the size of the squares on the grid gives us the start of the Fibonacci number sequence: 1, 1, 2, 3, 5 and 8.



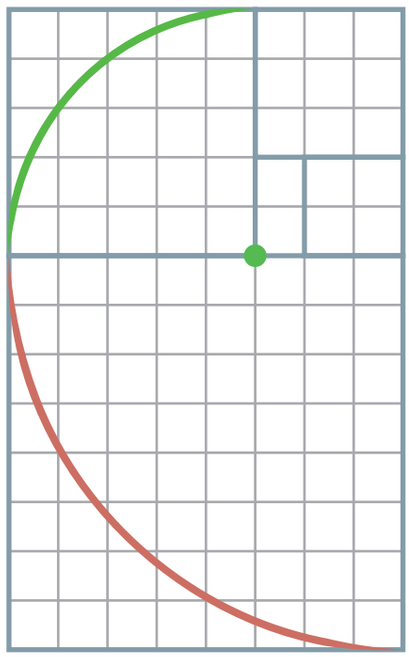
STEP 5 Draw the first curve

Place the compass needle on the dot shown below in green in the top right corner of the 8 x 8 square. Extend the arms so that the pencil point rests on the top left corner of the 8 x 8 square and draw a quarter circle down to the bottom right corner.



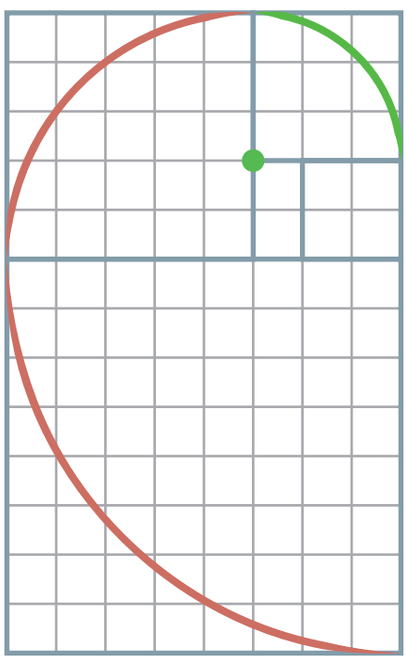
STEP 6 Draw the second curve

Draw the next quarter circle in the 5 x 5 square, starting with the compass needle on the dot shown below in green. The end of the previous curve should flow into the new one.



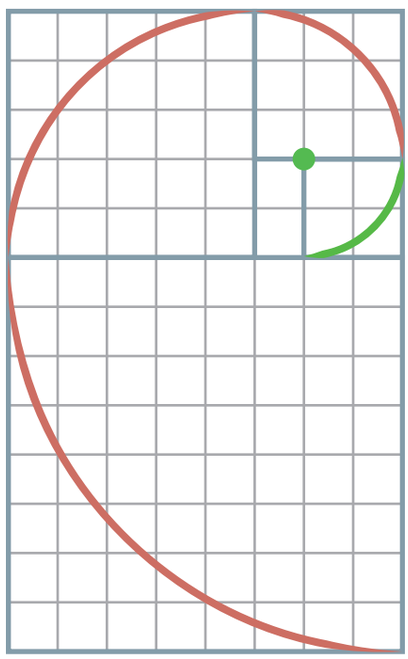
STEP 7 Draw the third curve

Draw the next quarter circle in the 3 x 3 square, starting with the compass needle on the dot shown below in green.



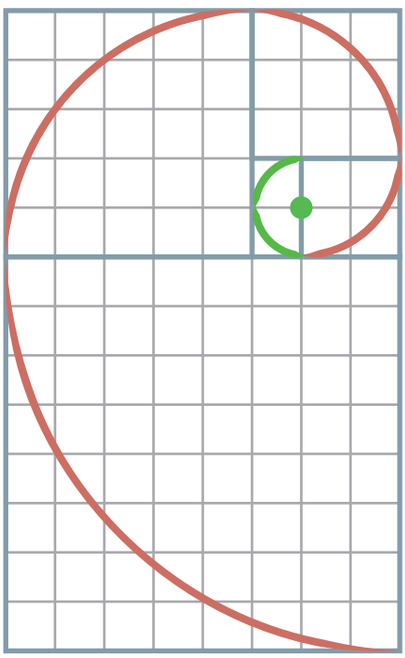
STEP 8 Draw the fourth curve

You should now see a clear spiral forming. Draw the next curve in the 2 x 2 square, placing the compass needle on the dot shown below in green.



