



-  **Got It?** 4. a. How can you use the Multiplication Property of Equality to change the equations in this system in order to solve it using elimination? $4x + 3y = -19$
 $3x - 2y = -10$
 b. Write and solve a revised system.
 c. Show that the solution of the revised system is a solution of the original system.

Recall that if you get a false statement as you solve a system, then the system has no solution. If you get an identity, then the system has infinitely many solutions.


 **Problem 5 Finding the Number of Solutions**

How many solutions does the system have? $2x + 6y = 18$
 $x + 3y = 9$

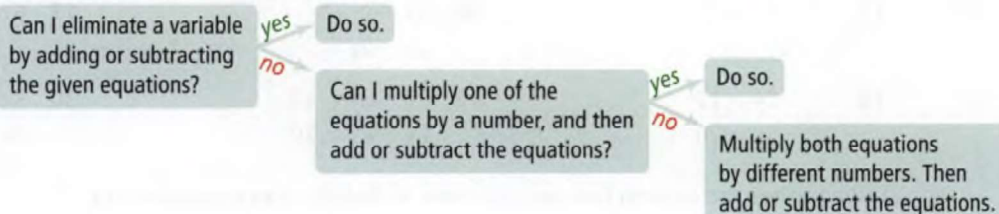
Multiply the second equation by -2 .

$$\begin{array}{r} 2x + 6y = 18 \\ x + 3y = 9 \end{array} \quad \begin{array}{c} \text{Multiply by } -2. \\ \hline \end{array} \quad \begin{array}{r} 2x + 6y = 18 \\ -2x - 6y = -18 \\ \hline 0 = 0 \end{array} \quad \begin{array}{l} \text{Add the equations.} \end{array}$$

Because $0 = 0$ is an identity, there are infinitely many solutions.

-  **Got It?** 5. How many solutions does the system have? $-2x + 5y = 7$
 $-2x + 5y = 12$

The flowchart below can help you decide which steps to take when solving a system of equations using elimination.



Think

Could you have solved this problem another way?

Yes. For example, you could have multiplied the second equation by 2 and subtracted.

 **Lesson Check**

Do you know HOW?

Solve each system using elimination.

- $3x - 2y = 0$
 $4x + 2y = 14$
- $3p + q = 7$
 $2p - 2q = -6$
- $3x - 2y = 1$
 $8x + 3y = 2$

Do you UNDERSTAND?  **MATHEMATICAL PRACTICES**

- Vocabulary** If you add two equations in two variables and the sum is an equation in one variable, what method are you using to solve the system? Explain.
- Reasoning** Explain how the Addition Property of Equality allows you to add equations.
- Writing** Explain how you would solve a system of equations using elimination.



Practice and Problem-Solving Exercises



A Practice

Solve each system using elimination.

◀ See Problems 1 and 2.

7. $3x + 3y = 27$
 $x - 3y = -11$

8. $-x + 5y = 13$
 $x - y = 15$

9. $2x + 4y = 22$
 $2x - 2y = -8$

10. $4x - 7y = 3$
 $x - 7y = -15$

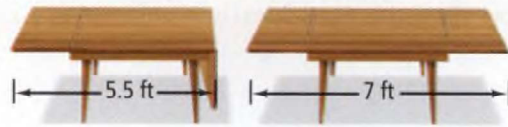
11. $5x - y = 0$
 $3x + y = 24$

12. $6x + 5y = 39$
 $3x + 5y = 27$

13. **Talent Show** Your school's talent show will feature 12 solo acts and 2 ensemble acts. The show will last 90 min. The 6 solo performers judged best will give a repeat performance at a second 60-min show, which will also feature the 2 ensemble acts. Each solo act lasts x minutes, and each ensemble act lasts y minutes.

- Write a system of equations to model the situation.
- Solve the system from part (a). How long is each solo act? How long is each ensemble act?

14. **Furniture** A carpenter is designing a drop-leaf table with two drop leaves of equal size. The lengths of the table when one leaf is folded up and when both leaves are folded up are shown. How long is the table when no leaves are folded up?



Solve each system using elimination.

◀ See Problems 3 and 4.

15. $2x + 3y = 9$
 $x + 5y = 8$

16. $3x + y = 5$
 $2x - 2y = -2$

17. $6x + 4y = 42$
 $-3x + 3y = -6$

18. $3x + 2y = 17$
 $2x + 5y = 26$

19. $6x - 3y = 15$
 $7x + 4y = 10$

20. $5x - 9y = -43$
 $3x + 8y = 68$

Tell whether the system has *one solution*, *infinitely many solutions*, or *no solution*.

◀ See Problem 5.

21. $9x + 8y = 15$
 $9x + 8y = 30$

22. $3x + 4y = 24$
 $6x + 8y = 24$

23. $5x - 3y = 10$
 $10x + 6y = 20$

24. $2x - 5y = 17$
 $6x - 15y = 51$

25. $4x - 7y = 15$
 $-8x + 14y = -30$

26. $4x - 8y = 15$
 $-5x + 10y = -30$

B Apply

27. **Think About a Plan** A photo studio offers portraits in 8×10 and wallet-sized formats. One customer bought two 8×10 portraits and four wallet-sized portraits and paid \$52. Another customer bought three 8×10 portraits and two wallet-sized portraits and paid \$50. What is the cost of an 8×10 portrait? What is the cost of a wallet-sized portrait?

- Can you eliminate a variable simply by adding or subtracting?
- If not, how many of the equations do you need to multiply by a constant?