# Systems of Equations Practice Test

Multiple Choice
Identify the choice that best completes the statement or answers the question.

_____ 1. Which linear system has the solution $x = -2$ and $y = 6$?
   a. $x + 3y = 16$
       $4x + 4y = 16$
   b. $x + 3y = 17$
       $2x + y = 15$
   c. $x + 2y = -2$
       $2x + 4y = -4$
   d. $2x + y = -2$
       $x + y = 16$

_____ 2. Which linear system has the solution $x = 4$ and $y = -2$?
   a. $x + 4y = 15$
       $4x - 2y = -17$
   b. $2x + 4y = 4$
       $-2x + y = 14$
   c. $4x + y = 14$
       $-2x + 4y = -16$
   d. $x + 4y = 4$
       $2x + 4y = 8$

_____ 3. Create a linear system to model this situation:
   A woman is 3 times as old as her son. In thirteen years, she will be 2 times as old as her son will be.
   a. $w = s + 3$
       $w + 13 = 2s$
   b. $w = 3s$
       $w + 13 = 2(s + 13)$
   c. $w = 3s$
       $w = 2s$
   d. $w = 3s$
       $s + 13 = 2(w + 13)$

_____ 4. Create a linear system to model this situation:
   A length of outdoor lights is formed from strings that are 5 ft. long and 11 ft. long. Fourteen strings of lights are 106 ft. long.
   a. $5x + 11y = 14$
       $x + y = 106$
   b. $x + y = 14$
       $5x + 11y = 106$
   c. $x + y = 14$
       $5x + 11y = 106(14)$
   d. $x + y = 14$
       $x + 2y = 106$

_____ 5. Create a linear system to model this situation:
   A rectangular field is 35 m longer than it is wide. The length of the fence around
   the perimeter of the field is 290 m.
   a. $l + 35 = w$
       $2l + 2w = 290$
   b. $l = w + 35$
       $2l + 2w = 290$
   c. $l = w + 35$
       $l + w = 290$
   d. $l = w + 35$
       $lw = 290$

_____ 6. Which graph represents the solution of the linear system:
   $y = -2x + 2$
   $y + 6 = 2x$

Graph A

(2, –2)

Graph C

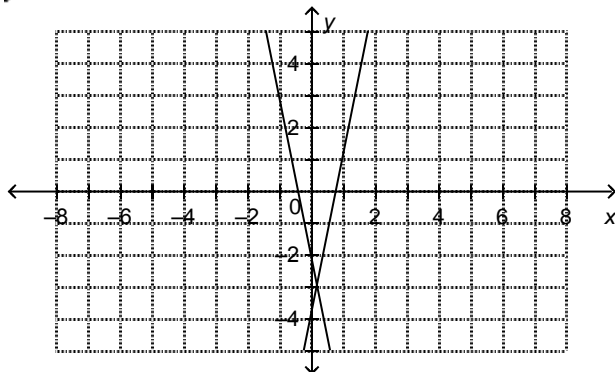(2.2, –0.5)

Graph B

(1, –2)