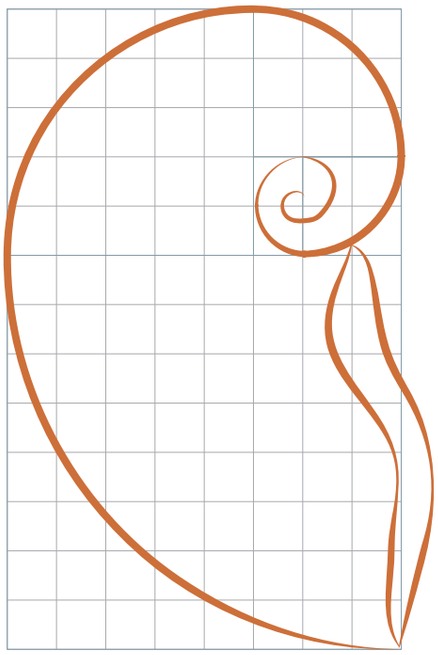
STEP 9 Draw the last two curves

The two 1 x 1 squares may be too narrow to use the compass, so sketch these in by hand.



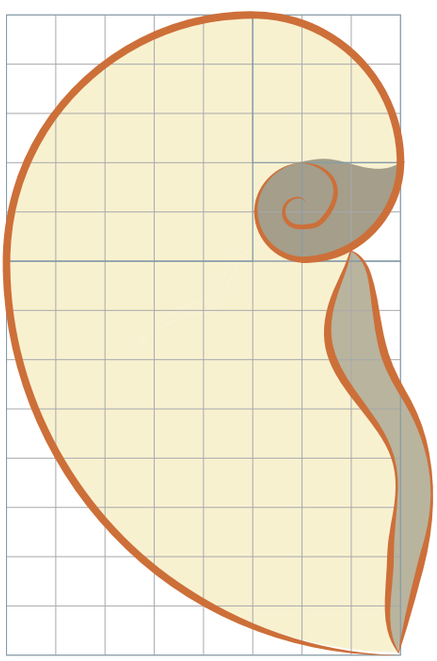
STEP 10 Draw the shell opening

Add the curved opening of the nautilus shell and the final curves at the centre of the spiral, as shown below, to complete the outline. Choose a reddish brown coloured pencil to go over and thicken the entire outline.



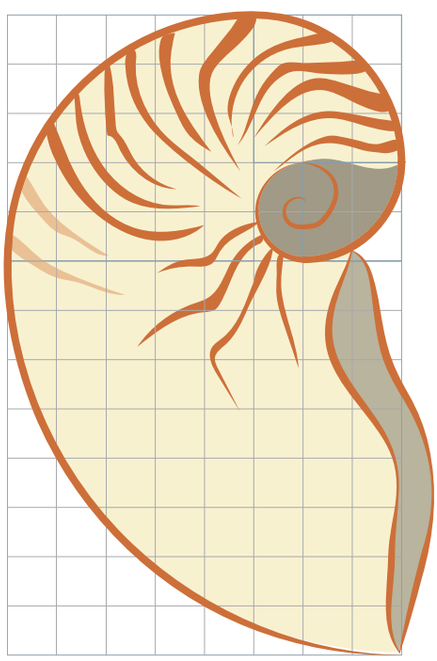
STEP 11 Add colour

Using the images on page 31 to help you choose a background colour, colour the nautilus shell. A creamy or pale yellow colour works well for the shell itself; use a darker grey or brown shade for the shadows.

