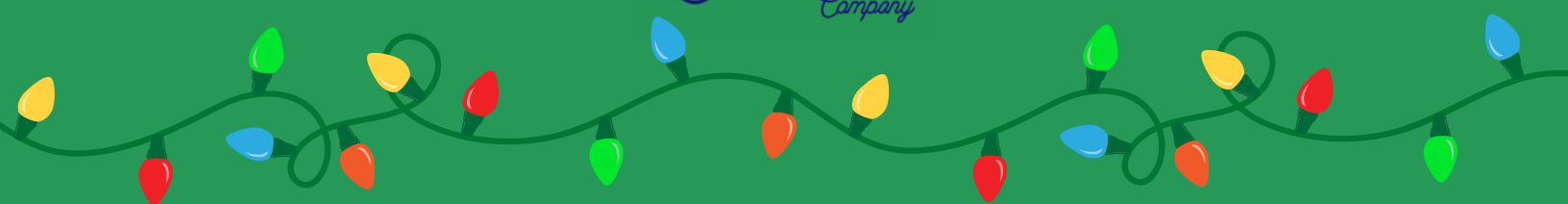


Lessons from Scout Elf School:

# Snowflake Symmetry





## Note to Teacher

In the Stories from Scout Elf School, the elves learn all about snowflakes: their shapes, patterns and symmetry. They especially love knowing how the ice crystals stick together to form snowballs! In this activity, your students will practice geometry and spatial reasoning to complete symmetrical diagrams of snowflakes.

## Core Curriculum Standards

### CCSS1.G.A.1

Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

### CCSS1.G.A.2

Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape and compose new shapes from the composite shape.

### CCSS2.G.A.1

Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.

### CCSS3.G.A.1

Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

### CCSS4.G.A.1

Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

## Activity Instructions

Give students a simple explanation of how snowflakes form:

Ask: “Have you ever wondered how snowflakes form?”

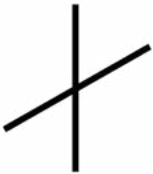


Draw a single vertical line on the board.

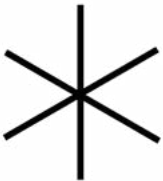


"A drop of cold water freezes onto a speck of dust in the sky and an ice crystal forms."

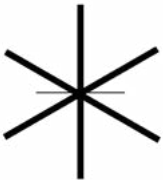
Continue drawing additional elements as you explain.



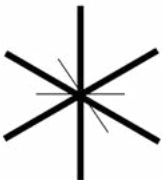
"As the snow crystal falls, water vapor sticks to that first crystal and freezes..."



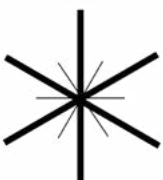
"...forming new crystals which become the six branches of the snowflake."



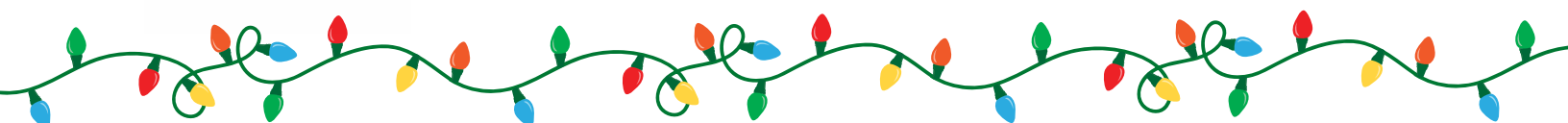
"The snowflake keeps falling and as it goes through different temperatures and water in the air..."



"it causes the snowflake to grow in new ways..."

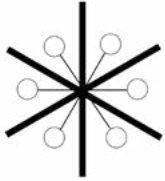


"...but whatever happens to one branch will happen to all the others, because all the branches of the snowflake go through the same changing conditions."

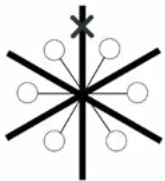




“This is why snowflakes are always completely symmetrical, which means...”



“...they have all the same parts on each branch.”



“...because the temperature and water vapor in the air cause the same changes.”



“Each side will always look like a mirror of the other side.”

## Sources and Further Reading

Herring, Angela. “The Physics of a Snowball.” News @ Northeastern, Northeastern University, 2 Jan. 2014, <https://news.northeastern.edu/2014/01/02/the-physics-of-a-snowball/>.

“How Do Snowflakes Form? Get the Science behind Snow.” National Oceanic and Atmospheric Administration, United States Department of Commerce, 19 Dec. 2016, <https://www.noaa.gov/stories/how-do-snowflakes-form-science-behind-snow>.

Thompson, Helen. “Do You Want to Build a Snowman? Physics Can Help.” Smithsonian.com, Smithsonian Institution, 27 Jan. 2015, <https://www.smithsonianmag.com/science-nature/do-you-want-build-snowman-physics-180954024/>.



## Further Snowflake Practice

### Beginning Learners

- Students will complete Snowflake Symmetry Levels 1A through 1D.

### Progressing Learners

- Students will complete Snowflake Symmetry Levels 2A through 2D.

### Advanced Learners

- Students will complete Snowflake Symmetry Levels 3A through 3D.



Santa has granted your students special access to Santa's Roblox Village for an epic snow battle with his Scout Elves and Elf Pets! Visit The Elf on the Shelf Snowball Fight on Roblox: <https://bit.ly/3Fdhkgi>