Graph D

(1.4, –0.8)
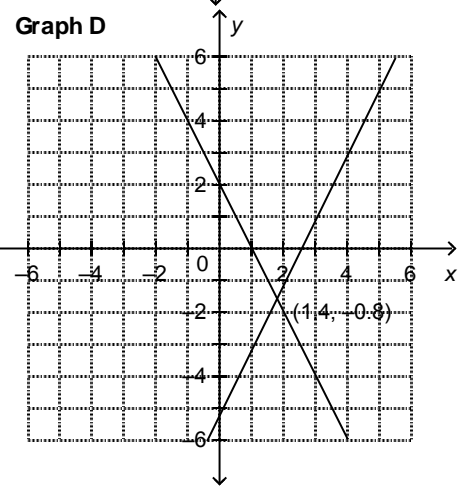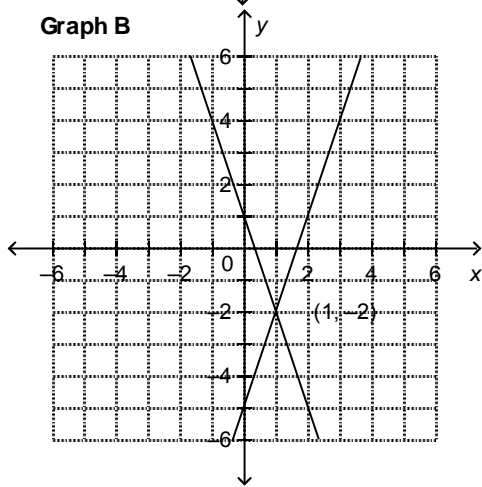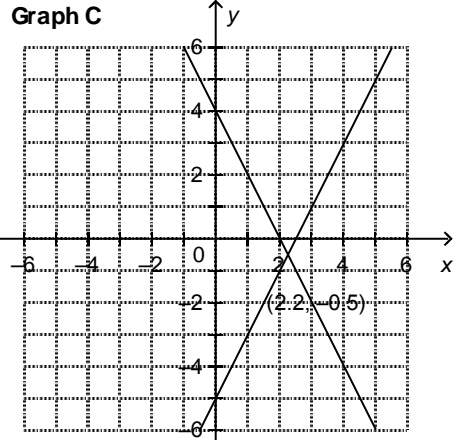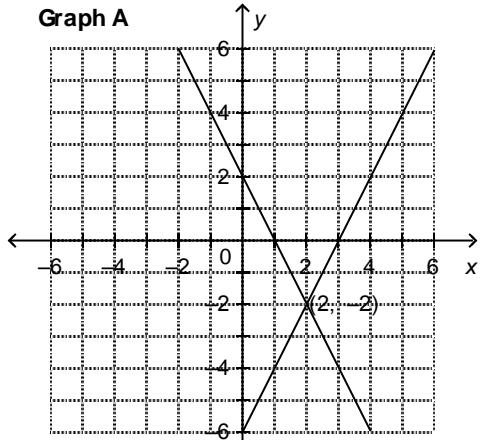
a. Graph B
b. Graph A

c. Graph C
d. Graph D

_____ 7. Use the graph to approximate the solution of the linear system:
$y = -5x - 2$
$y = 5x - 4$

a. (–3, 0.2)
b. (0, –2.8)

c. (0.2, –3)
d. (–2.8, 0)

_____ 8. Two life insurance companies determine their premiums using different formulas:
Company A: $p = 2a + 24$
Company B: $p = 2.25a + 13$, where p represents the annual premium, and a represents the client's age.
Use the graph to determine the age at which both companies charge the same premium.
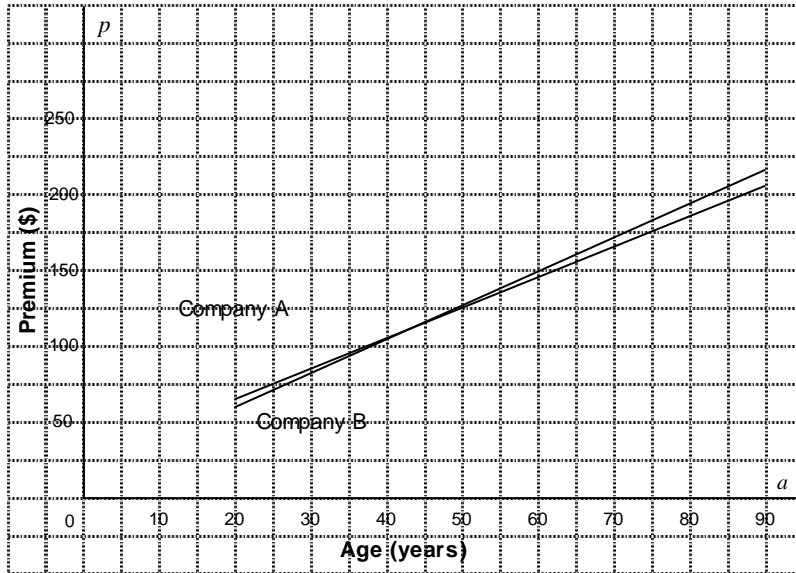
a. 62 years   b. 24 years   c. 59 years   d. 44 years

