Answers to Unit 9

SECTION 1 Pages 329–330

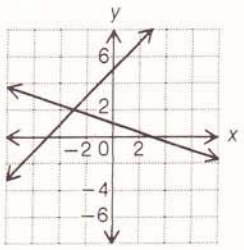
Example 2

$2x - 5y = 8$	
$2(-1) - 5(-2)$	8
$-2 + 10$	8
$8 = 8$	

$-x + 3y = -5$	
$-(-1) + 3(-2)$	-5
$1 + (-6)$	-5
$-5 = -5$	

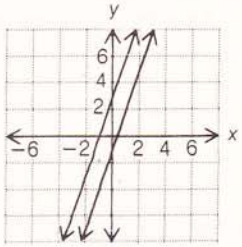
Yes, $(-1,-2)$ is a solution of the system of equations.

Example 4



The solution is $(-3,2)$.

Example 6

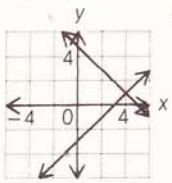


The lines are parallel and therefore do not intersect. The system of equations has no solution.

Pages 331–334

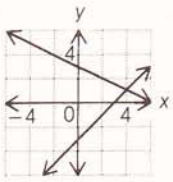
1. Yes, (2,3) is a solution of the system of equations. **3.** Yes, $(1,-2)$ is a solution of the system of equations. **5.** No, (4,3) is not a solution of the system of equations. **7.** No, $(-1,3)$ is not a solution of the system of equations. **9.** No, (0,0) is not a solution of the system of equations. **11.** Yes, $(2,-3)$ is a solution of the system of equations. **13.** Yes, (5,2) is a solution of the system of equations. **15.** Yes, $(-2,-3)$ is a solution of the system of equations. **17.** No, $(0,-3)$ is not a solution of the system of equations.

19.



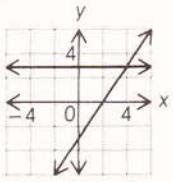
The solution is (4,1).

21.



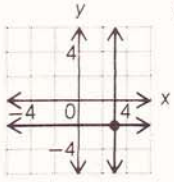
The solution is (4,1).

23.



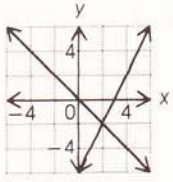
The solution is (4,3).

25.



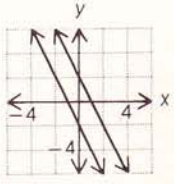
The solution is $(3,-2)$.

27.



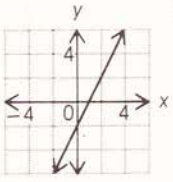
The solution is $(2,-2)$.

29.



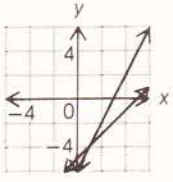
The system of equations has no solution.

31.



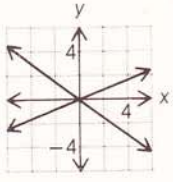
Any solution of one equation is also a solution of the other equation.

33.



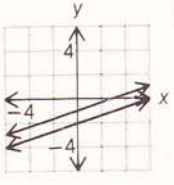
The solution is $(1,-4)$.

35.



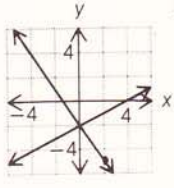
The solution is (0,0).

37.



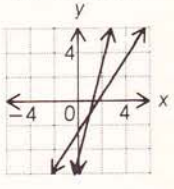
The system of equation has no solution.

39.



The solution is $(0,-2)$.

41.



The solution is $(1,-1)$.

SECTION 2 Pages 335–336

Example 2

$$\begin{aligned} (1)\quad & 7x - y = 4 \\ (2)\quad & 3x + 2y = 9 \end{aligned}$$

Solve equation (1) for y.

$$\begin{aligned} 7x - y &= 4 \\ -y &= -7x + 4 \\ y &= 7x - 4 \end{aligned}$$

Substitute in equation (2).

$$\begin{aligned} 3x + 2y &= 9 \\ 3x + 2(7x - 4) &= 9 \\ 3x + 14x - 8 &= 9 \\ 17x - 8 &= 9 \\ 17x &= 17 \\ x &= 1 \end{aligned}$$

Substitute in equation (1).

$$\begin{aligned} 7x - y &= 4 \\ 7(1) - y &= 4 \\ 7 - y &= 4 \\ -y &= -3 \\ y &= 3 \end{aligned}$$

The solution is (1,3).

