Math: Level H

Solving for Unknown Values in Proportional Relationships

Activity Checklist

Day 1

- ❒ Video With Guided Notes
- ❒ Practice — Levels 1-3

Day 2

- ❒ Activity: Proportional Puzzle
- ❒ Practice — Levels 4-5

Learning Objective:

- ❒ I can find an unknown value in a proportional relationship by writing and solving an equation that represents the relationship.

Necessary Skills:

Before starting this lesson, you need to be able to...

- ❒ Write an equation to represent a proportional relationship
- ❒ Substitute a given value into an equation
- ❒ Solve a one-step equation to find an unknown variable

Substitute and Evaluate

Directions:

- Substitute the given value into the expression.
- Evaluate the expression.

1. Evaluate $\mathbf{9x}$ when x = 2.5.

2. Evaluate $\frac{\mathbf{x}}{\mathbf{5}}$ when x = 2.5.

3. Evaluate $\frac{\mathbf{1}}{\mathbf{4}}\mathbf{x}$ when x = 16.

4. Evaluate $\mathbf{8.5x}$ when x = 10.5.

Scan or click the QR code to review evaluating expressions with substitution.

Video With Guided Notes

Writing and Solving Equations for Proportional Relationships

Mission:
Solve and Level Up

Write and solve an equation to help Zoey determine how many containers she will need to pack if she picks 144 strawberries.

Substitute - a process where the variable is replaced with a given number

Example:
Evaluate 16x when x = 2.

16(2)
32

Write an equation to represent the relationship between the number of strawberries and the number of containers.

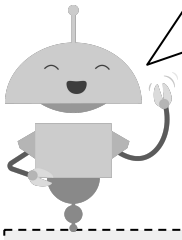
Strawberries (s)	Containers (c)
24	2
48	4
72	6

Solve the equation.

Example Problem

1. In the Farm Quest game, players can purchase tokens to unlock new areas. Write an equation to represent the data, then substitute and solve to find the cost of 5 tokens.

Tokens (t)	Cost in Dollars (c)
4	$3.00
8	$6.00
12	$9.00



Scan or click the QR code to review solving one-step equations.

If a player spent 18 dollars, how many tokens did they purchase?

$c = 0.75t$

Steps for Solving Equations

1. **Identify the variable** and what operation is being done to it.
2. **Isolate the variable** using inverse operations.

Reminder: You can **check your work** by substituting your answer into the original equation.

Example Problem

2. The equation **m = 60h** shows the proportional relationship between miles (m) and hours (h) traveled. How many hours will it take to drive 300 miles?

Thinking Ahead: Solve With Equivalent Ratios

Finding equivalent ratios is another strategy to solve for unknown values in proportional relationships.

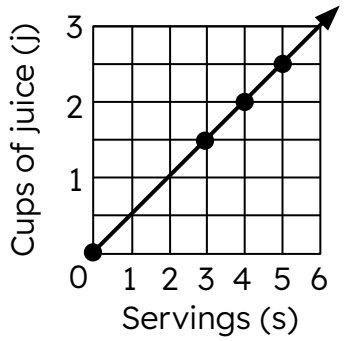
Example: It takes 1 cup of flour to make 8 muffins. If we keep the recipe proportional, how many cups of flour are needed to make 24 muffins?

$$\frac{\text{cups of flour}}{\text{muffins}} \quad \frac{1}{8} \overset{\cdot 3}{=} \frac{?}{24} \quad \cdot 3$$

3 cups of flour for 24 muffins

It costs $28 for 2 amusement park tickets. How much does it cost to purchase 10 tickets? Use equivalent ratios to find the cost.

The graph shows the proportional relationship between the number of servings (s) and the amount of juice (j), in cups.



a. Write an equation to represent the relationship.

b. Solve the equation to find the number of servings in 16 cups of juice.

Multiplying by a fraction is the same as dividing by its reciprocal.

$y = \frac{1}{5}x$

$y = \frac{1}{5}\left(\frac{x}{1}\right)$

$\frac{1}{5} \cdot \frac{x}{1} = \frac{x}{5}$

$y = \frac{x}{5}$

When you rewrite multiplying by a fraction as dividing, you can solve the equation by multiplying by the divisor, which is the inverse of dividing.

Example Problem

3. The equation $f = \frac{1}{4}m$ is used to calculate the cups of flour (f) needed to make different numbers of minicakes (m). How many minicakes can be made with 10 cups of flour?

$f = \frac{1}{4}m$

Reflect on Your Learning

How confident are you in your understanding of this lesson's objective?

I can find an unknown value in a proportional relationship by writing and solving an equation that represents the relationship.