_____ 9. Use the graph to approximate the solution of this linear system:
$6x - 7y = -4$
$-\dfrac{3}{5}y = 3x + 7$
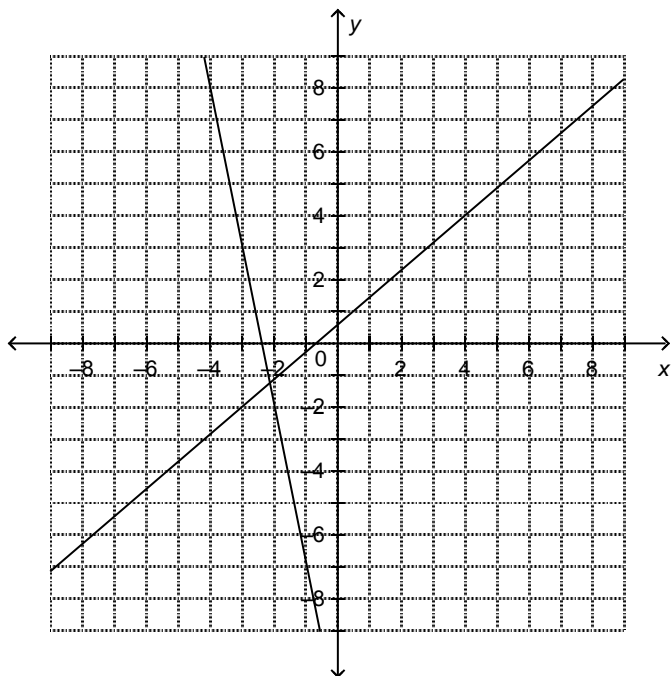
    a. (–0.1, 3.8)   b. (–2.1, –1.2)   c. (–1.2, 3.8)   d. (–2.1, –0.1)

____ 10. Express each equation in slope-intercept form.

$-2x + 4y = 68$

$13x + 4y = 284$

a.
$$y = \frac{1}{2}x - 17$$
$$y = -\frac{13}{4}x - 71$$

c.
$$y = \frac{1}{2}x + 17$$
$$y = -\frac{13}{4}x + 71$$

b.
$$y = -\frac{284}{13}x + 17$$
$$y = -\frac{13}{4}x + \frac{4}{13}$$

d.
$$y = \frac{4}{13}x - \frac{284}{13}$$
$$y = \frac{1}{2}x - \frac{284}{13}$$

____ 11. Use substitution to solve this linear system:

$x - y = 18$

$$\frac{3}{4}x + \frac{3}{4}y = -\frac{15}{2}$$

    a. $x = 4; y = 18$ b. $x = -14; y = -14$ c. $x = 4; y = -14$ d. $x = 4; y = 4$

____ 12. Use an elimination strategy to solve this linear system.

$3x - 2y = 5$

$2x + 7y = 20$

    a. $x = 3$ and $y = -2$ c. $x = 3$ and $y = 2$

b. $x = \dfrac{1}{5}$ and $y = \dfrac{14}{5}$
       d. $x = -3$ and $y = -2$

_____ 13. Write an equivalent linear system where both equations have the same x-coefficients.
$2x + 6y = 5$
$8x - 6y = 12$

a. $8x + 6y = 20$ and $8x - 6y = 12$ c. $8x + 24y = 20$ and $8x - 6y = 12$
b. $24x + 8y = 20$ and $6x + 8y = 12$ d. $12x + 24y = 20$ and $12x - 6y = 12$

_____ 14. Determine the number of solutions of the linear system:
$14x - 5y = 123$
$14x - 5y = 73$

a. no solution   c. two solutions
b. infinite solutions   d. one solution

Short Answer

15. **a)** Write a linear system to model this situation:
    Angela is 24 years older than her cousin Zack. In 13 years, she will be double his age.
    b) Use a graph to solve this problem:
    How old are Angela and Zack now?
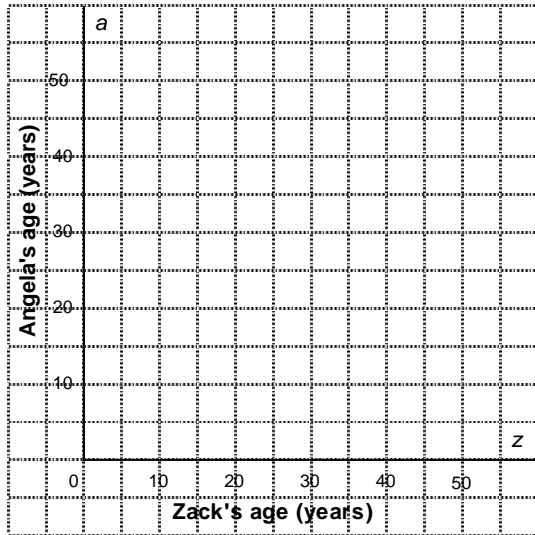
16. Create a linear system to model this situation. Then use substitution to solve the linear system to solve the problem.

At the local fair, the admission fee is $8.00 for an adult and $4.50 for a youth. One Saturday, 209 admissions were purchased, with total receipts of $1304.50. How many adult admissions and how many youth admissions were purchased?

Problem

17. In a piggy bank, the number of nickels is 8 more than one-half the number of quarters. The value of the coins is $21.85.
    a) Create a linear system to model the situation.
    b) If the number of quarters is 78, determine the number of nickels.

18. **a)** Write a linear system to model this situation:
    A large tree removes 1.5 kg of pollution from the air each year. A small tree removes 0.04 kg each year. An urban forest has 1650 large and small trees. Together, these trees remove 1818 kg of pollution each year.
    b) Use graphing technology to solve this problem:
    How many of each size of tree are in the forest?
    c) Verify the solution.

19. a) Model this situation with a linear system:
    To rent a car, a person is charged a daily rate and a fee for each kilometre driven. When Chena rented a car for 15 days and drove 800 km, the charge was $715.00. When she rented the same car for 25 days and drove 2250 km, the charge was $1512.50.
    b) Determine the daily rate and the fee for each kilometre driven. Verify the solution.

20. Use an elimination strategy to solve this linear system. Verify the solution.
    $$2s - 2c = 10$$
    $$6s + 6c = 50$$