Example 6

$$\begin{aligned} (1)\quad & y = -2x + 1 \\ (2)\quad & 6x + 3y = 3 \end{aligned}$$

$$\begin{aligned} 6x + 3y &= 3 \\ 6x + 3(-2x + 1) &= 3 \\ 6x - 6x + 3 &= 3 \\ 3 &= 3 \end{aligned}$$

The two equations represent the same line. Any ordered pair that is a solution of one equation is also a solution of the other equation.

Example 4

$$\begin{aligned} (1)\quad & 3x - y = 4 \\ (2)\quad & y = 3x + 2 \end{aligned}$$

$$\begin{aligned} 3x - y &= 4 \\ 3x - (3x + 2) &= 4 \\ 3x - 3x - 2 &= 4 \\ -2 &= 4 \end{aligned}$$

The lines are parallel. The system has no solution.

Pages 337–338

1. The solution is (2,1). **3.** The solution is (4,1). **5.** The solution is (−1,1). **7.** The solution is (3,1). **9.** The solution is (1,1). **11.** The solution is (−1,1). **13.** The lines are parallel. The system of equations has no solution. **15.** The lines are parallel. The system of equations has no solution. **17.** The solution is $\left(-\frac{3}{4}, -\frac{3}{4}\right)$. **19.** The solution is (5,7). **21.** The solution is (1,7). **23.** The solution is $\left(\frac{17}{5}, -\frac{7}{5}\right)$. **25.** The solution is $\left(-\frac{6}{11}, \frac{31}{11}\right)$. **27.** The solution is (2,3). **29.** The solution is (0,0). **31.** The two equations represent the same line. Any ordered pair that is a solution of one equation is also a solution of the other equation. **33.** The solution is $\left(\frac{20}{17}, -\frac{15}{17}\right)$. **35.** The solution is (5,2). **37.** The solution is (−17,−8). **39.** The solution is $\left(-\frac{5}{7}, \frac{13}{7}\right)$. **41.** The solution is (3,−2).

SECTION 3 Pages 339–342

Example 2

(1) $x - 2y = 1$
(2) $2x + 4y = 0$

Eliminate y.

$$2(x - 2y) = 2 \cdot 1$$
$$2x + 4y = 0$$

$$2x - 4y = 2$$
$$2x + 4y = 0$$

Add the equations.

$$4x = 2$$
$$x = \frac{2}{4} = \frac{1}{2}$$

Replace x in equation (2).

$$2\left(\frac{1}{2}\right) + 4y = 0$$
$$1 + 4y = 0$$
$$4y = -1$$
$$y = -\frac{1}{4}$$

The solution is $\left(\frac{1}{2}, -\frac{1}{4}\right)$.

Example 6

(1) $4x + 5y = 11$
(2) $3y = x + 10$

Write equation (2) in the form $Ax + By = C$.

$$3y = x + 10$$
$$-x + 3y = 10$$

Eliminate x.

$$4x + 5y = 11$$
$$4(-x + 3y) = 4 \cdot 10$$

$$4x + 5y = 11$$
$$-4x + 12y = 40$$

Add the equations.

$$17y = 51$$
$$y = 3$$

Replace y in equation (1).

$$4x + 5y = 11$$
$$4x + 5 \cdot 3 = 11$$
$$4x + 15 = 11$$
$$4x = -4$$
$$x = -1$$

The solution is $(-1,3)$.

Example 4

(1) $2x - 3y = 4$
(2) $-4x + 6y = -8$

Eliminate y.

$$2(2x - 3y) = 2 \cdot 4$$
$$-4x + 6y = -8$$

$$4x - 6y = 8$$
$$-4x + 6y = -8$$

Add the equations.

$$0 + 0 = 0$$
$$0 = 0$$

The two equations represent the same line. Any ordered pair that is a solution of one equation is also a solution of the other equation.

Pages 343–344

1. The solution is $(5,-1)$. **3.** The solution is $(1,3)$. **5.** The solution is $(1,1)$. **7.** The solution is $(3,-2)$. **9.** The two equations represent the same line. Any ordered pair that is a solution of one equation is also a solution of the other equation. **11.** The solution is $(3,1)$. **13.** The two equations represent the same line. Any ordered pair that is a solution of one equation is also a solution of the other equation. **15.** The solution is $\left(-\frac{13}{17},-\frac{24}{17}\right)$. **17.** The solution is $(2,0)$.

19. The solution is $(0,0)$. **21.** The solution is $(5,-2)$. **23.** The solution is $\left(\frac{32}{19},-\frac{9}{19}\right)$. **25.** The solution is $(3,4)$.

