mystery science

Grades K-5
Mini-Lesson + Activity: “Is every snowflake different?”

VIDEO TRANSCRIPT

VIDEO 1

Hi, it's Danni. Do you live in a place that gets snow? As a kid, I dreamed of seeing snow, but the place I lived never got any. Then, when I was thirteen years old, my family went on a vacation to a cabin someplace cold. And one night, I looked out the window and—woah—it was snowing!

I put on my coat and ran outside. It wasn't snowing very hard, but I could see a tiny sheen of glittering white snowflakes on the ground and more clumps of snowflakes falling down from the sky all around us. I tried to catch a snowflake to look at it up close, but as soon as I got one in my hand, it melted.

Someone named Damien has a question about snowflakes. Let's call Damien now.

[Video Call]

- Hi, Danni.
- Hi, Damien.
- I’ve got a question for you. Is every snowflake different?
- That's a great question.

Getting a good, long look at a snowflake is not easy. Let me introduce you to someone who thought a lot about snowflakes. This is Wilson Bentley. If you've read the book *Snowflake Bentley*, you may already know him. Wilson Bentley lived in the US state of Vermont a long time ago. Vermont gets lots of snow in the winter. And as a teenager, Wilson Bentley became obsessed with snowflakes.

His mom saw how interested he was and gave him an important gift: a microscope.
A microscope is a tool that helps you see tiny things up close. Wilson Bentley discovered that if he carefully scooped one snowflake under the lens of his microscope…wow! Each tiny snowflake had so much detail!

At first, he tried to draw what he saw under his microscope, but the snowflakes always melted before he was done. So he figured out something better. He connected a camera to his microscope. Wilson Bentley photographed over 5,000 snowflakes during his lifetime, and what he captured was amazing. Take a look.

They all look so different from each other. Being able to look at these up close helps us appreciate how incredibly unique they are, and it also helps us notice something else: how they are similar. Take a look for yourself. What about these snowflakes look similar?

VIDEO 2

As special as each snowflake is, all snowflakes do have things in common. Many snowflakes have parts that stick out from the center; let's call these branches. The branches on a single snowflake often look like they match each other. Like this branch on this side is almost identical

to the branch over here. And here's another thing. Count how many branches this snowflake has: one, two, three, four, five, six. Now count how many branches this snowflake has: six.

This one doesn't really have branches that stick out, but count how many flat sides it has: one, two, three, four, five, six. All of these snowflakes have six sides, or six branches. And there's one more thing. If you look at the center of this snowflake, you can see a shape with six sides and six points—that's called a hexagon. This one has a hexagon in the middle, and so does this one, and this one. So many of these have a hexagon in the center.

The details that are similar about all snowflakes are a clue to how snowflakes form. Now, you might not think of a snowflake as something that forms or grows, but they do. A snowflake doesn't start out looking like the lacy, detailed thing we see here.

Snowflakes begin as one tiny speck of frozen water in a cloud, a tiny hexagon. That tiny hexagon is so small, it's almost impossible to see, but the snowflake isn't done forming yet. Next, those six points of the hexagon collect more tiny droplets of frozen water, and more, and more. Eventually, it forms those six branches.

Because all six branches form at the same time, they end up looking similar. However, each spot where a snowflake forms is unique, like this spot in the cloud that might be a little colder, and this spot might be a little warmer. This spot here might get a little more wind than this spot over here. Differences like these determine what the snowflakes look like. That's why they each end up looking so different.

It might be hard to believe that a tiny change in the wind or cold really could change a snowflake that much, but check this out. When the weather conditions in a cloud are just the right mix,

snowflakes can turn out like this: bumpy tubes. These are still snowflakes. They still have a hexagon in the center and six flat sides, but they are so different from the snowflakes like these.

So, in summary, every snowflake is different, and they all have similarities. We know this because we can use tools, such as microscopes, to observe them closely. We can see that each snowflake has a hexagon in the center and six branches, or sides, that match. Those branches are shaped by the conditions in the cloud where the snowflake forms. Because conditions are different for every snowflake, every snowflake is different.

Snowflakes are all unique, just like everything else in nature. No two snowflakes are exactly the same. But also, no two trees are exactly the same. No two mountains are exactly the same. No two *people* are exactly the same. The closer we look at anything in nature, the more we notice what makes it similar to others of its kind and what makes it unique.

That's all for this week's question. Thanks for asking, Damien.

We have something special for this week's lesson. My friends and I here at Mystery Science have created a step-by-step activity that's all about snowflakes. I hope you'll try it.

ACTIVITY: GRADES K-1

ACTIVITY INTRODUCTION VIDEO

In today's activity, you're going to become a snowflake designer. You'll be creating your very own model of a snowflake—a model is a pretend version of something real. It helps us understand how something works or how it's made.

Although every snowflake is unique, they still have things in common. After you make your models, you'll become a detective and compare them to pictures of real snowflakes to spot the similarities. You'll also take a look at other snowflake models that don't follow the rules of a real snowflake—we'll call them snow fakes. In the end, you'll be a certified snowflake expert.

We'll show you how to get started, step by step.

ACTIVITY STEP 1

Today, you'll be working with a partner. You'll each make a snowflake. If you're working alone, that's okay too. When you're done with this step, click the arrow on the right.

ACTIVITY STEP 2

Get your supplies.

ACTIVITY STEP 3

Real snowflakes are made of ice, which would melt if we tried to use it for our activity. Instead, we're going to use coffee filters to make our own snowflakes. Turn it like this, then use both hands to flatten and smooth out your coffee filter. Just like real snowflakes, coffee filters are delicate, so make sure to be gentle so they don't rip or tear. It might not lay completely flat, and that's okay.

ACTIVITY STEP 4

We're going to start folding our models a few different times. All of the folds are going to be really important to make it look like a real snowflake. Slowly fold your coffee filter in half and

match the edges. Take your time. Press down on your coffee filter to flatten it out. You should have a shape like a taco, or a rainbow. Check that your partner has lined up their edges. Turn their coffee filter over so you can check both sides. Take some time to fix it now if needed.

ACTIVITY STEP 5

Turn your coffee filter like this. This will make our upcoming folding steps easier to complete.

ACTIVITY STEP 6

Snowflakes have six equal sections, so we're going to fold our coffee filter in a special way to make the parts equal. Watch this entire step before trying it yourself.

Take the bottom corner and bring it up to the top corner like this. Then slide it down along the edge until you have what looks like two equal pieces of pizza. For example, this looks too small, and this looks too big. This looks about equal. Once your pieces of pizza look equal, press down to flatten it out, running your fingers along the bottom edge.

Check your partner's work. Make sure they've lined up the edges and that the sections look equal, like two equal pieces of pizza. Take some time to fix it now if needed.

ACTIVITY STEP 7

Okay. Now you're going to take the top corner and fold it down and over to meet the bottom corner. At the end of this step, your coffee filter should look like one piece of pizza.

Check your partner's work. Make sure that they've lined up the edges.

Take some time to adjust your folds now if needed. It's really important that the edges are lined up as closely as possible. Otherwise, your snowflake branches will end up looking a little wonky.

ACTIVITY STEP 8

The center of each snowflake has a six-sided shape called a hexagon. Take a look at these. To make this shape on your snowflake, place your finger near the point of your model like this, then use your finger as a guide to draw a straight line with a crayon. It may not look like it now, but when we unfold our snowflake later, you'll see that it makes a hexagon.

ACTIVITY STEP 9

We're going to use our finger as a guide to draw the designs for our snowflake branches. Find this bendy part of your finger where there's a little line. Line it up with the bottom edge of your model like this. Make sure your finger is in the middle. Look over at your partner to check their finger placement. Then use your crayon to draw a dot above your finger.

ACTIVITY STEP 10

Now it's time to decide on your snowflake branch designs. We suggest watching this whole first step to see how we do it. We'll start by adding a triangle. You could draw a narrow triangle, a medium triangle, or a wide triangle. If you choose the wide triangle, be careful not to draw it too wide. Be sure to leave space on each side of your triangle, like this. Now choose how you'd like to draw your triangle. Draw two lines down from the dot to make the triangle shape.

ACTIVITY STEP 11

Now let's do the same thing on the other side of our snowflake. Turn your model like this, then line up your finger with the bottom edge of your model. Make sure your finger is in the middle. Look over at your partner to check their finger placement, then use your crayon to draw a dot above your finger. Make sure this new dot does not touch the triangle you drew over here.

