

Lesson 5-1A

Action Fractions
Math+CT

Fraction Circles 2

Math Connections: Children represent fractions using different-sized wholes.

CS Connections: Children explore the idea that changing the argument in a block or the number of blocks used in a script can change the outcome, and that there are multiple scripts that produce the same outcome. Depending on the desired goal and strategy, different instructions will be needed.

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► Before You Begin

Gather enough complete sets of fraction circle pieces for children to have at least one set per group or table.

Computational Thinking

- **SEQUENCE:** Different sets of instructions can produce the same outcome.
- **SEQUENCE:** Programs are made by assembling instructions from a limited set.

1

Warm Up 10–15 min

Materials

Fraction Circles 1

Children review the previous fraction circles project.

Fraction Circles 1 project

“I Can ...” Statements

Children read the explicit Math and CS goals.

Different Wholes

Children use different fraction circle pieces to represent the whole.

fraction circle pieces; *Student Reference Book* pp. 135–136

2

Focus 35–40 min

Fraction Circles 2 TIPP&SEE

Children explore the project and figure out how each block works.

Fraction Circles 2 project; *Fraction Circles 2 TIPP&SEE* journal pages

Fractions of Different Wholes

Children write, draw, and build scripts to represent fractions in words, fraction circle pictures, and fraction number sentences.

Fraction Circles 2 journal page; *Fraction Circles 2* project; fraction circle pieces (optional)

“I Can ...” statements

- *I can name the fractional part of a given whole.*
- *I can rename parts when I change the whole.*
- *I can use different combinations of blocks to create a program with the same output.*
- *I can generate the same fraction by changing the piece or changing the whole.*

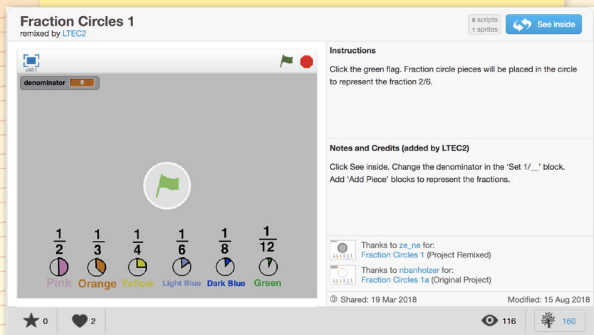
Anticipated Barriers

- Blocks with text (say blocks) may need to be made visible for much longer times for struggling readers.
- The change inherent in the last question on the *TIPP&SEE* pages may be difficult for children who are struggling with either the math or the coding. Some visual examples and more modeling may be helpful.

Student Options

- Consider these options for adapting the lesson to your students’ preferences:
- Provide children with the physical manipulatives alongside the Scratch virtual manipulatives.

SS: Fraction Circles 1



1 Warm Up 10–15 min

► Fraction Circles 1

Open the Fraction Circles 1 project (<https://scratch.mit.edu/projects/211001031>) and remind students that they recently worked with this program. Run the project. Ask: *What is the whole?* **The grey circle.** *What fraction of the whole is each piece we added?* **1/6** *What fraction is shown when the script is done running?* **2/6**

Have children observe as you change the Set 1/[x] block to 1/4 and re-run the program. Ask: *What changed?* **The size and color of the pieces** *Did we change the whole?* **No, it's still the grey circle.** *Did we change the fraction we showed?* **Yes.** *What is the fraction now?* **2/4** As needed, show additional examples, changing the value in the Set 1/[x] block and the number of Add Piece blocks. Each time, ask students to identify the value of each piece and the fraction that is shown at the end of the script.

► I Can ...

Display the “I Can ...” statements and remind children 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.

► Different Wholes

Student Reference Book, pp. 135–136

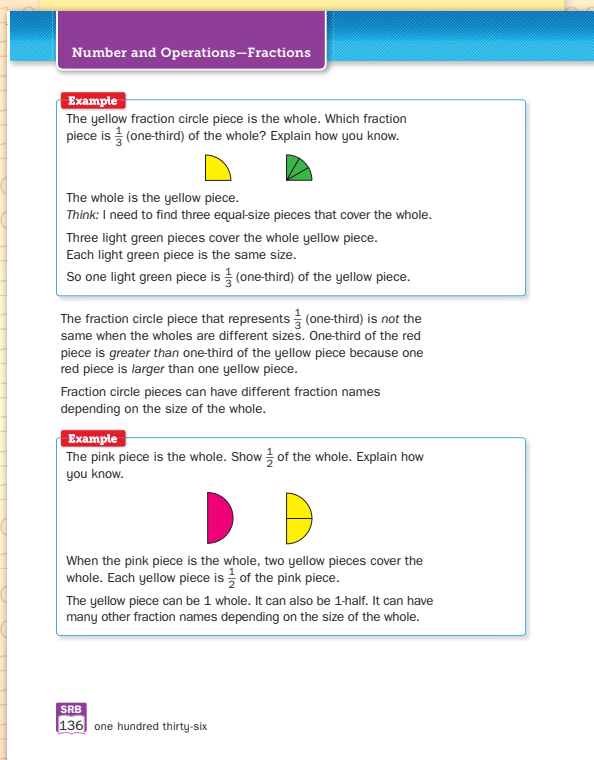
Distribute physical fraction circle pieces to children and display *Student Reference Book*, page 135. Read the page as a class. Be sure to stress that the fraction name for any piece depends on which piece is the whole. Note that in the previous Scratch project, the whole remained the same—it was a circle, as in the example on page 135.

