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# 5.2 Solving Systems of Linear Equations by Substitution

**For use with Exploration 5.2**

**Essential Question** How can you use substitution to solve a system of linear equations?

## 1 EXPLORATION: Using Substitution to Solve Systems

**Work with a partner.** Solve each system of linear equations using two methods.

**Method 1** **Solve for $x$ first.**

Solve for $x$ in one of the equations. Substitute the expression for $x$ into the other equation to find $y$. Then substitute the value of $y$ into one of the original equations to find $x$.

**Method 2** **Solve for $y$ first.**

Solve for $y$ in one of the equations. Substitute the expression for $y$ into the other equation to find $x$. Then substitute the value of $x$ into one of the original equations to find $y$.

Is the solution the same using both methods? Explain which method you would prefer to use for each system.

**a.** $x + y = -7$
$-5x + y = 5$

**b.** $x - 6y = -11$
$3x + 2y = 7$

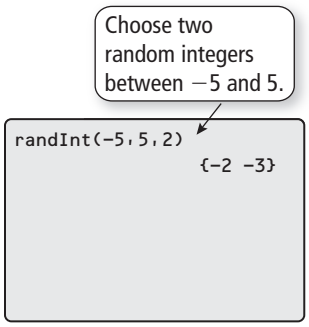
**c.** $4x + y = -1$
$3x - 5y = -18$

## 2 EXPLORATION: Writing and Solving a System of Equations

**Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.**

**Work with a partner.**

**a.** Write a random ordered pair with integer coordinates. One way to do this is to use a graphing calculator. The ordered pair generated at the right is $(-2, -3)$.




**b.** Write a system of linear equations that has your ordered pair as its solution.

**c.** Exchange systems with your partner and use one of the methods from Exploration 1 to solve the system. Explain your choice of method.

## Communicate Your Answer

**3.** How can you use substitution to solve a system of linear equations?

**4.** Use one of the methods from Exploration 1 to solve each system of linear equations. Explain your choice of method. Check your solutions.

**a.** $x + 2y = -7$
$2x - y = -9$

**b.** $x - 2y = -6$
$2x + y = -2$

**c.** $-3x + 2y = -10$
$-2x + y = -6$

**d.** $3x + 2y = 13$
$x - 3y = -3$

**e.** $3x - 2y = 9$
$-x - 3y = 8$

**f.** $3x - y = -6$
$4x + 5y = 11$

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# 5.2 Notetaking with Vocabulary

**For use after Lesson 5.2**

**In your own words, write the meaning of each vocabulary term.**

system of linear equations

solution of a system of linear equations

## Core Concepts

### Solving a System of Linear Equations by Substitution

**Step 1** Solve one of the equations for one of the variables.

**Step 2** Substitute the expression from Step 1 into the other equation and solve for the other variable.

**Step 3** Substitute the value from Step 2 into one of the original equations and solve.

### Notes:

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## 5.2 Notetaking with Vocabulary (continued)

## Extra Practice

**In Exercises 1–18, solve the system of linear equations by substitution. Check your solution.**

**1.** $2x + 2y = 10$
$y = 5 + x$

**2.** $2x - y = 3$
$x = -2y - 1$

**3.** $x - 3y = -1$
$x = y$

**4.** $x - 2y = -3$
$y = x + 1$

**5.** $2x + y = 3$
$x = 3y + 5$

**6.** $3x + y = -5$
$y = 2x + 5$

**7.** $y = 2x + 8$
$y = -2x$

**8.** $y = \frac{3}{4}x + 1$
$y = \frac{1}{4}x + 3$

**9.** $2x - 3y = 0$
$y = 4$

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## 5.2 Notetaking with Vocabulary (continued)

**10.** $x + y = 3$
$2x + 4y = 8$

**11.** $y = \frac{1}{2}x + 1$
$y = -\frac{1}{2}x + 9$

**12.** $3x - 2y = 3$
$4x - y = 4$

**13.** $7x - 4y = 8$
$5x - y = 2$

**14.** $y = \frac{3}{5}x - 12$
$y = \frac{1}{3}x - 8$

**15.** $3x - 4y = -1$
$5x + 2y = 7$

**16.** $y = -x + 3$
$x + 2y = 0$

**17.** $y - 5x = -2$
$-4x + y = 2$

**18.** $4x - 8y = 3$
$8x + 4y = 1$

**19.** An adult ticket to a museum costs \$3 more than a children's ticket. When 200 adult tickets and 100 children's tickets are sold, the total revenue is \$2100. What is the cost of a children's ticket?