Answer Key

Section 4-1

1. B 2. D 3. A 4. D 5. C
6. C

Section 4-2

1. B 2. B 3. D 4. 6 5. D
6. A 7. $\frac{24}{5}$ 8. 2 or 3

Section 4-3

1. C 2. D 3. A 4. B

Section 4-4

1. C 2. B 3. C 4. B

Chapter 4 Practice Test

1. C 2. A 3.D 4. B 5. A
6. A 7. A 8. D 9. C 10. 420
11. $\frac{7}{2}$ or 3.5 12. 5 or 6

Answers and Explanations

Section 4-1

1. B

$-3+n \le 25$

$-3+n+3 \le 25+3$ Add 3 to each side.

$n \le 28$ Simplify.

$4n \le 4 \cdot 28$ Multiply each side by 4.

$4n \le 112$ Simplify.

$4n-12 \le 112-12$ Subtract 12 from each side.

$4n-12 \le 100$ Simplify.

2. D

$\frac{1}{2}x-\frac{1}{3}>\frac{7}{9}+\frac{5}{2}x$

$\frac{1}{2}x-\frac{1}{3}-\frac{5}{2}x>\frac{7}{9}+\frac{5}{2}x-\frac{5}{2}x$ Subtract $\frac{5}{2}x$ from each side.

$-2x-\frac{1}{3}>\frac{7}{9}$ Simplify.

$-2x-\frac{1}{3}+\frac{1}{3}>\frac{7}{9}+\frac{1}{3}$ Add $\frac{1}{3}$ to each side.

$-2x>\frac{10}{9}$ Simplify.

$-\frac{1}{2}(-2x)<-\frac{1}{2}(\frac{10}{9})$ Multiply each side by $-\frac{1}{2}$ and change > to <.

$x<-\frac{5}{9}$ Simplify.

Therefore, $-\frac{1}{2}$ is not a solution to the inequality.

3. A

$-3a+7 \ge 5a-17$

Add $-5a-7$ to each side of the inequality.

$-3a+7+(-5a-7) \ge 5a-17+(-5a-7)$

$-8a \ge -24$ Simplify.

$(-8a)\div(-8) \le (-24)\div(-8)$ Divide each side by -8 and change $\ge$ to $\le$.

$a \le 3$ Simplify.

$3a \le 3(3)$ Multiply each side by 3.

$3a \le 9$ Simplify.

$3a+7 \le 9+7$ Add 7 to each side.

$3a+7 \le 16$ Simplify.

Therefore, the greatest possible value of $3a+7$ is 16.

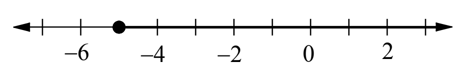
4. D

$$\underbrace{9}_{\text{nine}} \quad \underbrace{\le}_{\text{is not more than}} \quad \underbrace{n+17}_{\text{the sum of a number and 17}}$$

5. C

$$\underbrace{7n}_{\text{the product of 7 and a number } n} \quad \underbrace{\ge}_{\text{is no less than}} \quad \underbrace{91}_{91}$$

6. C



The solution set is $n \ge -5$.

Section 4-2

1. B

$3-n<-2$ or $2n+3 \le -1$

$3-n-3<-2-3$ or $2n+3-3 \le -1-3$

$-n<-5$ or $2n \le -4$

$n>5$ or $n \le -2$

$-6 \le -2$, $-2 \le -2$, and $6>5$ are true. 2 is not a solution to the given compound inequality.

2. B

$5w+7>2$ and $6w-15\le 3(-1+w)$
$5w+7-7>2-7$ and $6w-15\le -3+3w$
$5w>-5$ and $3w\le 12$
$w>-1$ and $w\le 4$

Thus, 2 is a solution to the inequality.

3. D

$-x\le 5$	First inequality
$(-1)(-x)\ge(-1)(5)$	Multiply each side by -1 and change $\ge$ to $\le$.
$x\ge -5$	First inequality simplified.
$7-\frac{1}{2}x>x+1$	Second inequality
$7-\frac{1}{2}x-7>x+1-7$	Subtract 7 from each side.
$-\frac{1}{2}x>x-6$	Simplify.
$-\frac{1}{2}x-x>x-6-x$	Subtract x from each side.
$-\frac{3}{2}x>-6$	Simplify.
$(-\frac{2}{3})(-\frac{3}{2}x)<(-\frac{2}{3})(-6)$	Multiply each side by $-\frac{2}{3}$ and change $>$ to $<$.
$x<4$	Simplify.