Systems of Equations Practice Test
Answer Section

MULTIPLE CHOICE

    1. ANS: A   PTS: 1   DIF: Easy
      REF: 7.1 Developing Systems of Linear Equations   LOC: 10.RF9
      TOP: Relations and Functions   KEY: Conceptual Understanding
    2. ANS: C   PTS: 1   DIF: Easy
      REF: 7.1 Developing Systems of Linear Equations   LOC: 10.RF9
      TOP: Relations and Functions   KEY: Conceptual Understanding
    3. ANS: B   PTS: 1   DIF: Moderate
      REF: 7.1 Developing Systems of Linear Equations   LOC: 10.RF9
      TOP: Relations and Functions   KEY: Conceptual Understanding
    4. ANS: B   PTS: 1   DIF: Easy
      REF: 7.1 Developing Systems of Linear Equations   LOC: 10.RF9
      TOP: Relations and Functions   KEY: Conceptual Understanding
    5. ANS: B   PTS: 1   DIF: Easy
      REF: 7.1 Developing Systems of Linear Equations   LOC: 10.RF9
      TOP: Relations and Functions   KEY: Conceptual Understanding
    6. ANS: B   PTS: 1   DIF: Easy
      REF: 7.2 Solving a System of Linear Equations Graphically   LOC: 10.RF9
      TOP: Relations and Functions   KEY: Conceptual Understanding
    7. ANS: C   PTS: 1   DIF: Easy
      REF: 7.2 Solving a System of Linear Equations Graphically   LOC: 10.RF9
      TOP: Relations and Functions   KEY: Conceptual Understanding
    8. ANS: D   PTS: 1   DIF: Easy
      REF: 7.2 Solving a System of Linear Equations Graphically   LOC: 10.RF9
      TOP: Relations and Functions   KEY: Conceptual Understanding
    9. ANS: B   PTS: 1   DIF: Easy
      REF: 7.2 Solving a System of Linear Equations Graphically   LOC: 10.RF9
      TOP: Relations and Functions   KEY: Conceptual Understanding
  10. ANS: C   PTS: 1   DIF: Moderate
      REF: 7.3 Using Graphing Technology to Solve a System of Linear Equations
      LOC: 10.RF9   TOP: Relations and Functions   KEY: Conceptual Understanding
  11. ANS: C   PTS: 1   DIF: Moderate
      REF: 7.4 Using a Substitution Strategy to Solve a System of Linear Equations
      LOC: 10.RF9   TOP: Relations and Functions   KEY: Conceptual Understanding
  12. ANS: C   PTS: 1   DIF: Easy
      REF: 7.5 Using an Elimination Strategy to Solve a System of Linear Equations
      LOC: 10.RF9   TOP: Relations and Functions   KEY: Procedural Knowledge
  13. ANS: C   PTS: 1   DIF: Easy
      REF: 7.5 Using an Elimination Strategy to Solve a System of Linear Equations
      LOC: 10.RF9   TOP: Relations and Functions   KEY: Procedural Knowledge
  14. ANS: A   PTS: 1   DIF: Easy
      REF: 7.6 Properties of Systems of Linear Equations   LOC: 10.RF9
      TOP: Relations and Functions   KEY: Conceptual Understanding
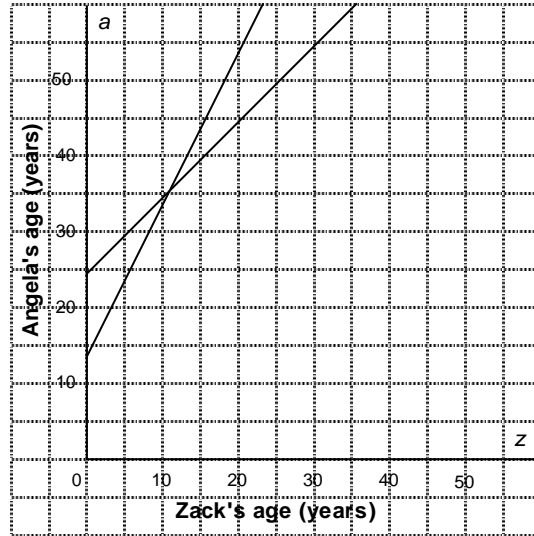
SHORT ANSWER

15. ANS:
   a)

   $a = z + 24$
   $a + 13 = 2(z + 13)$

   b)

   Zack is approximately 11 years old and Angela is approximately 35 years old.

   PTS: 1   DIF: Moderate   REF: 7.2 Solving a System of Linear Equations Graphically
   LOC: 10.RF9   TOP: Relations and Functions   KEY: Conceptual Understanding

16. ANS:
   Let a represent the number of adult admissions, and y represent the number of youth admissions purchased.
   $a + y = 209$
   $8a + 4.5y = 1304.5$
   104 adult admissions and 105 youth admissions were purchased.

   PTS: 1   DIF: Moderate
   REF: 7.4 Using a Substitution Strategy to Solve a System of Linear Equations
   LOC: 10.RF9   TOP: Relations and Functions   KEY: Conceptual Understanding

PROBLEM

17. ANS:
   a) Let n represent the number of nickels and q represent the number of quarters.

   $n = \dfrac{1}{2}q + 8$

   $0.05n + 0.25q = 21.85$

   b) To determine the number of nickels when the number of quarters is 78:
   Substitute $q = 78$ in one of the equations in part a, then use the other equation to verify.

   $n = \dfrac{1}{2}q + 8$

$$n = \frac{1}{2}(78) + 8$$

$n = 39 + 8$

$n = 47$

The number of nickels is 47.

To verify, substitute $q = 78$ and $n = 47$ into $0.05n + 0.25q = 21.85$.

L.S. $= 0.05n + 0.25q$
   $= 0.05(47) + 0.25(78)$
   $= 2.35 + 19.5$
   $= 21.85$

R.S. $= 21.85$

Since the left side equals the right side, the number of nickels in the collection must be 47.

PTS: 1   DIF: Difficult   REF: 7.1 Developing Systems of Linear Equations
LOC: 10.RF9   TOP: Relations and Functions   KEY: Problem-Solving Skills

18. ANS:

a) Let l represent the number of large trees. Let s represent the number of small trees.
An urban forest has a total of 1650 trees.
So, one equation is: $l + s = 1650$
Together, the trees remove 1818 kg of pollution. So, another equation is:
$1.5l + 0.04s = 1818$

Then, a linear system is:
$l + s = 1650$
$1.5l + 0.04s = 1818$

b) $l + s = 1650$ (1)
$1.5l + 0.04s = 1818$ (2)

Write each equation in the form $y = mx + b$.
Equation (1):
$l + s = 1650$ Subtract l from each side.
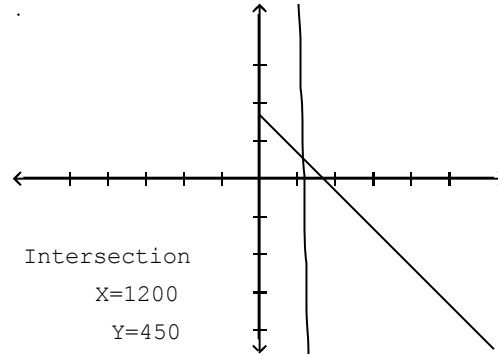 $s = -l + 1650$
Equation (2):
$1.5l + 0.04s = 1818$
   $0.04s = -1.5l + 1818$ Divide each side by 0.04.
       $s = -37.5l + 45\ 450$

On a graphing calculator, input the expressions:
Y1 =(–)X+1650 and
Y2 =(–)37.5*X+45 450
Adjust the window settings so the point of intersection appears in the window, then press graph.
From the calculator screen, the solution is:
$x = 1200$ and $y = 450$

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Intersection
   X=1200
   Y=450
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The value of x is the value of l, so the number of large trees is 1200.
The value of y is the value of s, so the number of small trees is 450.

c) The total number of trees is: $1200 + 450 = 1650$; this is the same as the given information.
1200 large trees and 450 small trees remove $1.5(1200) + 0.04(450)$, or 1818 kg of pollution; this is the same as the given information.
The solution is correct.

PTS: 1   DIF: Difficult
REF: 7.3 Using Graphing Technology to Solve a System of Linear Equations
LOC: 10.RF9   TOP: Relations and Functions   KEY: Problem-Solving Skills
19. ANS:
a) Let d dollars represent the daily rate and let k dollars represent the fee for each kilometre driven.