Now carefully go through the examples on *Student Reference Book*, page 136 using physical fraction circle pieces. Here, the fraction that the smaller piece represents changes depending on which piece is identified at the whole. Tell children that today they will be looking at a new Scratch project which allows them to use different pieces as the whole.

“I Can ...” statements

- I can name the fractional part of a given whole.
- I can rename parts when I change the whole.
- I can use different combinations of blocks to create a program with the same output.
- I can generate the same fraction by changing the piece or changing the whole.

Student Reference Book p. 136



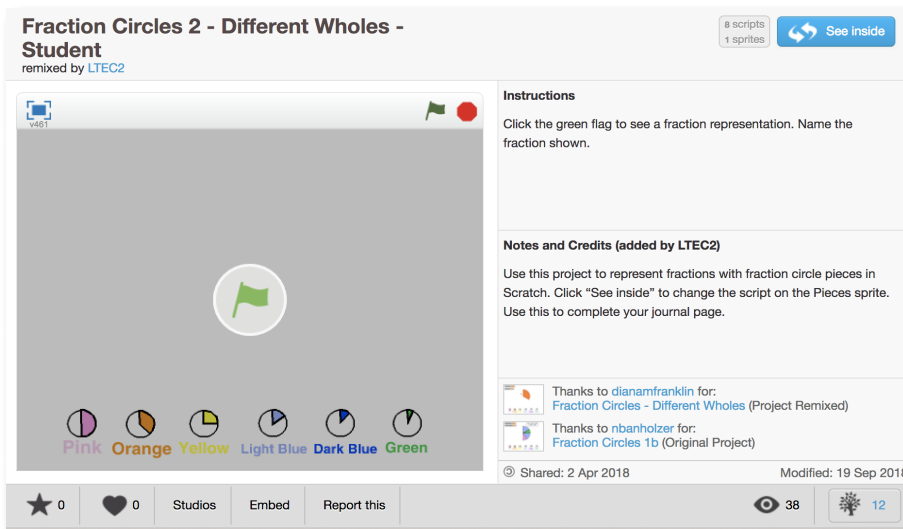
2 Focus

35-40 min

► Fraction Circles 2 TIPP&SEE

WHOLE CLASS | SMALL GROUP | PARTNER | INDEPENDENT

Hand out the *Fraction Circles 2* TIPP&SEE journal pages. Have children go to their computers and open the Fraction Circle 2 - Different Wholes - Student project. (<https://scratch.mit.edu/projects/213717863/>)



Children should work in partnerships to complete the pages. When they have finished, revisit their partner discussions as a class. Ask:

- Why did the Set 1/[4] block make the dark blue piece appear when the pink piece was the whole? **Sample answer:** It takes 4 four dark blue pieces to cover the pink piece, so the dark blue piece is $\frac{1}{4}$ of the pink piece.
- Did the Set 1/[4] block still make the dark blue piece appear when you changed the whole to be the orange piece? Why or why not? **No.** **Sample explanation:** It wouldn't make sense for it to show the same piece if the whole changed. The dark blue piece is $\frac{1}{4}$ of the pink piece, but it isn't $\frac{1}{4}$ of the orange piece. The green piece is $\frac{1}{4}$ of the orange piece, so that is what showed up.
- Did anything different happen when you changed the Set 1/[4] block to Set piece [green]? Why or why not? **No.** When the orange piece is the whole, the green piece is $\frac{1}{4}$, so the two blocks do the same thing.

Point out that, even with a very limited number of instructions, children can create the same output using two different scripts. Tell children that they will have more practice showing fractions of different wholes using scripts like these.

Fraction Circles 2 TIPP&SEE, p. 1

NAME: _____

Lesson 5-1A

SCRATCH ID: _____ DATE: _____ TIME: _____




TIPP&SEE


Fraction Circles 2




Objective: I can closely observe a Scratch program and find the scripts that caused the actions.
Scratch Link: Fraction Circles 2 (<https://scratch.mit.edu/projects/213717863/>)

Read carefully: **TIPP** (Title) **SEE** (Instructions) **SEE** (Purpose)

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

- When I clicked , this fraction circle piece was placed first:
 
- Then this fraction circle piece was placed on top of it:
 
- When the first fraction circle piece is the whole, the name of the second fraction circle piece is this unit fraction:
 $\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{6}$ $\frac{1}{8}$ $\frac{1}{12}$

SEE Inside.
 First click on the **Sprite Pieces**, then find the **Event**  **Explore:** Circle the answer.

