

UNIT 1 • RELATIONSHIPS BETWEEN QUANTITIES

Lesson 2: Creating Equations and Inequalities in One Variable

Instruction

Guided Practice 1.2.1

Example 1

James earns \$15 per hour as a teller at a bank. In one week he pays 17% of his earnings in state and federal taxes. His take-home pay for the week is \$460.65. How many hours did James work?

1. Read the statement carefully.

2. Reread the scenario and make a list of the known quantities.

James earns \$15 per hour.

James pays 17% of his earning in taxes.

His pay for the week is \$460.65.

3. Read the statement again and look for the unknown or the variable.

The scenario asks for James's hours for the week. The variable to solve for is hours.

4. Create expressions and inequalities from the known quantities and variable(s).

James's pay for the week was \$460.65.

$$\underline{\hspace{2cm}} = 460.65$$

He earned \$15 an hour. Let h represent hours.

$$15h$$

He paid 17% in taxes.

$$-0.17(15h)$$

Put this information all together.

$$15h - 0.17(15h) = 460.65$$

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5. Solve the equation.

$$15h - 0.17(15h) = 460.65$$

Multiply -0.17 and $15h$.

$$15h - 2.55h = 460.65$$

Combine like terms $15h$ and $-2.55h$.

$$12.45h = 460.65$$

Divide both sides by 12.45 .

$$\frac{12.45h}{12.45} = \frac{460.65}{12.45}$$

$$h = 37 \text{ hours}$$

James worked 37 hours.

6. Convert to the appropriate units if necessary.

The scenario asked for hours and the quantity given was in terms of hours. No unit conversions are necessary.



Example 2

Brianna has saved \$600 to buy a new TV. If the TV she wants costs \$1,800 and she saves \$20 a week, how many years will it take her to buy the TV?

1. Read the statement carefully.

2. Reread the scenario and make a list of the known quantities.

The TV costs \$1,800.

Brianna saved \$600.

Brianna saves \$20 per week.

3. Read the statement again and look for the unknown or the variable.

The scenario asks for the number of years. This is tricky because the quantity is given in terms of weeks. The variable to solve for first, then, is weeks.

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4. Create expressions and inequalities from the known quantities and variable(s).

Brianna needs to reach \$1,800.

$$\underline{\hspace{2cm}} = 1800$$

Brianna has saved \$600 so far and has to save more to reach her goal.

$$600 + \underline{\hspace{2cm}} = 1800$$

Brianna is saving \$20 a week for some unknown number of weeks to reach her goal. Let x represent the number of weeks.

$$600 + 20x = 1800$$



5. Solve the problem for the number of weeks it will take Brianna to reach her goal.

$$600 + 20x = 1800$$

$$\begin{array}{r} -600 \quad -600 \\ \hline \end{array}$$

$$20x = 1200$$

$$\begin{array}{r} 20x \quad 1200 \\ \hline 20 \quad 20 \end{array}$$

$$x = 60 \text{ weeks}$$

Brianna will need 60 weeks to save for her TV.



6. Convert to the appropriate units.

The problem statement asks for the number of years it will take Brianna to save for the TV. There are 52 weeks in a year.

$$\begin{array}{r} 1 \text{ year} \\ \hline 52 \text{ weeks} \end{array}$$

$$60 \text{ weeks} \cdot \frac{1 \text{ year}}{52 \text{ weeks}}$$

$$60 \cancel{\text{ weeks}} \cdot \frac{1 \text{ year}}{52 \cancel{\text{ weeks}}} \approx 1.15 \text{ years}$$

Brianna will need approximately 1.15 years, or a little over a year, to save for her TV.



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Example 3

Suppose two brothers who live 55 miles apart decide to have lunch together. To prevent either brother from driving the entire distance, they agree to leave their homes at the same time, drive toward each other, and meet somewhere along the route. The older brother drives cautiously at an average speed of 60 miles per hour. The younger brother drives faster, at an average speed of 70 mph. How long will it take the brothers to meet each other?

1. Read the statement carefully.

2. Reread the scenario and make a table of the known quantities.

Problems involving “how fast,” “how far,” or “how long” require the distance equation, $d = rt$, where d is distance, r is rate of speed, and t is time.

Complete a table of the known quantities.

	Rate (r)	Distance (d)
Older brother	60 mph	55 miles
Younger brother	70 mph	55 miles

3. Read the statement again and look for the unknown or the variable.

The scenario asks for how long, so the variable is time, t .