

Lesson 5-3A

Action Fractions
Math+CT

Adding Fractions: Same Denominators

Math Connections: Students find different combinations of fractions (with same denominator) that add up to the same total.

CS Connections: Students use variables to store denominator values.

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Computational Thinking

- **VARIABLES:** It can be helpful to use variables within programs.
- **VARIABLES:** Variables are often created by programmers to suit their needs within programs.
- **VARIABLES:** Variables hold one value at a time that is updated in a variety of ways.

1 Warm Up 5–10 min

Materials

Finding Different Sums for the Same Total

Students find different sets of unit fractions with the same sum.

4.NF.3, 4.NF.3a, 4.NF.3b, 4.NF.3d

“I Can ...” Statements

Students read the explicit math and CS goals.

2 Focus 35–40 min

Adding Fractions: Same Denominators TIPP&SEE

Students explore using a variable in multiple lines of code.

Adding Fractions: Same Denominators

TIPP&SEE journal pages; Adding Fractions: Same Denominators project

4.NF.3, 4.NF.3a, 4.NF.3b, 4.NF.3d

Finding Fraction Sums

Students use their projects to illustrate fraction sums.

Fraction Sums journal pages; Adding

Fractions: Same Denominators project

4.NF.3, 4.NF.3a, 4.NF.3b, 4.NF.3d

“I Can ...” statements

- *I can use variables to represent denominator values.*
- *I can reuse variables to complete my program.*
- *I can decompose fractions into a sum of unit fractions.*
- *I can add fractions with the same denominator.*
- *I can create different fraction combinations with the same total.*
- *I can add fractions using a number line.*
- *I can assign or set a value to a variable.*

Anticipated Barriers

- Shifting from whole-number addition to fraction addition may be challenging for some students.
- Some students may struggle with the directions given in the Scratch project.

Student Options

Consider these options for adapting the lesson to your students’ preferences:

- Students may want to model the problems with physical fraction circle pieces or on a number line.

1

Warm Up

10–15 min

“I Can ...” statements

- I can use variables to represent denominator values.
- I can reuse variables to complete my program.
- I can decompose a fraction into a sum of unit fractions.
- I can add fractions with the same denominator.
- I can create different fraction combinations with the same total.
- I can add fractions using a number line.
- I can assign or set a value to a variable.

► Finding Different Sums for the Same Total

Ask students to solve the following problem individually or with a partner: A sandwich is cut into 8 equal pieces. Ann, Jamie, and Keshawn each take pieces of the sandwich. Together, they take $\frac{6}{8}$ of the sandwich. What fraction of the sandwich might each of the students take?

When students have had some time to work, start a class discussion about the problem. Ask: *What is the whole in this number story?* 8 pieces, or $\frac{8}{8}$ sandwich, or 1 whole sandwich. Then ask for volunteers to share their answers. Sample answers: Ann took $\frac{1}{8}$, Jamie took $\frac{2}{8}$, and Keshawn took $\frac{3}{8}$; Ann took $\frac{4}{8}$, Jamie took $\frac{1}{8}$, and Keshawn took $\frac{1}{8}$. As each solution is shared, have students help you write a number sentence to represent the solution. Sample number sentences: $\frac{1}{8} + \frac{2}{8} + \frac{3}{8} = \frac{6}{8}$; $\frac{4}{8} + \frac{1}{8} + \frac{1}{8} = \frac{6}{8}$.

Remind students of the meanings of numerator and denominator. Ask: *In the number sentences we wrote to represent your solutions, what does the numerator of each fraction represent?* The number of equal pieces of the sandwich each student took. *What does the denominator represent?* The number of equal pieces the whole sandwich was cut into.

Tell students that today they will use variables in a Scratch program. Remind them that variables in computer science are values that can be used in a program in multiple places. Ask: *Looking at our number sentences, what value is used multiple times?* 8, the denominator. *Do you think we could use a variable to represent the denominator in a Scratch program?* yes. *What should the variable be named?* Sample answer: denominator

Remind students that when they played Robot Boxes, they learned that variables hold values in a computer program. The values that they hold are assigned to them by the computer running the program or are entered into the program by a user. Variables can hold only one value at a time.

► I Can ...

Display the “I Can ...” statements and remind students that these statements express the goals for today’s lesson and can give them clues about what to expect. Carefully read each statement and ask them to use their thumbs to show how true they feel each statement is for them right now.

TIPP&SEE, p. 1

TIPP&SEE Adding Fractions with Same Denominators

Objective: I can use variables in multiple lines of code.

Scratch Link: Adding Fractions with Same Denominators (<https://scratch.mit.edu/projects/210099188/>)

Start with TIPP&SEE! Get a TIPP from the Project Page.

Read carefully: Title Instructions Purpose

Play the project and write down the action(s) that happened for each event below.

