Lesson
5-7A
Action Fractions
Math+CT

Subtracting Fractions (unplugged)

Math Connections: Students solve a number story involving subtracting fractions less than one with same denominator.
CS Connections: Students consider when and why you might use countable or conditional repetition when subtracting fractions.

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Before You Begin

Option 1: Include this discussion during the Math Message Follow-Up in Lesson 5-7.
Option 2: Do this as a standalone activity, using a different fraction subtraction number story similar to the one in the Math Message of Lesson 5-7.

Because this activity can fit into an existing lesson, "*I Can*..." statements are not formally discussed. However, we provide "*I Can* ..." statements below if you wish to use this routine with this lesson.

Vocabulary

countable repetition • conditional repetition

Computational Thinking

- **REPETITION:** Understand when and why to use countable, infinite, and conditional repetition.

2 Focus 15–20 min

Materials

Seeing Repetition in Fraction Subtraction Strategies
Students consider what steps they repeat in fraction subtraction strategies and how they know when to stop repeating.

4.NF.3., 4.NF.3a, 4.NF.3b, 4.NF.3d, 4.MD.2

"*I Can ...*" statements

- *I can subtract fractions less than one with same denominator.*
- *I can add and subtract fractions by counting up and back.*
- *I can repeat subtracting unit fractions until reaching the intended result.*
- *I can repeat subtracting unit fractions a given number of times.*

Anticipated Barriers

- Students may have confusion about conditional repetition and conditionals.

Student Options

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

- Students may need physical representations of unit fractions.
- Students may need digital representations of unit fractions.

2 Focus 15–20 min

Seeing Repetition in Fraction Subtraction Strategies

WHOLE CLASS | SMALL GROUP | PARTNER | INDEPENDENT

As students share their strategies for solving the Math Message, be sure these two strategies are shared. If no students use these strategies, introduce them yourself.

- *Counting back*: Using a number line partitioned into eighths, start at $\frac{7}{8}$ and count back five units of $\frac{1}{8}$ to arrive at $\frac{2}{8}$.
- *Counting up*: Using a fraction circle with five $\frac{1}{8}$ pieces, add $\frac{1}{8}$ pieces until there are seven $\frac{1}{8}$ pieces, noting that you added two pieces.

Either method can be used with either tool (number line or fraction circles).

Ask: *Do you notice any steps being repeated as you use these strategies?* Sample answer: Yes. For counting back, I repeated the step of counting back $\frac{1}{8}$ or subtracting $\frac{1}{8}$. For counting up, I repeated counting up $\frac{1}{8}$ or adding $\frac{1}{8}$. *Did you just keep repeating those steps forever?* No, we stopped. Lead a discussion to help students compare how they knew when to stop repeating the step using each strategy. For counting back, ask:

- *When you counted back, how did you know when you could stop subtracting $\frac{1}{8}$?* Sample answer: I knew I had to count back 5 hops, because I knew Ella used $\frac{5}{8}$ yard of fabric.
- *Did you know how many $\frac{1}{8}$s you would have to hop back before you started?* Sample answer: Yes, I knew she used $\frac{5}{8}$ yard, so I counted back until I did five hops.

Explain that in computer science that is called a **countable repetition** (i.e., "move back $\frac{1}{8}$ five times"). Cumulatively, the five hops result in a total distance moved on the number line of $\frac{5}{8}$. Mathematically, this can be stated as "take away $\frac{5}{8}$."

Next, discuss the same ideas for the counting up strategy. Ask:

- *How did you know when you could stop adding $\frac{1}{8}$ pieces?* Sample answer: I counted up to $\frac{7}{8}$, so I stopped adding $\frac{1}{8}$ pieces when I reached $\frac{7}{8}$ in all.
- *Did you know how many $\frac{1}{8}$s you would have to add before you started?* Sample answer: No, I had to see how many it took to get $\frac{7}{8}$.

Explain that in computer science, this repetition strategy is called **conditional repetition** (i.e., "add $\frac{1}{8}$ pieces to the circle until there are $\frac{7}{8}$"). The action of adding $\frac{1}{8}$ is repeated until a condition is met, in this case, that there are seven $\frac{1}{8}$ pieces in total.

Wrap Up

WHOLE CLASS | SMALL GROUP | PARTNER | INDEPENDENT

As students continue to solve fraction subtraction number stories in the rest of the lesson, encourage them to think about what actions they are repeating (usually, adding or taking away unit fractions) and how they knew when to stop repeating (after counting a certain number or after meeting a certain condition).