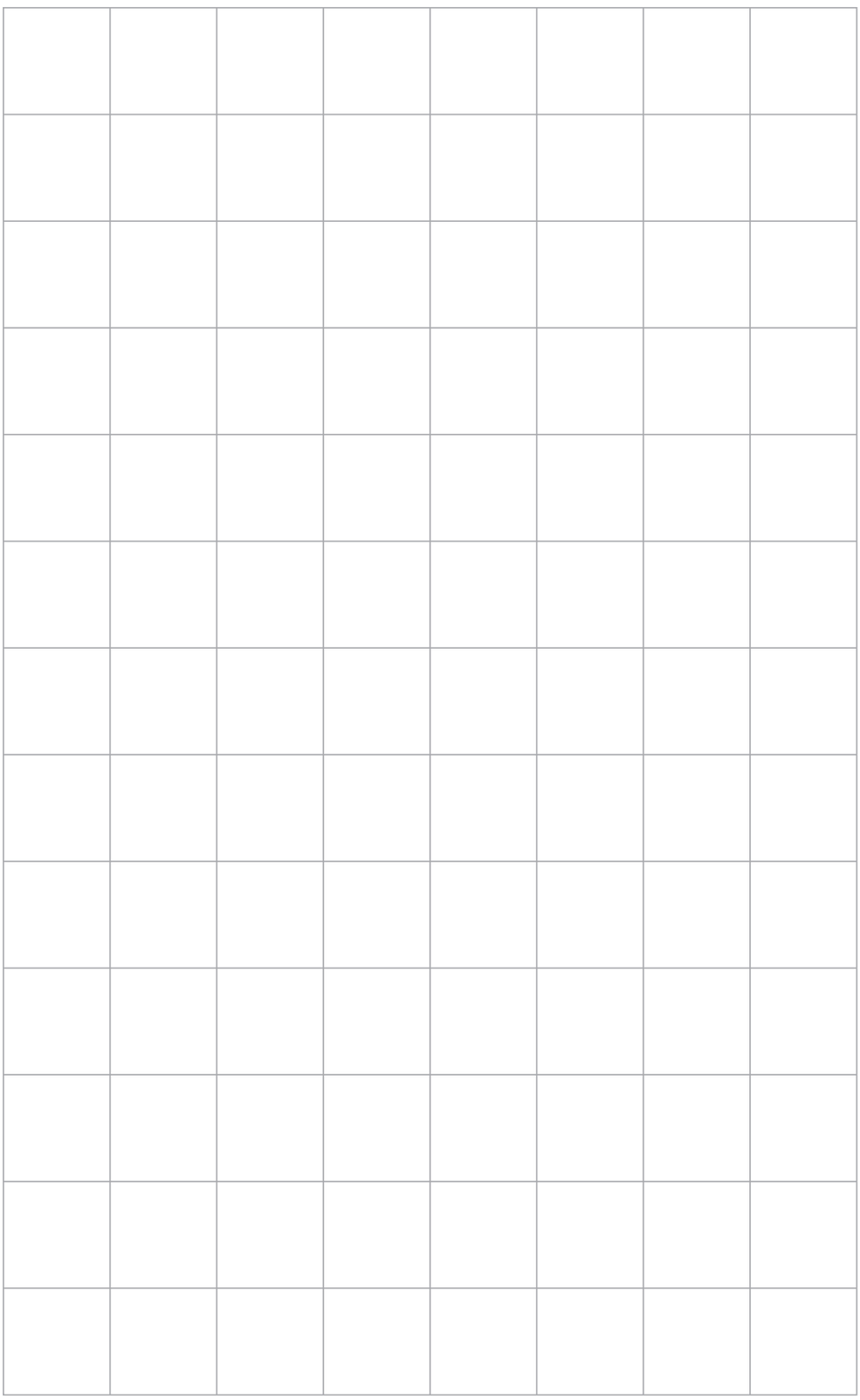


STEP 12 Add pattern

The nautilus shell has line patterns around the top of it. Using the images on the first page of this activity to help you, add these to complete the drawing.