- This block chooses the whole:
 
- This block chooses the part:
 
- This block makes the second fraction circle piece appear:
 

Fraction Circles 2 TIPP&SEE, p. 2

NAME: _____




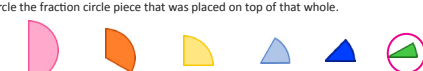
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SCRATCH ID: _____ DATE: _____ TIME: _____

TIPP&SEE

Fraction Circles 2 (con't)

Explore: Make these changes to the script. Click the green flag to see what happens.

- Change Set 1/[3] to Set 1/[4]. Run and watch.
 - Circle the fraction circle piece that is the whole.
 
 - Circle the fraction circle piece that was placed on top of that whole.
 
 - Talk with a partner about why the Set 1/[4] block placed the piece you circled in part b. **Four dark blue pieces can fit on the pink "whole" piece (dark blue piece is $\frac{1}{4}$ of pink).**
- Change Set whole: pink to Set whole: orange. (Do not change Set 1/[4])
 - Circle the fraction circle piece that is the whole.
 
 - Circle the fraction circle piece that was placed on top of that whole.
 
 - Did the whole change? Talk to a partner about why or why not. **Yes, because we changed the set whole block to the orange piece.**
 - Did the piece on top of the whole change? Talk to a partner about why or why not. **Yes, because four green pieces fit on orange piece (green piece is $\frac{1}{4}$ of an orange piece)**
- Change Set 1/[4] to Set piece: green.
 - Did the whole change? YES NO
 - Did the piece on top of the whole change? YES NO

Fraction Circles 2, p. 1

Fraction Circles 2

Lesson 5-1A

Use fraction circle pieces and Scratch to help you complete each row in the table. For problem 6, use as many Add Piece blocks as you need to solve it.

Whole Color	Piece Color	Script	Picture	Fraction of Whole
Pink	Dark Blue			$\frac{1}{4}$ one-fourth
Yellow	Dark Blue			$\frac{1}{2}$ one-half
Pink	Light Blue			$\frac{1}{3}$ one-third
Orange	Light Blue			$\frac{1}{2}$ one-half

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Fractions of Different Wholes

WHOLE CLASS | SMALL GROUP | PARTNER | INDEPENDENT

Distribute and display the *Fraction Circles 2* journal pages. Read the directions as a class. Draw attention to the example in the first row and tell children that you will work together use the Scratch project to complete the row.

Open the student Scratch project, click on the Pieces sprite. Ask: *How can we change the script in the project so that it matches the script shown in the first row?* Change the Set whole block to say pink. Change the Set piece block so it says dark blue. Make the changes and run the script. Ask: *Does the picture on the stage look like the picture in the first row?* Yes.

Draw children’s attention to the last column on the journal page. Ask:

- How many dark blue pieces would cover a red circle? 8
- What is the name of the dark blue piece when the whole is a full circle (like in the first project)? The dark blue piece is 1/8 when the full circle is the whole.
- Does the dark blue piece show 1/8 now? No. What fraction does the dark blue piece represent in this example? Why? It’s 1/4 now because our whole isn’t a full circle. The dark blue piece is 1/4 of the pink piece, and the pink piece is the whole for this example.

Write 1/4 in the last column of the example row. Point out to children that to fill in the last column of the table, they have to figure out what fraction of the whole the smaller piece represents. Ask: *How could we use the Set 1/[x] block to check whether we wrote the right fraction in the last column?* Change the Set piece block to a Set 1/[x] block and fill in the denominator of the fraction. Check to see if the picture changes when you run the script. Tell children that they should first use the Add piece block to help them complete the page, but they can use the Set 1/[x] block to check their answers and make changes if needed.

Have children use the Scratch project to complete their journal page. Have children work independently, in partners, or in small groups to solve each problem. When they reach problem 6, remind them that they can use more than one Add Piece block, as they did in the Fraction Circles 1 project, to help them solve it.

Wrap Up

WHOLE CLASS | SMALL GROUP | PARTNER | INDEPENDENT

When children have had sufficient time to finish their journal pages, bring them together to reflect on the different ways they used the blocks in the program to create an output. Also ask children to reflect on what they noticed about the fraction pieces when the whole got bigger or smaller. **Sample answers:** The same piece is a larger fraction of the whole when the whole gets smaller. A dark blue piece is only 1/4 of a pink whole, but it’s 1/2 of a yellow whole.

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

“I Can ...” statements

- I can name the fractional part of a given whole.
- I can rename parts when I change the whole.
- I can use different combinations of blocks to create a program with the same output.
- I can generate the same fraction by changing the piece or changing the whole.