NAME Bartlett DATE PERIOD

Unit 4, Lesson 3: Revisiting Proportional Relationships

Let's use constants of proportionality to solve more problems.

5 mins.

3.1: Recipe Ratios

2-3 mins work, 3-2 min discussion

A recipe calls for $\frac{1}{2}$ cup sugar and 1 cup flour. Complete the table to show how much sugar and flour to use in different numbers of batches of the recipe.

$\cdot 2$

sugar (cups)	flour (cups)
$\frac{1}{2}$	1
$\frac{3}{4}$	$1\frac{1}{2}$
$\frac{7}{8}$	$1\frac{3}{4}$
1	2
$1\frac{1}{4}$	$2\frac{1}{2}$

$\cdot \frac{1}{2}$

15 mins

3.2: The Price of Rope

2-3 mins quiet work time, then pair-share

Two students are solving the same problem: At a hardware store, they can cut a length of rope off of a big roll, so you can buy any length you like. The cost for 6 feet of rope is \$7.50. How much would you pay for 50 feet of rope, at this rate?

1. Kiran knows he can solve the problem this way.

	length of rope (feet)	price of rope (dollars)	
	6	7.50	
$\cdot\frac{1}{6}$	1	1.25	$\cdot\frac{1}{6}$
$\cdot 50$	50	62.50	$\cdot 50$

What would be Kirans' answer?

\$62.50, because $(1.25) \cdot 50 = 62.5$

. Kiran wants to know if there is a more efficient way of solving the problem. Priya says she can solve the problem with only 2 rows in the table.

$\cdot 1.25$ constant of proportionality method

length of rope (feet)	price of rope (dollars)
1	1.25
6	7.50
50	62.50

Scale factor method $\cdot 8\frac{1}{3}$ $\quad \cdot\frac{50}{6}$ $\quad \cdot\frac{50}{6}$ $\quad \cdot 8\frac{1}{3}$

What do you think Priya's method is?

Q's: • How did you find the scale factor?
• How did you find the constant?
• What does the constant mean?

10 mins 3-5 mins. quiet work, whole class discussion • Which method do you prefer

3.3: Swimming, Manufacturing, and Painting

1. Tyler swims at a constant speed, 5 meters every 4 seconds. How long does it take him to swim 114 meters?

Tyler swims 1 meter in 0.8 seconds because $4 \div 5 = 0.8$

distance (meters)	time (seconds)
1	0.8 or 4/5
5	4
114	91.2

$\cdot 0.8$

2. A factory produces 3 bottles of sparkling water for every 8 bottles of plain water. How many bottles of sparkling water does the company produce when it produces 600 bottles of plain water?

The factory produces 0.375 of a bottle of sparkling water per bottle of plain water because $3 \div 8 = 0.375$.

number of bottles of sparkling water	number of bottles of plain water
0.375 or 3/8	1
3	8
225	600

$\cdot 0.375$

3. A certain shade of light blue paint is made by mixing $1\frac{1}{2}$ quarts of blue paint with 5 quarts of white paint. How much white paint would you need to mix with 4 quarts of blue paint?

$13\frac{1}{3}$ quarts of white paint. There are $3\frac{1}{3}$ quarts of white paint per quart of blue paint because $5 \div 1\frac{1}{2} = 3\frac{1}{3}$.

$4 \cdot 3\frac{1}{3} = 13\frac{1}{3}$

$\cdot 3\frac{1}{3}$

Blue Paint	white paint
$1\frac{1}{2}$	5
4	$13\frac{1}{3}$
1	$3\frac{1}{3}$

4. For each of the previous three situations, write an equation to represent the proportional relationship.

Q's: • What are two related quantities in the problem?

1. $t = \frac{4}{5}d$

$t = 1\frac{1}{5}d$

2. $p = \frac{8}{3}s$

$p = 2\frac{2}{3}s$

3. $w = \frac{10}{3}b$

$w = 3\frac{1}{3}b$

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OPTIONAL:

Q: How many miles do they run in one hour?

3.4: Finishing the Race and More Orange Juice

1. Lin runs $2\frac{3}{4}$ miles in $\frac{2}{5}$ of an hour. Tyler runs $8\frac{2}{3}$ miles in $\frac{4}{3}$ of an hour. How long does it take each of them to run 10 miles at that rate?

   Lin takes $1\frac{5}{11}$ hrs. ~~per miles~~ to run 10 miles.
   Lin takes $\frac{8}{55}$ of an hour to run 1 miles.

   Tyler takes $\frac{2}{13}$ of an hour to run each mile.
   Tyler takes $1\frac{7}{13}$ of an hour to run 10 miles.

