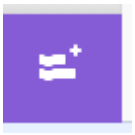
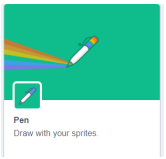
Computational Thinking

Math Scratch Activities and Lessons

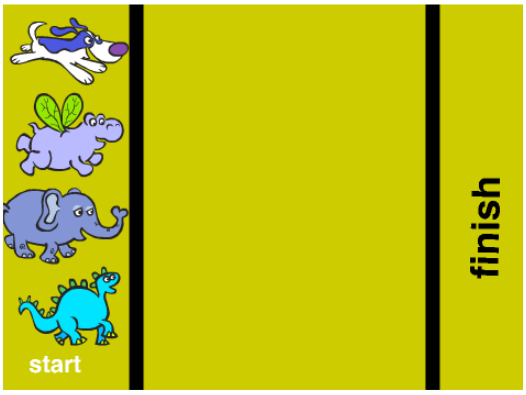
Grades K—3

Many of these projects use a pen from the Pen category. However the blocks for the pen do not appear until you turn on the Pen category. To show the Pen category in a new Scratch activity:

- Click on this block at the bottom left of the screen. 
- Many choices appear.
- Click on the Pen. 

- Now the Pen category will appear below the My Blocks category.
- Click on the pen and the Pen blocks will appear. 

Math (Grades: K - 3)



1. Off to the Races

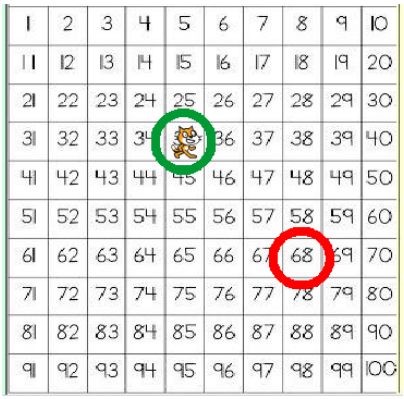
Summary: Students decide how quickly each animal will arrive at the finish line by inputting a number from 1 to 10, into a glide to block. They can change the winner by changing the input number.

Link for Teacher: https://scratch.mit.edu/projects/119974448/#editor

Link for Students: https://scratch.mit.edu/projects/119975098/#editor

Lesson: Click here **p. 4**

2. 100's Chart Hit the Target

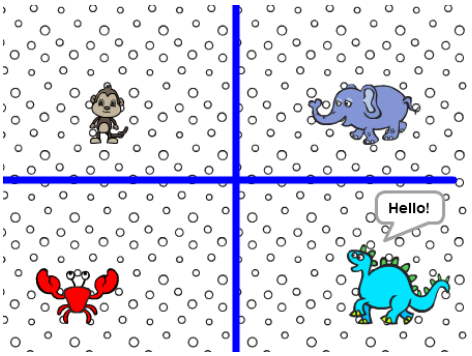


Summary: Students drag the green and red circle sprite to any number on the 100 chart. When the green flag is clicked the cat moves to the green circle. Students use the +1, +10, -1, or -10 blocks and repeat blocks to make the cat move from the green circle to the red circle.

Link: https://scratch.mit.edu/projects/166882693

Lesson: Click here **p. 6**

3. Make a Zoo



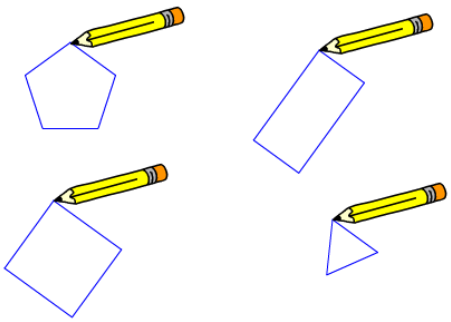
Summary: Students work with partners or individually. They divide a "zoo", which is a regular polygon, into four equal sections for four different animals. They create scripts to make the animals move and talk.

Link for teacher: https://scratch.mit.edu/projects/130730095/

Link for students: https://scratch.mit.edu/projects/130745510/

Lesson: Click here **p. 8**

4. Attributes of 2-D Shapes



Summary: Students work with partners or individually to complete a partial script which draws a square, a rectangle, a triangle, and a pentagon. They use the debugging skill, Guess and Check, to complete the scripts. They record their thinking by making duplicate scripts and changing input values until the scripts create the specific 2-D shape correctly.

Teacher Link: https://scratch.mit.edu/projects/130981912/

Student Link: https://scratch.mit.edu/projects/130989351/

Lesson: Click here **p. 12**

5. Concentric Circles and Fractions

Summary: Students use already created fraction blocks to draw 7 concentric circles. They have a choice of these fractions 1/16, 1/8, 1/4, 1/5, 1/3, and 1/2, or they can use a 1 whole block. Once they have 7 concentric circles, they can move the center/radius of the circles to make many copies of the 7 circles.

Link for Teacher: https://scratch.mit.edu/projects/169045023

Link for Students: *https://scratch.mit.edu/projects/170096184*

Lesson: Click here **p. 20**

6. Multiplication Dance and Moves

Summary: Students use a partially completed project that asks how many times a sprite should move in one dance and how many times the sprite should perform the dance. When all the dances are complete, the sprite asks how many moves it made in all of its dances. In the example shown in this picture, the sprite had 3 moves in each dance and danced 4 times. 3 x 4 = 12. The sprite made 12 moves total in its 4 dances.

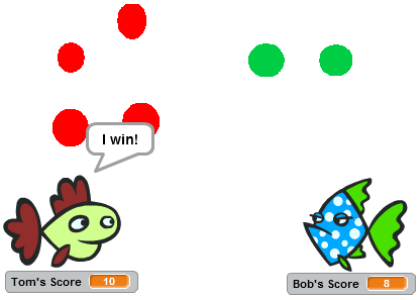
Link for teacher: https://scratch.mit.edu/projects/125158928/

Link for students: https://scratch.mit.edu/projects/125265539/

Lesson: Click here **p. 25**

7. Top it

Summary: When the space bar is pressed a random number of dots appear above two fish named Tom and Bob. Students decide if the fish with the most or the fish with the least dots win. They click the winning fish to change the score. Play continues until one of the fish reaches 10 points. Then that fish says, "I win." Students complete the script that makes the fish change colors and say, "I win."

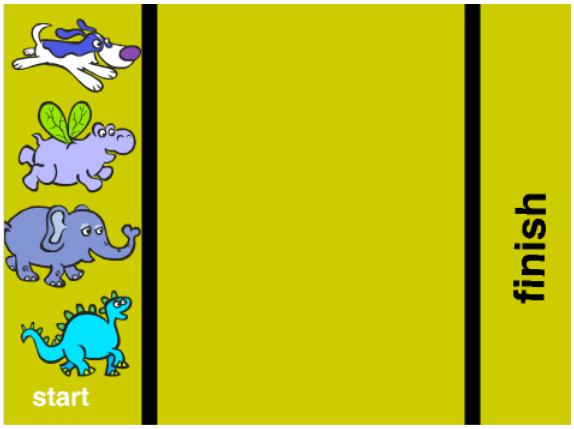


Link for teacher: https://scratch.mit.edu/projects/167773143

Lind for students: https://scratch.mit.edu/projects/167791256

Lesson: There is no lesson for this activity at this time.

Title: Off to the Races



Summary: Students decide how quickly each animal will arrive at the finish line by inputting a number from 1 to 10, into a glide to block. They can change the winner by changing the input number.

Common Core:

- SL.K.2) Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.
- (K.CC.C.7) Compare two numbers between 1 and 10 presented as written numerals.
- (K.CC.B.4) Count to tell the number of objects. (C. Understand that each successive number name refers to a quantity that is one larger.)

Programming Skills with Scratch:

- Link blocks together
- Use When space key pressed block
- Input numbers into a block
- Debug or fix a script

Link for Teacher: https://scratch.mit.edu/projects/119974448/#editor

Link for Students: https://scratch.mit.edu/projects/119975098/#editor

Unplugged Activity:

Load a big stopwatch on the projector screen. Start the stopwatch several times. Stop it at random number from 1 to 10. Ask which times were quick. Which times were slow.

Activity:

1. Show students the completed project found at the **Link for Teacher** above.
2. Play the game several times.
3. Show students the scripts and show them how to change the input number in the glide to block. What numbers should you input to make the elephant win? What numbers should you input to make the elephant lose?

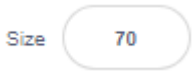
4. Show the students the **Link for Students**. Explain that the script is not working correctly. Tell them you will need their help in fixing the script. When the space bar is clicked the animals do not move. Why? (The blocks are not linked, and there are no numbers in the glide to blocks.)

5. Allow time for students to "fix" the scripts and share the project with others.

Extension:

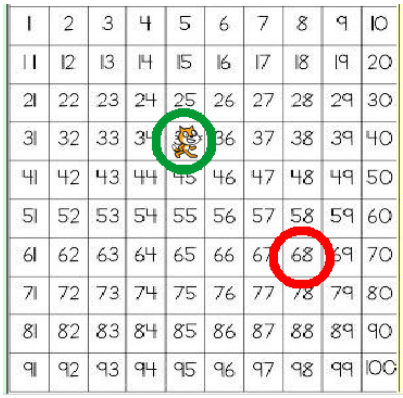
1. Ask students to change their scripts so the animals finish the race in this order:
    - Dinosaur, hippo, elephant, and last dog.
    - Let them decide in which order the animals finish.
2. Ask student to change the race so all the animals tie.
    - Let students decide which animals tie.

