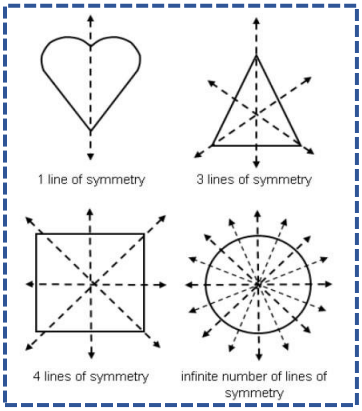
December, the Doorway to Winter: Snowflakes and Shapes

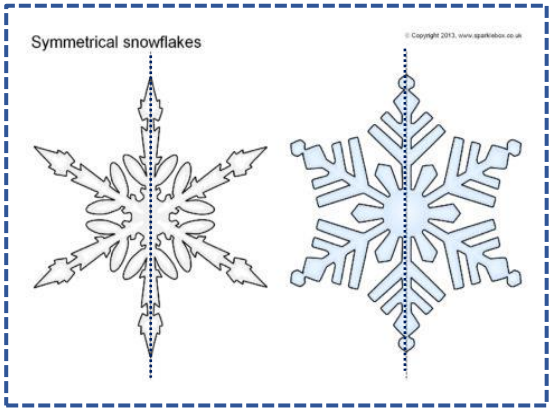
Find out what makes a snowflake a snowflake, and how different types form!

The next time it snows, put on your jacket and a pair of gloves and head outside to investigate. Hold out your hands and look closely at all the snowflakes you have caught! Do you notice any differences or similarities between the snowflakes?

Despite the assorted shapes and sizes, all snowflakes share characteristcs. They are all symmetrical and hexagonal. If something is symmetrical, it means that it is the same on both sides. If you look at a snowflake and "cut" it directly in half, that "cut" represents a line of symmetry, and both sides reflect the other, making each side identical.



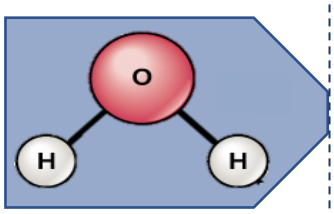
Different shapes and their lines of symmetry. Source.



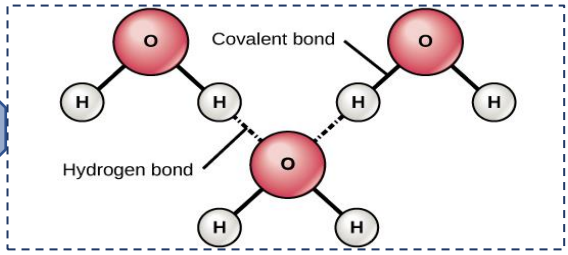
An example of one line of symmetry through a snowflake. Source.

A real snowflake, or snow crystal, up close. Source.

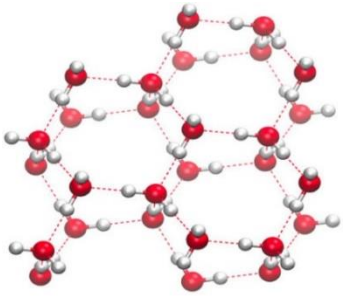
Snowflakes are also hexagonal, which means that they are 6-sided. This configuration occurs because of the structure of water molecules and how the form develops when it crystalizes. Before you have snow, you must have water, and those molecules are made up of two hydrogen atoms and one oxygen atom. Once the temperature drops to freezing or below freezing, which is 32 degrees F, those water molecules can start to form together. When that happens, they meticulously assemble in a lattice of hexagonal rings making them a 3D hexagonal structure.



Water molecule.



Water molecules bonding together.



Lattice structure of frozen

Source for photos above.

For more visuals and to learn more about snowflake symmetry and their hexagonal shape, watch these videos from NASA, Discovery Canada, and TED Ed.

Activity: Snowflake Symmetry

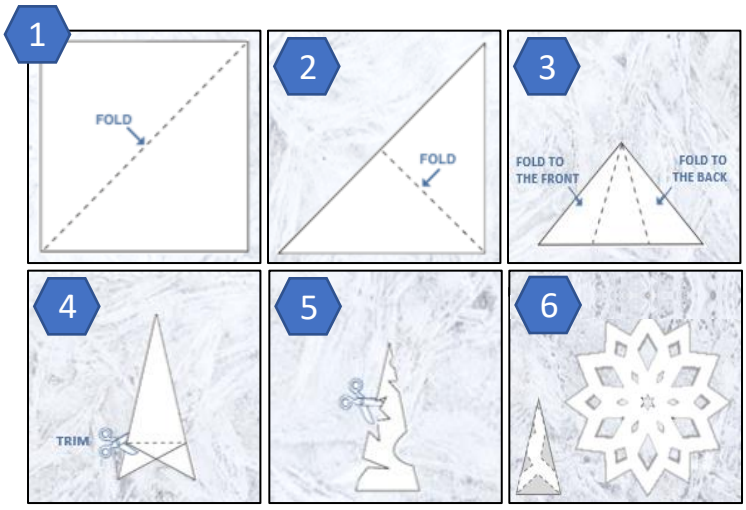
You can create your own 6-sided snowflakes that are made out of paper as a fun activity to learn about a snowflake's shape.

