

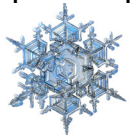
# SCIENTISTS ON THE GO



## Why are Snowflakes Unique?

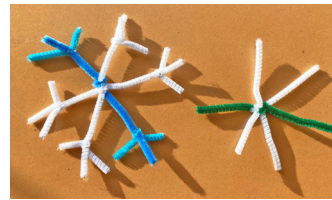
No two snowflakes are exactly the same, though they will always have six sides. Why is this? All snowflakes have six sides because of the crystallization pattern of water molecules. However, snowflakes look different because every snowflake's journey is unique.

A snowflake begins to form when an extremely cold water droplet freezes on a speck of pollen or dust in the sky. This creates an ice crystal. As the ice crystal falls from the sky, the atmospheric conditions influence the design, size, and water content of tiny, new snowflake.



## Grow a Borax Crystal Snowflake

1. Cut two pipe cleaners in half.
2. Twist three of the pieces together at the center to form the six points.
3. Optional: Cut  $\frac{1}{2}$  inch pieces of pipe cleaner and twist around ends of the snowflake.
4. With an adult's help, in the jar add 3 tablespoons of Borax for every cup of boiling water. Mix solution carefully with a spoon. Add a few drops of food coloring if you'd like.
5. Tie the snowflake to one end of the string and wrap the other end around the pencil/pen.
6. Place pencil/pen on the top of the jar so that the snowflake dangles into the solution. Let sit about 12 hours. If you do it in the morning, you can watch the crystals form.
7. Once your pipe cleaner is covered in borax crystals, remove the snowflake and let dry.



### Supplies

Jar or cup  
Borax  
Pipe cleaners  
Scissors  
Boiling hot water  
Pencil or pen  
String  
Food coloring (optional)

## Discussion Questions

Do Borax crystals look the same or different from each other?

How is your borax snowflake similar to a natural snowflake? How is it different?

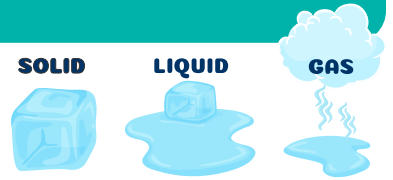
What question do you now have about snowflakes or crystals?



**We'd love to see your finished activity!**

Email a photo to [info@wetsciencecenter.org](mailto:info@wetsciencecenter.org) and we'll mail you a prize.

# Ready, Set, Melt Ice Cube Race



Why does ice start to melt when we take it out of the freezer or the sun beats down on it? Ice melts when the air surrounding it is warmer than the ice's temperature. What if we can keep warm solids, liquids, or gases from touching the ice? This will prevent heat from transferring to the molecules in the ice, causing it to change from a solid to a liquid. Design an insulated box to keep the ice from melting for as long as possible!

## Experiment: What materials insulates the best?

1. Find at least two insulating materials. Get creative! You can use towels, bubble wrap, styrofoam, wood shavings, fabric scraps, or anything else you find.
2. Create an insulated box. Choose plastic containers that are about the same size. For each box, add the insulation, ice cube, and close the lid. The control ice cube goes into a container without insulation.
3. Place the containers out of direct sunlight and start the timer.
4. Check on the ice cubes every 15 minutes and record your observations. Be careful to not let in too much air warm into the container.

- Supplies**
- Ice cubes
  - Insulation materials
  - Small plastic containers
  - Timer
  - Scissors



## Ice Cube Melting Result

Time Elapsed	Control (No Insulation)	Insulating Material 1	Insulating Material 2
15 minutes			
30 minutes			
45 minutes			
1 hour			
1 hour and 15 mins.			
1 hour and 30 mins.			
1 hour and 45 mins			
2 hours			

## Discussion Questions

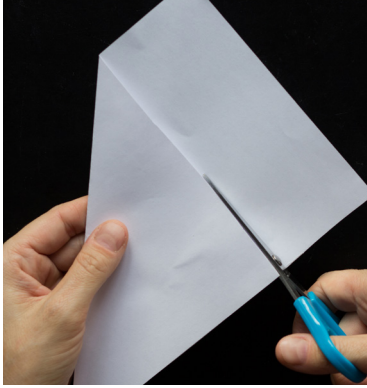
Which material provided the best insulation? Why? \_\_\_\_\_

\_\_\_\_\_

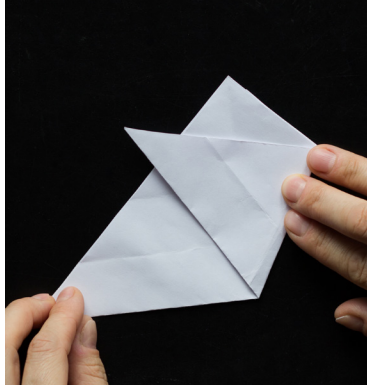
# Predicting Snowflake Patterns

## Make Cut-Out Snowflakes

The design of a snowflake in nature is affected by temperature and water content. What affects the pattern of a paper snowflake? It all depends on the number of folds, the shapes you cut and where you cut. Make a cut-out snowflake using the steps below and then follow along with the questions.



