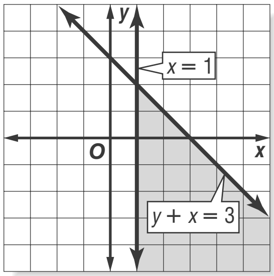
30. The solution includes the ordered pairs in the intersection of the graphs of $x \geq 1$ and $y + x \leq 3$. The region is shaded. The graphs of $x = 1$ and $y + x = 3$ are boundaries of this region. The graphs of both boundaries are solid and are included in the solution.



Chapter 7 Practice Test

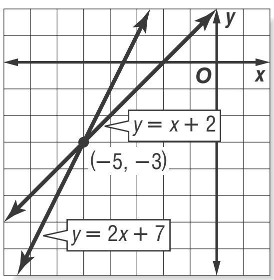
Page 403

1. c; inconsistent

2. a; consistent

3. b; elimination

4.



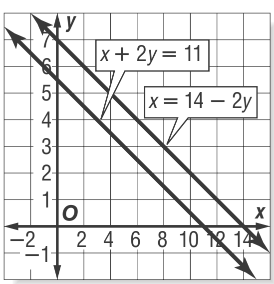
The graphs appear to intersect at $(-5, -3)$. Check in each equation.

Check:

$$\begin{aligned} y &= x + 2 \\ -3 &\stackrel{?}{=} -5 + 2 \\ -3 &= -3 \checkmark \end{aligned} \qquad \begin{aligned} y &= 2x + 7 \\ -3 &\stackrel{?}{=} 2(-5) + 7 \\ -3 &\stackrel{?}{=} -10 + 7 \\ -3 &= -3 \checkmark \end{aligned}$$

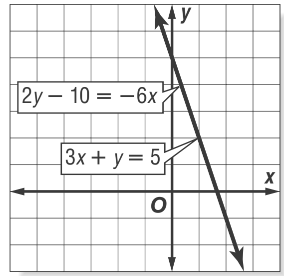
There is one solution. It is $(-5, -3)$.

5.



The graphs of the equations are parallel lines. Since they do not intersect, there are no solutions to this system of equations.

6.



The graphs of the equations coincide. Since every point is a point of intersection, there are infinitely many solutions to this system of equations.

7. Eliminate y.

$$\begin{array}{lll} 2x + 5y = 16 & \text{Multiply by 2.} & 4x + 10y = 32 \\ 5x - 2y = 11 & \text{Multiply by 5.} & \underline{(+)\ 25x - 10y = 55} \\ & & 29x \qquad\quad = 87 \\ & & \frac{29x}{29} = \frac{87}{29} \\ & & x = 3 \end{array}$$

Now substitute 3 for x in either equation to find the value of y.

$$\begin{aligned} 2x + 5y &= 16 \\ 2(3) + 5y &= 16 \\ 6 + 5y &= 16 \\ 6 + 5y - 6 &= 16 - 6 \\ 5y &= 10 \\ \frac{5y}{5} &= \frac{10}{5} \\ y &= 2 \end{aligned}$$

The solution is $(3, 2)$.

8. Solve the second equation for y.

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

Since $y = -2x + 4$, substitute $-2x + 4$ for y in the first equation.

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

The statement $4 = -1$ is false. This means there is no solution of the system of equation.

9. Multiply the first equation by -3 so the coefficients of the y terms are additive inverses. Then add the equations.

$$\begin{array}{lll} 2x + y = -4 & \text{Multiply by } -3. & -6x - 3y = 12 \\ 5x + 3y = -6 & & \underline{(+)\ 5x + 3y = -6} \\ & & -x \qquad = 6 \\ & & (-1)(-x) = (-1)6 \\ & & x = -6 \end{array}$$

Now substitute -6 for x in either equation to find the value of y.

$$\begin{aligned} 2x + y &= -4 \\ 2(-6) + y &= -4 \\ -12 + y &= -4 \\ -12 + y + 12 &= -4 + 12 \\ y &= 8 \end{aligned}$$

The solution is $(-6, 8)$.

10. Since $y = 7 - x$, substitute $7 - x$ for y in the second equation.

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

Use $y = 7 - x$ to find the value of y.

$$\begin{aligned} y &= 7 - x \\ y &= 7 - 2 \\ y &= 5 \end{aligned}$$

The solution is (2, 5).