The inequality can be written as $-5\le x<4$, so answer choice D is correct.

4. 6

$-2<n<-1$	
$(\frac{1}{2})(-2)<(\frac{1}{2})n<(\frac{1}{2})(-1)$	Multiply each side by $\frac{1}{2}$.
$-1<\frac{1}{2}n<-\frac{1}{2}$	Simplify.
$7-1<7+\frac{1}{2}n<7-\frac{1}{2}$	Add 7 to each side.
$6<7+\frac{1}{2}n<6.5$	Simplify

Thus, $7+\frac{1}{2}n$ rounded to the nearest whole number is 6.

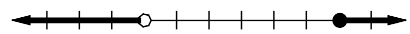
5. D

$\left|\frac{1}{2}x-1\right|\le 1$ is equivalent to $-1\le\frac{1}{2}x-1\le 1$.

$-1+1\le\frac{1}{2}x-1+1\le 1+1$	Add 1 to each side.
$0\le\frac{1}{2}x\le 2$	Simplify.
$2\cdot 0\le 2\cdot\frac{1}{2}x\le 2\cdot 2$	Multiply each side by 2.
$0\le x\le 4$	Simplify.

Thus, 6 is not a solution of the given inequality.

6. A



The compound inequality $x<-2$ or $4\le x$ represents the graph above.

7. $\frac{24}{5}$

$\frac{1}{4}x-1\le -x+5$

Add $x+1$ to each side of the inequality.

$\frac{1}{4}x-1+(x+1)\le -x+5+(x+1)$	
$\frac{5}{4}x\le 6$	Simplify.
$\frac{4}{5}(\frac{5}{4}x)\le\frac{4}{5}(6)$	Multiply each side by $\frac{4}{5}$.
$x\le\frac{24}{5}$	Simplify.

The greatest possible value of x is $\frac{24}{5}$.

8. 2 or 3

$\left|\frac{3}{4}n-2\right|<1$ is equivalent to $-1<\frac{3}{4}n-2<1$.

$-1+2<\frac{3}{4}n-2+2<1+2$	Add 2 to each side.
$1<\frac{3}{4}n<3$	Simplify.
$\frac{4}{3}\cdot 1<\frac{4}{3}\cdot\frac{3}{4}n<\frac{4}{3}\cdot 3$	Multiply each side by $\frac{4}{3}$.
$\frac{4}{3}<n<4$	Simplify.

Since n is an integer, the possible values of n are 2 and 3.

Section 4-3

1. C

The equation of the boundary line is $y = -2$. Any point above that horizontal has a y-coordinate that satisfies $y > -2$. Since the boundary line is drawn as a dashed line, the inequality should not include an equal sign.

2. D

The slope-intercept form of the boundary line is $y = \frac{2}{3}x + 2$. The standard form of the line is $3y - 2x = 6$. Since the boundary line is drawn as a solid line, the inequality should include an equal sign. Select a point in the plane which is not on the boundary line and test the inequalities in the answer choices. Let's use $(0,0)$.

C) $3y - 2x \geq 6$
$3(0) - 2(0) \geq 6$ $\quad x = 0,\ y = 0$
$0 \geq 6$ $\quad$ false

D) $3y - 2x \leq 6$
$3(0) - 2(0) \leq 6$ $\quad x = 0,\ y = 0$
$0 \leq 6$ $\quad$ true

Since the half-plane containing the origin is shaded, the test point $(0,0)$ should give a true statement. Answer choice D is correct. Choices A and B are incorrect because the equations of the boundary lines are not correct.

3. A

The slope-intercept form of the boundary line is $y = -x - 1$. The standard form of the line is $x + y = -1$. Since the boundary line is drawn as a dashed line, the inequality should not include an equal sign. Select a point in the plane which is is not on the boundary line and test the inequalities in the answer choices. Let's use $(0,0)$.

A) $x + y < -1$
$0 + 0 < -1$ $\quad x = 0,\ y = 0$
$0 < -1$ $\quad$ false

Since the half-plane containing the origin is not shaded, the test point $(0,0)$ should give a false statement. Answer choice A is correct. Choices C and D are incorrect because the inequalities include equal signs.

4. B

The slope-intercept form of the boundary line is $y = 2x$. The standard form of the line is $2x - y = 0$. Since the boundary line is drawn as a solid line, the inequality should include an equal sign. Select a point in the plane which is not on the boundary line and test the inequalities in the answer choices. We cannot use $(0,0)$ for this question because $(0,0)$ is on the boundary line. Let's use $(0,1)$.