❒ **I feel confident!** ☺	❒ **I feel so-so.** 😐	❒ **I feel confused.** ☹

Activity: Proportional Puzzle

Directions:

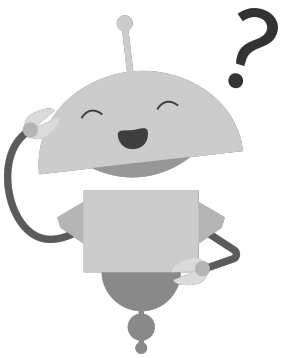
1. For each question on the following two pages, do the following:
   a. Complete each statement by solving an equation and writing the answer on the line.
   b. Find the answer in the list of answer choices.
   c. Write the corresponding letter in the "letter" box for the question.
2. Decode the answer to the riddle below by writing the letter that corresponds with the question number written below in each blank.

The first one has been done for you as an example.

Why can you always trust k?

___	___		___	E	___	___	E	___		
6	5		2	1	10	1		11		

___	___	___	___	___	E	___	!
3	7	8	2	9	1	4	



Answer Choices:

A: 14	B: 63,375	C: 50	D: 10
E: 600	F: 13.9	G: 15	H: 1,400
I: 9	J: $\frac{1}{2}$	K: 250	L: 3.5
M: 350	N: 7	O: 288	P: 65
Q: 2.77	R: 162	S: 8	T: 225
U: 91.13	V: 120	W: 576	X: 2.67
Y: 2,800	Z: $\frac{1}{4}$		

1. The equation **e = 15h** is used to find the earnings in dollars (e) that Grady earns after working after a certain number of hours (h).

   He earns $__600__ after 40 hours.

   e = 15h
   e = 15(40)
   e = 600

   Letter: E

2. The equation **p = 20h** is used to find the number of pages (p) Jake reads in a certain number of hours (h).

   Jake reads 140 pages in _____ hours.

   Letter:

3. The equation **c = $\frac{1}{5}$b** is used to find the cups of popcorn (c) needed to fill a certain number of snack bags (b).

   10 cups of popcorn makes _____ bags.

   Letter:

4. The equation **f = $\frac{1}{6}$b** is used to find the cups of flour (f) needed to make a certain number of brownies (b).

   ____ cups of flour make 48 brownies.

   Letter:

5. The table shows the number of hours (h) that Brandy babysat and her earnings (e) in dollars.

Hours (h)	Earnings (e)
4	$36
9	$81
11	$99

   Brandy would make $_____ in 25 hours.

   Letter:

6. The table shows the relationship between the number of pizzas (p) and the total number of slices (s).

Pizzas (p)	Slices (s)
5	40
7	56
12	96

   There are 72 slices in _____ pizzas.

   Letter:

7. In a video game, players can purchase power ups. The list shows the number of power ups (p) that can be purchased and their costs (c).

   - 3 power ups cost 210 coins
   - 8 power ups cost 560 coins
   - 12 power ups cost 840 coins

   20 power ups cost _____ coins.

   Letter:

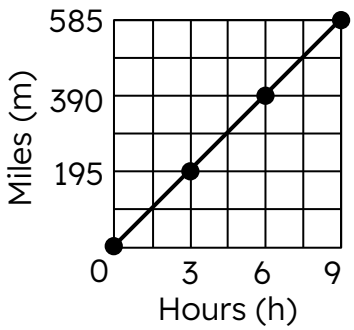
8. The list shows the number of cups of raisins (r) needed for different numbers of trail mix batches (b).

- 2 batches need 1 cup of raisins.
- 3 batches need $1\frac{1}{2}$ cups of raisins.
- 4 batches need 2 cups of raisins

_____ batches need 7 cups of raisins.

Letter:

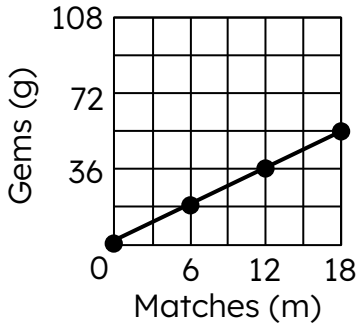
9. The graph shows the number of miles (m) Sarah traveled compared to the time it took in hours (h).



Sarah can travel 975 miles in _____ hours.

Letter:

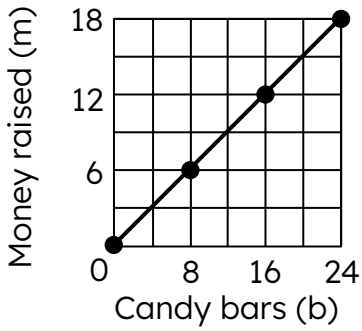
10. The graph shows the number of gems (g) earned compared to the number of matches (m) made in a video game.



Making 40 matches will earn _____ gems.

Letter:

11. The graph shows the money raised (m) in dollars compared to the number of candy bars (b) sold.



If $121.50 was raised, _____ candy bars were sold.

Letter: