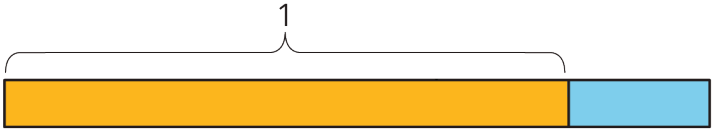
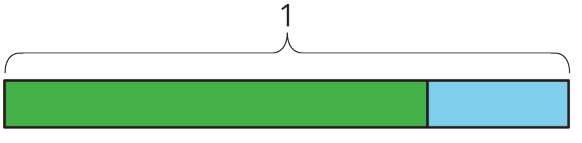
Lesson 1: Half as Much Again

Let's use fractions to describe increases and decreases.

1.1: Notice and Wonder: Tape Diagrams

What do you notice? What do you wonder?





1.2: Walking Half as Much Again

1. Complete the table to show the total distance walked in each case.

   a. Jada's pet turtle walked 10 feet, and then half that length again.

   b. Jada's baby brother walked 3 feet, and then half that length again.

   c. Jada's hamster walked 4.5 feet, and then half that length again.

   d. Jada's robot walked 1 foot, and then half that length again.

   e. A person walked x feet and then half that length again.

initial distance	total distance
10	
3	
4.5	
1	
x	

2. Explain how you computed the total distance in each case.

3. Two students each wrote an equation to represent the relationship between the initial distance walked (x) and the total distance walked (y).

   - Mai wrote $y = x + \frac{1}{2}x$.
   - Kiran wrote $y = \frac{3}{2}x$.

   Do you agree with either of them? Explain your reasoning.

Are you ready for more?

Zeno jumped 8 meters. Then he jumped half as far again (4 meters). Then he jumped half as far again (2 meters). So after 3 jumps, he was $8 + 4 + 2 = 14$ meters from his starting place.

1. Zeno kept jumping half as far again. How far would he be after 4 jumps? 5 jumps? 6 jumps?

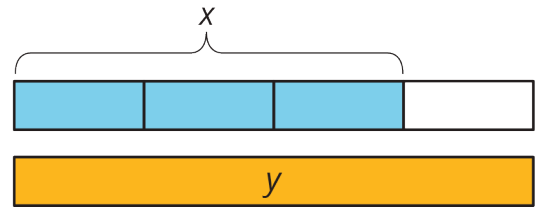
2. Before he started jumping, Zeno put a mark on the floor that was exactly 16 meters from his starting place. How close can Zeno get to the mark if he keeps jumping half as far again?

3. If you enjoyed thinking about this problem, consider researching Zeno's Paradox.

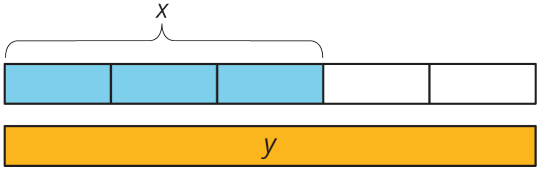
1.3: More and Less

1. Match each situation with a diagram. A diagram may not have a match.

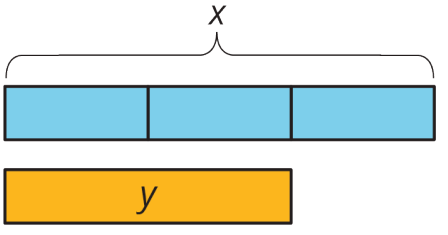
A



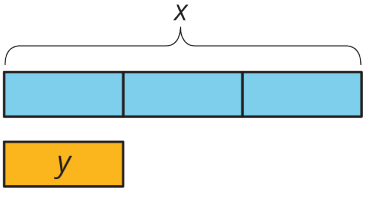
B



C



D



   - Han ate x ounces of blueberries. Mai ate $\frac{1}{3}$ less than that.
   - Mai biked x miles. Han biked $\frac{2}{3}$ more than that.
   - Han bought x pounds of apples. Mai bought $\frac{2}{3}$ of that.

2. For each diagram, write an equation that represents the relationship between x and y.

   a. Diagram A:

   b. Diagram B:

   c. Diagram C:

   d. Diagram D:

3. Write a story for one of the diagrams that doesn't have a match.

1.4: Card Sort: Representations of Proportional Relationships

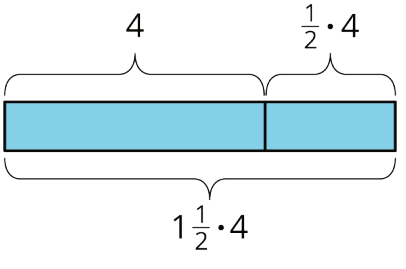
Your teacher will give you a set of cards that have proportional relationships represented three different ways: as descriptions, equations, and tables. Mix up the cards and place them all face-up.

1. Take turns with a partner to match a description with an equation and a table.
    a. For each match you find, explain to your partner how you know it's a match.
    b. For each match your partner finds, listen carefully to their explanation, and if you disagree, explain your thinking.
2. When you agree on all of the matches, check your answers with the answer key. If there are any errors, discuss why and revise your matches.

Lesson 1 Summary

Using the distributive property provides a shortcut for calculating the final amount in situations that involve adding or subtracting a fraction of the original amount.

For example, one day Clare runs 4 miles. The next day, she plans to run that same distance plus half as much again. How far does she plan to run the next day?



Tomorrow she will run 4 miles plus $\frac{1}{2}$ of 4 miles. We can use the distributive property to find this in one step: $1 \cdot 4 + \frac{1}{2} \cdot 4 = \left(1 + \frac{1}{2}\right) \cdot 4$

Clare plans to run $1\frac{1}{2} \cdot 4$, or 6 miles.

This works when we decrease by a fraction, too. If Tyler spent x dollars on a new shirt, and Noah spent $\frac{1}{3}$ less than Tyler, then Noah spent $\frac{2}{3}x$ dollars since $x - \frac{1}{3}x = \frac{2}{3}x$.