A) $2x - y \geq 0$
$2(0) - (1) \geq 0$ $\quad x = 0,\ y = 1$
$-1 \geq 0$ $\quad$ false

B) $2x - y \leq 0$
$2(0) - (1) \leq 0$ $\quad x = 0,\ y = 1$
$-1 \leq 0$ $\quad$ true

Since the half-plane containing the $(0,1)$ is shaded, the test point $(0,1)$ should give a true statement. Answer choice B is correct. Choices C and D are incorrect because the equations of the boundary lines are not correct.

Section 4-4

1. C

$y - x \geq 1$
$y \leq -2x$

Select a point from each section, then test them on the inequalities. Let's use $(3,0)$, $(0,3)$, $(-3,0)$, and $(0,-3)$, from each section as test points.

$0 - 3 \geq 1$ $\quad x = 3,\ y = 0$ is false.
$0 \leq -2(3)$ $\quad x = 3,\ y = 0$ is false.

$3 - 0 \geq 1$ $\quad x = 0,\ y = 3$ is true.
$3 \leq -2(0)$ $\quad x = 0,\ y = 3$ is false.
$0 - (-3) \geq 1$ $\quad x = -3,\ y = 0$ is true.
$0 \leq -2(-3)$ $\quad x = -3,\ y = 0$ is true.

Since $x = -3$ and $y = 0$ are true for both inequalities, section C represents all of the solutions to the system.

2. B

$y > x - 4$
$x + y < 5$

Check each answer choice, to determine which ordered pair (x, y) is a solution to the system of inequalities.

A) $(4, -2)$

$-2 > 4 - 4$ $\quad x = 4,\ y = -2$ is false.
$4 + (-2) < 5$ $\quad x = 4,\ y = -2$ is true.

B) $(0, 2)$

$2 > 0 - 4$ $\quad x = 0,\ y = 2$ is true.
$0 + 2 < 5$ $\quad x = 0,\ y = 2$ is true.

$(0, 2)$ is a solution to the system of inequalities because the ordered pair gives a true statement for both pairs of inequalities.

3. C

$x - 2y \le -2$
$y < -x + 2$

Select a point from each section, then test them on the inequalities. Let's use $(3, 0)$, $(0, 3)$, $(-3, 0)$, and $(0, -3)$, from each section as test points.

$3 - 2(0) \le -2$ $\quad x = 3,\ y = 0$ is false.

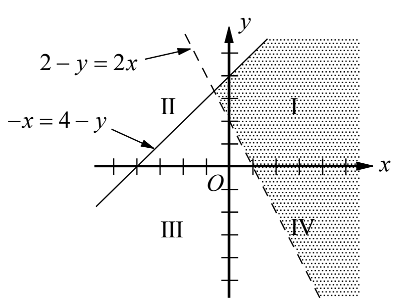
If the first statement is false, we don't need to check the second statement because the ordered pair must give a true statement for both pairs of the inequalities.

$0 - 2(3) \le -2$ $\quad x = 0,\ y = 3$ is true.
$3 < -(0) + 2$ $\quad x = 0,\ y = 3$ is false.

$-3 - 2(0) \le -2$ $\quad x = -3,\ y = 0$ is true.
$0 < -(-3) + 2$ $\quad x = -3,\ y = 0$ is true.

Since $x = -3$ and $y = 0$ are true for both inequalities, section R represents all of the solutions to the system.

4. B



To determine which quadrant does not contain any solution to the system of inequalities, graph the inequalities. It is easier to use x- intercept and y- intercept to graph the boundary line. Graph the inequality $2 - y < 2x$ by drawing a dashed line through the x- intercept $(1, 0)$ and y- intercept $(0, 2)$. Graph the inequality $-x \ge 4 - y$ by drawing a solid line through the x- intercept $(-4, 0)$ and y- intercept $(0, 4)$. The solution to the system of inequalities is the shaded region as shown in the graph above. It can be seen that the solutions only include points in quadrants I, II, and IV and do not include any points in quadrant III.