① When I clicked : Answers vary. Possible answers: number line appeared, fraction circles appeared (7/8), duck appeared, duck jumped/flew, puddle appeared, fractions appeared.

② When I clicked on : nothing happened

③ When I clicked on : puddle moved slightly and said “Click and drag me along the number line!”

④ How many times did the duck jump? 2 times

⑤ Write a fraction number sentence to represent the duck’s jumps. $\frac{5}{8} + \frac{2}{8} = \frac{7}{8}$

SEE Inside. Make changes, play, and observe closely to understand the code.

⑥ Explore: Click on the Fraction Circle Sprite, and look closely at the code. Circle your answers.

a. This block tells the duck how far to fly:

Denominator

b. This block draws the tick marks on the number line:

Denominator

c. These blocks have a place to enter the fraction’s denominator. (You can circle more than one.)

Denominator

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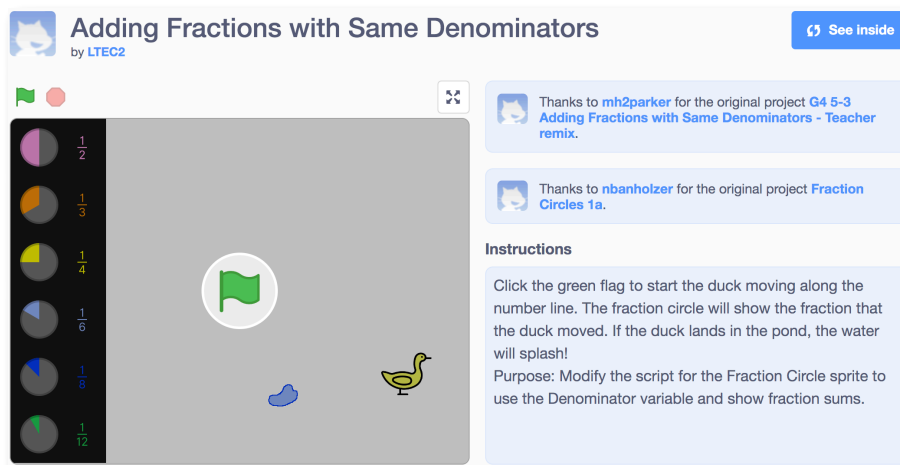
2 Focus

35–40 min

► Adding Fractions: Same Denominators TIPP&SEE

WHOLE CLASS SMALL GROUP PARTNER INDEPENDENT

Have students open today's Scratch project: Adding Fractions: Same Denominators. (<https://scratch.mit.edu/projects/210099188/>) Distribute the TIPP&SEE journal pages and have students complete them alone or with a partner.



When students are finished, lead a discussion about how students used the Denominator variable in the project. Display the Scratch project and ask a student pair to walk you through what they did to start using the variable. Ask:

- What was helpful about using the Denominator variable? **Sample answer:** I could use it in all the places the denominator goes so now I don't have to worry about changing all of them.
- What number is the computer using as the denominator right now? **Answers vary.**
- How do think you could you tell the computer to use a different value for the denominator? **Answers vary.**

If no one mentions it, point out the **set Denominator** block.

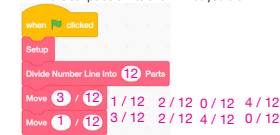
- What do you think this block does? **Sample answer:** Put a number into the Denominator variable so that the computer can use it.
- How did you know to add this block to your script? **Sample answer:** When we tried to use the Denominator variable blocks, there was an error message asking about the value.
- Should this block go before the blocks where the Denominator variable is used, or after those blocks? Why? **We should put it before those other blocks so the computer knows what value to use before it comes to one of the places the variable is used.**

Model adding the “set Denominator” block to the script after the “Setup” block. Explain that whenever students use variables, it will be important

TIPP&SEE, p. 2

TIPP&SEE Adding Fractions with Same Denominators (con't)

- ⑦ Change the starting script so that the duck flies to the fraction $\frac{4}{12}$. Fill in the script below to show what you did. **Answers vary.**



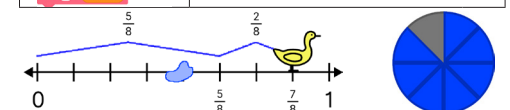
- ⑧ In how many blocks did you have to change the denominator? **3**
- ⑨ Circle one: This is the block I can use to represent the denominator in more than one place.
- a. **Divide Number Line into 12 Parts** **Denominator** **Setup**
- b. Drag a Denominator variable block into each place the denominator is used in the script. Play the script. What happens? **a message appeared saying "Wait! You need to set the Denominator variable!"**
- ⑩ Fix your script by adding a block to set the value of the variable. When your script is working, draw it below. **Answers vary.**
- when clicked**
Setup
Set Denominator to 12
Divide Number Line into "Denominator" Parts
Move _ / "Denominator"
Move _ / "Denominator"
- ⑪ **Think:** How could you change the script now to use a different denominator? Talk about it with a partner. **Change the value in the "Set Denominator to _" block.**

