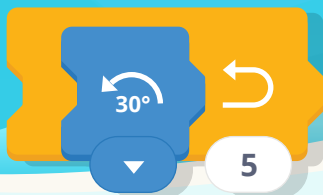
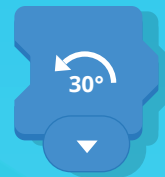
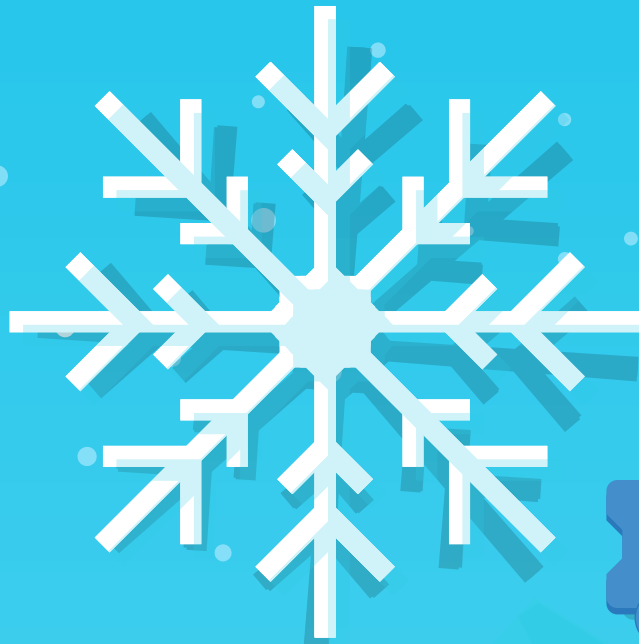


5-Step Lesson Plan Template

Grades 6–8

Using Code to Create a Snowflake





Standards:

ISTE 2016: 5d. Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

CCSS.MATH.CONTENT.4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

Objective:

"I will demonstrate how to use code to make snowflakes with repeating patterns, or sequences."

Essential Question:

How can you use code to create different snowflake shapes?

Key Points:

1. You can order actions, one after another, into a **sequence**.
2. You can **remix** other people's code to create something new.
3. In coding, you can use a **loop** to repeat actions.

Opening:

Start by showing students the **Code a Snowflake Teacher Handout**. You can project the image on a screen, or hold the handout up for students to see.

- Ask students to describe the snowflake's features. What shapes do they notice? What patterns do they see?
- Point out that snowflakes are always six-sided, and symmetrical.

Introduction
of New Material:

Materials needed:

- Computers or tablet devices, one for each student or pair of students
- The **Code a Snowflake** Santa Tracker game: <https://santatracker.google.com/#snowflake>

Give students 10 minutes to explore the Code a Snowflake computer game on their own, without much guidance. Some teachers call this "exploring fearlessly" – allowing kids to tinker with computer programming and teach one another, as engineers would.

The module concludes by allowing you to design a holiday e-card with your custom snowflake. Steer students away from this part of the module until the very end of class. Focus on the code.

1. Direct students to Code a Snowflake on the Google Santa Tracker: <https://santatracker.google.com/#snowflake>
2. Encourage students to work together: "You have 10 minutes to explore fearlessly. Try creating a snowflake out of the blocks. Pay attention to what you try, what you find confusing, and different patterns you see."

3. Invite volunteers to share what they noticed about Code a Snowflake:
 - What do the different blocks do?
 - Did anyone play with the loop block? What happened?
 - What did you find confusing?
 - What made sense? What didn't?

Guided Practice:

Materials needed:

- The **Code a Snowflake Student Handout**

Next, in pairs, have students create snowflakes by copying the Code a Snowflake Student Handout. They'll practice putting specific blocks together to create specific shapes, and then remix them.

1. Distribute the **Code a Snowflake Student Handout** to each pair of students.
2. Have students follow the handout. They'll start by copying code, and then start remixing it by adding more blocks, colors, and sizes.
3. Once finished, have students share what they learned with their neighbors. How did they remix the code? What did they do differently, or the same?
4. Before moving on, make sure you cover the following points:
 - Each block is an **action**, or a command. It tells the program to do something.
 - When you put blocks together, you form a **sequence**. A sequence is a set of actions, one after the other.
 - Notice that the **loop** block repeats actions using fewer blocks. This helps shorten the code.
 - **Remixing** is something computer engineers do often. They take existing code, and build on it.

Independent Practice:

Materials needed:

- Computers or tablet devices, one for each student or pair of students
- Extra copies of the **Code a Snowflake Student Handout**, or sample snowflake patterns
- The **Code a Snowflake Santa Tracker** game:
<https://santatracker.google.com/#snowflake>

Have students design a snowflake to send as an e-card to a friend or family member.

Tips:

- Set some ground rules for who students can email their digital cards to, if anyone. For example, you can have students send the cards to you to print out and post in the classroom.
- If students have an idea for a snowflake, encourage them to try it out. Can they use the blocks to create their idea?
- If students don't know where to start, encourage them to start with one of the snowflakes on the handout.
- Make sure the blocks are connected to each other, otherwise their program won't run.
- To remove a block, drag it down toward the bottom of the screen and release. (To remove just one block, it needs to be moved to the end of the sequence.)

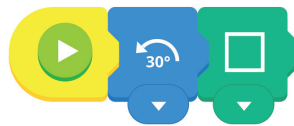
Differentiated Instruction

Some students might want to add as many blocks as they can, just to see what happens. Help them think through what's happening and plan ahead, and challenge them to recreate sample snowflakes from the **Code a Snowflake Student Handout**.

Closing:

To conclude the lesson, ask students:

1. **What is a sequence, and what does it have to do with coding?**
A sequence is a series of events or actions that happen in a certain order. You can tell a computer to follow a sequence.
2. **Can you explain what this sequence does?**



Rotate 30 degrees and add the square. This gets repeated 6 times, creating a snowflake shape.

3. **How do loops help engineers code?**
A loop can help engineers shorten and simplify their code.

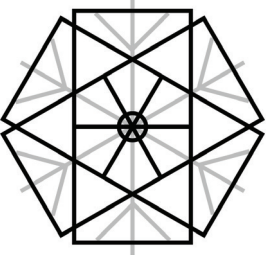

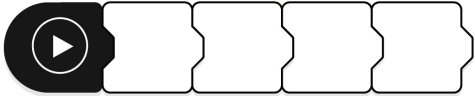
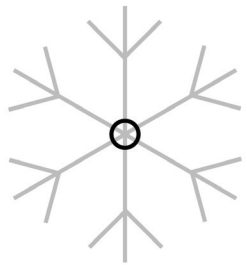
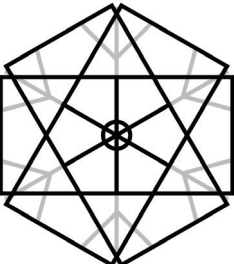
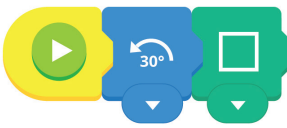
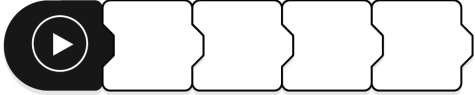
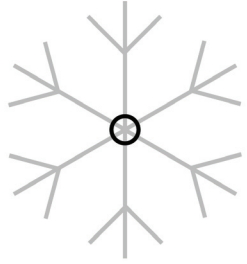
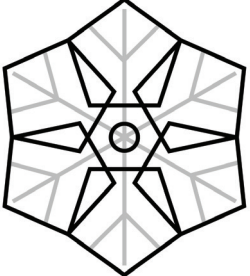

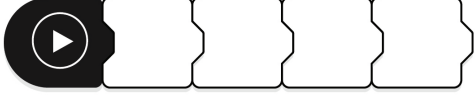
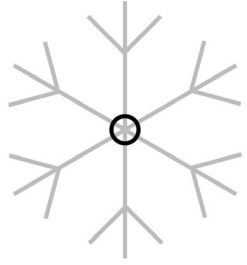
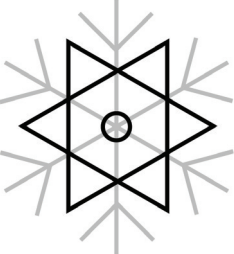
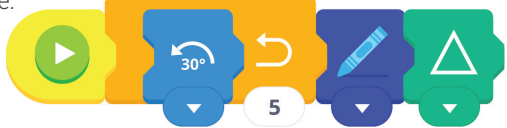
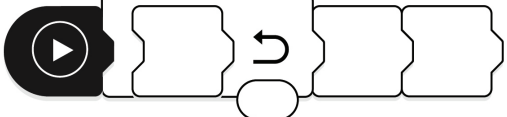
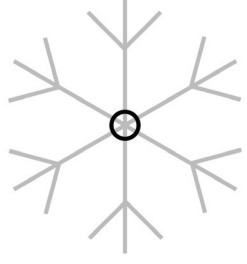


g.co/santatracker

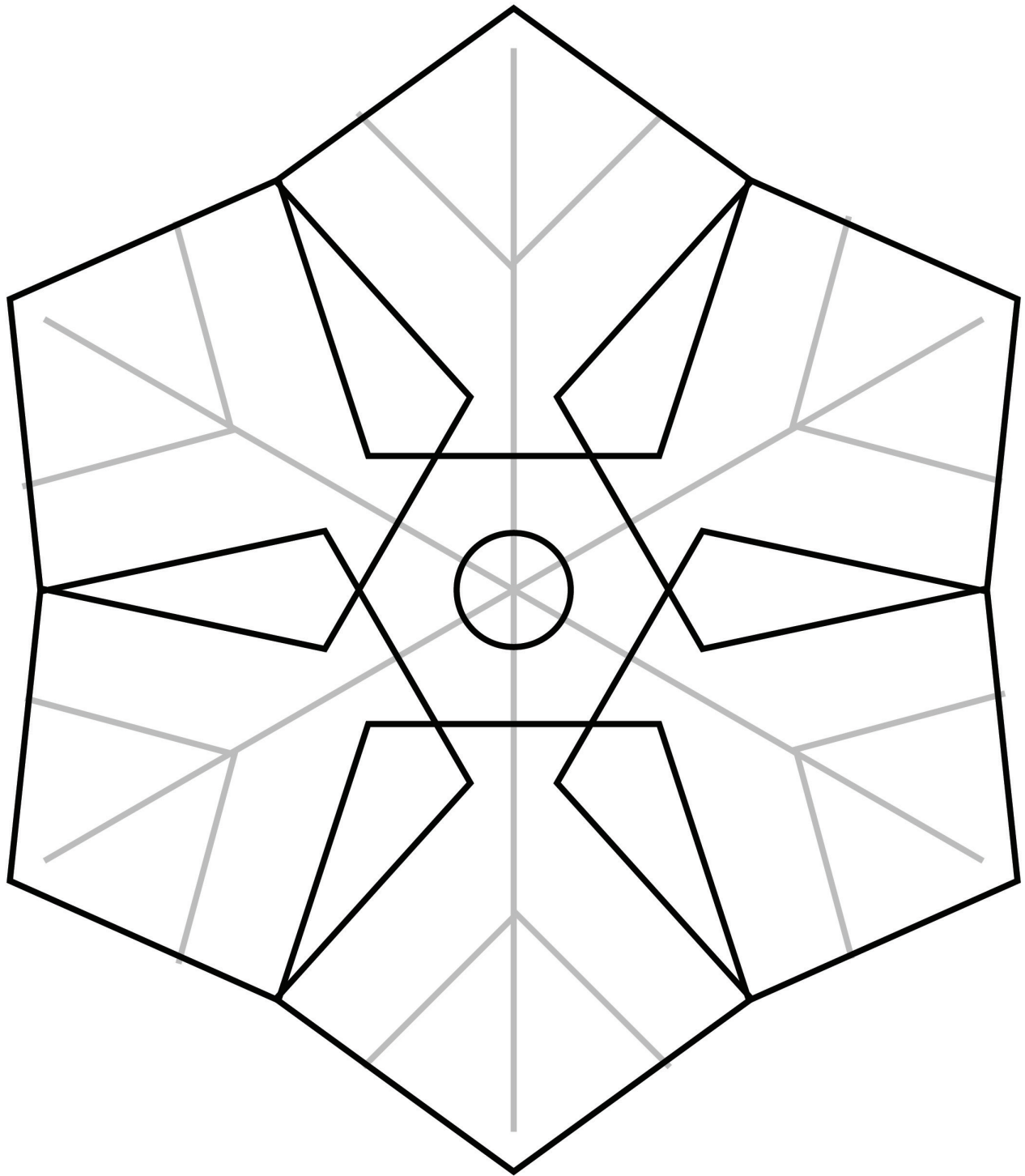
Code a Snowflake Student Handout



Make each of these snowflakes. Then add or remix the blocks, and write your new sequence.

<p>Level 1</p> 	<p>Code – This snowflake is made with only one shape.</p>  <p>Remix the Code – Draw your new sequence</p> 	<p>Remixed Snowflake Draw your new snowflake</p> 
<p>Level 2</p> 	<p>Code – Notice where the square is now. Is this different from Level 1?</p>  <p>Remix the Code – Draw your new sequence</p> 	<p>Remixed Snowflake Draw your new snowflake</p> 
<p>Level 3</p> 	<p>Code – Notice how far the pentagon is from the center.</p>  <p>Remix the Code – Draw your new sequence</p> 	<p>Remixed Snowflake Draw your new snowflake</p> 
<p>Level 4</p> 	<p>Code – Notice how the loop block is changing the angle of the triangle.</p>  <p>Remix the Code – Draw your new sequence</p> 	<p>Remixed Snowflake Draw your new snowflake</p> 

Code a Snowflake Teacher Handout



Notice how this snowflake is symmetrical. If you were to fold the snowflake in half, the sides would match. Also notice that it has 6 points. All snowflakes have 6 points.

Bonus question:

Can anyone tell what shape this snowflake is made out of? (Pentagons)