27. The solution is $(1,-1)$. **29.** The two equations represent the same line. Any ordered pair that is a solution of one equation is also a solution of the other. **31.** The solution is $(3,1)$. **33.** The solution is $(-1,2)$. **35.** The solution is $(1,1)$. **37.** The solution is $\left(\frac{1}{2},-\frac{1}{2}\right)$. **39.** The solution is $\left(\frac{2}{3},\frac{1}{9}\right)$. **41.** The solution is $\left(\frac{7}{25},-\frac{1}{25}\right)$.

SECTION 4 Pages 345–348

Example 2

Strategy

▷ Rate of the current: c
Rate of the canoeist in calm water: r

	Rate	Time	Distance
With current	$r + c$	3	$3(r + c)$
Against current	$r - c$	5	$5(r - c)$

▷ The distance traveled with the current is 15 mi.
The distance traveled against the current is 15 mi.

Solution

$3(r + c) = 15$ $\qquad \frac{1}{3}\cdot 3(r + c) = \frac{1}{3}\cdot 15$

$5(r - c) = 15$ $\qquad \frac{1}{5}\cdot 5(r - c) = \frac{1}{5}\cdot 15$

$$r + c = 5$$
$$r - c = 3$$

$$2r = 8$$
$$r = 4$$

$$r + c = 5$$
$$4 + c = 5$$
$$c = 1$$

The rate of the current is 1 mph.
The rate of the canoeist in calm water is 4 mph.

Example 4

Strategy

▷ The number of dimes in the first bank: d
The number of quarters in the first bank: q

First bank:

	Number	Value	Total Value
Dimes	d	10	$10d$
Quarters	q	25	$25q$

Second bank:

	Number	Value	Total Value
Dimes	$\frac{1}{2}d$	10	$5d$
Quarters	$2q$	25	$50q$

▷ The total value of the coins in the first bank is \$4.80.
The total value of the coins in the second bank is \$8.40.

Solution

$10d + 25q = 480$
$5d + 50q = 840$

$$10d + 25q = 480$$
$$-2(5d + 50q) = -2\cdot 840$$

$$10d + 25q = 480$$
$$-10d - 100q = -1680$$
$$-75q = -1200$$
$$q = 16$$

$$10d + 25q = 480$$
$$10d + 25(16) = 480$$
$$10d + 400 = 480$$
$$10d = 80$$
$$d = 8$$

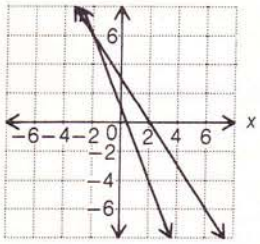
There are 8 dimes and 16 quarters in the first bank.

Pages 349–350

1. The rate of the canoeist in calm water is 7 mph. The rate of the current is 1 mph. **3.** The rate of the motorboat in still water is 22.5 or $22\frac{1}{2}$ mph. The rate of the current is 2.5 or $2\frac{1}{2}$ mph. **5.** The rate of the rowing team in calm water is 6 mph. The rate of the current is 2 mph. **7.** The rate of the plane in calm air is 110 mph. The rate of the wind is 20 mph. **9.** The crew can row 14 km/h in calm water. The rate of the current is 6 km/h. **11.** The cost per copy for a black-and-white page is \$.04. The cost per copy for a color page is \$.10. **13.** The cost per kilogram of the tin alloy is \$3. The cost per kilogram of the aluminum alloy is \$2. **15.** There are 12 quarters and 6 nickels in the first bank. **17.** There are 12 dimes and 10 quarters in the bank. **19.** The present age of the adult is 31. The present age of the child is 7.

REVIEW/TESTS
Pages 351–352

1.1a Yes, $(-2,3)$ is a solution of the system of equations. **1.1b** Yes, $(1,-3)$ is a solution of the system of equations.
1.2



The solution is $(-2,6)$.
2.1a The solution is $(3,1)$. **2.1b** The solution is $(1,-1)$. **2.1c** The solution is $(2,-1)$. **2.1d** The solution is $\left(\frac{22}{7},-\frac{5}{7}\right)$. **3.1a** The solution is $(2,1)$. **3.1b** The solution is $\left(\frac{1}{2},-1\right)$. **3.1c** The solution is $(2,-1)$. **3.1d** The solution is $(1,-2)$. **4.1** The rate of the plane in calm air is 100 mph. The rate of the wind is 20 mph. **4.2** The price of a reserved-seat ticket is \$10. The price of a general-admission ticket is \$6.

Pages 353–354

1.1a d **1.1b** b **1.2** a **2.1a** b **2.1b** b **2.1c** c **2.1d** b **3.1a** a **3.1b** b **3.1c** a **3.1d** c **4.1** c **4.2** b