

Lesson 5-7B

Action Fractions
Math+CT

Getting Mack Home

Math Connections: Students solve a number story that involves subtracting fractions less than one with same denominator.

CS Connections: Students think about when and why you might use countable repetition (a set number of times) or conditional repetition (until a condition is met).

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Computational Thinking

- **REPETITION:** Understand when and why to use countable, infinite, and conditional repetition.
- **REPETITION:** Different kinds of repetition have different commands.

1 Warm Up 5–10 min

Materials

Counting Repeated Steps

Students review the connection between subtraction strategies and repeating steps.

“I Can ...” Statements

Students read the explicit math and CS goals.

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

2 Focus 35–40 min

Getting Mack Home TIPP&SEE

Students explore how to use countable repetition in the *Getting Mack Home* project.

Getting Mack Home TIPP&SEE journal pages; *Getting Mack Home* project

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

The Puddle Shuffle

Students explore how to use conditional repetition in the *Getting Mack Home* project.

Shuffle Puddle journal pages; *Getting Mack Home* project

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

“I Can ...” statements

- *I can explain how countable repetition works in a program.*
- *I can explain how conditional repetition works in a program.*
- *I can use countable repetition (a Repeat block) when I know the distance to the intended location.*
- *I can use conditional repetition (a Repeat Until block) to make the program work for different situations.*

Anticipated Barriers

- Some students may have difficulty distinguishing between countable and conditional repetition.

Student Options

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

- Students may need to review the definitions of countable and conditional repetition from Lesson 5-7A.
- Students may want to act out Mack’s script.

1 Warm Up 10–15 min

"I Can ..." statements

- I can explain how countable repetition works in a program.
- I can explain how conditional repetition works in a program.
- I can use countable repetition (a Repeat block) when I know the distance to the intended location.
- I can use conditional repetition (a Repeat Until block) to make the program work for different situations.

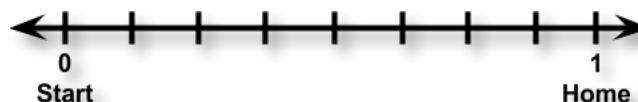
▶ Counting Repeated Steps

Ask students to solve the following problem individually or with a partner: *Mack the dog is 1 mile from home. After he walked $\frac{5}{8}$ of a mile, he stepped in a mud puddle. How much farther does he have to walk to get home and dry off? $\frac{3}{8}$ mile*

When most students have solved the problem, ask for volunteers to share their strategies. Sample strategies:

- **Modeling with fraction circle pieces:** I showed the 1 mile with eight dark blue eighth pieces. I took away five of the pieces because Mack already walked $\frac{5}{8}$ mile. There were three eighth pieces left, so I knew Mack had $\frac{3}{8}$ mile to go.
- **Mentally counting up:** I knew Mack had to get from $\frac{5}{8}$ mile to 1 mile, or $\frac{8}{8}$. I counted up by eighths, starting at 5-eighths: 6-eighths, 7-eighths, 8-eighths. It took three counts of 1-eighth to get to 1, so the answer is $\frac{3}{8}$.

Sketch a number line from 0 to 1 divided into eighths. Label 0, 1, "Start," and "Home," as shown below. As appropriate for your class, add labels at $\frac{4}{8}$ or other tick marks.



Ask: *What does the distance between each mark on this number line represent? $\frac{1}{8}$ How do you know? The space from 0 to 1 is in 8 equal pieces, so each piece is $\frac{1}{8}$. Where did Mack step in the mud puddle? $\frac{5}{8}$ mile from where he started Where on the number line should I draw Mack in the puddle? count up five $\frac{1}{8}$ marks from 0, or Start.*

Model counting up five $\frac{1}{8}$ marks up from 0, and draw a sketch of a dog in a puddle. Remind students that in the previous lesson, they thought about repeating steps in their subtraction strategies and how they knew when to stop repeating. Ask: *What step did I just repeat to find the place where Mack stepped in a puddle? Adding $\frac{1}{8}$, or moving forward $\frac{1}{8}$ on the number line. How many times did I repeat that step? 5 times.*

Tell students that today they will work in Scratch to create a program that shows Mack walking into a puddle and then walking home. Ask: *What Scratch block do you know that can help you make programs where the same step is repeated? The Repeat block Explain that students will use the Repeat block and also learn about a new kind of block.*

▶ 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

NAME _____

Lesson 5-7B

SEARCH ID _____ DATE _____ TIME _____

TIPP&SEE
Getting Mack Home

Objective: I can use the repeat block when I know the distance to the intended location.
Scratch Link: Getting Mack Home (<https://scratch.mit.edu/projects/210105463/>)

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

Read carefully:	Title	Instructions	Purpose
Play the project and circle or write down the action(s) that happened for each question below.			