PHOTOCOPIABLE RESOURCE 6A



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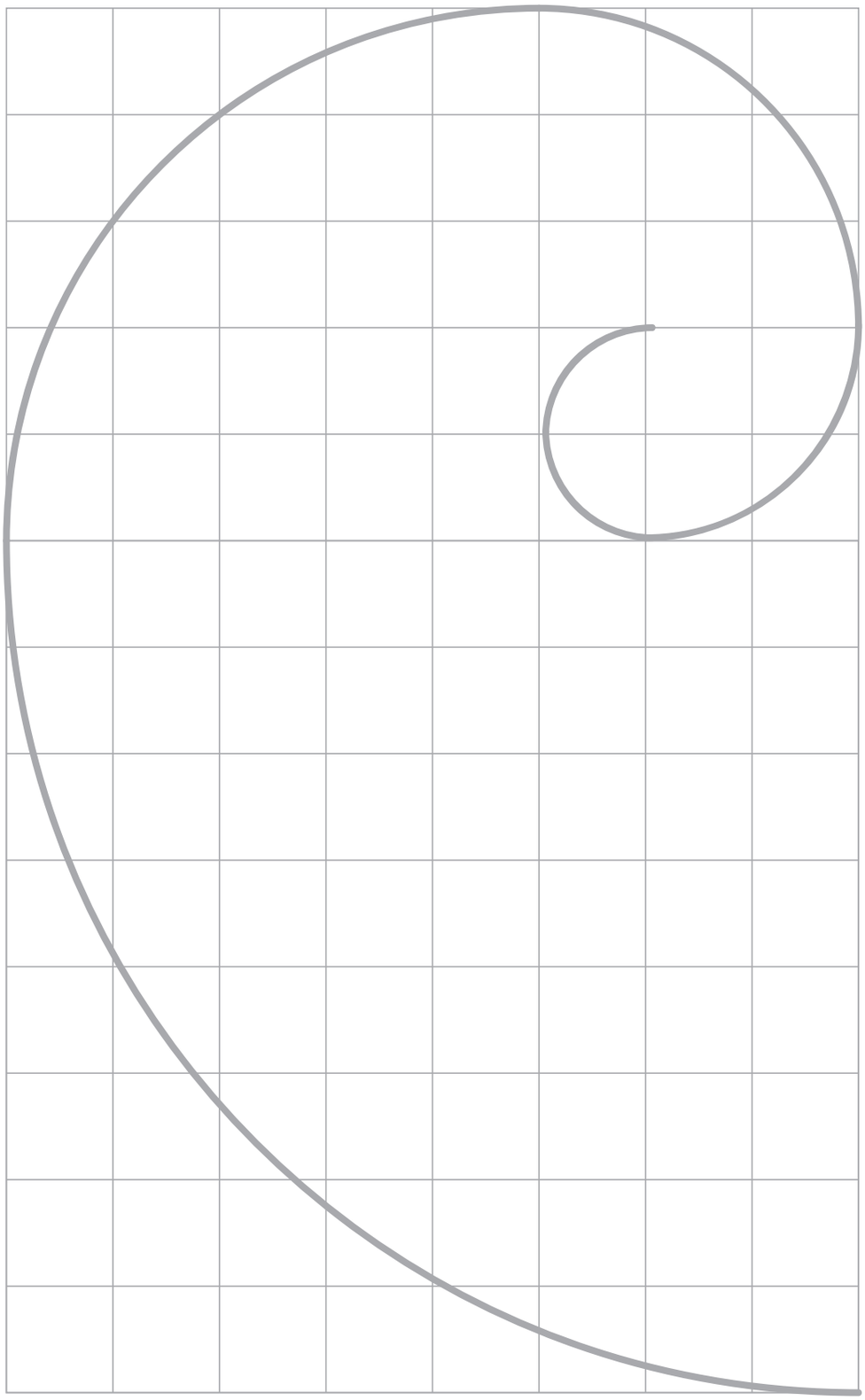

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Full production of this publication is carbon balanced and the paper used is FSC certified and fully recyclable.