11. Since $x = 2y - 7$, substitute $2y - 7$ for x in the second equation.

$$\begin{aligned} y - 3x &= -9 \\ y - 3(2y - 7) &= -9 \\ y - 6y + 21 &= -9 \\ -5y + 21 &= -9 \\ -5y + 21 - 21 &= -9 - 21 \\ -5y &= -30 \\ \tfrac{-5y}{-5} &= \tfrac{-30}{-5} \\ y &= 6 \end{aligned}$$

Use $x = 2y - 7$ to find the value of x.

$$\begin{aligned} x &= 2y - 7 \\ x &= 2(6) - 7 \\ x &= 12 - 7 \\ x &= 5 \end{aligned}$$

The solution is (5, 6).

12. Since the coefficients of the y terms, 1 and -1, are additive inverses, you can eliminate the y terms by adding the equations.

$$\begin{array}{rrcr} & x + y & = & 10 \\ (+) & x - y & = & 2 \\ \hline & 2x & = & 12 \end{array}$$

$$\begin{aligned} \tfrac{2x}{2} &= \tfrac{12}{2} \\ x &= 6 \end{aligned}$$

Now substitute 6 for x in either equation to find the value of y.

$$\begin{aligned} x + y &= 10 \\ 6 + y &= 10 \\ 6 + y - 6 &= 10 - 6 \\ y &= 4 \end{aligned}$$

The solution is (6, 4).

13. Multiply the first equation by 2 so the coefficients of the y terms are additive inverses. Then add the equations.

$3x - y = 11$ Multiply by 2. $6x - 2y = 22$

$x + 2y = -36$ $(+)\ x + 2y = -36$

$$\begin{array}{rrcr} & 6x - 2y & = & 22 \\ (+) & x + 2y & = & -36 \\ \hline & 7x & = & -14 \end{array}$$

$$\begin{aligned} \tfrac{7x}{7} &= \tfrac{-14}{7} \\ x &= -2 \end{aligned}$$

Now substitute -2 for x in either equation to find the value of y.

$$\begin{aligned} 3x - y &= 11 \\ 3(-2) - y &= 11 \\ -6 - y &= 11 \\ -6 - y + 6 &= 11 + 6 \\ -y &= 17 \\ (-1)(-y) &= (-1)17 \\ y &= -17 \end{aligned}$$

The solution is $(-2, -17)$.

14. Since the coefficients of the x terms, 3 and 3, are the same, you can eliminate the x terms by subtracting the equations.

$$\begin{array}{rrcr} & 3x + y & = & 10 \\ (-) & 3x - 2y & = & 16 \\ \hline & 3y & = & -6 \end{array}$$

$$\begin{aligned} \tfrac{3y}{3} &= \tfrac{-6}{3} \\ y &= -2 \end{aligned}$$

Now substitute -2 for y in either equation to find the value of x.

$$\begin{aligned} 3x + y &= 10 \\ 3x + (-2) &= 10 \\ 3x - 2 &= 10 \\ 3x - 2 + 2 &= 10 + 2 \\ 3x &= 12 \\ \tfrac{3x}{3} &= \tfrac{12}{3} \\ x &= 4 \end{aligned}$$

The solution is $(4, -2)$.

15. Since the coefficients of the y terms, -3 and 3, are additive inverses, you can eliminate the y terms by adding the equations.

$$\begin{array}{rrcr} & 5x - 3y & = & 12 \\ (+) & -2x + 3y & = & -3 \\ \hline & 3x & = & 9 \end{array}$$

$$\begin{aligned} \tfrac{3x}{3} &= \tfrac{9}{3} \\ x &= 3 \end{aligned}$$

Now substitute 3 for x in either equation to find the value of y.

$$\begin{aligned} 5x - 3y &= 12 \\ 5(3) - 3y &= 12 \\ 15 - 3y &= 12 \\ 15 - 3y - 15 &= 12 - 15 \\ -3y &= -3 \\ \tfrac{-3y}{-3} &= \tfrac{-3}{-3} \\ y &= 1 \end{aligned}$$

The solution is (3, 1).

16. Multiply the second equation by -2 so the coefficients of the x terms are additive inverses. Then add the equations.

$$\begin{array}{lr} 2x + 5y = 12 & 2x + 5y = 12 \\ x - 6y = -11 \text{ Multiply by } -2. & \underline{(+)\ -2x + 12y = 22} \\ & 17y = 34 \\ & \frac{17y}{17} = \frac{34}{17} \\ & y = 2 \end{array}$$

Now substitute 2 for y in either equation to find the value of x.

$$\begin{aligned} x - 6y &= -11 \\ x - 6(2) &= -11 \\ x - 12 &= -11 \\ x - 12 + 12 &= -11 + 12 \\ x &= 1 \end{aligned}$$

The solution is (1, 2).

