

# Using Formulas

## 1 Here's How

A formula is an equation that states a relationship between quantities. The quantities are often represented by variables. If you know some of the values in a formula, you can find an unknown value.

$$\text{Distance} = \text{rate} \cdot \text{time}$$
$$D = rt$$

Look at these examples.

$$D = rt$$

Example 1

$$D = 60 \cdot 3$$

At 60 miles an hour, how far will a car travel in 3 hours?

$$D = 180$$

In this problem,  $r$  is 60 and  $t$  is 3. Multiply them to find  $D$ , a distance of 180 miles.

$$D = rt$$

Example 2

$$200 = r \cdot 4$$

What speed must a car travel in order to go 200 miles in 4 hours?

$$\frac{200}{4} = \frac{4r}{4}$$

In this problem,  $D$  is 200 and  $t$  is 4. Set up an equation and solve for  $r$ .

$$50 = r$$

Use the inverse operation. The rate,  $r$ , equals 50 miles per hour.

$$D = rt$$

Example 3

$$360 = 55 \cdot t$$

How long will it take a car to travel 360 miles at 55 miles per hour?

$$\frac{360}{55} = \frac{55t}{55}$$

In this problem,  $D$  is 360 and  $r$  is 55. Set up an equation and solve for  $t$ .

$$6.55 = t$$

Use the inverse operation. The time,  $t$ , equals 6.55 hours.

## 2 Try It

Complete each step.

$$D = rt$$

A jet flew a distance of 2,850 miles in 6 hours. What was its speed?

$$2,850 = r \cdot 6$$

Fill in the values you know. Use the variable for the unknown value.

$$\frac{2,850}{6} = \frac{6r}{6}$$

Distance: 2,850 miles. Rate:  $r$ . Time: 6 hours.

$$475 = r$$

Write the formula using the values in the space at the left.

How can you isolate the variable? divide both sides by 6

Do that step at the left.

The speed of the jet was 475 miles per hour.

### 3 On Your Own

Use the formula  $D = rt$  to find each unknown value.

1.  $r = 45$  mph,  $t = 5$  h

$$D = 45 \cdot 5$$

$$D = 225$$

$$D = \underline{225 \text{ miles}}$$

2.  $D = 2,400$  km,  $t = 8$  h

$$2,400 = r \cdot 8$$

$$\frac{2,400}{8} = \frac{8r}{8}$$

$$300 = r$$

$$r = \underline{300 \text{ km per hour}}$$

3.  $D = 7.7$  mi,  $r = 2.2$  mph

$$7.7 = 2.2 \cdot t$$

$$\frac{7.7}{2.2} = \frac{2.2t}{2.2}$$

$$3.5 = t$$

$$t = \underline{3.5 \text{ hours}}$$

Use the formula  $A = lw$  for Area = length  $\cdot$  width to find each unknown value.

4.  $l = 2.5$  cm,  $w = 4.5$  cm

$$A = 2.5 \cdot 4.5$$

$$A = 11.25$$

$$A = \underline{11.25 \text{ cm}^2}$$

5.  $A = 30$  in.<sup>2</sup>,  $l = 6$  in.

$$30 = 6 \cdot w$$

$$\frac{30}{6} = \frac{6w}{6}$$

$$5 = w$$

$$w = \underline{5 \text{ in.}}$$

6.  $A = 625$  km<sup>2</sup>,  $w = 25$  km

$$625 = l \cdot 25$$

$$\frac{625}{25} = \frac{l \cdot 25}{25}$$

$$25 = l$$

$$l = \underline{25 \text{ km}}$$

Use the formula  $I = prt$  for Interest = principal  $\cdot$  rate  $\cdot$  time to find each unknown value.

7.  $p = \$250$ ,  $r = 5\%$ ,  
 $t = 2$  years

$$I = 250 \cdot 0.05 \cdot 2$$

$$I = 25$$

$$I = \underline{\$25}$$

8.  $I = \$4,000$ ,  $r = 8\%$ ,  
 $t = 5$  years

$$4,000 = p \cdot 0.08 \cdot 5$$

$$\frac{4,000}{0.4} = \frac{p \cdot 0.4}{0.4}$$

$$10,000 = p$$

$$p = \underline{\$10,000}$$

9.  $I = \$1,500$ ,  $p = \$5,000$ ,  
 $r = 10\%$

$$1,500 = 5,000 \cdot 0.1 \cdot t$$

$$\frac{1,500}{500} = \frac{500t}{500}$$

$$3 = t$$

$$t = \underline{3 \text{ years}}$$

### 4 Think About It

Answer the question. Write your answer below.

10. A rectangular computer screen has a perimeter of 60 inches. Its length is 18 inches. How can you use formulas to find the area? Explain.

*Explanations will vary; example: I can substitute the known values in the perimeter formula,  $P = 2l + 2w$ , to find the width:  $60 = (2 \cdot 18) + (2 \cdot w)$ . Once I know the width, I can substitute it into the area formula along with the known length to find the area.*