EXAMPLE 4 Write and solve a linear system

KAYAKING During a kayaking trip, a kayaker travels 12 miles upstream (against the current) and 12 miles downstream (with the current), as shown. The speed of the current remained constant during the trip. Find the average speed of the kayak in still water and the speed of the current.

STEP 1 **Write** a system of equations. First find the speed of the kayak going upstream and the speed of the kayak going downstream.

Upstream: $d = rt$ **Downstream:** $d = rt$

$12 = r \cdot 3$ $12 = r \cdot 2$

$4 = r$ $6 = r$

Use the speeds to write a linear system. Let x be the average speed of the kayak in still water, and let y be the speed of the current.

COMBINE SPEEDS
When you go upstream, the speed at which you can travel in still water is decreased by the speed of the current. The opposite is true when you go downstream.

Equation 1: Going upstream

Speed of kayak in still water		Speed of current		Speed of kayak going upstream
x	$-$	y	$=$	4

Equation 2: Going downstream

Speed of kayak in still water		Speed of current		Speed of kayak going downstream
x	$+$	y	$=$	6

STEP 2 **Solve** the system of equations.

$x - y = 4$ **Write Equation 1.**

$x + y = 6$ **Write Equation 2.**

$2x = 10$ **Add equations.**

$x = 5$ **Solve for x.**

Substitute 5 for x in Equation 2 and solve for y.

$5 + y = 6$ **Substitute 5 for x in Equation 2.**

$y = 1$ **Subtract 5 from each side.**

▶ The average speed of the kayak in still water is 5 miles per hour, and the speed of the current is 1 mile per hour.

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