17. Multiply the first equation by -3 so the coefficients of the x terms are additive inverses. Then add the equations.

$$\begin{array}{lr} x + y = 6 \text{ Multiply by } -3. & -3x - 3y = -18 \\ 3x - 3y = 13 & \underline{(+)\ 3x - 3y = 13} \\ & -6y = -5 \\ & \frac{-6y}{-6} = \frac{-5}{-6} \\ & y = \frac{5}{6} \end{array}$$

Now substitute $\frac{5}{6}$ for y in either equation to find the value of x.

$$\begin{aligned} x + y &= 6 \\ x + \tfrac{5}{6} &= 6 \\ x + \tfrac{5}{6} - \tfrac{5}{6} &= 6 - \tfrac{5}{6} \\ x &= 5\tfrac{1}{6} \end{aligned}$$

The solution is $\left(5\frac{1}{6}, \frac{5}{6}\right)$.

18. Multiply the first equation by 5 so the coefficients of the y terms are additive inverses. Then add the equations.

$$\begin{array}{lr} 3x + \frac{1}{3}y = 10 \text{ Multiply by 5.} & 15x + \frac{5}{3}y = 50 \\ 2x - \frac{5}{3}y = 35 & \underline{(+)\ 2x - \frac{5}{3}y = 35} \\ & 17x \qquad = 85 \\ & \frac{17x}{17} = \frac{85}{17} \\ & x = 5 \end{array}$$

Now substitute 5 for x in either equation to find the value of y.

$$\begin{aligned} 3x + \tfrac{1}{3}y &= 10 \\ 3(5) + \tfrac{1}{3}y &= 10 \\ 15 + \tfrac{1}{3}y &= 10 \\ 15 + \tfrac{1}{3}y - 15 &= 10 - 15 \\ \tfrac{1}{3}y &= -5 \\ (3)\tfrac{1}{3}y &= (3)(-5) \\ y &= -15 \end{aligned}$$

The solution is $(5, -15)$.

19. Let t = the tens digit, and let u = the units digit.

$u = 2t + 1$
$u + t = 10$

Since u = $2t + 1$, substitute $2t + 1$ for u in the second equation.

$$\begin{aligned} u + t &= 10 \\ (2t + 1) + t &= 10 \\ 3t + 1 &= 10 \\ 3t + 1 - 1 &= 10 - 1 \\ 3t &= 9 \\ \tfrac{3t}{3} &= \tfrac{9}{3} \\ t &= 3 \end{aligned}$$

Use $u = 2t + 1$ to find the value of u.

$u = 2t + 1$
$u = 2(3) + 1$
$u = 6 + 1$
$u = 7$

The tens digit is 3 and the units digit is 7. So, the number is 37.

20. Let ℓ = the length of the rectangle and let w = the width of the rectangle.

$\ell - w = 7$
$2\ell + 2w = 50$

Solve the first equation for ℓ.

$$\begin{aligned} \ell - w &= 7 \\ \ell - w + w &= 7 + w \\ \ell &= 7 + w \end{aligned}$$

Since $\ell = 7 + w$, substitute $7 + w$ for ℓ in the second equation.

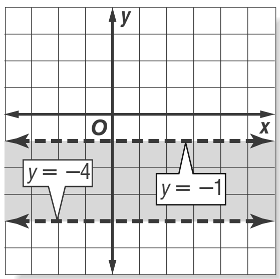
$$\begin{aligned} 2\ell + 2w &= 50 \\ 2(7 + w) + 2w &= 50 \\ 14 + 2w + 2w &= 50 \\ 14 + 4w &= 50 \\ 14 + 4w - 14 &= 50 - 14 \\ 4w &= 36 \\ \tfrac{4w}{4} &= \tfrac{36}{4} \\ w &= 9 \end{aligned}$$

Substitute 9 for w in either equation to find the value of ℓ.

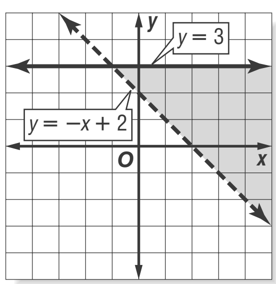
$\ell = 7 + w$
$\ell = 7 + 9$
$\ell = 16$

The length of the rectangle is 16 cm and the width of the rectangle is 9 cm.

