



Grade 4 Area & Perimeter Exploration with Scratch - Teacher version

Mathematics topic: Area and perimeter of rectangles

Mathematics standard: 4.MD.3

Focus CT ideas: Debugging

Technology tool: Scratch, project link: <https://scratch.mit.edu/projects/391750018/>

Activity directions:

1. Share your screen showing the Scratch project at <https://scratch.mit.edu/projects/391750018/>
2. Press the green flag. The beetle will draw a rectangle. Tell students that each square on the grid is 1 cm long and 1 cm tall. Ask:
 - a. What is the perimeter of the rectangle the beetle drew? How do you know?
 - b. What is the area of the rectangle the beetle drew? How do you know?
3. Click See Inside. Encourage students to look at the code that tells the beetle to draw the rectangle. Ask students to tell you what they think each block does.
4. Remind students they just determined that the rectangle had an area of 6 square centimeters and a perimeter of 10 centimeters. Ask:
 - a. Do you see those numbers in the code? (No.)
 - b. What do the numbers in the code represent? (The length and width.)
 - c. If we changed those numbers to a new length and width, do you think you could predict what the area and perimeter of the rectangle would be when you run the code? How can you tell?

Guide a discussion about the idea that we can predict the perimeter and area of a rectangle from the length and width because we know the formulas for area and perimeter. Ask volunteers to remind you of the area and perimeter formulas for rectangles.

5. Change the numbers in the code to show a length of 4 and a width of 5.
 - a. Ask volunteers to predict the perimeter and area and explain how they figured it out.
 - b. Run the code and ask children to check their predictions.



6. Tell children you would like to tell the beetle to create a rectangle that has an area of 10 square centimeters. Ask:
 - a. What numbers could I use for the length and width of a rectangle to give it an area of 10 square centimeters? (5 and 2, 10 and 1).
 - b. How can I change the code to show that length and width?Have children share their ideas about how to edit the code, but don't run the edited code. Explain children will now have a chance to try out their edits for themselves.

7. Introduce the [student pages](#) and have children use the Scratch project to complete them.



Area and Perimeter Exploration student pages

1. Open the Scratch project at: <https://scratch.mit.edu/projects/391750018/>
2. Click the green flag and watch the beetle draw a rectangle.
3. Click “See Inside”. Use the numbers you see in the code to help you fill in the blanks in these area and perimeter formulas for the rectangle.

Area = _____ * _____ = _____ square centimeters

Perimeter = 2 * _____ + 2 * _____ = _____ centimeters

In 4 and 5:

- Use the code picture to predict what the area and perimeter of the rectangle will be. Use your predictions to fill in the blanks in the number sentences.
- Change the code on the Scratch project to match the picture.
- Run the code to check your predictions. Debug if you need to!

4.	Area = _____*_____ = _____ sq. cm Perimeter = 2 * ____ + 2 * ____ = _____ cm	5.	Area = _____*_____ = _____ sq. cm Perimeter = 2 * ____ + 2 * ____ = _____ cm
----	---	----	---

--	--	--	--

6. How could you change the code so the beetle draws a rectangle with an area of 10 square centimeters?

- Fill in the blanks in the code shown here:
- Change the code in the Scratch project to match.
- Run the code. Does the rectangle have an area of 10 square centimeters? If not, debug!
- Write a number sentence for the area of your rectangle.

- Write a number sentence for the perimeter of your rectangle.



7. How could you change the code so the beetle draws a rectangle with a perimeter of 24 centimeters?

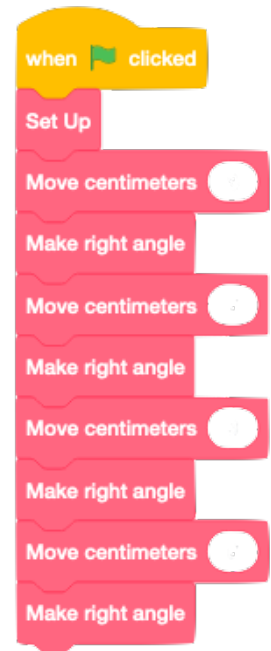
a. Fill in the blanks in the code shown here:

b. Change the code in the Scratch project to match.

c. Run the code. Does the rectangle have a perimeter of 24 centimeters? If not, debug!

d. Write a number sentence for the area.

e. Write a number sentence for the perimeter.