Fraction Sums, p. 1

Fraction Sums

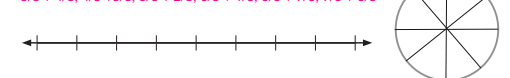
Use the Scratch project to find fractions with the same denominator that add up to each sum. Be sure to help the duck avoid the pond! Fill in the blanks in each script and each number sentence to show what you did. Then draw the duck movement and the fraction circle pieces.

| Code | Fraction A | + | Fraction B | = | Sum |
|------------------------------------------------------|---------------|---|---------------|---|---------------|
| E.g. Find two fractions whose sum is $\frac{7}{8}$. | | | | | |
| | $\frac{5}{8}$ | + | $\frac{2}{8}$ | = | $\frac{7}{8}$ |



| | | | | | |
|-------------------------------------------------------------|---------------|---|---------------|---|---------------|
| ① Find two different fractions whose sum is $\frac{7}{8}$. | | | | | |
| | $\frac{1}{8}$ | + | $\frac{6}{8}$ | = | $\frac{7}{8}$ |

Answers vary. Possible Answers: $\frac{1}{8} + \frac{6}{8}$, $\frac{2}{8} + \frac{5}{8}$, $\frac{3}{8} + \frac{4}{8}$, $\frac{4}{8} + \frac{3}{8}$, $\frac{5}{8} + \frac{2}{8}$, $\frac{6}{8} + \frac{1}{8}$, $\frac{0}{8} + \frac{7}{8}$, $\frac{7}{8} + \frac{0}{8}$



Fraction Sums, p. 4

Fraction Sums (con't)

Fill in the blanks in each script and each number sentence.
Then draw the duck movement and the fraction circle pieces.

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Scratch ID _____ DATE _____ TIME _____

| Code | Fraction A | + | Fraction B | + | Fraction B | = | Sum |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---|---------------|---|---------------|---|---------------|
| <p>⑥ Find three fractions whose sum is $\frac{3}{4}$.</p> <div style="border: 1px solid black; padding: 5px; margin: 5px;"> <p>1/4 + 1/4 + 1/4</p> <p>(0/4 + 0/4 + 3/4, 0/4 + 3/4 + 0/4, 0/4 + 2/4 + 1/4, 0/4 + 1/4 + 2/4, 1/4 + 2/4 + 0/4, 1/4 + 0/4 + 2/4, 2/4 + 0/4 + 1/4, 2/4 + 1/4 + 0/4, 3/4 + 0/4 + 0/4)</p> </div> | $\frac{1}{4}$ | + | $\frac{1}{4}$ | + | $\frac{1}{4}$ | = | $\frac{3}{4}$ |
| <p>⑦ Create your own number sentence using three fractions whose sum is less than 1.</p> <div style="border: 1px solid black; padding: 5px; margin: 5px;"> <p>_____ + _____ + _____ = _____</p> </div> <p>Answers vary.</p> | | + | | + | | = | |

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for them to include this block to tell the computer what value to use for a variable. In Scratch this block is called a “set variable” block and we say that we **assign** a value to the variable. As needed, remind students that a variable holds one value at a time.

Have volunteers suggest fraction addition problems or number sentences to represent and ask students how they might change the code to show these fraction sums in the Scratch project. Model one or two of the suggestions for the class, then tell students they will get the chance to practice using their Scratch projects to show more fraction sums.

Finding Fraction Sums

WHOLE CLASS SMALL GROUP **PARTNER** INDEPENDENT

Distribute the *Fraction Sums* journal pages and circulate and assist as students complete the pages. As needed, remind students of how they found multiple ways for three students to share $\frac{6}{8}$ of a sandwich earlier in the lesson. Explain that for an extra challenge, students could try to drag the pond to different locations and find fraction sums that the duck can model without splashing in the pond.

Wrap Up

WHOLE CLASS **SMALL GROUP** PARTNER INDEPENDENT

When students have had sufficient time to work, bring them together for a whole class discussion about today’s work.

Suggested Questions:

- How did you use variables in your program? **Answers vary.**
- What were some things that were difficult or confusing? **Answers vary.**
- Can you think of any other ways you could use a variable like ‘Denominator’? **Answers vary.**
- Why might it be helpful to use a variable in a program? **Answers vary.**
- Why is it important to include a “set variable” block in your program? **Answers vary.**

Now “I Can ...” Review today’s “I Can ...” statements and ask students to use their thumbs to show their opinion of each statement.

“I Can ...” statements

- I can use variables to represent denominator values.
- I can reuse variables to complete my program.
- I can decompose a fraction into a sum of unit fractions.
- I can add fractions with the same denominator.
- I can create different fraction combinations with the same total.
- I can add fractions using a number line.
- I can assign or set a value to a variable.