① When I clicked , the number line was divided into:

halves thirds fourths fifths sixths sevenths **eighths** ninths tenths

② The puddle was located at:

$\frac{3}{8}$ $\frac{5}{6}$ **$\frac{5}{8}$** $\frac{1}{2}$ $\frac{3}{4}$

④ What did the dog Mack do? **Answers vary. Possible answer: He walked to $\frac{5}{8}$, stepped in a puddle, and said "Oh no, I stepped in a puddle! I'm five-eighths the way to my house. Can you write the code so I can go home?"**

⑤ How much further should Mack walk to get home?

$\frac{3}{8}$ $\frac{5}{6}$ $\frac{5}{8}$ $\frac{1}{2}$ $\frac{3}{4}$

⑥ Write a fraction number sentence for this problem. **$\frac{5}{8} + \frac{3}{8} = \frac{8}{8}$**

SEE Inside. First click on the Mack Sprite, then find the Event.

⑦ Explore: Circle your answers.

a. This block determines how many equal parts the line gets divided into:

b. This block makes Mack walk forward one tick mark:

c. This block determines how many tick marks Mack walks:

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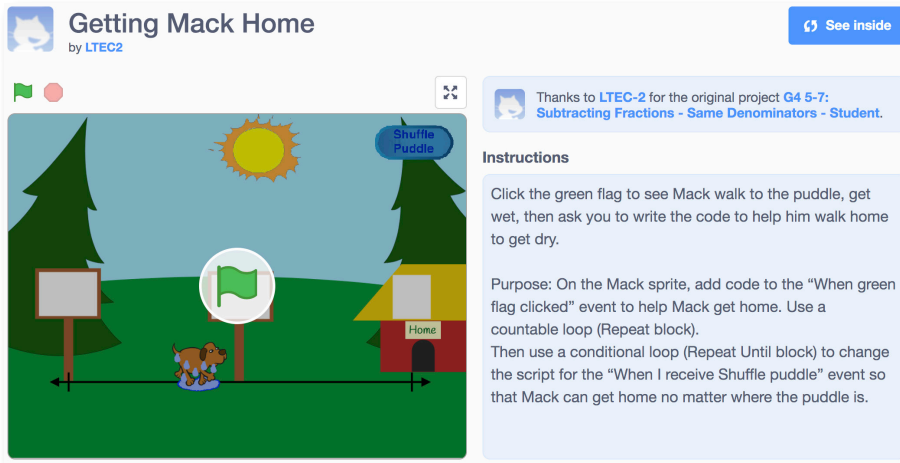
2 Focus

35–40 min

▶ Getting Mack Home TIPP&SEE

WHOLE CLASS SMALL GROUP PARTNER INDEPENDENT

Have students open today’s Scratch project: Getting Mack Home (<https://scratch.mit.edu/projects/210105463/>). Distribute the TIPP&SEE journal pages and have students complete them alone or with a partner. If students get stuck on questions 8 and 9, encourage them to look closely at the code that got Mack to the puddle and model the new section of code after that.



When students have completed the TIPP&SEE page, have students close their computers and come together for a discussion. Ask: *How did you use a Repeat block to help Mack walk home?* **Sample answer:** I put the block for walking $\frac{1}{8}$ mile inside the Repeat block, then put the number of times he had to walk $\frac{1}{8}$ mile to get home (3 times). Point out that because students solved the problem about how far Mack was from home before they started working in Scratch, they knew how many $\frac{1}{8}$ s he had to walk. Remind them that repeating a step when you know how many times to repeat is called **countable repetition**.

▶ The Puddle Shuffle

WHOLE CLASS SMALL GROUP PARTNER INDEPENDENT

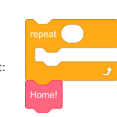
Reopen the Getting Mack Home project. (<https://scratch.mit.edu/projects/210105463/>) Press the Shuffle Puddle button and have students watch closely. Note that the project will put the puddle at a random tick mark between Mack and home. For example, the puddle may move to the $\frac{3}{8}$ mark. Ask: *What happened?* **Sample answer:** The puddle moved to $\frac{3}{8}$, then Mack walked to the puddle and stopped. *What blocks do you think the programmer used to make Mack walk and stop?* **Sample answer:** a Repeat block with the walk $\frac{1}{8}$ block in it and a 3 as the number of repeats. Acknowledge this as a possibility, but then press the Shuffle Puddle button again and tell students to watch carefully. Mack will walk to the puddle again, but the puddle will be at a different location, such as $\frac{6}{8}$. Ask: *What happened this time?* **Sample answer:** Mack walked to the puddle again. *Could a Repeat block with a 3 as the number of repeats have made that happen?* **No.**

TIPP&SEE, p. 2

NAME _____
Lesson 5-7B
SCRATCH ID _____ DATE _____ TIME _____

TIPP&SEE
Getting Mack Home (con't)

Explore: Help Mack get home!