Grade 4 Area & Perimeter Exploration in Scratch, Student version

These formulas will be helpful as you work on this activity.

Area formula for a rectangle: $\text{Area} = \text{length} * \text{width}$

Perimeter formula for a rectangle: $\text{Perimeter} = 2 * \text{length} + 2 * \text{width}$

1. Open this Scratch project: <https://scratch.mit.edu/projects/391750018/>

2. Press the green flag and watch the beetle draw a rectangle.

a. What is the area of the rectangle you see? _____ sq. cm

b. Write a number sentence for the area: _____

c. What is the perimeter of the rectangle? _____ cm

d. Write a number sentence for the perimeter: _____

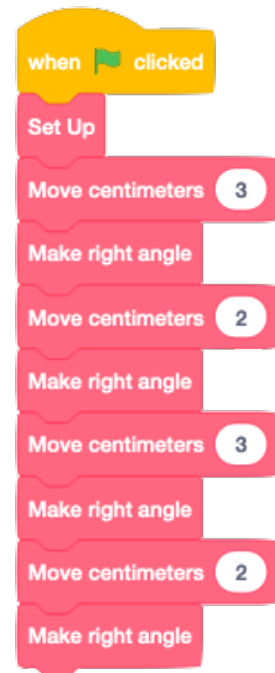
3. Click “See Inside.” Do you see any of the numbers from your number sentences in the code? Write what you notice.

4. Here is a picture of the code.

Draw an arrow next to each place you see the length of the rectangle.

Draw a star next to each place you see the width of the rectangle.

In 5 and 6:



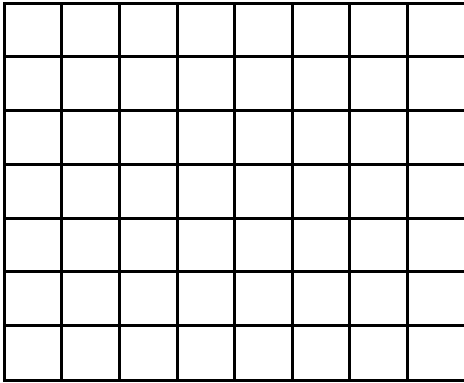


- Fill in the numbers in the code to match the length and width given.
- Change the code in the Scratch projects and run the code.
- Draw the rectangle the beetle draws on the grid.
- Fill in the number sentences for the area and perimeter.

```
when clicked
  Set Up
  Move centimeters [ ]
  Make right angle
  Move centimeters [ ]
  Make right angle
  Move centimeters [ ]
  Make right angle
  Move centimeters [ ]
  Make right angle
```

```
when clicked
  Set Up
  Move centimeters [ ]
  Make right angle
  Move centimeters [ ]
  Make right angle
  Move centimeters [ ]
  Make right angle
  Move centimeters [ ]
  Make right angle
```

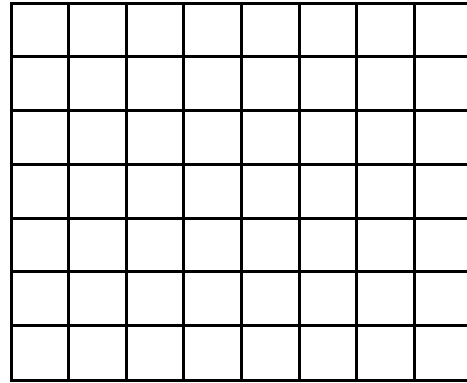
<p>5. Length: 6</p> <p>Width: 5</p> <div style="border: 1px solid black; width: 100%; height: 100%; margin-top: 20px;"></div> <div style="border: 1px solid black; width: 100%; height: 100%; margin-top: 20px; display: flex; justify-content: space-around;"><div style="border: 1px solid black; width: 20px; height: 20px;"></div><div style="border: 1px solid black; width: 20px; height: 20px;"></div><div style="border: 1px solid black; width: 20px; height: 20px;"></div><div style="border: 1px solid black; width: 20px; height: 20px;"></div><div style="border: 1px solid black; width: 20px; height: 20px;"></div><div style="border: 1px solid black; width: 20px; height: 20px;"></div><div style="border: 1px solid black; width: 20px; height: 20px;"></div><div style="border: 1px solid black; width: 20px; height: 20px;"></div></div>	<p>6. Length: 4</p> <p>Width: 7</p> <div style="border: 1px solid black; width: 100%; height: 100%; margin-top: 20px;"></div> <div style="border: 1px solid black; width: 100%; height: 100%; margin-top: 20px; display: flex; justify-content: space-around;"><div style="border: 1px solid black; width: 20px; height: 20px;"></div><div style="border: 1px solid black; width: 20px; height: 20px;"></div><div style="border: 1px solid black; width: 20px; height: 20px;"></div><div style="border: 1px solid black; width: 20px; height: 20px;"></div><div style="border: 1px solid black; width: 20px; height: 20px;"></div><div style="border: 1px solid black; width: 20px; height: 20px;"></div><div style="border: 1px solid black; width: 20px; height: 20px;"></div><div style="border: 1px solid black; width: 20px; height: 20px;"></div></div>
---	---



Area = $\underline{\quad}$ * $\underline{\quad}$ = $\underline{\quad}$ sq. cm

Perimeter =

$2 * \underline{\quad} + 2 * \underline{\quad} = \underline{\quad}$ cm



Area = $\underline{\quad}$ * $\underline{\quad}$ = $\underline{\quad}$ sq. cm

Perimeter =

$2 * \underline{\quad} + 2 * \underline{\quad} = \underline{\quad}$ cm



Grade 4 Equivalent Fraction Exploration with a virtual manipulative - Teacher Version

Mathematics topic: Generating and representing equivalent fractions 4.NF.1

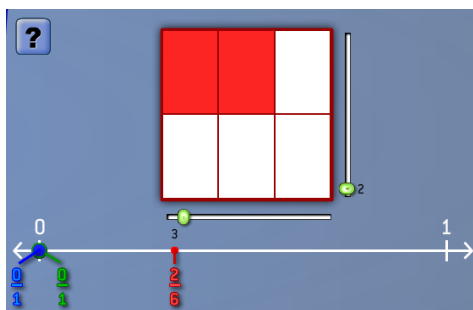
Mathematics standard: 4. NF.1

Focus CT idea: Patterns

Technology tool: NCTM Illuminations Equivalent Fractions virtual manipulative, <https://www.nctm.org/Classroom-Resources/Illuminations/Interactives/Equivalent-Fractions/>

Activity Directions:

1. Open the Equivalent Fractions applet at this URL: <https://www.nctm.org/Classroom-Resources/Illuminations/Interactives/Equivalent-Fractions/>
2. Choose "Build Your Own." Then share your screen.
3. Tell students you are going to use the red square to show a fraction. Move the sliders and click some of the sections in the square to represent a fraction without saying aloud the name of the fraction. You can choose a fraction appropriate for the experiences of students in your classroom. These activity directions will use $\frac{2}{6}$ as the fraction, as shown below.



4. Ask students to tell you what fraction is shown in the red square and how they can tell. (Sample answer: The red square shows $\frac{2}{6}$ because there are six parts in the square and two are shaded.)
5. Ask: Where else do you see $\frac{2}{6}$? (The red fraction on the number line is $\frac{2}{6}$.)
6. Tell students you will make some changes in the red square and they should watch what happens to the red fraction on the number line. Fill in more of the parts in the area model. Then remove some shading in the area model (by clicking a red section again).
Ask:




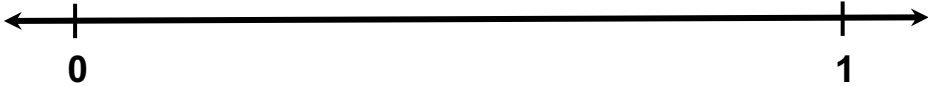

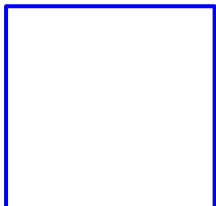




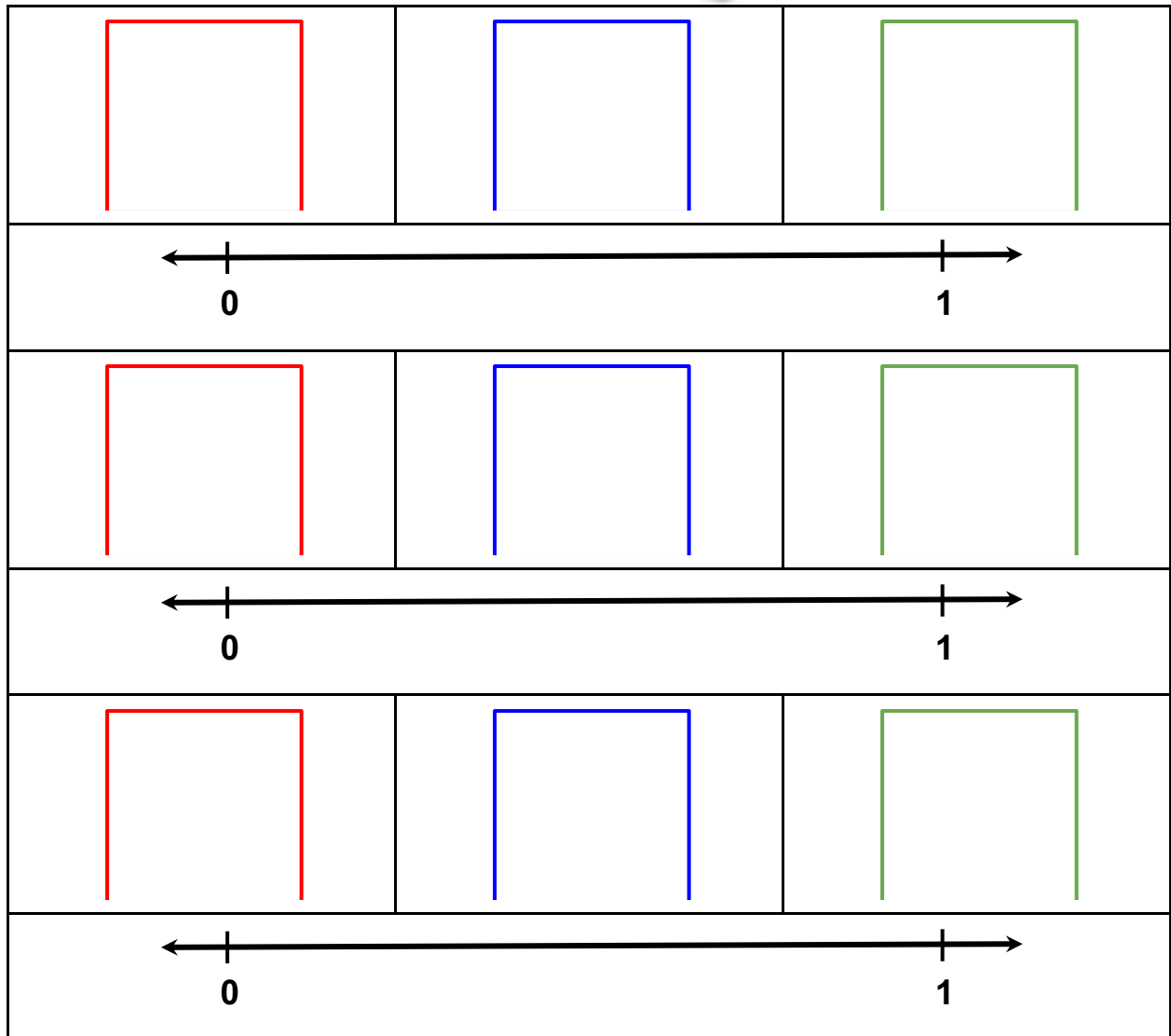
- a. What did you notice? (Sample answers: The numerator changed. The red dot moved toward the 1 when you added shading. The red dot moved toward the 0 when you took away shading.)
 - b. How do you think we could get the denominator of the red fraction to change? (The denominator is the number of parts, so we could change how many parts there are in the red square.)
7. Draw students' attention to the blue and green fractions on the number line. Ask for ideas about how you might be able to get those to change. (Change the parts and shading in the blue and green squares.)
8. Move the sliders on the blue square so that it is divided into 12 parts. Shade in two parts. Ask:
 - a. What fraction does the blue square show? ($2/12$)
 - b. Is that greater than or less than $2/6$? How can you tell? Encourage students to think about how you can tell from the area models *and* how you can tell from the number line. (Less than because a smaller part of the blue square is shaded. Less than because the blue dot is closer to 0 on the number line than the red dot.)
 - c. Shade in two more parts to show $4/12$. Ask: What fraction does the blue square show now? ($4/12$) Is $4/12$ greater than or less than $2/6$? How can you tell? (They are equal because the number line dots are at the same spot and the same amount of color is in each square.)
9. Press the check mark button. Point out that the green check mark on the blue square means that the fraction shown in the blue square is equivalent to the fraction shown in the red square. There is a red X on the green square because it doesn't show a fraction equivalent to the other two fractions yet. Ask for suggestions from students about how they could find another equivalent fraction. Sample strategies:
 - a. Divide the green square into two pieces horizontally. Then make the pieces in each half skinnier and skinnier until you find a number where you can shade the same amount as the red and blue squares.
 - b. Look for patterns in the numerator and denominators of the two fractions that are already equivalent. See if you can use the patterns to guess another equivalent fraction, then use the area model and number line to check your prediction.
10. As a class, show another equivalent fraction in the green square. Click the check mark to check your work. Point out how when students find three equivalent fractions, they will show up in the table.
11. Introduce the [student pages](#). Have students use the fraction tool to complete the pages.



Equivalent Fractions Exploration Student Pages

1. Open this fraction tool: <https://www.nctm.org/Classroom-Resources/Illuminations/Interactives/Equivalent-Fractions/>
2. Click the dot next to "Build Your Own."
3. For each row:
 - a. Change the red square to show any fraction you choose.
 - b. Use the blue and green squares to show fractions equal to the fraction shown in the red square. Use the check mark button check your work.
 - c. When you have found three equal fractions, divide and shade the red, blue, and green squares here to show what you did.
 - d. Show the three fractions on the number line.



4. What patterns do you notice in the table of fractions on your screen?

5. **Challenge:** Click the dot next to “Automatic.” Find fractions equal to the fraction shown in the red square. Record your work on a separate sheet of paper.



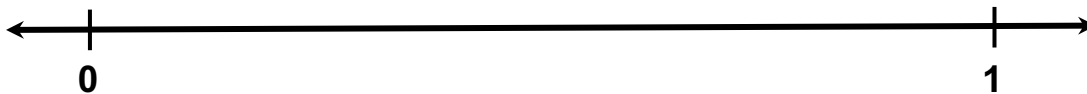
Grade 4 Equivalent Fraction Exploration with a virtual manipulative - student version

1. Open this fraction tool: <https://www.nctm.org/Classroom-Resources/Illuminations/Interactives/Equivalent-Fractions/>

2. Click the dot next to “Build Your Own.”

3. Use the slider below the red square to divide the red square into two parts. Click one of the parts to shade it red. What fraction does the red square show now? _____

4. What happened to the red fraction on the number line? Draw it below.



5. Move the sliders by the blue square so that it has 4 parts. Shade in two of the parts. What fraction does the blue square show? _____

6. Add the blue fraction to the number line under question 4.

7. What do you notice about the red and blue dots on the number line?

8. When two fractions are equal, they are shown at the same point on the number line and by shading in the same amount of a square.

a. Make changes to the green square so it shows a fraction equal to $\frac{1}{2}$ and $\frac{2}{4}$. Show how you divided and shaded your square.



b. Add the fraction to the number line under question 4.

9. Press the check mark button. If you found three equal fractions, they will show up in the table. If you did not, make changes and try again.

10. For each row:

- Change the red square to look like what is shown.
- Use the blue and green squares to show fractions equal to the fraction shown in the red square. Divide and shade the blue and green squares here to show what you did.
- Show the three fractions on the number line.



11. What patterns do you notice in the table of fractions on your screen?
