

7.2 Solve Linear Systems by Substitution

STEP 1 Solve one of the equations for one of its variables. When possible, solve for a variable that has a coefficient of 1 or -1.

$$-x + y = 8 \rightarrow y = (x + 8)$$

$$2(y) - 3x = 5$$

check

$$-(11) + (19) = 8 \checkmark$$

$$2(19) - 3(11) = 5 \checkmark$$

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

$$2(x + 8) - 3x = 5 \rightarrow 2x + 16 - 3x = 5$$

$$-x + 16 = 5 \quad x = 11$$

$$-x = -11$$

STEP 3 Substitute the value from Step 2 into the revised equation from Step 1 and solve.

$$y = (x) + 8$$

$$y = (11) + 8$$

$$y = 19$$

$$(11, 19)$$

Practice

14. $x = (4y + 14)$

$$y = -3(x) + 3$$

$$y = -3(4y + 14) + 3$$

$$y = -12y - 42 + 3$$

$$y = -12y - 39$$

$$+12y \quad +12y$$

$$13y = -39$$

$$y = -3$$

$$x = 4(-3) + 14$$

$$x = -12 + 14$$

$$x = 2$$

$$(2, -3)$$

15. $y = (-3x - 1)$

$$4x + 3(y) = 2$$

$$4x + 3(-3x - 1) = 2$$

$$4x - 9x - 3 = 2$$

$$-5x - 3 = 2$$

$$-5x = 5$$

$$x = -1$$

$$y = -3(-1) - 1$$

$$y = 3 - 1$$

$$y = 2$$

$$(-1, 2)$$

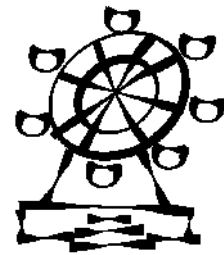
20. $x + 2y = 11 \rightarrow x = (-2y + 11)$
 $3x - 4y = -17$
 $3(-2y + 11) - 4y = -17$
 $-6y + 33 - 4y = -17$
 $-10y + 33 = -17$
 $-10y = -50$
 $y = 5$
 $x = -2(5) + 11$
 $x = -10 + 11$
 $x = 1$
(1, 5)

21. $-3x + y = 8$
 $x + 2y = -5$
 $x + 2(3x + 8) = -5$
 $x + 6x + 16 = -5$
 $7x = -21$
 $x = -3$
 $y = -3(-3) + 8$
 $y = 9 + 8$
 $y = 17$
(-3, -1)

Multistep Problem

W - water slide
 F - Ferris wheel

Bill and Steve decide to spend the afternoon at an amusement park enjoying their favorite activities, the water slide and the gigantic Ferris wheel. Their tickets are stamped each time they slide or ride. At the end of the afternoon they have the following tickets:



| Fun Time Amusements | |
|---------------------|---|
| Water Slide: | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| Ferris Wheel: | <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> |
| Total: | \$10.20 |

| Fun Time Amusements | |
|---------------------|---|
| Water Slide: | <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> |
| Ferris Wheel: | <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> |
| Total: | \$15.55 |

Bill's Ticket

Steve's Ticket

$W + 3F = 10.20$

$2W + 3F = 15.55$

How much does it cost to ride the Ferris Wheel?
 How much does it cost to slide on the Water Slide?

$W = 10.20 - 3F$

Practice

Two small pitchers and one large pitcher can hold 8 cups of water. One large pitcher minus one small pitcher constitutes 2 cups of water. How many cups of water can each pitcher hold?

$$2s + l = 8$$

$$l - s = 2 \rightarrow l = 2 + s$$

$$2s + (2 + s) = 8 \quad l = 2 + 2$$

$$3s + 2 = 8$$

$$l = 4$$

$$3s = 6$$

$$s = 2$$

Driving Your brother and sister took turns driving on a 635-mile trip that took 11 hours to complete. Your brother drove at a constant speed of 60 miles per hour and your sister drove at a constant speed of 55 miles per hour. Let x be the number of miles your brother drove and let y be the number of miles your sister drove. Solve to find the number of miles each of your siblings drove.