⑧ Find these blocks and add them to the starting script:

⑨ Make changes to the script so that Mack walks home after stepping in the puddle. Think: **Go for a Walk 1/8 "Denominator"**

- What step (block) does Mack have to repeat a few more times to get home? **Where in my script should I put that block? After the last say block "I'm five-eighths..."**
- How many times does Mack have to repeat that step (block) to get home? **3**
Where in my script can I enter that number? In the white oval of the repeat block.

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Getting Mack Home, p. 1

NAME _____
Lesson 5-7B
SCRATCH ID _____ DATE _____ TIME _____

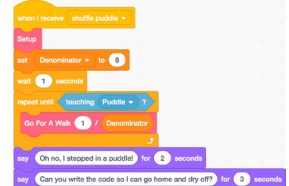
Shuffle Puddle

Objective: I can use the repeat until block.
Scratch Link: Getting Mack Home (<https://scratch.mit.edu/projects/210105463/>)

Press the Shuffle Puddle button and observe the project run again. (Do this at least twice.)

① How does the project run differently from when you pressed the green flag? **Mack now stops when he reaches the puddle. The puddle is in different places on the line each time. Before, Mack stopped at five-eighths every time.**

SEE Inside: Click on the Mack sprite, then find the **when I receive shuffle puddle** event. Look at the first part of this script. Then answer the questions below.





② Where does Mack stop walking? **at the puddle**

③ What causes Mack to stop walking? **touching the puddle**

Now think about how to help Mack walk the rest of the way home.

④ When do you want Mack to stop walking during the second part of his walk?
When he gets home.

⑤ Which block do you think you could use to tell Mack when to stop?


⑥ Which repeat block can you use with the block you circled in Problem 5?


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Getting Mack Home, p. 2

NAME _____

Lesson 5-7B

SCRATCH ID _____ DATE _____ TIME _____

Shuffle Puddle (con't)

② Add to the script to help Mack walk home.
Then press the button to test your script.

When your script is finished and working, remix, share, and draw your additions to the starting script below.

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Lead a discussion about the idea that whatever script is attached to this button is using the same block to make Mack walk to the puddle no matter where the puddle is. Ask: *What is different about each time Mack walks to the puddle?* **Sample answers: where the puddle is; how many $\frac{1}{8}$ miles Mack walks.** Reiterate that because the number of $\frac{1}{8}$ s walked changes, students can't use counted repetition to get Mack to the puddle every time. Ask: *What is the same about each time Mack walks?* **He always stops at the puddle.**

Remind students that when they talked about repetition in their subtraction strategies in the previous lesson, they noticed that sometimes they didn't know in advance how many steps they would have to take on a number line. Instead, they knew the location where they had to stop. Ask: *Does anyone remember what this kind of repetition is called?* **Conditional repetition** Explain that students can use conditional repetition in Scratch by using a Repeat Until block. Ask: *Why do you think it's called a Repeat Until block?* **Sample answer: Because it tells the computer to keep repeating something until it gets to a certain spot or something happens.**

Now click See Inside and then click on the Mack Sprite.

Find the script on the block.

Have students help you find the Repeat Until block. Ask: *How did the programmer tell the computer when to have Mack stop walking?* **Sample answer: There is a block for when a sprite is touching the puddle.**

Tell students that they will now have a chance to use a Repeat Until block to have Mack walk the rest of the way home after stepping in the puddle. Distribute the Getting Mack Home journal page and have students work in Scratch to complete it alone or with a partner.

▶ Wrap Up

WHOLE CLASS

SMALL GROUP

PARTNER

INDEPENDENT

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

Suggested Questions:

- *How would you explain the two kinds of repetition to a friend?*
Answers vary.
- *What were some things that were difficult or confusing about using repetition in Scratch?* **Answers vary.**
- *Can you think of any other situations where you would use a countable repetition?* **Answers vary.**
- *Can you think of any other situations where you would use a conditional repetition?* **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 explain how countable repetition works in a program.*
- *I can explain how conditional repetition works in a program.*
- *I can use countable repetition (a Repeat block) when I know the distance to the intended location.*
- *I can use conditional repetition (a Repeat Until block) to make the program work for different situations.*