

Objectives

- Find the value of an unknown variable in a formula.
- Solve a formula for a specified variable.
- Solve applications by using proportions.
- Solve applications about distance, rate, and time.
- Solve applications about work rates.

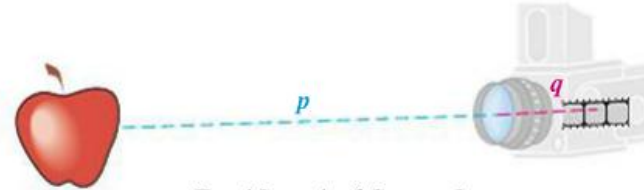
7.5 Applications of Rational Expressions

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Find the Value of a Variable in a Formula

- In physics, the focal length f of a lens is given by the formula:

$$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$$



Focal Length of Camera Lens

FIGURE 5

In the formula, p is the distance from the object to the lens and q is the distance from the lens to the image. Find f if $p = 50$ cm and $q = 10$ cm.

Solve a Formula for a Specified Variable

- Solve for q .

$$\frac{3}{p} + \frac{3}{q} = \frac{5}{r}$$

Solve a Formula for a Specified Variable

- Solve for n .

$$I = \frac{nE}{R + nr}$$

Steps to Solving an Applied Problem

- **READ** the problem carefully until you understand what is given and what is to be found.
- **ASSIGN A VARIABLE** to represent the unknown value, using diagrams or tables as needed. Write down what the variable represents. If necessary, express any other unknown values in terms of the variable.
- **WRITE AN EQUATION** using the variable expression(s).
- **SOLVE** the equation.
- **STATE THE ANSWER.** Does it seem reasonable?
- **CHECK** the answer in the words of the *original* problem.

Solving A Proportion

- In 2008, about 15 of every 100 Americans had no health insurance. The population at that time was about 302 million. How many million Americans had no health insurance?

Proportion Involving Rates

- Lauren's car uses 15 gallons of gasoline to drive 390 miles. She has 6 gallons of gasoline in the car, and she wants to know how much more gasoline she will need to drive 800 miles. If we assume that the car continues to use gasoline at the same rate, how many more gallons will she need?

Distance, Rate, and Time Relationships

$$d = rt$$

	<i>r</i> rate	<i>t</i> time	<i>d</i> distance

Distance, Rate, and Time Problem

- A plane travels 100 miles against the wind in the same time that it takes to travel 120 miles with the wind. The wind speed is 20 miles per hour. Find the rate of the plane in still air.

	<i>r</i> rate	<i>t</i> time	<i>d</i> distance
Against wind			
With the wind			

Distance, Rate, and Time Problem

- At the Salt Lake international airport, Cheryl and Bill are walking to the gate at the same rate to catch their flight. Since Bill wants a window seat, he step onto the moving sidewalk and continues to walk while Cheryl uses the stationary sidewalk. If the sidewalk moves at 1 m per sec and Bill saves 50 sec covering the 300-m distance, what is their walking rate?

	<i>r</i> rate	<i>t</i> time	<i>d</i> distance
Bill			
Cheryl			

continued

Rate of Work Problem

- People work at different rates. If,

r = the rate at which work is done

t = the time required

A = the amount of work accomplished

- We can use the formula:

(Notice the similarity to the distance formula, $d = rt$.)

- If 1 job is completed then:

Rate of Work Problem

- If a job can be completed in t units of time, then the rate of work is

Rate of work $\times$ Time worked = Fractional part of job done

	r rate	t time working together	j part of job done working together

- Stan needs 45 minutes to do the dishes, while Bobbie can do them in 30 minutes. How long will it take them if they work together?

	r	t	j

Rate of Work Problem

- Andy and Katie operate a small roofing company. Katie can roof an average house alone in 8 hours. Andy can roof a house alone in 9 hours. How long will it take them to do the job if they work together?

	r	t	j