3) A person swims 11 miles downriver in the same time they can swim 7 miles upriver. The speed of the current is 4 miles per hour. Find the speed of the person in still water.

	Distance	Rate	Time
Upstream	7	$x-4$	$\frac{7}{x-4}$
Downstream	11	$x+4$	$\frac{11}{x+4}$

$$\frac{7}{x-4} = \frac{11}{x+4}$$

$$7(x+4) = 11(x-4)$$

$7x + 28 = 11x - 44$
$-7x \quad -44 \quad -7x \quad -44$
$-72 = -4x$
$18 = x$

18 mph

"It takes as long ..." from the problem means that the two times are equal to each other. So, the equation can be written as:

	Distance	Rate	Time
Upstream	4	$5-c$	$\frac{4}{5-c}$
Downstream	16	$5+c$	$\frac{16}{5+c}$

○ $\frac{4}{5-c} = \frac{16}{5+c}$ ⇐ solve by cross-multiplying ⇒ $4(5+c) = 16(5-c)$ ⇒ $c = 3$

Answer: The speed of the current is 3 miles per hour.

Note: The speed of the current can not be a negative number, or larger than five. Why?

Practice Problems

Solve each problem and check all solutions. Answer using a complete sentence.

1) A boat goes 240 miles downstream in the same time it can go 160 miles upstream. The speed of the current is 5 miles per hour. What is the speed of the boat in still water?

	Distance	Rate	Time
Upstream	160	$x-5$	$\frac{160}{x-5}$
Downstream	240	$x+5$	$\frac{240}{x+5}$

$$\frac{160}{x-5} = \frac{240}{x+5}$$

$240(x-5) = 160(x+5)$
$240x - 1200 = 160x + 800$
$-160x \qquad -160x$
$80x = 2000$
$\frac{80x}{80} = \frac{2000}{80}$

$x = 25$ mph

$d = r \cdot t$

$t = \frac{d}{r}$

2) A plane flies 910 miles with the wind in the same time it can go 660 miles against the wind. The speed of the plane in still air is 305 miles per hour. What is the speed of the wind?

	Distance	Rate	Time
Against	660	$305-w$	$\frac{660}{305-w}$
With	910	$305+w$	$\frac{910}{305+w}$

$$\frac{660}{305-w} = \frac{910}{305+w}$$

$660(305+w) = 910(305-w)$
$201300 + 660w = 277550 - 910w$
$-201300 \qquad -201300$
$660w + 910w = +910w$
$1570w = 76250$

$$w = \frac{76250}{1570}$$

$w = 48.6$ mph

$t = \frac{d}{r}$

4) Kent can paint a certain room in 6 hours, but Kendra needs 4 hours to paint the same room. How long does it take them to paint the room if they work together?

$Kent = \frac{1}{6}$
$Kendra = \frac{1}{4}$

$12 \cdot (\frac{1}{6} + \frac{1}{4} = \frac{1}{x})$

$2x + 3x = 12$
$5x = 12$
$x = \frac{12}{5}$

$x = 2.4$ hrs

5) Marco can build a lap top twice as fast as Cliff. Working together, it takes them 5 hours. How long would it have taken Marco working alone?

$Cliff = \frac{2}{2x}$
$Marco = \frac{1}{x}$

$10x (\frac{1}{2x} + \frac{1}{x} = \frac{1}{5})$

$5 + 10 = 2x$
$15 = 2x$
$x = 7.5$ hrs

6) If s varies inversely as t^2, and s = 10 when t = 2, find s when t is 10.

$S = \frac{k}{t^2}$

$10 = \frac{k}{2^2}$

$10 = \frac{k}{4}$

$k = 40$

$S = \frac{40}{10^2} = \frac{40}{100} = \frac{4}{10}$

7) The time (t) traveled by Delmar in a car varies inversely as rate (r). If Delmar drives at a speed of 80 mph in 12 hours, what will be the time to travel if he drives at 60 mph?

$t = \frac{k}{r}$

$12 = \frac{k}{80}$

$k = 960$

$t = \frac{960}{60}$

16 hrs

8) For a given area of a triangle, the base varies inversely as its height. When the height is 10 in. the base is 5 in. Find the base if the height is increased to 20 in.

$b = \frac{k}{h}$

$5 = \frac{k}{10}$

$k = 50$

$b = \frac{50}{20} = 2.5$

Answer Key

1) The speed of the boat in still water is 25 mph.   2) The speed of the wind is about 48.6 mph.
3) The person can swim 18 mph in still water.   4) I will take 2.4 hours working together.
5) It takes Marco 7.5 hours.   6) s equals 0.4
7) It will take 16 hours to drive.   8) The base would be reduced to 2.5 in.