

DRAW SHAPES [SCRATCH]

Unit: Fundamentals

Desired Results	Evidence
Students can... <ul style="list-style-type: none">• Use loops in a Scratch program to repeat a task.• Use variables in a Scratch program to store a value.• Use user input to change the output of a Scratch program.	<ul style="list-style-type: none">• Draw Shapes Project• Presentations

Materials

Student Prompt / Sample Project
Slides
Scratch Tutorial

Activity Plan

Introduction: 30 minutes

Teachers	Students	Time
<p>Introduce the project by showing students this sample project.</p> <p>Ask students to volunteer numbers to enter in the box. Do not let students see inside the project.</p>	<p>Listen to the teacher explain the project for the day.</p> <p>Explore the sample project with the entire class.</p> <p>Interact with the sample project by participating in whole-class discussion.</p>	5 mins
<p>Introduce the Think Pair Share. Be sure to have at least two students repeat the instructions before continuing.</p> <p>Set a timer for 5 minutes for each section of the Think Pair Share.</p> <p>Listen to paired student conversations to prepare for a whole class discussion.</p> <p>Set an order for pairs to share out highlights from their discussion.</p>	<p>Listen to instructions for the Think Pair Share activity. Make sure you understand what is expected of you during this activity.</p> <p>Go through a Think Pair Share with the following prompts.</p> <ul style="list-style-type: none">• Explain what the sample project did.• How could you customize this project or make it different in some way?• What do you need to learn in order to build this project yourself?	20 mins
<p>Explain to students that they will build this project by the end of the day. However, they will first start with smaller programs so they can understand the scope of the project and any new information better.</p>	<p>Listen to the teacher as they explain what the day's project is.</p>	3 mins
<p>Run through the agenda on the board. With the class.</p>	<p>Listen to the teacher as they explain the agenda.</p>	2 mins

Start the Project: 2 hours

Draw a Square (1 hour)

Teachers	Students	Time
Challenge students to make the Scratch cat draw a square. Have at least two students reiterate instructions.	Listen to instructions for the draw a square activity so you understand expectations for the activity.	5 mins
<p>Set a timer for 30 minutes.</p> <p>Walk around the room monitoring and encouraging students. Do not give too much help.</p> <p>Write the post-activity journal prompt on the board.</p>	<p>Work independently on the Draw a Square activity. Explore the different block menus and try new things to solve the problem.</p> <p>If you find a solution, challenge yourself to find a different way to draw a square.</p> <p>Extensions:</p> <p>Make the square bigger, a different color or filled in.</p> <p>Draw a row of squares.</p> <p>Tessellate the square across the screen.</p>	30 mins
When the timer goes off, instruct students to respond to it in their journals.	<p>When the timer goes off, respond to the following prompt in your journal:</p> <ul style="list-style-type: none"> In plain English, explain how you got the cat to draw a square. 	10 mins
Elicit two to three volunteers to read their response to the journal prompt.	Volunteer to read your response to the class.	5 mins
<p>Lead a discussion on the different strategies students employed to solve the problem. Take notes of these strategies on the board.</p> <p>Be sure the students see the “repeat X times” block and uncover its purpose.</p>	Discuss the different solution strategies you and your peers used to solve this problem. Try to understand alternate solutions.	10 mins

Draw Triangles (30 minutes)

Teacher	Students	Time
Challenge students to draw an equilateral triangle using the “repeat X times” block. Have at least two students reiterate the expectations for independent working time.	Listen to instructions so you know what is expected of you during this challenge.	3 mins
<p>Set a timer for 10 minutes</p> <p>Circulate the room offering support and encouragement.</p> <p>Questions:</p> <p>Lots of students will try 60 degrees and then get stuck, when in reality they should use 120 degrees because when the cat turns, it sweeps out the exterior angle of the polygon.</p> <ul style="list-style-type: none"> Stand up and walk how you want the cat to walk. When you get to a corner, does your body turn a lot or a little? (more than 90 degrees or less?) Is the cat going around the outside or the inside of the triangle? 	Work independently to try to draw an equilateral triangle.	10 mins
When the timer goes off, instruct students to respond to the journal prompts in their journals.	<p>When the timer goes off, respond to the journal prompts in your journal.</p> <ul style="list-style-type: none"> How many degrees did your cat have to turn at each corner to draw the triangle? How many degrees would a cat have to turn at each corner to draw a hexagon? Provide an explanation for your answers. 	2 mins
Lead a discussion around the responses to the journal prompt. Make sure you have consensus on the answers (120° and 60°).	Volunteer to read out your response to the class.	5 mins

Abstracting (30 mins)

Teacher	Students	Time
<p>Create a table on the board / projector with "Number of Sides" in one column and "Degrees Turned" in the other.</p> <p>Explain to students that they will work with a partner to...</p> <ul style="list-style-type: none">• Complete the table• Find a mathematical formula that relates the number of sides in the polygon with the degrees turned at each corner by the cat. <p>Have at least two students reiterate the expectations on them for this group work to check that they understand what to do.</p>	<p>Listen to the instructions from the teacher.</p> <p>Rephrase the instructions in your own words to check that you fully understand what is expected of you.</p>	5 mins
<p>Set timer for 15 minutes and let students work.</p> <p>Circle the room offering encouragement and help.</p> <p>Try to answer questions with more leading questions.</p> <p>Note which groups are getting the correct answer and which are not.</p>	<p>Copy the table from the board into your notebook.</p> <p>Work with your partner to fill in the table.</p> <p>When you have the table filled in, see if you can find a relationship between the two columns. Try different strategies to find this relationship, is there addition, subtraction, multiplication or division in the relationship?</p>	15 mins

<p>After the timer goes off, have a group volunteer to fill in the table.</p> <p>Ask for another group to volunteer their formula for the relationship. Be sure to ask each group to explain how they found their answer. See how many different solution strategies your class used.</p> <p>Discuss as a class. Guide the discussion to the correct answer.</p> <p>Explain to students that they have just used examples to generalize an algorithm that will help them create the program that draws any regular polygon.</p> <p>Correct answer: $\text{degrees turned} = 360 / (\text{num sides})$</p>	<p>Volunteer to fill in the table on the board.</p> <p>Volunteer your solution for the relationship.</p> <p>Be ready to explain your reasoning!</p>	<p>10 mins</p>
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Introduce New Information (30 mins)

Math (10 mins)

Teacher	Students	Time
Tell the students that Scratch can do math for you! Show them the green operations menu where they can find a division block.	Follow along with the teacher as they show you where to find mathematical operations in Scratch.	3 mins
Write the following question on the board: <ul style="list-style-type: none"> Why are some blocks rectangular and other have rounded corners? What differences do you see in block appearance? What do they signify? Set a timer to 7 minutes and tell students to investigate these questions on their computers and write their responses in their journals.	Read the question on the board. Investigate scratch to find an answer. Write your answer in your journal.	7 mins
Lead a short discussion on the question. Guide students to understand that blocks that represent quantities have rounded corners whereas blocks that do something have square corners.	When the timer goes off, volunteer to read your response to the class.	2 mins

User Input (10 mins)

Teacher	Students	Time
Show students the blue sensing menu where they will find the ask block. Explain to students that the ask block asks a question. The response is stored in the answer block, which has rounded corners and therefore holds a value.	Follow along with the teacher to explore the blue sensing menu and find the "ask" and "answer" blocks.	3 mins

Set a timer to 3 minutes and challenge students to use the ask block in a program. Differentiate: as you circle the class, encourage students to use the “say for 2 seconds” block in the purple looks menu to make the cat repeat your input.	Find a creative way to use the ask and answer blocks in a program!	4 mins
Ask students to volunteer to show off their programs. Make sure students feel supported and proud of their mini-programs. Extension: Ask students what would happen if you asked two questions in a program. Which value would the “answer” block store?	Discuss the ask block and see what your peers came up with! Volunteer to show off your program.	3 mins

Variables (5 minutes)

Teacher	Students	Time
Show students the orange Data menu. Ask students to follow along as you show them how to make a variable. Click the “Make Variable” button. Give the variable a useful name. Show students the “Set variable to” block. Ask students what they think it does. Show students how to retrieve the value stored in a variable by using the variable block with rounded corners. Show them that the block can only be used as an input in another block.	Follow along as the teacher shows you the orange Data menu and how to create variables.	5 mins
Set a timer to 5 minutes. Ask students to store the “answer” value in a variable.	Use a variable in a mini-program to store user input.	5 mins

Finish Project (45 mins)

Teacher	Students	Time
<p>Challenge students to work in pairs to finish the project.</p> <p>Ask for volunteers to remind the class what exactly the sample project did.</p> <ul style="list-style-type: none"> • Asked for number of sides • Drew shape with that many sides 	<p>Listen to instructions.</p> <p>Remember the example project and participate in class discussion.</p>	5 mins
<p>Set a timer to 40 minutes.</p> <p>Circulate the room offering encouragement and support to students.</p> <p>Support:</p> <p>Let's break this down. What do you want to happen first?</p> <p>Let's write a plan out on paper.</p> <p>How do you ask the user a question?</p> <p>What value is the user giving your program?</p> <p>What was the formula for how much the cat turns?</p> <p>How do you use blocks with rounded edges in scratch?</p> <p>Where is the X block?</p>	<p>Work on your final project for the day. Find ways to make the project your own! Change the colors, make a background color, change the size or orientation of the shape!</p>	40 mins
	<p>Extensions:</p> <p>Can you also ask for the side length of the shape?</p> <p>Can you fill the shape in a different color?</p> <p>Can you change the thickness of the line the cat draws?</p> <p>Can you get the cat to draw the shape in the other direction?</p>	

Presentations (30 mins)

Run **Group Mini-Presentations** to allow girls to present their work.

As girls watch presentations, have them try to identify all the different ways they found to solve the problem. (Differences in code)

Reflection (15 mins)

In their journals, have students respond to the following questions:

- After seeing how other people created their programs, what would you change about your own?
- What surprised you about someone else's program?

Wrap-Up (15 mins)

Run a **Four Corners** activity on the following prompts. Identify the four corners as Agree, Somewhat Agree, Somewhat Disagree and Disagree. Have people from each group volunteer their reasonings for their selection. Discuss how you can make tomorrow more fun and productive.

- I am proud of what I made today.
- If I had more time, I would change something about the program I made today.
- Today's challenge was really hard.
- I enjoyed solving the problems we tackled today.

Give a recap of the day. Have students volunteer definitions as you add the words Loop and Variable (along with any others that arose) to the word wall.

Give your shout-outs for the day. Remember to track your shout-outs to ensure that everyone feels appreciated.

Have girls share a shout out on **Loop**!
