EXAMPLE 2 A linear system with infinitely many solutions

Show that the linear system has infinitely many solutions.

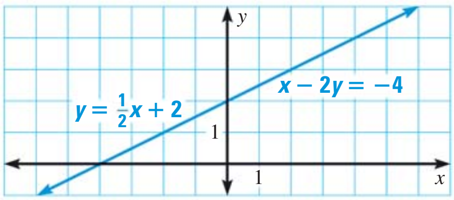
$x - 2y = -4$ Equation 1

$y = \frac{1}{2}x + 2$ Equation 2

Solution

METHOD 1 Graphing

Graph the linear system.



▶ The equations represent the same line, so any point on the line is a solution. So, the linear system has infinitely many solutions.

METHOD 2 Substitution

Substitute $\frac{1}{2}x + 2$ for y in Equation 1 and solve for x.

$x - 2y = -4$ Write Equation 1.

$x - 2\left(\frac{1}{2}x + 2\right) = -4$ Substitute $\frac{1}{2}x + 2$ for y.

$-4 = -4$ Simplify.

▶ The variables are eliminated and you are left with a statement that is true regardless of the values of x and y. This tells you that the system has infinitely many solutions.

IDENTIFY TYPES OF SYSTEMS

The linear system in Example 2 is called a consistent dependent system because the lines intersect (are consistent) and the equations are equivalent (are dependent).

✓ GUIDED PRACTICE for Examples 1 and 2

Tell whether the linear system has *no solution* or *infinitely many solutions*. *Explain.*

1. $5x + 3y = 6$
$-5x - 3y = 3$

2. $y = 2x - 4$
$-6x + 3y = -12$

IDENTIFYING THE NUMBER OF SOLUTIONS When the equations of a linear system are written in slope-intercept form, you can identify the number of solutions of the system by looking at the slopes and y-intercepts of the lines.

Number of solutions	Slopes and y-intercepts
One solution	Different slopes
No solution	Same slope Different y-intercepts
Infinitely many solutions	Same slope Same y-intercept