3. New sprites could run the race, or the number of sprites in the race could change. Invite students to change the sprites or add new ones. Students would need to adjust the size of each new sprite to fit on the race track. With this extension, students can compare numbers from 1 to 100 by comparing the small sprites to large sprites. Show students how to change the size of a sprite:
    - Use the size box above the stage to change the size of the sprite. Currently all the sprites, except the dinosaur, are set to size 70. The dinosaur is set to size 65.



4. Give students time to talk about and share their projects.

100's Chart Hit the Target



Summary: Students drag the green and red circle sprite to any number on the chart. When the green flag is clicked the cat moves to the green circle. Students use the +1, +10, -1, or -10 blocks and repeat blocks to make the cat move from the green circle to the red circle.

Materials:

- Link to the Scratch activity, *100's Chart Hit the Target* at*:* https://scratch.mit.edu/projects/166882693
- Classroom computer and student computers

Programming Skills with Scratch:

- Use already created blocks from More Blocks category
- Decide on a input number for repeat blocks
- Make decisions about **Sequence**
- Scratch blocks used by students: (repeat, wait_ secs, My blocks, go to green, When space key pressed, When green flag clicked)

Lesson:

1. Open the Scratch activity *100's Chart Hit the Target* at*:* https://scratch.mit.edu/projects/166882693
2. Pull out the add 1, add 10, subtract 1, and subtract 10 blocks from the repeat blocks.
3. Place the green circle on 32 and red circle on 77 on the chart. Press the green flag. Ask students why the cat moves to the green circle. Show the script to students that makes that happen.
4. Pull out as many of the add 1, add 10, subtract 1, or subtract 10 blocks from the My Blocks as necessary to make the cat move to the red circle. Connect these blocks to the block. Press the space bar and watch as the cat moves to the red circle. Add wait __ secs blocks to slow down When space key pressed the cat so students can see each step the cat takes. Do this several times. Be sure to use addition and subtraction blocks. (Put the green circle on a higher number than the red circle to use subtraction blocks.)
5. Ask students how they could shorten the script using the repeat blocks.
6. When students are comfortable, allow them to open and remix the activity. Ask them to move the red and green circles to a new location on the chart, then create scripts to make the cat move from the green circle to the red circle.

7. Allow time for students to share their scripts with others.

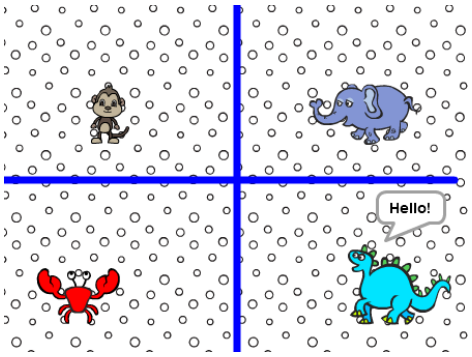
Extensions:

1. Create a new blue circle sprite. Ask students to create scripts that will make the cat start at the green circle, move to the blue circle, and end on the red circle.
2. Show students how to record their own voices using the Sounds Tab to record a problem such as 83 - 25 = 68. In this project when right arrow key pressed, a recording plays. (Notice this script is located in the script area by the script that defines the +1, +10, -1, -10 blocks. You may need to scroll down in the script area to see these scripts.) Ask students to record a problem, then illustrate that problem with the activity.
3. Ask students to find more than one way to make the cat go from the green circle to the red circle.

Accommodations:

- Allow students to work with a partner.
- Allow students to create scripts without using the repeat blocks.

Make a Zoo (1st EDM unit 8) (allow 40—50 minutes)



Summary: Students work with partners or individually. They divide a "zoo", which is a regular polygon, into four equal sections for four different animals. They create scripts to make the animals move and talk.

Materials:

- Link to the Scratch activity *Zoo Teacher Copy at:* https://scratch.mit.edu/projects/130730095/
- Link to the scratch activity *Zoo Student Copy* at: https://scratch.mit.edu/projects/130745510/
- Copies of Make a Zoo (p. 11 worksheet)
- Crayons or markers for students
- Scissors and glue for students
- Classroom computer and student computers

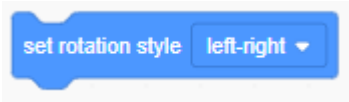
Programing Skills with Scratch:

- Open, remix, save a Scratch activity
- Use event blocks to start scripts
- Show, hide, and place sprites on the stage
- Make a sprite move, turn, and move again on the stage
- Make a sprite say something
- Use pen down and set pen size to blocks to create a line on the stage
- Use erase all block to clear all lines
- Sequence and link blocks shown in the script area to create scripts
- Use a wait block to slow action of a sprite
- Test partial scripts to verify they work
- Scratch blocks used: (When green flag clicked, when this sprite clicked, when right arrow key pressed, wait, point in direction, move, hide, show, say, set pen size to, erase all, pen down, repeat, forever)

Lesson:

1. Open the Scratch activity *Zoo Teacher*.
2. Show students the black dot sprite that will be used to divide the zoo. Place the dot in the middle on the left side of the screen and click the right arrow. This cuts the stage into 2 equal parts.
3. Then move the black dot sprite to the middle of the top of the screen and press the down arrow. This cuts the stage into 4 equal parts.

4. Show students the blocks used by the black dot sprite. Look at the script to clear the lines and move the black dot to the center of the stage. Click the go to x:0 y:0 and erase all blocks.
5. Try changing the pen size to a number other than 7. What happens?
6. Show the drop down menu on the point in direction block. Change this. What happens?
7. Together decide which animals to place in the zoo. When you click on the animal below the stage its scripts appear in the script area. Click show and the animal will appear on the stage. Place the animal in one of the sections of the zoo.
8. Before class, experiment with the rotational style for each sprite. This block allows your sprite to face the direction it is turning. Youtube videos show how this block works. To find a video, search Youtube "How to change the rotational style of spites in Scratch".



9. Press the space bar. The animal moves. Discuss the blocks that are used to make the animal speak one at a time. Remove the wait blocks and see if students can tell why they are important in the script.
10. Click the sprite on the stage. Show students how to change what the animal says when it is clicked.
11. Add three more animals to the zoo. Go through their scripts.
12. Decide if you want your students to work with partners or alone.
13. Pass out the Make a Zoo worksheet.
14. Allow time for students to complete the worksheet. Give these directions:
    - Divide the rectangle into 4 equal parts for the zoo
    - Choose 4 animals for the zoo
    - Cut, glue, and place each of your four animals into one of the equal sections of the zoo
    - Write what each animal will say
14. As each student or partners finish the worksheet, allow time for them to open and remix a copy of the Scratch activity *Zoo Students Copy*. First they should create the scripts for the black dot sprite to divide the zoo into 4 equal sections.
15. After they have finished, and you have checked their black dot scripts, allow them to finish the zoo by choosing their four animals and creating scripts for each. Encourage students to test their scripts as they create them to see if they are working the way they expect them to work.
16. If necessary, leave the script you used for one of the zoo animals on the classroom computer as an example for all to see.

17. Allow time for students to share their **zoo** with others.

Extensions:

1. Let student use a repeat block or forever block around the part of the script that makes the animal move to make the animal move back and forth in the zoo more than once.
2. Let students divide the zoo a different way to get 4 equal sections. For example, they could use 4 equal rows or 4 equal columns.
3. Let students add more animals to their zoo and divide the zoo into a different number of equal sections.

Accommodations:

- Decide if making the animals move and talk in their pens is too much for some students. If so, you can connect the blocks needed to make the animals move and talk for those students. Just ask students to create the script for the black dot. You can also ask students to change what each animal will say.

Common Core: 1.GA.1, 1.GA.2, 1.GA.3

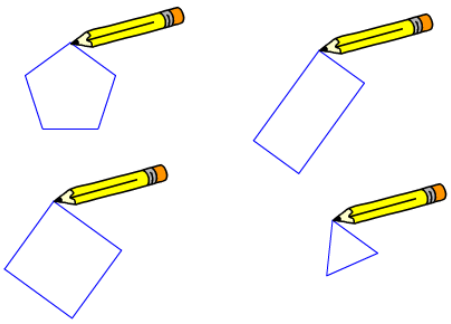
CS/CT Standards:

CS-Create Simple Programs, Understand that programs execute by following precise and unambiguous instructions, Use logical reasoning to predict the behavior of simple programs

CT-Pattern Recognition

Name: _____ **Make a Zoo**

Attributes of 2-D Shapes



Summary: Students work with partners or individually to complete a partial script which draws a square, a rectangle, a triangle, and a pentagon. They use the debugging skill, Guess and Check, to complete the scripts. They record their thinking by making duplicate scripts and changing input values until the scripts create the specific 2-D shape correctly.

Materials:

- Link to the Scratch activity *Attributes of 2-D shapes teacher copy* at: https://scratch.mit.edu/projects/130981912/
- Link to the Scratch activity *Attributes of 2-D Shapes student copy* at: https://scratch.mit.edu/projects/130989351/
- Classroom and student computers

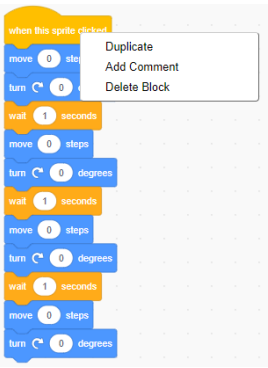
Programing Skills with Scratch:

- Open, remix, and save a Scratch Activity
- Input values into move and turn blocks
- Use Guess and Check to correctly complete a script
- Create and use a duplicate of a script to record thinking
- Scratch blocks used: (pen down, erase all, move, turn _ degrees, wait, when this sprite clicked, repeat)

Lesson:

1. Open the Scratch activity *Attributes of 2-D Shapes teacher copy.*
2. Run the program. Students should notice that a different 2-D shape is created when each pencil is clicked. The name of each sprite below the stage tells what shape each pencil will draw.
3. Open the Scratch activity *Attributes of 2-D Shapes student copy.*
4. Notice that the scripts do not have any value in the move or turn blocks. Show students how to use Guess and Check to find the correct number to input in these blocks.

