

9-6 Wind and Water Current Problems

Objective: To use systems of equations to solve wind and water current problems.

Example A jet can travel the 6000 km distance between Washington, D.C. and London in 6 h with the wind. The return trip against the same wind takes 7 h 30 min. Find the rate of the jet in still air and the rate of the wind.

Solution

Step 1 The problem asks for the rate of the jet in still air and the rate of the wind.

Step 2 Let r = the rate in km/h of the jet in still air.
Let w = the rate in km/h of the wind.

The time 7 h 30 min is $7\frac{30}{60}$ h, or 7.5 h.

	Rate \times Time = Distance		
With the wind	$r + w$	6	6000
Against the wind	$r - w$	7.5	6000

Step 3 Use the information in the chart to write two equations.

$$\begin{aligned} 6(r + w) &= 6000, & \text{or } r + w &= 1000 \\ 7.5(r - w) &= 6000, & \text{or } r - w &= 800 \end{aligned}$$

Step 4

$$\begin{array}{r} r + w = 1000 \\ r - w = 800 \\ \hline 2r = 1800 \\ r = 900 \\ 900 + w = 1000 \\ w = 100 \end{array}$$

Step 5 The check is left for you.

The rate of the jet is 900 km/h.
The rate of the wind is 100 km/h.

Solve.

1. A small plane traveled the 1200 km distance between two islands in 4 h with the wind. The return trip against the same wind took 5 h. Find the rate of the plane in still air and the rate of the wind.
2. A plane traveled the 2080 km distance between two cities in 5 h with the wind. The return trip against the same wind took 6.5 h. Find the rate of the plane in still air and the rate of the wind.

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Solve.

3. A small plane can travel the 3200 km distance between two cities in 10 h with the wind. Against the same wind the plane can only fly 2400 km in 10 h. Find the rate of the plane in still air and the rate of the wind.
4. A plane can fly 4800 km in 4 h with the wind. The return trip against the same wind takes 5 h. Find the rate of the plane in still air and the rate of the wind.
5. The 4200 km trip from New York to San Francisco takes 7 h flying against the wind, but only 6 h returning. Find the speed of the plane in still air and the wind speed.
6. Paddling with current, a canoeist can travel 48 km in 3 h. Against the current the canoeist takes 4 h to travel the same distance. Find the rate of the canoeist in still water and the rate of the current.
7. A cabin cruiser traveling with the current went 120 km in 3 h. Against the current it took 5 h to travel the same distance. Find the rate of the cabin cruiser in still water and the rate of the current.
8. A sailboat travels 24 mi downstream in 3 h. The return trip upstream takes 4 h. Find the speed of the sailboat in still water and the rate of the current.
9. A crew can row 45 km downstream in 3 h. Rowing against the same current, the crew rowed the same distance in 5 h. Find the rowing rate of the crew in still water and the rate of the current.
10. The 3600 km trip between two cities takes 6 h flying with the wind and 7.2 h against the wind. Find the speed of the plane in still air and the wind speed.

Mixed Review Exercises

Solve each system using multiplication with the addition-or-subtraction method.

1.
$$\begin{aligned} 2x - 3y &= 12 \\ x + y &= 1 \end{aligned}$$

2.
$$\begin{aligned} x + y &= 3 \\ 3x - 5y &= 17 \end{aligned}$$

3.
$$\begin{aligned} 2x - 3y &= 6 \\ 3x + 4y &= -25 \end{aligned}$$

Simplify.

4.
$$\frac{2n^2 - 13n + 20}{2n - 5}$$

5.
$$\frac{3}{x - 1} + \frac{4}{1 - x}$$

6.
$$\frac{2x + 1}{6} - \frac{x + 3}{4}$$

7.
$$a - 1 - \frac{a + 2}{a - 3}$$

8.
$$\frac{x^2 - 10xy + 25y^2}{x - y} \div \frac{x^2 - 4xy - 5y^2}{x^2 - y^2}$$