

GEOMETRY

ENQUIRY OF LEARNING Is Antarctica worth protecting?

LEARNING QUESTION How can I draw a six-pointed snowflake?

This activity has been developed as part of a Year 6 enquiry of learning about Antarctica and the impact of climate change on this unique frozen continent. However, it can equally be adapted and used to explore the season of winter with students in other year groups. Some ideas for differentiation are given below.

The wider Year 6 enquiry is linked to the principle of Interdependence, allowing students to explore how individual species in Antarctica are part of an interdependent system. They also learn about the link between our use of fossil fuel-based energy, melting sea ice and rising sea levels and find ways to reduce energy use in school and at home. This activity introduces the learning in Week 3.



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.

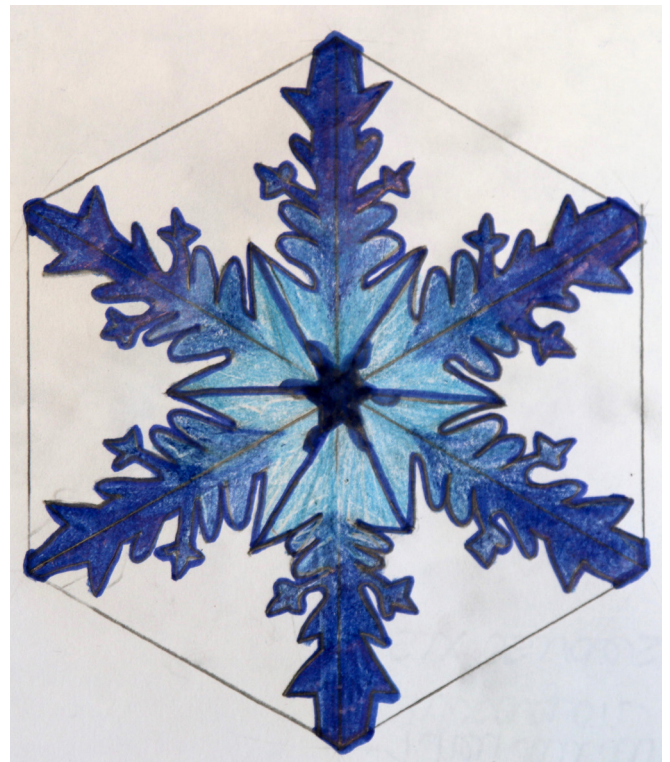
YOU WILL NEED

- A ruler
- A pencil
- Tracing paper
- Handheld mirrors
- Printed templates (p. 4)
- A4 paper (optional)
- A compass (optional)

IDEAS FOR DIFFERENTIATION

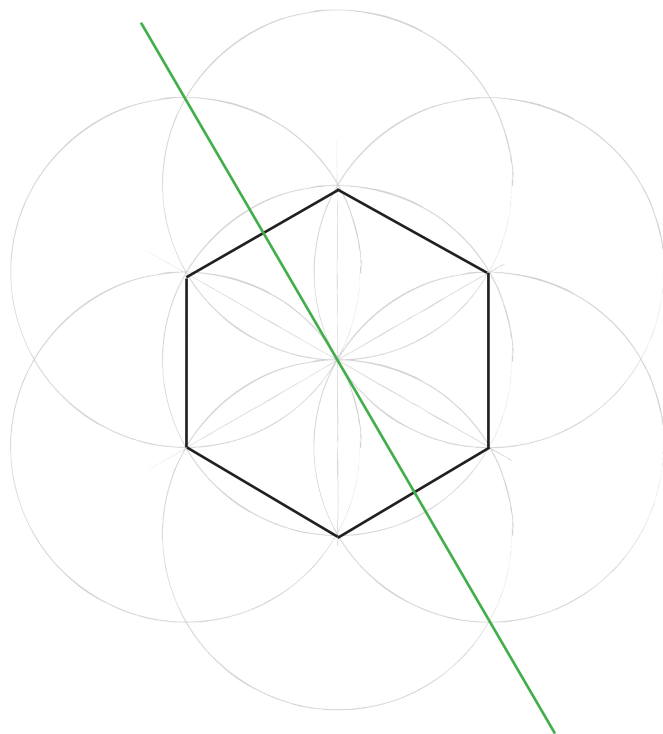
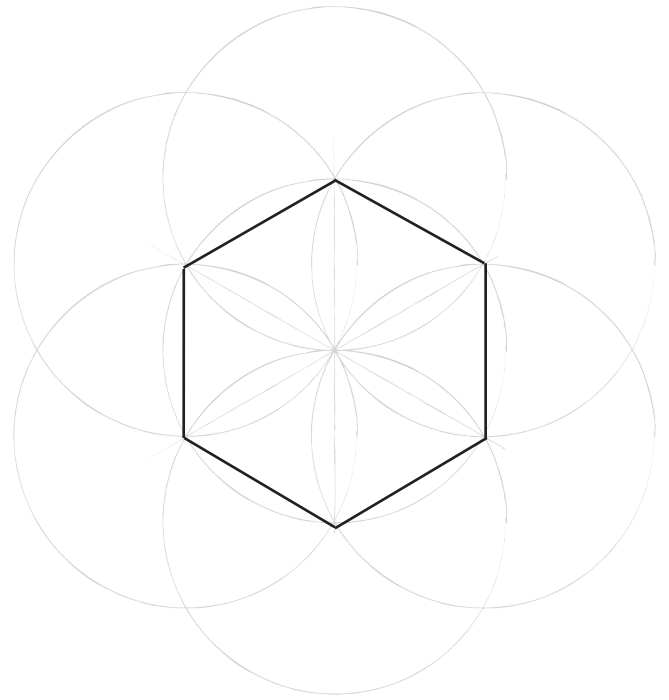
If you are adapting this activity to use with younger children, or for students who need additional support, you could use dots to indicate the points of intersection that need to be joined in Step 1, or you could draw the hexagon created in Step 2 onto the template for them. Alternatively, you could draw half a simple snowflake design onto the template and ask the students to complete the design, paying close attention to reflective symmetry. They could use a handheld mirror to help them with this.

Older or more confident learners can be given an additional level of challenge by creating the template themselves. To do this, start by setting the arms of a compass to 4cm and drawing a circle in the centre of an A4 sheet of paper. Place the point of the compass anywhere on the edge of this circle and draw a second circle. Next, place the point of the compass on one of the points where the second circle intersects the first and draw a third circle. Carry on placing the point of the compass on points of intersection around the edge of the original circle and drawing more circles until you have drawn six circles in addition to the first one.



STEP 1 Join points on the central circle to create a hexagon

On the template that can be found on p. 4, use a ruler and a pencil to draw lines that join the six points around the edge of the central circle, as shown. Discuss with the children the name and the properties of the shape they have drawn.

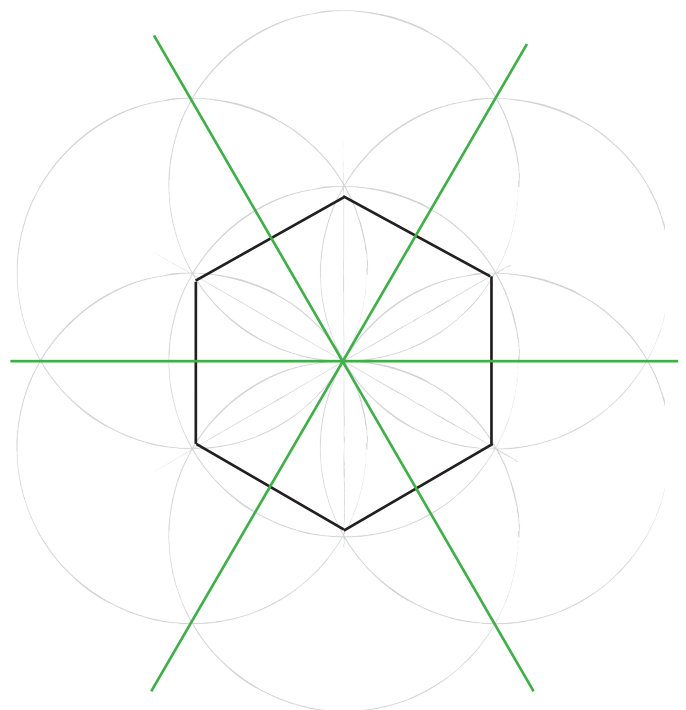


STEP 2 Draw a diagonal line across the hexagon

Next, use a pencil and ruler to draw a line that joins the point where two of the outer circles intersect to the centre point of the central circle. Extend this line to join up with the point where two of the outer circles intersect on the opposite side of the hexagon.

STEP 3 Repeat to join the remaining points

Repeat Step 2 to draw two further lines joining the point where two of the outer circles intersect, to the corresponding point opposite. Ensure each line passes through the centre point.



STEP 4 Create a symmetrical design for one point of the snowflake

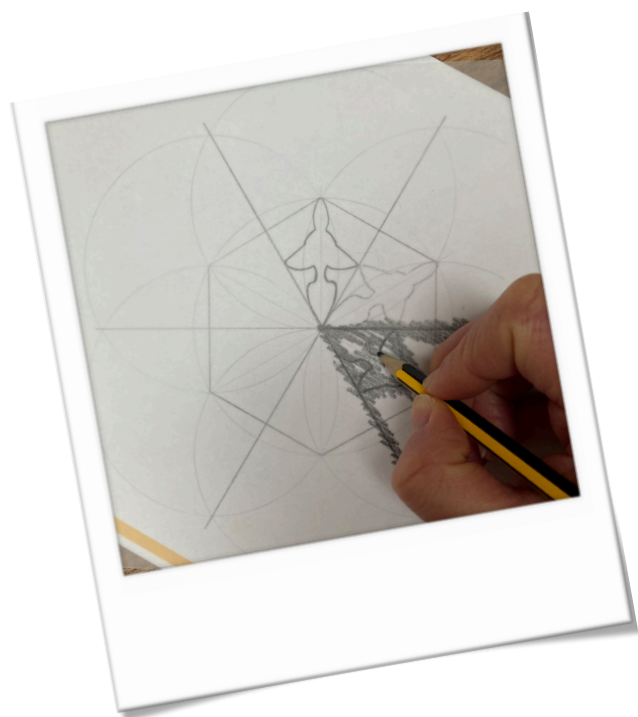
Working in one of the six sections you have created inside the hexagon, create a symmetrical design for one of the points of your snowflake. Use the line on the template that connects each vertex of the hexagon to the centre point as a line of symmetry to help you. Encourage children to check the symmetry of their designs using a handheld mirror.

STEP 5 Trace the design onto tracing paper

Lay a small piece of tracing paper over the design you have created and use a pencil to trace the design onto it. If you also trace the two straight lines on either side of your design, it will be much easier to position the design in the correct place in the next few steps.

STEP 6 Turn the tracing paper over and scribble on the back of it

Next, turn the tracing paper over and use the side of your pencil lead to scribble lightly over the outlines of your design.



TOP TIP

If you find that the tracing paper moves while you're drawing on it, use a couple of small pieces of masking tape on two opposite corners of the sheet of tracing paper to stick it down. Peel them off carefully.



DID YOU KNOW?

In Nature, snowflakes take a huge range of forms, each with its own distinct geometry. In this activity, we have focused on the geometry of 'six-pointed' snowflakes. Use the close-up photographs of snowflakes taken by scientist Kenneth Libbrecht at snowcrystals.com, to inspire your students' own designs.



STEP 7 Trace the next section of the snowflake

Turn the tracing paper back over, so that the side you drew on originally is facing up. Now rotate the design on the tracing paper through 60° from the original design you drew on the template. Line up one edge of the design on the tracing paper with one edge of the original design on the template. The two straight lines on the sides of the design will help you with this. The design on the tracing paper should now be positioned in a second section of the hexagon, next to the first one. Go over the design on the tracing paper with a pencil, pressing firmly.

STEP 8 Trace the remaining sections of the snowflake

Repeat Step 7 to draw the remaining four sections of the snowflake on the template until the snowflake design is complete.

STEP 9 Transfer the design to a fresh sheet of paper

Students can now carefully go over the outline of their snowflake design in pen, then trace the entire snowflake design and transfer it to a fresh sheet of paper. They could then use watercolour paints or coloured pencils to colour it, if they wish, or go over the outline of the snowflake in a fine, metallic pen.

PRINTABLE TEMPLATE