- Click on the sprite called **square** shown below the stage. Select numbers that you know are not correct to put in the move and turn blocks. Try the script. It will not make a square.



- Show students how to make a duplicate copy of the script:
  - ⇒ Right click on the script you want to copy. A drop down menu will appear.
  - ⇒ Click Duplicate.

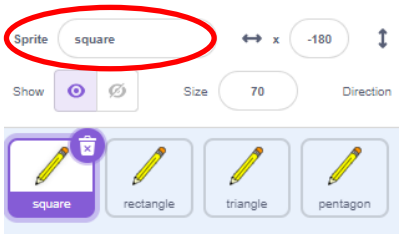
- Now you have a record of your first guess and a new script for you to guess again. Choose new numbers and try the script again.

5. Continue to use Guess and Check and duplicate copies of the script until you find the correct numbers needed to make a square.

Information for teacher:

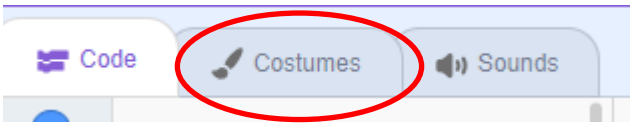
- For an example of how to use Guess and Check, go to this link: https://www.youtube.com/watch?v=vHAJCdu3iGY&feature=youtu.be&list=PLHqz-wcqDQIEPCObVuoxWbzYsPGaf-Jsl or this link: *Video: Guess and Check With Triangles (using loops/repeat)*

- To change the name of a sprite, type the new name in the box above the sprites.



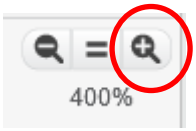
- It looks like all the pencil sprites in this activity are drawing the line from the tip of the pencil. To make the pencil sprite look like it is writing from its tip, adjust the costume of the sprite. To adjust the costume:

  ⇒ Click the sprite below the stage.

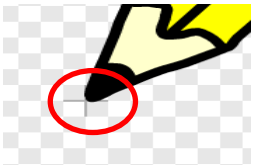


  ⇒ Open the COSTUMES TAB.

  ⇒ Enlarge the drawing area by clicking the plus magnifier on the bottom right side.



  ⇒ Select the pencil and drag it until the tip of the pencil is by the cross. The cross indicates the spot from which the line will be drawn.



- To make duplicates of the pencil sprite after you have adjusted the costume, right click the sprite below the stage. Click duplicate. The new sprites can be renamed. Because you duplicated a sprite that already had it costume adjusted, all the new sprites will also have their costume adjusted to draw from the pencil point, too.

6. Decide if you want students to work with a partner or individually.
7. Allow students to open and remix the Scratch activity: *Attributes of 2-D Shapes student copy.*
8. Ask them to use Guess and Check to complete the scripts for a rectangle, triangle, and pentagon. Ask them to show their thinking by making copies of the script each time they use Guess and Check.
9. Allow time for students to share their activities.

Extensions:

1. After students have completed their scripts, ask them to shorten the number of blocks needed in the script by using a repeat block.
2. Ask students to create another pencil sprite that will draw a hexagon or a trapezoid.

Accommodations:

- If completing four shapes is too difficult for some students, ask them to complete a fewer number of scripts.
- If necessary, offer students a range of numbers for the degrees. For example, for the pentagon suggest students use numbers from 68 to 74 for the degrees.

Optional Unplugged Activity:

1. Do the activity described in the video found at: https://vimeo.com/122322844

Supplies needed for this activity:

- 4 to 5 poster boards with footprints, 90 degree angles, 72 degree angles, and 120 degree angles marked on each for each group of students.
- 4 to 5 Yard/meter sticks per group.

After the teacher and 3 students model the activity, students work in groups of three to create a rectangle, triangle, and pentagon with the poster boards and the yard/meter sticks.

2. Make a Puzzle activity.

Supplies needed for this activity:

- Copies of the Scratch blocks needed to create a square p. 16 (worksheet), triangle p. 18 (worksheet), and pentagon p. 17 (worksheet) cut out and laminated.
- Envelopes

Directions:

- Put all the cut and laminated blocks needed to make a square in an envelope. All the blocks needed to make a triangle in another envelope. All the blocks needed to make a pentagon in another envelope.
- Create enough envelopes so each group of students has a puzzle.
- Do not label the envelopes. Students should not know which puzzle they have.
- Give each group of students an envelope. Ask them to figure out which shape can be made using all the blocks in their envelope.
- When each group solves their puzzle, allow them to open a new Scratch activity and create their script in Scratch. They can use this activity to see if they have all the blocks from their envelope in the correct sequence.

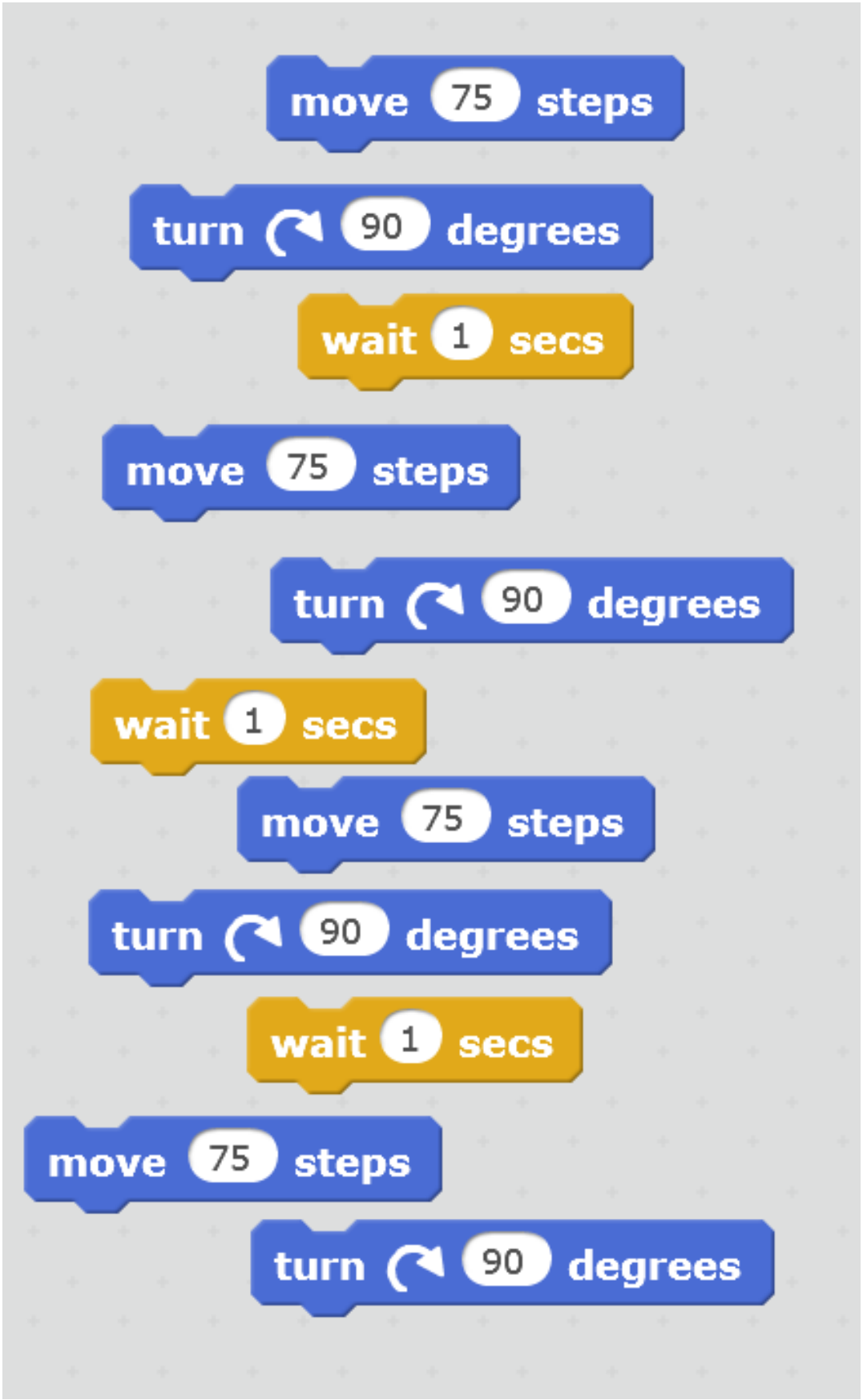
Common Core: 2.GA.1, 2.GA.2, 2.OA.C.4

CT/CS Standards:

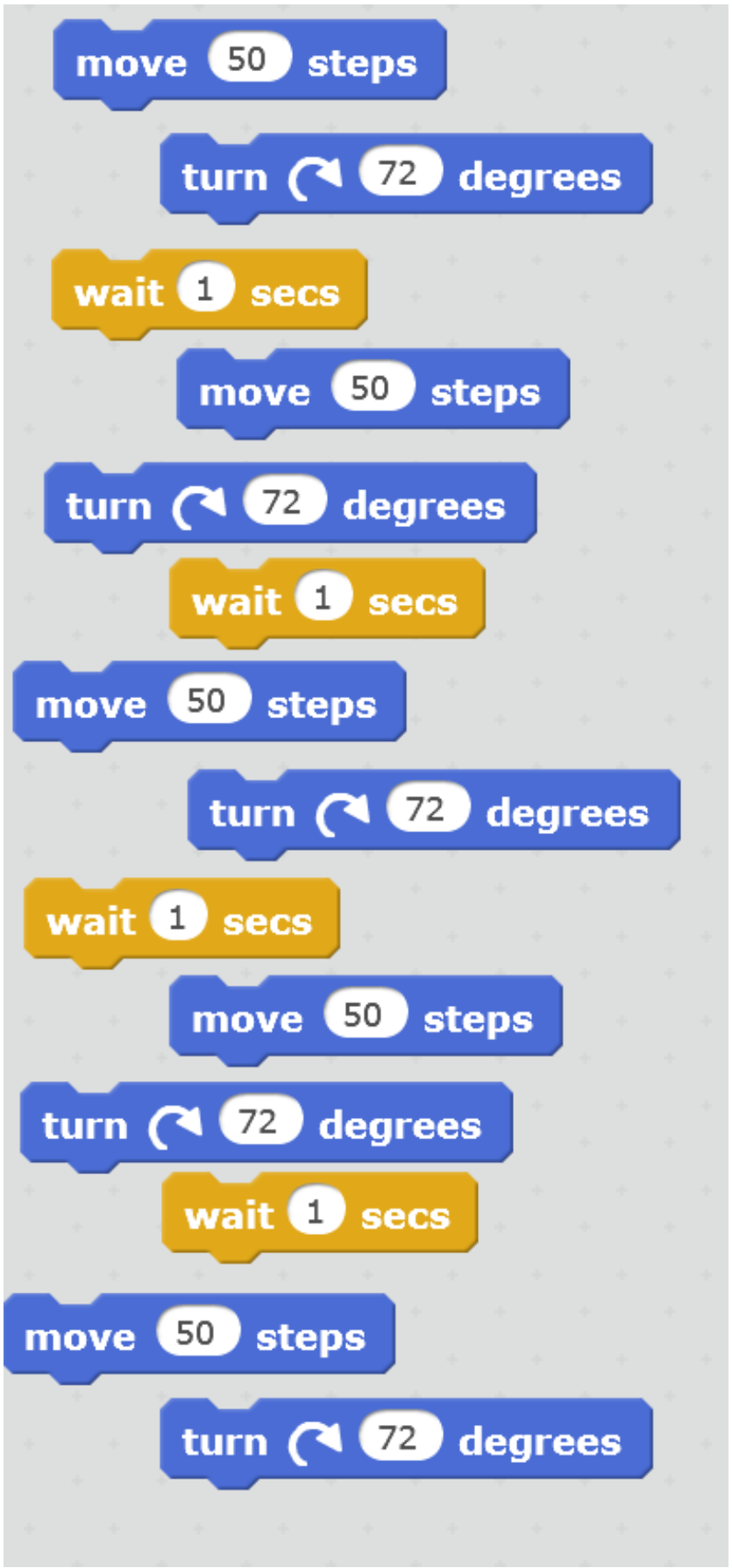
CT—Decomposition, Pattern Recognition

CS—Understand that algorithms are implemented as programs on digital devices, Understand that programs execute by following precise and unambiguous instructions, Debug simple programs, Use logical reasoning to predict the behavior of simple programs.

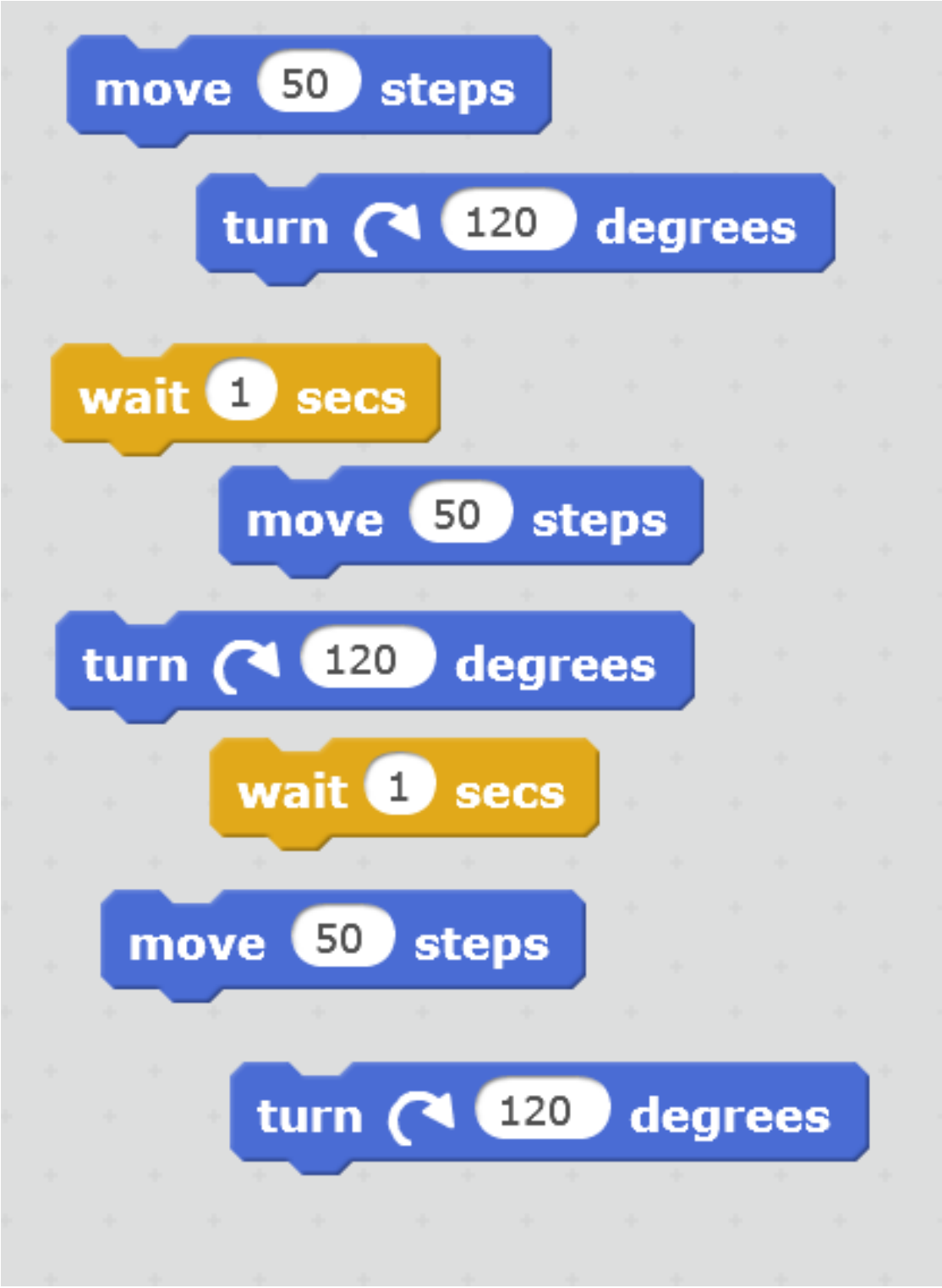
Blocks for the square envelope:



Blocks for the pentagon envelope:



Bocks for the triangle envelope:



Common Core:

CT Standards:

Concentric Circles and Fractions (3rd EDM Unit 6) (Allow 40—50 minutes)

Summary: Students use already created fraction blocks to draw 7 concentric circles. They have a choice of these fractions 1/16, 1/8, 1/4, 1/5, 1/3, and 1/2, or they can use a 1 whole block. Once they have 7 concentric circles, they can move the center/radius of the circles to make many copies of the 7 circles.

Materials:

- Copies of Planning Page
- Classroom computer and student computers
- Link to the Scratch activity *Concentric Circles and Fraction teacher* at: https://scratch.mit.edu/projects/169045023
- Link to the Scratch activity *Concentric Circles and Fractions Student at: https://scratch.mit.edu/projects/170096184*
- Link to the Scratch activity Concentric Circles and Fractions Accommodations at: https://scratch.mit.edu/projects/170059872
- Concentric Circles planning page p. 23 (worksheet) or p. 24 (worksheet)

Programing Skills with Scratch:

- Use already created blocks from My Blocks category
- Decide on a input number for repeat blocks
- Make decisions about **Sequence**
- Use Turbo Mode to speed the drawing of circles
- Scratch blocks used by students: (repeat, My Blocks, change size by 20, set size to 4%, show, hide, erase all, point in direction, go to center and radius, go to x: _ y: __, When space key pressed)

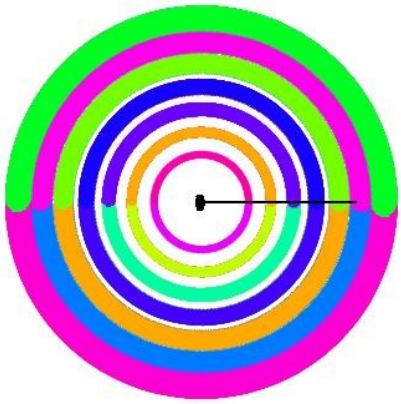
Lesson:

1. Open the Link *Concentric Circles and Fractions Student*.
2. Click the circle sprite. Click the green flag and then click the 1 whole block. Ask students what happened and why it happened.