The linear system is:
$15d + 800k = 715$ ①
$25d + 2250k = 1512.5$ ②

b) Multiply equation ① by 25 and equation ② by 15, then subtract to eliminate d.
$25 \times$ equation ①: $25(15d + 800k = 715)$
$$375d + 20000k = 17875 \qquad ③$$

$15 \times$ equation ②: $15(25d + 2250k = 1512.5)$
$$375d + 33750k = 22687.5 \qquad ④$$

Subtract equation ④ from equation ③.
$$375d + 20000k = 17875 \qquad ③$$
$$-(375d + 33750k = 22687.5) \qquad ④$$
$$\overline{\quad - 13750k = -4812.5\quad}$$
$$k = 0.35$$

Substitute $k = 0.35$ in equation ①.

$$15d + 800k = 715 \qquad \textcircled{1}$$

$$15d + 800(0.35) = 715$$

$$15d + 280 = 715$$

$$15d = 435$$

$$d = 29$$

Verify the solution.
In each equation, substitute: $k = 0.35$ and $d = 29$

$$15d + 800k = 715 \qquad \textcircled{1}$$
$$\text{L.S.} = 15d + 800k$$
$$= 15(29) + 800(0.35)$$
$$= 435 + 280$$
$$= 715$$
$$= \text{R.S.}$$

$$25d + 2250k = 1512.5 \quad \textcircled{2}$$
$$\text{L.S.} = 25d + 2250k$$
$$= 25(29) + 2250(0.35)$$
$$= 725 + 787.5$$
$$= 1512.5$$
$$= \text{R.S.}$$

So, the daily rate is \$29 and the fee for each kilometre driven is \$0.35.

PTS: 1   DIF: Difficult
REF: 7.5 Using an Elimination Strategy to Solve a System of Linear Equations
LOC: 10.RF9   TOP: Relations and Functions   KEY: Problem-Solving Skills

20. ANS:

$$2s - 2c = 10 \qquad \textcircled{1}$$
$$6s + 6c = 50 \qquad \textcircled{2}$$

Multiply equation $\textcircled{1}$ by 3, then add to eliminate c.
$3 \times$ equation $\textcircled{1}$: $3(2s - 2c = 10)$
$$6s - 6c = 30 \qquad \textcircled{3}$$

Add:

$$6s - 6c = 30 \qquad \textcircled{3}$$
$$+ 6s + 6c = 50 \qquad \textcircled{2}$$
$$\overline{12s \qquad = 80}$$

$$s = \frac{80}{12}$$

$$s = \frac{20}{3}$$

Substitute $s = \frac{20}{3}$ in equation $\textcircled{1}$.

$$2s - 2c = 10$$

$$2\left(\frac{20}{3}\right) - 2c = 10$$

$$\frac{40}{3} - 2c = 10$$

$$-2c = 10 - \frac{40}{3}$$

$$-2c = \frac{30}{3} - \frac{40}{3}$$

$$-2c = -\frac{10}{3}$$

$$c = \frac{10}{6}$$

$$c = \frac{5}{3}$$

Verify the solution.

In each equation, substitute: $s = \frac{20}{3}$ and $c = \frac{5}{3}$

$2s - 2c = 10$
L.S. $= 2s - 2c$

$$= 2\left(\frac{20}{3}\right) - 2\left(\frac{5}{3}\right)$$

$$= \frac{40}{3} - \frac{10}{3}$$

$$= \frac{30}{3}$$

$$= 10$$

$$= \text{R.S.}$$

$6s + 6c = 50$
L.S. $= 6s + 6c$

$$= 6\left(\frac{20}{3}\right) + 6\left(\frac{5}{3}\right)$$

$$= 40 + 10$$

$$= 50$$

$$= \text{R.S.}$$

For each equation, the left side is equal to the right side, so the solution is: $s = \frac{20}{3}$ and $c = \frac{5}{3}$

PTS: 1   DIF: Difficult
REF: 7.5 Using an Elimination Strategy to Solve a System of Linear Equations
LOC: 10.RF9   TOP: Relations and Functions
KEY: Communication | Problem-Solving Skills