ACTIVITY STEP 12

We want all of our snowflake branch designs to match just like a real snowflake. Whatever triangle you drew on this edge also has to be drawn on this edge. For example, if you drew a narrow triangle over here, then you should draw another narrow triangle over here. Do your best to make them look as similar as possible. Okay, go ahead and draw the same kind of triangle you drew on this edge over here too.

ACTIVITY STEP 13a

Turn your coffee filter like this so that the point is facing away from you. Line up your finger in the middle of the bottom edge, then use your crayon to draw a dot at the top of your finger.

ACTIVITY STEP 13b

Now we're going to add a shape on this bottom edge. Choose which shape you would like to draw. Make sure your new shape doesn't touch either of your triangles or the other edges. Here are some examples of other shapes you could draw.

ACTIVITY STEP 14

Great job! You have now finished drawing the shapes for your snowflake branches. Grab your scissors and make sure you're holding them like this. Cut along this line first. This will help us create the center shape for your snowflake.

ACTIVITY STEP 15

Next, let's carefully cut out the shapes along the edges like this. Put all of your scraps in a pile like a pile of snow. Look to your teacher to find out what to do with your little pile of snow scraps. When you're done with this step, click the arrow on the right.

ACTIVITY STEP 16

You did it—your snowflake is now complete! Carefully unfold your coffee filter to reveal your snowflake model.

Discuss: How is your snowflake similar to your partner's snowflake? How is it different?

ACTIVITY STEP 17a

Discuss: How is your model snowflake similar to a real snowflake? How is it different?

ACTIVITY STEP 17b

Here's what we noticed. When we looked at pictures of different snowflakes, we noticed that they are all unique, just like the ones you cut out. As we looked at them a little bit longer, we started to notice their similarities. We saw that each of them has a six sided shape in the middle

called a hexagon, just like our models. We also notice that each snowflake has six matching parts, or branches, just like yours.

ACTIVITY STEP 18a

Now you're an expert at knowing what makes a snowflake model look like the real thing. You might see model snowflakes in other places too. Maybe in people's homes, in cartoons, on cookies, or even on clothes. But some of those snowflakes might actually be *snow fakes*. Snow fakes don't follow the same rules as actual snowflakes. They might have a different shape in the center or the wrong number of branches.

Discuss: Which of these snowflake models are snow fakes? Remember, a real snowflake should have a hexagon in the center and six matching branches.

ACTIVITY STEP 18b

Here's what we think. Number one doesn't have enough branches. It also doesn't have a hexagon in the center. While it's a cool model, it doesn't represent a real snowflake. It's a snow fake. We think model number three is also a snow fake because it has too many branches and no hexagon in the middle. If you thought number two is the real snowflake model, that's correct.

ACTIVITY STEP 19

Congratulations! You're now a snowflake expert. If you have time, create more snowflake models. Follow these same steps. But next time, you might try out new branch designs or even other materials like paper. Have fun and stay curious!

ACTIVITY: GRADES 2-5

ACTIVITY INTRODUCTION VIDEO

In today's activity, you're going to become a snowflake designer. You'll be creating your very own model of a snowflake—a model is a pretend version of something real. It helps us understand how something works or how it's made.

Although every snowflake is unique, they still have things in common. After you make your models, you'll become a detective and compare them to pictures of real snowflakes to spot the similarities. You'll also take a look at other snowflake models that don't follow the rules of a real snowflake—we'll call them snow fakes. In the end, you'll be a certified snowflake expert.

We'll show you how to get started, step by step.

ACTIVITY STEP 1

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ACTIVITY STEP 2

Get your supplies.

ACTIVITY STEP 3

Real snowflakes are made of ice, which would melt if we tried to use it for our activity. Instead, we're going to use coffee filters to make our own snowflakes. Turn it like this, then use both

hands to flatten and smooth out your coffee filter. Just like real snowflakes, coffee filters are delicate, so make sure to be gentle so they don't rip or tear. It might not lay completely flat, and that's okay.

ACTIVITY STEP 4

We're going to start folding our models a few different times. All of the folds are going to be really important to make it look like a real snowflake. Slowly fold your coffee filter in half and match the edges. Take your time. Press down on your coffee filter to flatten it out. You should have a shape like a taco, or a rainbow. Check that your partner has lined up their edges. Turn their coffee filter over so you can check both sides. Take some time to fix it now if needed.

ACTIVITY STEP 5

Turn your coffee filter like this. This will make our upcoming folding steps easier to complete.

ACTIVITY STEP 6

Snowflakes have six equal sections, so we're going to fold our coffee filter in a special way to make the parts equal. Watch this entire step before trying it yourself.

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Check your partner's work. Make sure they've lined up the edges and that the sections look equal, like two equal pieces of pizza. Take some time to fix it now if needed.

ACTIVITY STEP 7

Okay. Now you're going to take the top corner and fold it down and over to meet the bottom corner. At the end of this step, your coffee filter should look like one piece of pizza.

Check your partner's work. Make sure that they've lined up the edges.

Take some time to adjust your folds now if needed. It's really important that the edges are lined up as closely as possible. Otherwise, your snowflake branches will end up looking a little wonky.

ACTIVITY STEP 8

At the center of each snowflake is a six-sided shape called a hexagon. Take a look at these. To make this shape, place your finger near the point of your model like this. Then use your finger as a guide to draw a straight line with a crayon. It may not look like it now, but when we unfold our snowflakes later, you'll see that it makes a hexagon.

ACTIVITY STEP 9

Before we start drawing our snowflake branch designs, here are a few tips to keep in mind.

Tip number one: Whatever you draw on one of the folded edges, you must match on the other edge. So try to keep it simple. For example, if you draw a triangle and a square on this side, when you turn it around, you have to draw a triangle and a square on this side too, so that the same shapes are across from each other. This will help make sure that your snowflake branches match.

Tip number two: Your shapes cannot touch each other. Make sure to leave space on both sides of your shapes like this. Be careful not to draw your shapes too tall either because when you redraw that same shape on the other side, they will touch. One more thing. Leave the rounded edge alone for now. We'll come back to it later. Okay, go to the next step to start drawing.

ACTIVITY STEP 10

Now you're ready to draw your own unique snowflake branch designs. I'll leave the two rules on the screen for you to look at in case you forget. For inspiration, here are some designs that we came up with. If you finish early, check with your partner to make sure their designs follow the two rules.

ACTIVITY STEP 11

All snowflakes have six branches, so we want to make sure that our models do too. To do that, we need to add a shape on this bottom edge. Choose which shape you would like to draw and make sure your new shape doesn't touch any of the other shapes you've drawn. Here are some ideas, or you can come up with your own.

ACTIVITY STEP 12

Great job! You have now finished drawing the shapes for your snowflake branches. Grab your scissors and make sure you're holding them like this. Cut along this line first. This will help us create the center shape for your snowflake.

ACTIVITY STEP 13

Next, let's carefully cut out the shapes along the edges like this. Put all of your scraps in a pile like a pile of snow. Look to your teacher to find out what to do with your little pile of snow scraps.

ACTIVITY STEP 14

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Discuss: How is your snowflake similar to your partner's snowflake? How is it different?

ACTIVITY STEP 15a

Discuss: How is your model snowflake similar to a real snowflake? How is it different?

ACTIVITY STEP 15b

Here's what we noticed. When we looked at pictures of different snowflakes, we noticed that they are all unique, just like the ones you cut out. As we looked at them a little bit longer, we started to notice their similarities. We saw that each of them has a six sided shape in the middle called a hexagon, just like our models. We also notice that each snowflake has six matching parts, or branches, just like yours.

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Now you're an expert at knowing what makes a snowflake model look like the real thing. You might see model snowflakes in other places too. Maybe in people's homes, in cartoons, on cookies, or even on clothes. But some of those snowflakes might actually be *snow fakes*. Snow

fakes don't follow the same rules as actual snowflakes. They might have a different shape in the center or the wrong number of branches.

Discuss: Which of these snowflake models are snow fakes?

ACTIVITY STEP 16b

Here's what we think. Number two and number four don't have enough branches. They also don't have a hexagon in the center. While these are cool models, they don't represent a real snowflake. They're snow fakes. We think model number three is also a snow fake because it has too many branches and no hexagon in the middle. If you thought numbers one, five, and six are the real snowflake models, you're correct.

ACTIVITY STEP 17

Congratulations! You're now a snowflake expert. If you have time, create more snowflake models. Follow these same steps. But next time, you might try out new branch designs or even other materials like paper. Have fun and stay curious!