**Step 1:** Make a square by folding one corner to the opposite side to form a triangle. Cut excess paper on top.



**Step 2:** With the creased edge on the bottom, fold the triangle into thirds. Diagonally fold one corner across.



**Step 3:** Diagonally fold the other corner across to form three points.



**Step 4:** Fold the paper in half to have two points. Cut off the tips straight across or round them.

## Let's Do Some Snowflake Math

The design of your snowflake all depends on the number of folds, the shapes you cut and where you cut. Cut and fold the paper into a triangle like in the steps above. Now follow along with the questions.

1. How many layers of paper will you cut through? \_\_\_\_\_
2. Cut a triangle on the side that opens up. What shape will it create on the snowflake? \_\_\_\_\_  
How many of these shapes will the snowflake have? \_\_\_\_\_
3. Cut two half circles on the opposite side of the triangle. What shape will this create?  
How many of these shapes will the snowflake have? \_\_\_\_\_
4. What will happen if you cut off the tip of the snowflake? \_\_\_\_\_

Open up the snowflake and check your answers! Design another snowflake and predict what it will look like.

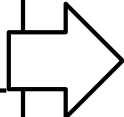
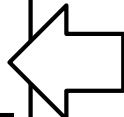
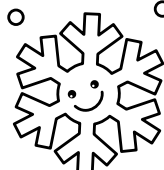
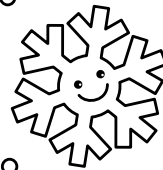
## Snowflake Number Fact

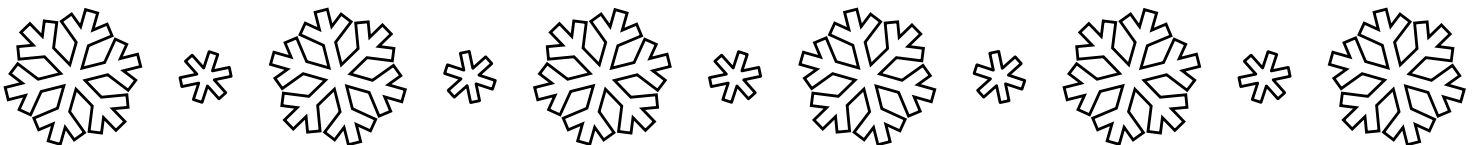
- Most snowflakes are less than  $\frac{1}{4}$  of an inch! How many snowflakes do you think are in a cup of snow?
- Snowflakes have about 200 snow crystals and fall at a speed of 3 - 4 miles an hour.
- The majority of the world's fresh water supply is in ice and snow.



# An A-Mazing Journey

Help the two snowflakes get out of the maze.  
Make a path by drawing a line through the boxes that have a sum of 50.