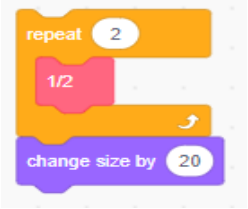
3. Click the change size by 20 block. Then click 1 whole again. Repeat this 6 times. This makes 7 concentric circles. Discuss why this works. Click the erase all block to clear the circles from the stage. (The circle sprite gets larger so it makes a larger circle.)

4. Drag the center and radius sprite to a new place on the stage, click back to the script for the circle by clicking on the circle sprite below the stage. Click the green flag. Then click the 1 whole block again followed by the change size by 20 block. What happens? Do this several times. Discuss how the black center and radius sprite shows the center of the circle and the radius of the circle. (However, the "radius" does not stop at the edge of the circle. But it does shows where the circle starts and stops.)

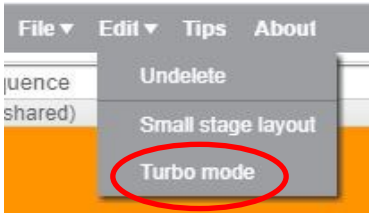
5. Click the erase all block. Move the center and radius sprite back to the center of the stage. Ask students what they think will happen if you click the green flag then click the 1/2 block. Show students what happens. Click the 1/2 block again to complete the circle.



6. Click the erase all block. Click the 1/2 block then the change size by 20 block. Then click the 1/2 block again. Watch what happens. Why? (The circle is not completed. The second half of the circle is larger than the first half.) Ask what you need to do to make 7 concentric circles where each circle shows 1/2 in a different color.
    - You will need to click 1/2 twice before you change the size with the change size by 20 block between each or the 7 circles. Or you can use a repeat block.



7. Ask if anyone has any ideas on how to make a circle with a repeat block and a 1/2 block. Ask what number should go in the repeat block. Why?
8. Decide if you want your students to work alone or with a partner. Tell students they are going to find a way to make 7 concentric circles. Each of the seven circles will be made of "1/4", "1/3", "1/5", "1/8", or "1/16" size sections. Ask them to keep all their scripts in the script area so that they can create any size fraction circles by clicking on a script. Remind them that their concentric circles scripts should use a repeat block instead of using the same fraction block over and over. When they find a way to create one group of concentric circles, they should come up to the classroom computer and create the script for other to see.
9. Ask students to open and remix the *Concentric Circle and Fractions Student* activity. Allow time for students to explore the activity. Then ask partners or students find a script that works for any size fraction block. When they find a script that works, ask them to display their scripts on the classroom computer for others to see.
10. When students have completed their scripts, ask how they knew which number to use as input in the repeat block. Why did that number work?
11. Use **Turbo mode** to speed up the program. It is in the Edit tab found above the stage.



12. Be sure to allow time for students to share their concentric circles.

Extensions:

1. Open *Concentric Circles and Fractions Teacher* and click the green flag. Drag the center and radius sprite to a new location on the stage and click the green flag again. Repeat several times. Then press the space bar. Allow time for students do the same with their scripts. They can use the same size fraction blocks to create their 7 concentric circles, or they can use different sizes of fraction blocks so each circle in their group of 7 concentric circles has a different size fraction shown.
2. Show students what happens when you click the green flag, then the When right arrow key pressed in the *Concentric Circles and Fractions Teacher* activity. (Each circle is drawn with many different fraction blocks.) Ask students to find a way to combine different fraction blocks to make one circle. Ask them to record the different ways found to make a circle. Remind students the circle should start and stop on the "center and radius" line. If it goes over or stops short of the line it is not a complete circle.
3. Show students what happens when you click the green flag, then click the When a key pressed. Discuss.

Accommodations:

- If creating scripts using repeat blocks are too difficult for some students allow them to use the *Concentric Circles and Fraction Accommodations* activity. This has script already completed. Students need only to add fraction blocks and decide on an input number in the repeat blocks.
- Allow students to use one or both of the Concentric Circles planning worksheet or worksheet to help them decide which fractions to use to create their concentric circles.

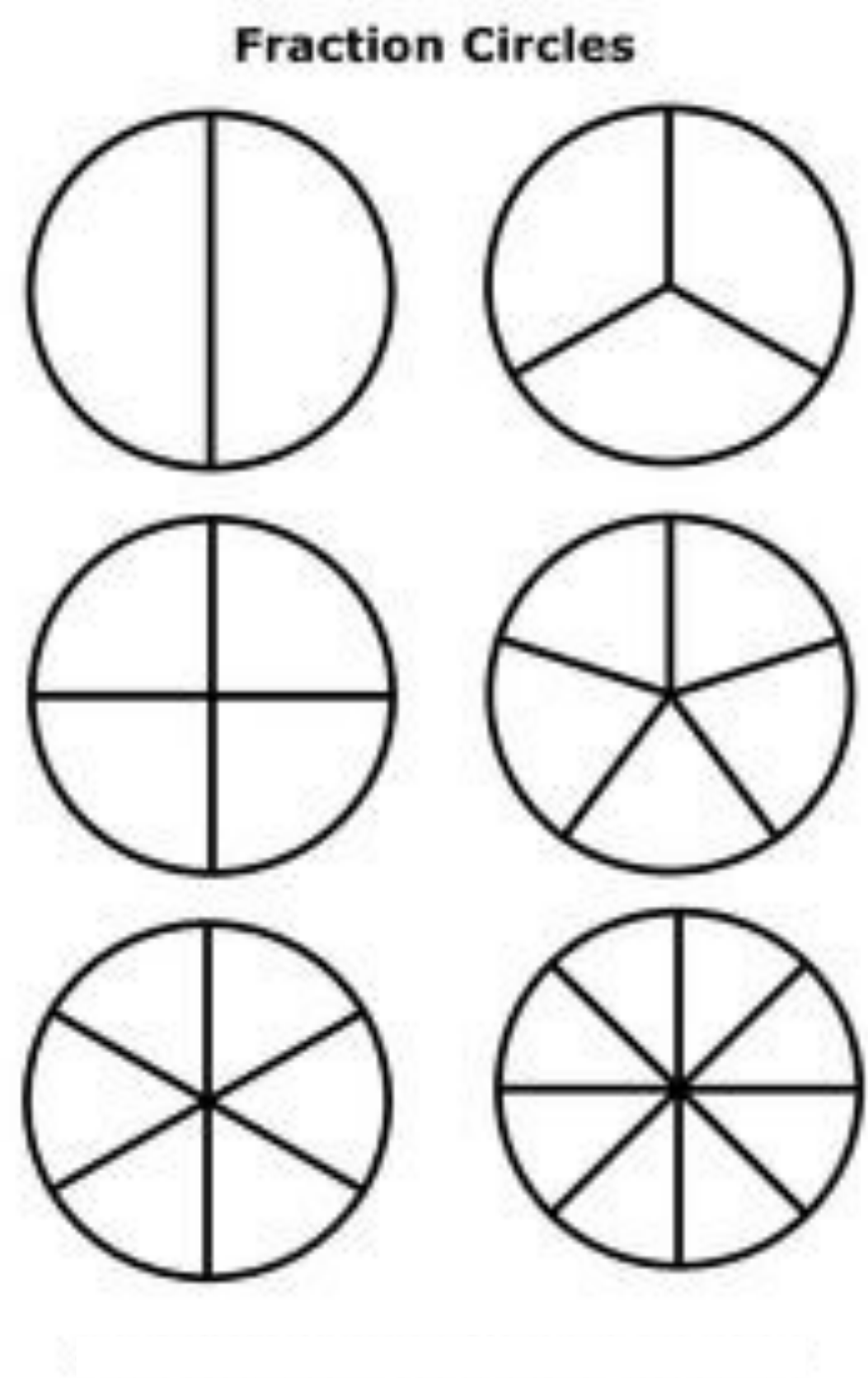
Common Core: 3.NF.1

CS/CT Standards:

CS-Create simple Programs, Understand that programs execute by following precise and unambiguous instructions, Use logical reasoning to predict the behavior of simple programs.

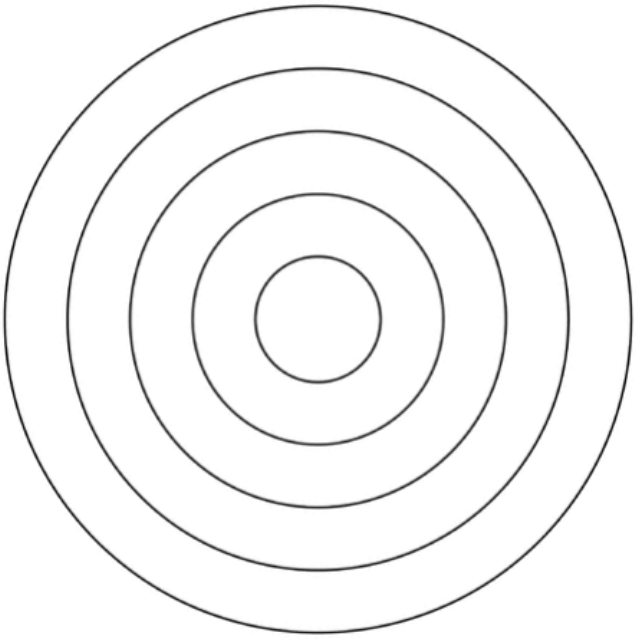
CT—Pattern Recognition

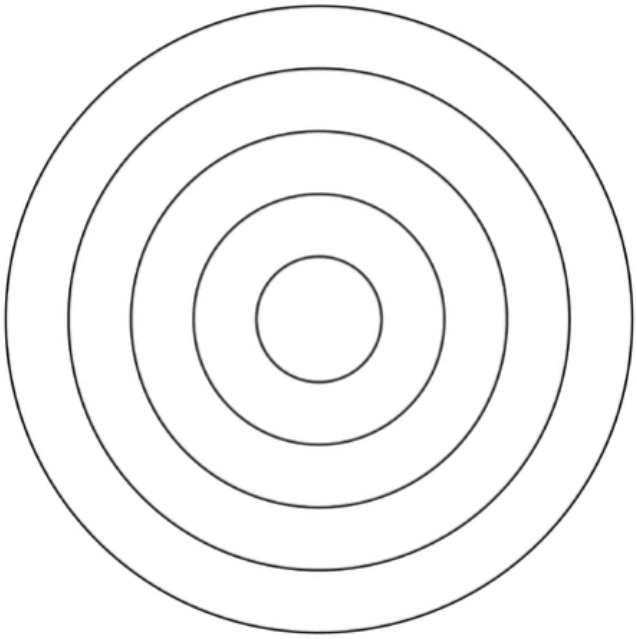
Concentric Circles Planning Page

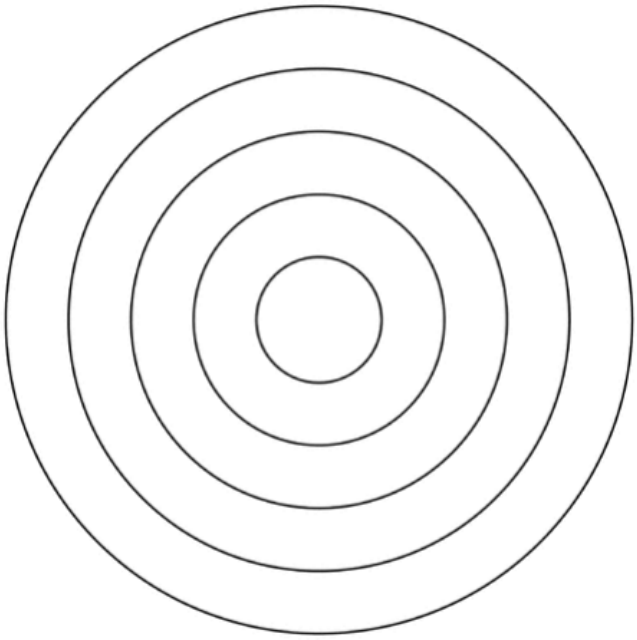


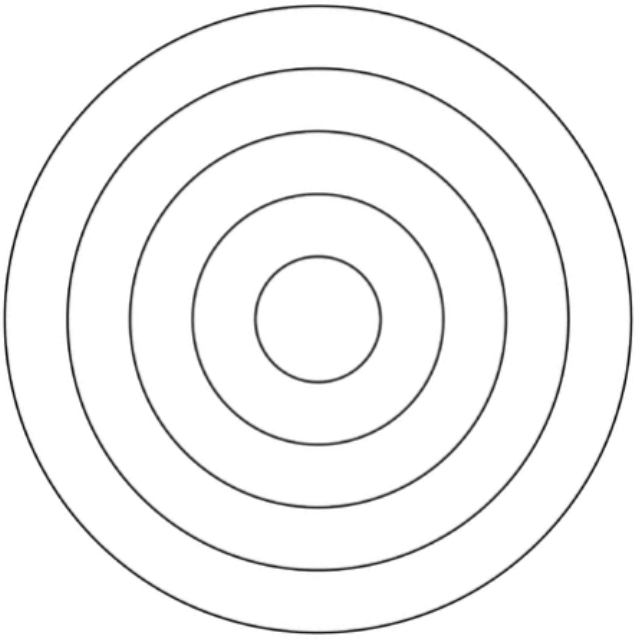
Name: _____

Concentric Circles Planning









Multiplication Dance and Moves

Summary: Students use a partially completed project that asks how many times a sprite should move in one dance and how many times the sprite should perform the dance. When all the dances are complete, the sprite asks how many moves it made in all of its dances. In the example shown in this picture, the sprite had 3 moves in each dance and danced 4 times. 3 x 4 = 12. The sprite made 12 moves total in its 4 dances.

Materials:

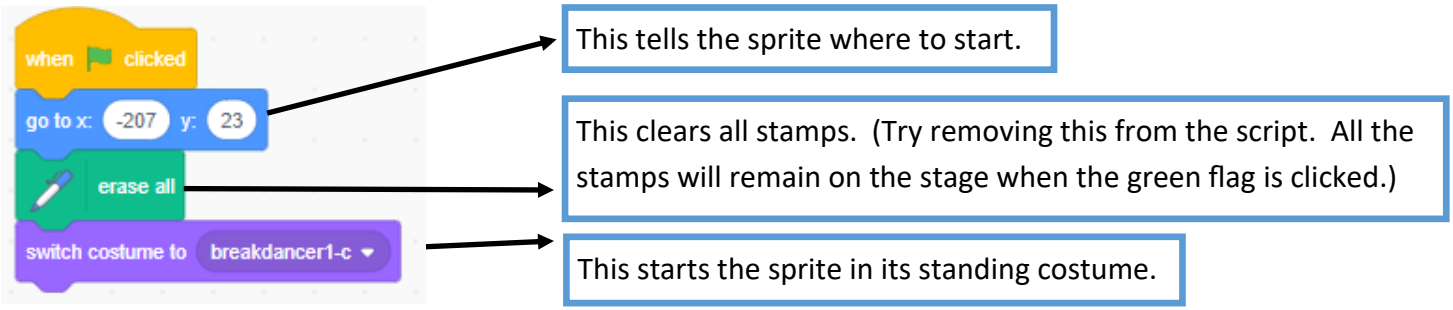
- Link to the Scratch activity *Dance and Moves* at: https://scratch.mit.edu/projects/125158928/
- Link to partially completed Scratch activity *Dance and Moves* copy for students at: https://scratch.mit.edu/projects/125265539/
- Link to the Scratch activity *Dance Complete Teacher Demo* at: https://scratch.mit.edu/projects/102100509/
- Copies of Scratch Blocks and Partial Scripts Part 1 p. (worksheet)
- Copies of Scratch Blocks and Partial Scripts Part 2 p. (worksheet)
- Copies of Scratch Blocks and Partial Scripts Part 3 p. (worksheet)
- Copies of Scratch Blocks and Partial Scripts Part 4 p. (worksheet)
- Scissors and glue sticks
- Classroom computer and student computers

Programming Skills with Scratch:

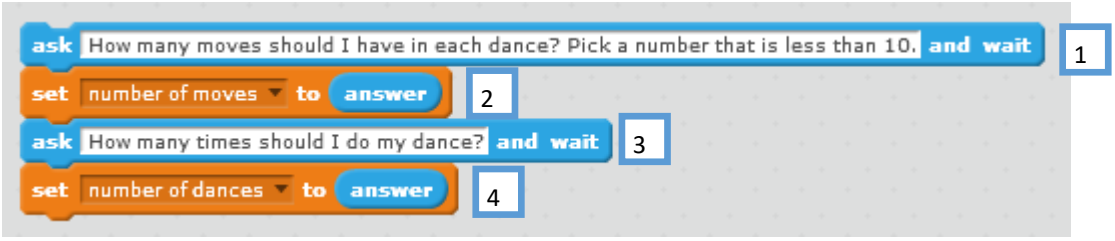
- Open, remix, save, and share a Scratch project
- Complete a partial script
- Set a variable to the answer of an ask and wait block
- Nest repeat blocks inside if_ then_ else blocks
- Nest a less than block with a variable as an input into an if_ then_ else block
- Nest a multiplication block with variables and an answer block into an equal block
- Change a sprites position using a change x by block and a go to x: y: block
- Scratch blocks used: (less than, multiplication, erase all, stamp, set variable to, ask and wait, answer, repeat, repeat until, if_ then_ else, wait, change color effect by, say, switch costume to, next costume, go to x: y:, change x by)

Lesson:

1. Open and discuss the completed *Dance and Moves* https://scratch.mit.edu/projects/125158928 link.
2. Try the activity several times using different numbers for the number of moves and the number of dances.
3. Explain that in this project the script is divided into 4 main parts.
4. Pull the script apart to look at part one shown below. Discuss what each block does. Each are explained below.
5. Allow time for students to complete Scratch Blocks Part 1 p. 30 (worksheet) with a partner or alone.