2. Priya mixes $2\frac{1}{2}$ cups of water with $\frac{1}{3}$ cup of orange juice concentrate. Diego mixes $1\frac{2}{3}$ cups of water with $\frac{1}{4}$ cup orange juice concentrate. How much concentrate should each of them mix with 100 cups of water to make juice that tastes the same as their original recipe? Explain or show your reasoning.

   Priya should use $13\frac{1}{3}$ cups of concentrate.

   Diego should use 15 cups of concentrate

Lesson 3 Summary

If we identify two quantities in a problem and one is proportional to the other, then we can calculate the constant of proportionality and use it to answer other questions about the situation. For example, Andre runs at a constant speed, 5 meters every 2 seconds. How long does it take him to run 91 meters at this rate?

In this problem there are two quantities, time (in seconds) and distance (in meters). Since Andre is running at a constant speed, time is proportional to distance. We can make a table with distance and time as column headers and fill in the given information.

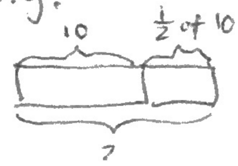
distance (meters)	time (seconds)
5	2
91	$36\frac{2}{5}$

To find the value in the right column, we multiply the value in the left column by $\frac{2}{5}$ because $\frac{2}{5} \cdot 5 = 2$. This means that it takes Andre $\frac{2}{5}$ seconds to run one meter.

At this rate, it would take Andre $\frac{2}{5} \cdot 91 = \frac{182}{5}$, or 36.4 seconds to walk 91 meters. In general, if t is the time it takes to walk d meters at that pace, then $t = \frac{2}{5}d$.

5 mins. quiet work, then whole class discussion

Draw a diagram. e.g.



10 mins.

4.2: Walking Half as Much Again

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

$\cdot(1.5)$

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 (i)	total distance (t)
10	15 ft.
3	4.5 ft.
4.5	6.75 ft.
1	1.5 ft.
x	$x + \frac{1}{2}x$ ft.

Q: How would you calculate it in words?

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

I took half of the initial distance & added it to the initial distance walked to get the total distance walked.

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.

They are both correct.

- The quotient of $t/i = k$, the constant. $k = 1.5$
- The total distance walked is always 1.5 times the initial.
- Plug in quantities for both Mai & Kiran to check.

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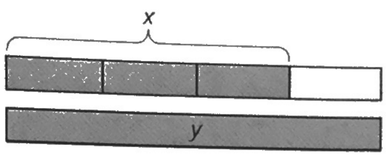
10 mins

4.3: More and Less

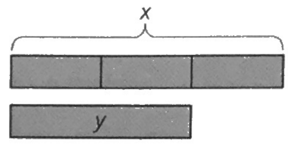
1-2 mins. quick think, pair-share on problem 1, 3-5 mins. to complete rest, whole class discussion

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

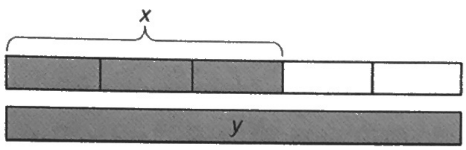
A



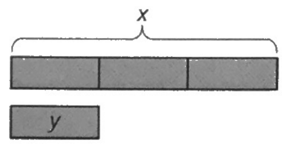
C



B



D



1. Han ate x ounces of blueberries. Mai ate $\frac{1}{3}$ less than that.

   C b/c y is less than x by 1/3

2. Mai biked x miles. Han biked $\frac{2}{3}$ more than that.

   B b/c y is more than x by 2/3

3. Han bought x pounds of apples. Mai bought $\frac{2}{3}$ of that.

   C b/c y consists of 2/3 of x

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

form of $y = kx$

a. Diagram A: $y = \frac{4}{3}x$

b. Diagram B: $y = \frac{5}{3}x$

c. Diagram C: $y = \frac{2}{3}x$

d. Diagram D: $y = \frac{1}{3}x$

If students confuse variables, as "who ate more? who biked farther? who bought more?"

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

e.g. Diagram A
Mai slept x hours.
Han slept 1/3 more than that

Diagram D
e.g. Han has x quarters.
Mai has 1/3 of that.

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OPTIONAL:

4.4: Card Sort: Representations of Proportional Relationships

Your teacher will give you a set of cards that have proportional relationships represented 3 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.

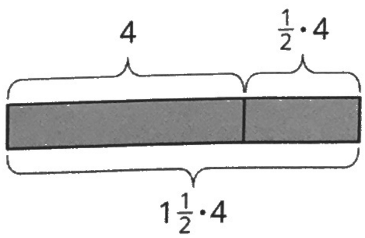
   b. For each match your partner finds, listen carefully to their explanation, and if you disagree, explain your thinking.

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 4 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 $x - \frac{1}{3}x = \frac{2}{3}x$.