$\begin{array}{r} 15 \\ +29 \\ \hline \end{array}$	$\begin{array}{r} 15 \\ +17 \\ \hline \end{array}$	$\begin{array}{r} 73 \\ +12 \\ \hline \end{array}$	$\begin{array}{r} 22 \\ +55 \\ \hline \end{array}$	$\begin{array}{r} 43 \\ + 3 \\ \hline \end{array}$	$\begin{array}{r} 11 \\ +44 \\ \hline \end{array}$	$\begin{array}{r} 11 \\ + 39 \\ \hline \end{array}$	
$\begin{array}{r} 16 \\ +61 \\ \hline \end{array}$	$\begin{array}{r} 16 \\ +34 \\ \hline \end{array}$	$\begin{array}{r} 12 \\ +55 \\ \hline \end{array}$	$\begin{array}{r} 44 \\ + 6 \\ \hline \end{array}$	$\begin{array}{r} 23 \\ + 8 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ +46 \\ \hline \end{array}$	$\begin{array}{r} 12 \\ +38 \\ \hline \end{array}$	$\begin{array}{r} 78 \\ +11 \\ \hline \end{array}$
$\begin{array}{r} 26 \\ +24 \\ \hline \end{array}$	$\begin{array}{r} 26 \\ +24 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ +49 \\ \hline 50 \end{array}$			$\begin{array}{r} 54 \\ +13 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ +40 \\ \hline \end{array}$	$\begin{array}{r} 28 \\ +22 \\ \hline \end{array}$
$\begin{array}{r} 15 \\ +35 \\ \hline \end{array}$	$\begin{array}{r} 16 \\ +43 \\ \hline \end{array}$	$\begin{array}{r} 18 \\ +15 \\ \hline \end{array}$		$\begin{array}{r} 2 \\ +88 \\ \hline \end{array}$	$\begin{array}{r} 17 \\ +28 \\ \hline \end{array}$	$\begin{array}{r} 17 \\ +33 \\ \hline \end{array}$	
$\begin{array}{r} 23 \\ +27 \\ \hline \end{array}$	$\begin{array}{r} 42 \\ + 8 \\ \hline \end{array}$	$\begin{array}{r} 38 \\ +20 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ +54 \\ \hline \end{array}$	$\begin{array}{r} 19 \\ + 8 \\ \hline \end{array}$	$\begin{array}{r} 25 \\ +40 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ +44 \\ \hline \end{array}$	$\begin{array}{r} 16 \\ +34 \\ \hline \end{array}$
$\begin{array}{r} 53 \\ +15 \\ \hline \end{array}$	$\begin{array}{r} 20 \\ +30 \\ \hline \end{array}$	$\begin{array}{r} 31 \\ +19 \\ \hline \end{array}$	$\begin{array}{r} 36 \\ +19 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ +46 \\ \hline \end{array}$	$\begin{array}{r} 24 \\ +26 \\ \hline \end{array}$	$\begin{array}{r} 43 \\ + 7 \\ \hline \end{array}$	$\begin{array}{r} 57 \\ +16 \\ \hline \end{array}$
$\begin{array}{r} 19 \\ +35 \\ \hline \end{array}$	$\begin{array}{r} 21 \\ +13 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ +45 \\ \hline \end{array}$	$\begin{array}{r} 36 \\ +14 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ +46 \\ \hline \end{array}$	$\begin{array}{r} 24 \\ +21 \\ \hline \end{array}$	$\begin{array}{r} 57 \\ +16 \\ \hline \end{array}$	$\begin{array}{r} 33 \\ +23 \\ \hline \end{array}$



# Word Search: One of a Kind

Can you find all the words about snowflakes?

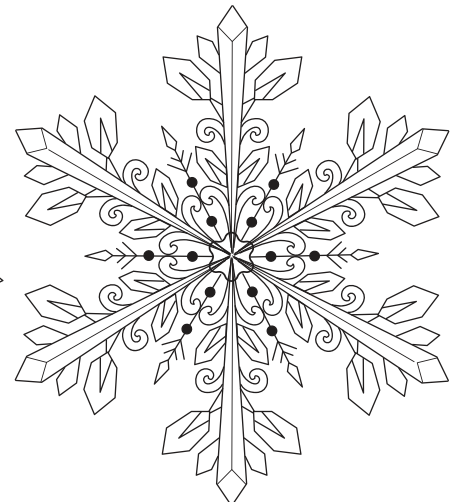
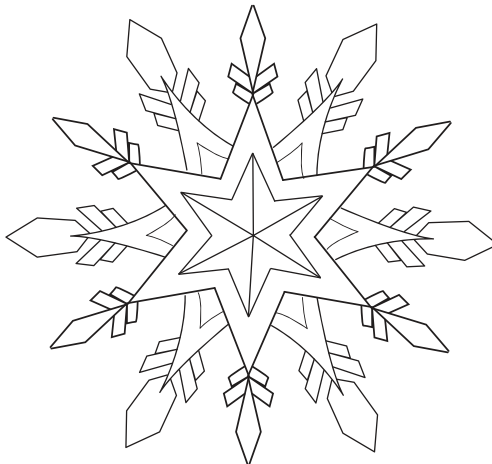
Words appear straight across, up and down, and diagonally.

F A D O A W R Y T I O W J C H  
B R B R A X S F S L J A O R X  
Q H O T C C T L R P E C L X G  
L K E Z D E R A V X E M Q V Z  
Y R C N E P E T E L C Y C J V  
B T C A F N A S J R X P G I N  
E E K L P R M Y M P U Y G V R  
C B W K X W M R U N I Q U E N  
I N A U B C O C F M G C X O O  
A W K V U X L N M X U S G I R  
X G J V U S T V S Q Z A S V F  
A D Y V J P C Z L Z X E D W I  
E K A L F W O N S E T A N S X  
U C V K G B C H H S P U L U A  
V Q M H D R S W C X T U L W I

CRYSTAL  
CYCLE  
FROZEN  
HEXAGON

ICE  
MELT  
SNOWFLAKE  
SNOWPACK

STREAM  
UNIQUE  
WATER





# What is different?

Find and circle all 10 differences between the pictures.