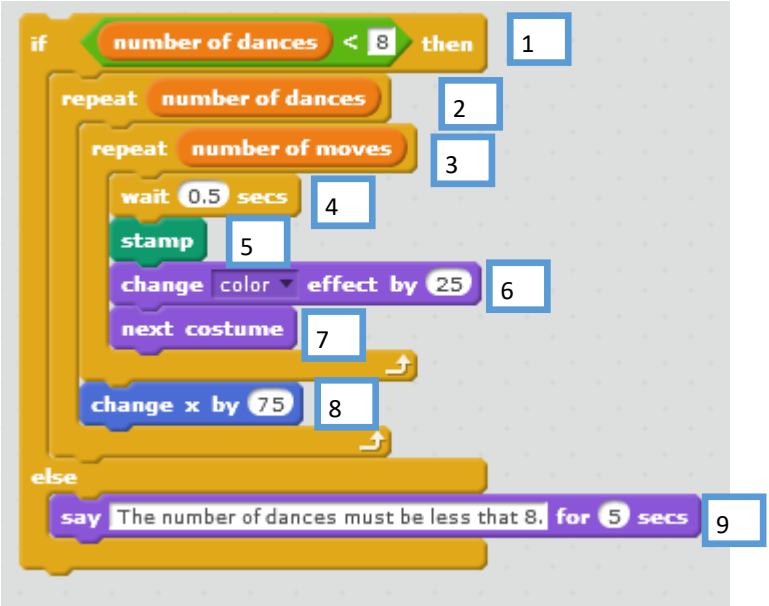


6. Pull the script apart and look at part two shown below. Discuss what each block does. Each are explained below.
7. Allow time for students to complete Scratch Blocks Part 2 p. 31 (worksheet) with a partner or alone.



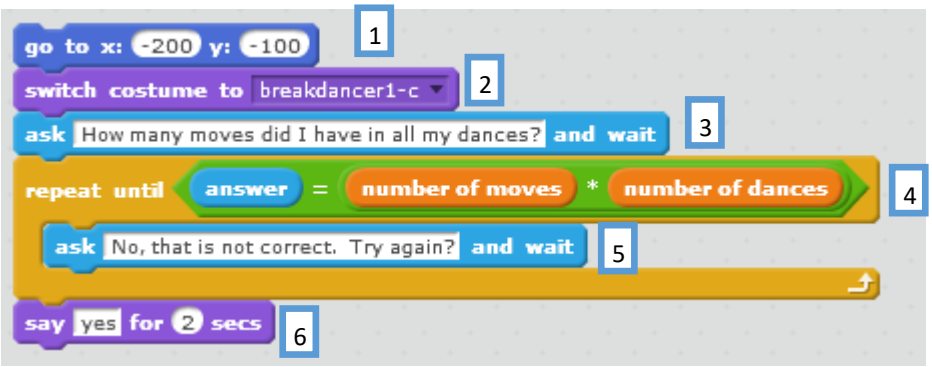
- Blocks 1 and 3 asks for input about the number of dances and the number of moves in each dance.
- Blocks 2 and 4 set already created variables to the number of moves and the number of dances given as the answer in the ask and wait blocks.

6. Pull the script apart and look at part three shown on the follow page. Discuss what each block does. Each are explained below.
7. Allow time for students to complete Scratch Blocks Part 3 p. 32 (worksheet) with a partner or alone.



- Block 1 is a conditional block. **If** the number of dances is less than 8 **then** the sprite will dance. **Else**, if the number of dances is 8 or greater the sprite will say, "The number of dances must be less than 8." Try changing this input to allow for more than 8 dances. Change 8 to 10. Try the script and ask the sprite to dance 9 times. Notice that the sprite does not have room on the stage to dance more than 7 times.
- Block 2 tells the sprite to repeat the dance the number of dances given as the input in the ask and wait block in part 2 of the script.
- Block 3 tells the sprite to do the number of moves given as the input in the ask and wait block in part 2 of the script.
- Block 4 tells the sprite to wait .4 of a second between each move.
- Block 5 tells the sprite to stamp.
- Block 6 tells the sprite to change colors. This shows the moves of the sprite clearer. Try taking it out. Without this block, it is difficult to see each of the moves the sprite makes.
- Block 7 tells the sprite to switch to its next costume.
- Block 8 moves the sprite 75 steps between dances. Without this the sprite would dance all the dances in the same place. Try removing this block. Notice it is not easy to tell how many times the sprite danced.
- Block 9 tells the sprite what to say if there are too many dances requested. Remember too many dances will not fit on the stage area.

8. Pull the script apart and look at part four shown on the following page. Discuss what each block does. Each are explained below.
9. Allow time for students to complete Scratch Blocks Part 4 p. 33 (worksheet) with a partner or alone.



- Block 1 moves the sprite to a new location after it has finished all of its dances.
- Block 2 changes the sprite back to its original costume.
- Block 4 ask, "How many moves did I have in all my dances?" This problem is solved with a multiplication problem. Multiply the number of moves in each dance by the number of dances in all. In the example shown at the beginning of this lesson, there were 3 moves in each dance and 4 dances. 3 x 4 = 12. So the answer for that example is that the sprite had 12 moves in all of its dances.
- Block 4 uses variables to show the multiplication steps. Variables are used because the input to the ask and wait blocks in part 2 could be any number. The answer to the question in block 3 must equal the number of moves times the number of dances. This block says that the answer to the question in block 3 must be correct before the sprites does the step shown in block 6.
- Block 5 tells the sprite what to say something each time the answer is incorrect. The sprite will say, "No, that is not correct. Try again?" It repeats until the answer is equal to the number of moves times the number of dances.
- Block 6 tells the sprite to say, "Yes." This will only happen when the input given in block 4 equals the correct answer.

10. Decide if you want students to work with a partner or individually.
11. Ask students to open, remix, and compete the partially completed link to *Dances and Moves* copy for students found at: https://scratch.mit.edu/projects/125265539/

- This is a partially completed script.
- All the blocks needed to complete the script are already shown in the script area.
- Student should use the worksheets they completed for parts 1, 2, 3, and 4 to complete the script.
- Students should test their script when they are finished.

Extensions:

1. Ask student to add sound to their project. The music should play while the sprite is dancing.
2. Ask students to open the link to the *Dance Complete Teacher Demo* project found at: https://scratch.mit.edu/projects/102100509/

- This project uses conditional statements to control the sprite. Student either clap their hands or shake their head to make the sprite dance and move.
- Students will have to click allow if this message appears on their screens. This allow Scratch to use the computer's camera and microphone.
- Allow time for students to explore this project. Ask them to look for a if_ then_ , else conditional. Ask them to explain that conditional to a partner.

Optional Unplugged Activity:

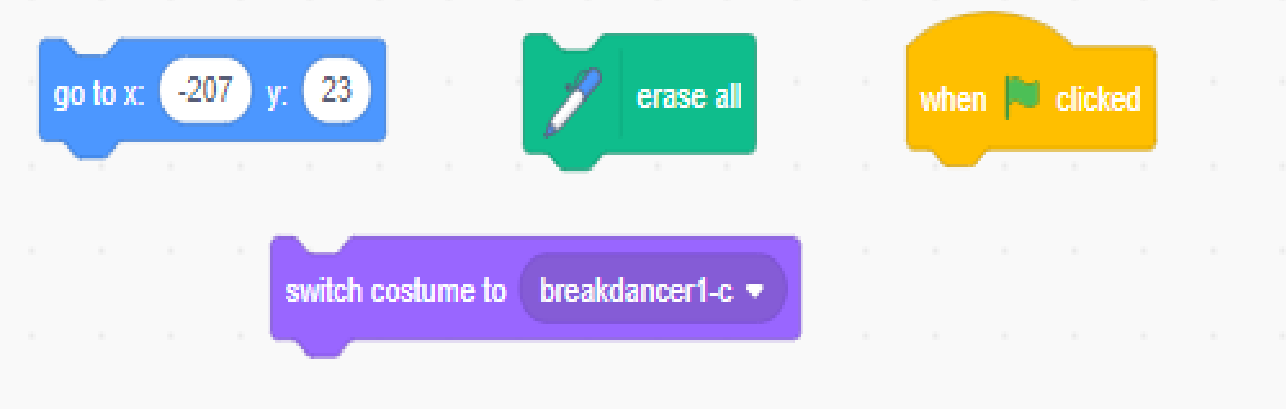
- Conditionals with Cards — From Code.org found at: https://drive.google.com/file/d/0BzVkHOIE3LXGblZoWEpodFIwMzQ/view

Common Core:

CT Standards and Skills:

Name: _____ Scratch Blocks and Partial Scripts Part 1

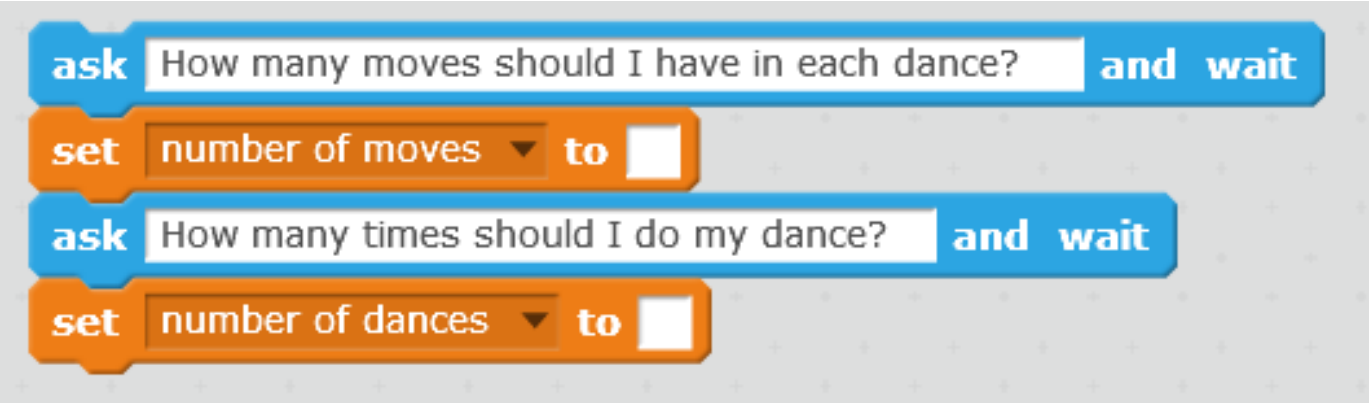
- Cut the blocks below apart.
- Glue them in the correct order here.



Name: _____ Scratch Blocks and Partial Scripts Part 2

This is an incomplete script.

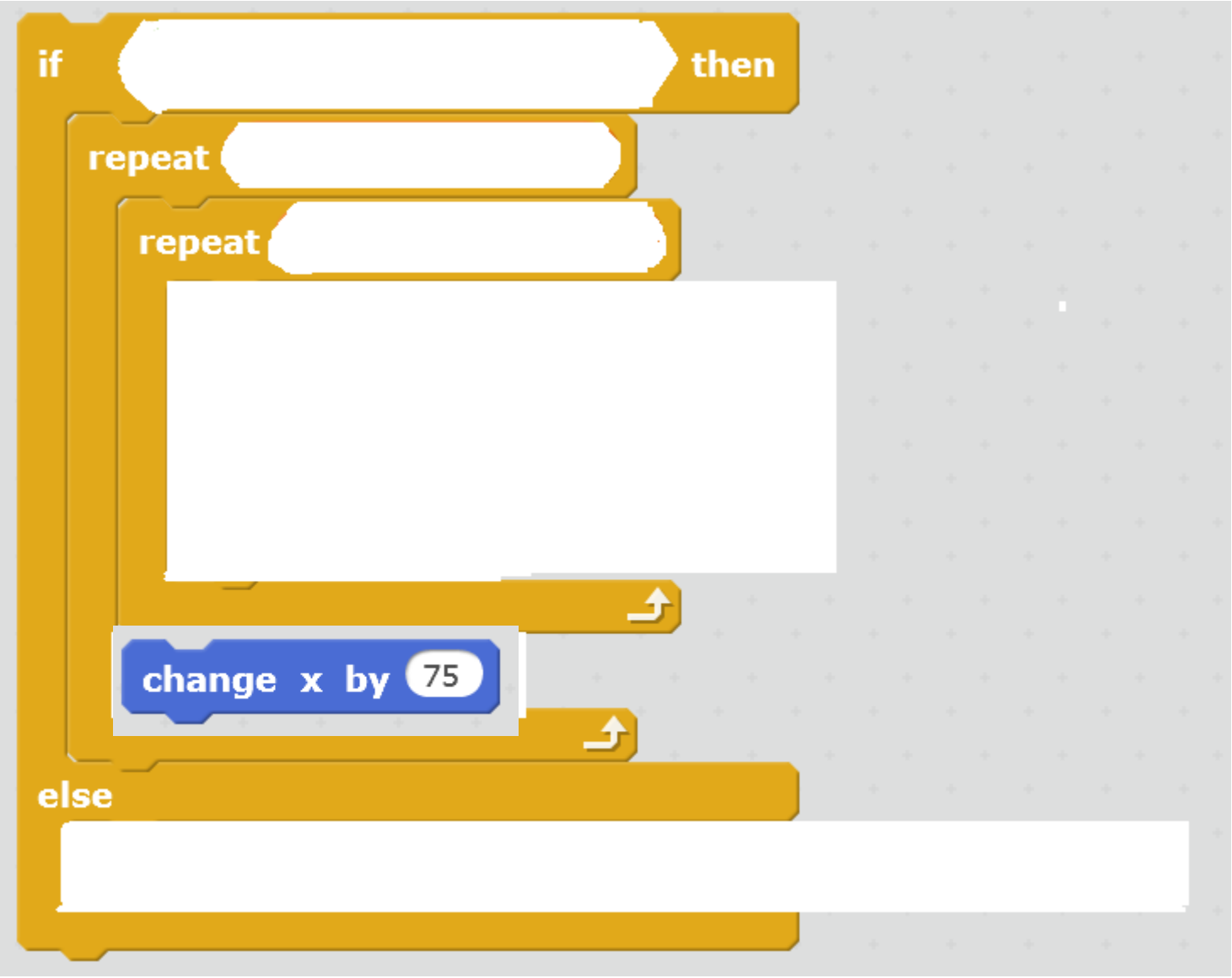
- Cut the blocks at the bottom of this page apart.
- Glue each in the correct location on this partial script.

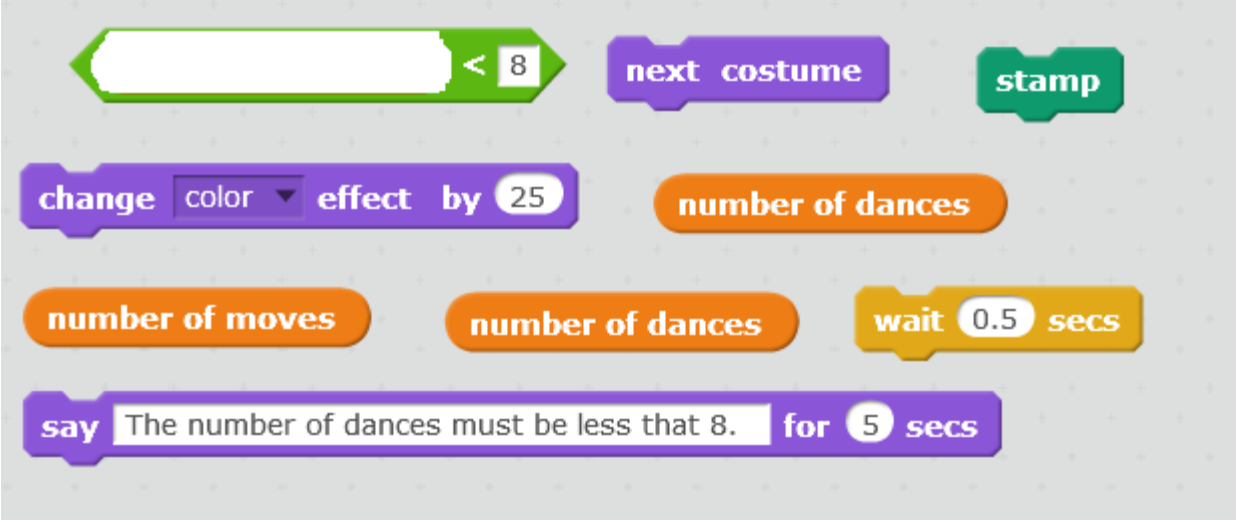


- Cut apart these blocks.
- Glue each in the correct location to complete the script above.

Name _____ Scratch Blocks and Partial Scripts Part 3

Cut apart the blocks below and glue them on this script in the correct locations.

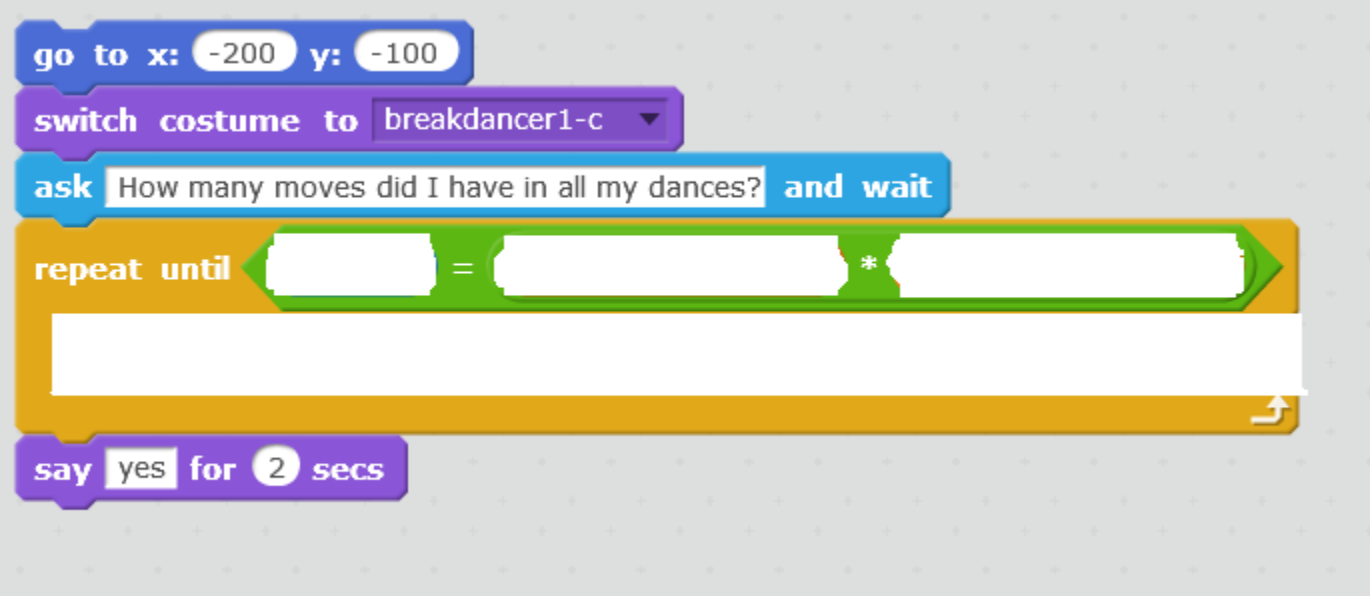




Name:_____ Scratch Blocks and Partial Scripts Part 4

This is an incomplete script.

- Cut the blocks at the bottom of this page apart.
- Glue each in the correct location on this partial script.



- Cut apart these blocks.
- Glue each in the correct location to complete the script above.