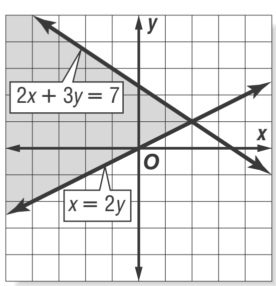
21. The solution includes the ordered pairs in the intersection of the graphs of $y > -4$ and $y < -1$. The region is shaded. The graphs of $y = -4$ and $y = -1$ are boundaries of this region. The graphs of both boundaries are dashed and are not included in the solution.



22. The solution includes the ordered pairs in the intersection of the graphs of $y \leq 3$ and $y > -x + 2$. The region is shaded. The graphs of $y = 3$ and $y = -x + 2$ are boundaries of this region. The graph of $y = 3$ is solid and is included in the graph of $y \leq 3$. The graph of $y = -x + 2$ is dashed and is not included in the graph of $y > -x + 2$.



23. The solution includes the ordered pairs in the intersection of the graphs of $x \leq 2y$ and $2x + 3y \leq 7$. The region is shaded. The graphs of $x = 2y$ and $2x + 3y = 7$ are boundaries of this region. The graphs of both boundaries are solid and are included in the solution.



24. Let x = the amount invested at 6% and let y = the amount invested at 8%.

$x + y = 10{,}000$
$0.06x + 0.08y = 760$

Solve the first equation for x.

$$\begin{aligned} x + y &= 10{,}000 \\ x + y - y &= 10{,}000 - y \\ x &= 10{,}000 - y \end{aligned}$$

Since $x = 10{,}000 - y$, substitute $10{,}000 - y$ for x in the second equation.

$$\begin{aligned} 0.06x + 0.08y &= 760 \\ 0.06(10{,}000 - y) + 0.08y &= 760 \\ 600 - 0.06y + 0.08y &= 760 \\ 600 + 0.02y &= 760 \\ 600 + 0.02y - 600 &= 760 - 600 \\ 0.02y &= 160 \\ \frac{0.02y}{0.02} &= \frac{160}{0.02} \\ y &= 8000 \end{aligned}$$

Substitute 8000 for y in either equation to find the value of x.

$x = 10{,}000 - y$
$x = 10{,}000 - 8000$
$x = 2000$

\$2000 was invested at 6% and \$8000 was invested at 8%.

25. D; For the system $\begin{array}{l} y > 2x + 1 \\ y < -x - 2 \end{array}$, both boundary lines should be dashed. The region representing the intersection of the graphs of these two inequalities is above the graph of $y = 2x + 1$ and below the graph of $y = -x - 2$. To check, test an ordered pair in this region to verify that the coordinates satisfy both inequalities. For example, check $(-3, -2)$.

Check:

$$\begin{array}{ll} y > 2x + 1 & y < -x - 2 \\ -2 \overset{?}{>} 2(-3) + 1 & -2 \overset{?}{<} -(-3) - 2 \\ -2 \overset{?}{>} -6 + 1 & -2 \overset{?}{<} 3 - 2 \\ -2 > -5\,\checkmark & -2 < 1\,\checkmark \end{array}$$

Chapter 7 Standardized Test Practice

Pages 404–405

1. B;

$$\begin{aligned} 4x - 2(x - 2) - 8 &= 0 \\ 4x - 2x + 4 - 8 &= 0 \\ 2x - 4 &= 0 \\ 2x - 4 + 4 &= 0 + 4 \\ 2x &= 4 \\ \frac{2x}{2} &= \frac{4}{2} \\ x &= 2 \end{aligned}$$

2. C;

Let p = the price of the CD before tax.

$$\begin{aligned} p + 0.07p &= 17.11 \\ 1.07p &= 17.11 \\ \frac{1.07p}{1.07} &= \frac{17.11}{1.07} \\ p &= 15.99 \quad \text{(to the nearest hundredth)} \end{aligned}$$

The price of the CD before tax was \$15.99.

3. B;

$$\begin{array}{lll} f(x) = 2x - 3 & f(x) = 2x - 3 & f(x) = 2x - 3 \\ f(3) = 2(3) - 3 & f(4) = 2(4) - 3 & f(5) = 2(5) - 3 \\ \quad = 6 - 3 & \quad = 8 - 3 & \quad = 10 - 3 \\ \quad = 3 & \quad = 5 & \quad = 7 \end{array}$$

The range is $\{3, 5, 7\}$.