Materials:

- Recycled paper cut into squares of any size, as long as each side is the same length
    - Newspaper, junk mail, old paper bags, etc.
- Scissors

Instructions:

1. Fold the paper in half diagonally.
2. Fold the paper in half again.
3. Then fold the paper again, this time fold evenly into thirds bringing one side to the front, and the other side to the back.
4. Trim the points off the bottom by cutting at the lowest point of the paper where you can create a straight line across.
5. Now it is time to create the design of your snowflake! Make several cutouts into the triangle, they can be round, triangular, zig-zagging, etc.
6. Unfold your snowflake and enjoy!



Now that we have learned all about why snowflakes are similar, lets take a look at what makes snowflakes different. While all snowflakes are symmetrical and have 6 sides, no two are identical! This is because each individual snowflake is influenced by the weather conditions it falls through. There are general snowflake types and how each of those types form is based on the temperature and humidity of the air as it is falling from the clouds.

Dendrites are described as being "tree-like" because they have the look of a main branch with smaller branches coming off it.

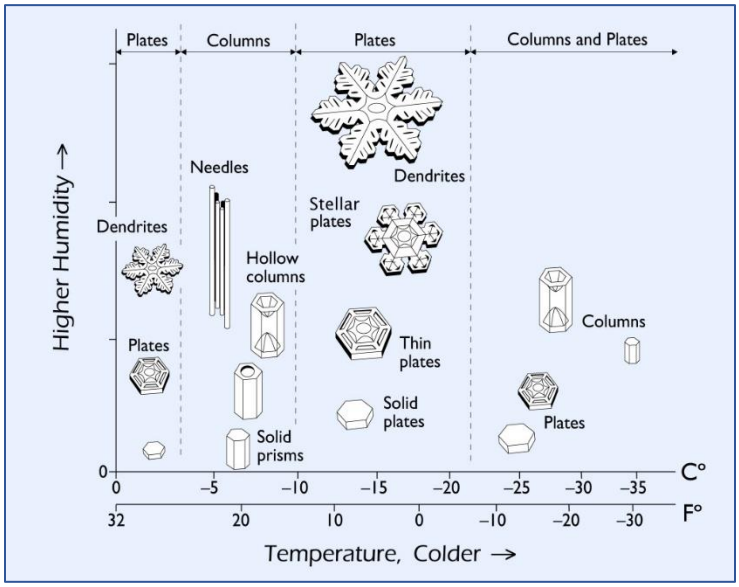
Plates are described as growing from the center with wider, flatter plate-like expansions.

Needles are accurately named because they are long, thin ice crystals that can be compared to a sewing needle. Sometimes needles are expanded upon by growing from the sides and ends which can look more like a cluster of needles.

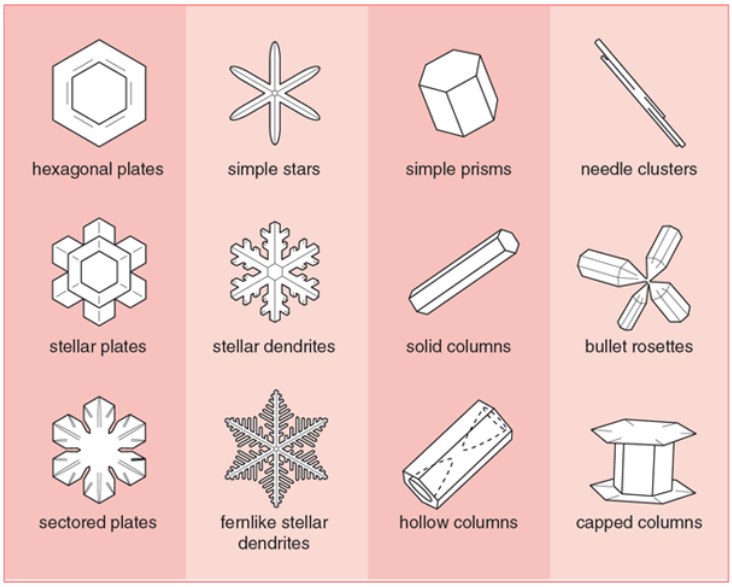
Columns look like 6-sided cylinders and can grow to become more intricate by becoming hallow or capped.

Prisms are the simplest looking of the snowflakes and can be compared to columns but are generally less detailed.

To learn about more types of snowflakes check out these articles from NASA and American Scientist.



See how atmospheric factors influence snowflake shape. Source.



A closer look at the different snowflake shapes. Source.

Activity 2: Match the Snowflakes

Look at the photos below and decide whether each is a dendrite, plate, needle, column, or prism based on the information and links above. Find the correct answers at the bottom of the page.

1

_____

2

_____

3

_____

4

_____

5

_____

6

_____

Answers: 1. Column; 2. Needle. 3. Dendrite; 4. Plate; 5. Column; 6. Prism

Observing snowflakes and analyzing their structures can be an interdisciplinary topic and used from elementary to secondary grade levels by adjusting the complexity.

Ideas to consider – Matching the Topic to NJ Student Learning Standards

NJSLS Crosscutting Concepts

Structure and Function - The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.

Patterns Observed- patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them.

Disciplinary Core Ideas in Earth and Space

• ESS2. 2-D: Weather and Climate

2-ESS2: Earth's Systems Patterns

♣ Patterns in the natural world can be observed. (2-ESS2-2),

Student Learning Standards for Mathematics

Geometry K.G A. Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres). 1. Describe objects in the environment using names of shapes and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to. 2. Correctly name shapes regardless of their orientations or overall size. 3. Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid")

Consider taking your students outside to explore on the next snowy day and for more extensions contact Kate Reilly, Manager of Education, Duke Farms. kreilly@dukefarms.org