Chapter 4 Practice Test

1. C

$$\underbrace{120k + 215j}_{\text{the sum of } 120k \text{ and } 215j} \quad \underbrace{\le}_{\text{does not exceed}} \quad \underbrace{2{,}500}_{2{,}500}$$

2. A

$$\underbrace{\frac{1}{2}n}_{\text{one half of a number}} \quad \underbrace{-3}_{\text{decreased by 3}} \quad \underbrace{\le}_{\text{is at most}} \quad \underbrace{-5}_{-5}$$

3. D

$\frac{3b+5}{-2} \ge b - 8$

$-2\left(\frac{3b+5}{-2}\right) \le -2(b-8)$	Multiply each side by -2 and change $\ge$ to $\le$.
$3b + 5 \le -2b + 16$	Simplify.
$3b + 5 + 2b \le -2b + 16 + 2b$	Add $2b$ to each side.
$5b + 5 \le 16$	Simplify.
$5b + 5 - 5 \le 16 - 5$	Subtract 5.
$5b \le 11$	Simplify.
$\frac{5b}{5} \le \frac{11}{5}$	Divide each side by 5.
$b \le \frac{11}{5}$	Simplify.

So, 3 is not a solution to the inequality.

4. B

$0.6(k - 7) - 0.3k > 1.8 + 0.9k$
$\Rightarrow\ 0.6k - 4.2 - 0.3k > 1.8 + 0.9k$
$\Rightarrow\ 0.3k - 4.2 > 1.8 + 0.9k$

$\Rightarrow\ 0.3k - 4.2 - 0.9k > 1.8 + 0.9k - 0.9k$

$\Rightarrow\ -0.6k - 4.2 > 1.8\ \Rightarrow\ -0.6k > 6$

$\Rightarrow\ \dfrac{-0.6k}{-0.6} < \dfrac{6}{-0.6}\ \Rightarrow\ k < -10$

5. A

$4m - 3 \le 2(m+1)$	or	$7m + 25 < 15 + 9m$
$4m - 3 \le 2m + 2$	or	$-2m + 25 < 15$
$2m \le 5$	or	$-2m < -10$
$m \le \dfrac{5}{2}$	or	$m > 5$

Thus, among the answer choices, 2 is the only solution to the compound inequality.

6. A

Slope m of the boundary line is $m = \dfrac{3-0}{0-(-4)} = \dfrac{3}{4}$. The y- intercept is 3. So, the slope-intercept form of the line is $y = \dfrac{3}{4}x + 3$.

The standard form of the line is $4y - 3x = 12$.

Select a point in the shaded region and test each inequality.
Let's use $(0,4)$, as a test point.

A) $4y - 3x > 12$

$4(4) - 3(0) > 12$	$x = 0,\ y = 4$
$16 > 12$	true

Since the half-plane containing $(0,4)$ is shaded, the test point $(0,4)$ should give a true statement. Answer choice A is correct.
Choices C and D are incorrect because the equations of the boundary lines are not correct.

7. A

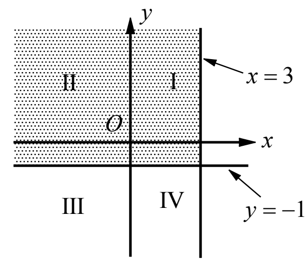
Let's check $(3,0)$, which is in section A.

$2(0) - 3(3) \le 6$	$x = 3,\ y = 0$ is true.
$0 > 1 - 3$	$x = 3,\ y = 0$ is true.

Since $x = 3$ and $y = 0$ are true for both inequalities, section A represents all of the solutions to the system.

8. D

To determine which quadrant does not contain any solution to the system of inequalities, graph the inequalities.



The solution to the system of inequalities is the shaded region shown in the graph above. Its solutions include points in all four quadrants.
D is correct answer.

9. C

$y < ax + 1$ and $y > bx - 1$

Since $(1,0)$ is a solution to the system of inequalities, substitute $x = 1$ and $y = 0$ in the given inequalities.

$0 < a(1) + 1$	and $0 > b(1) - 1$	$x = 1,\ y = 0$
$-1 < a$	and $1 > b$	Simplify.

Statements I and III are true. But we do not know the exact value of a or b, so statement II is not true.

10. 420

$y \ge 12x + 600$	First inequality
$y \ge -6x + 330$	Second inequality

Multiply each side of the second inequality by 2 and then add it to the first inequality.

$2y \ge -12x + 660$	2nd inequality multiplied by2.
$+\ y \ge 12x + 600$	First inequality
$3y \ge 1260$	Sum of two inequalities
$\dfrac{3y}{3} \ge \dfrac{1260}{3}$	Divide each side by 3.
$y \ge 420$	Simplify.

Therefore, the minimum possible value of y is 420.

11. $\dfrac{7}{2}$ or 3.5

$-6 \le 3 - 2x \le 9$	
$-6 - 3 \le 3 - 2x - 3 \le 9 - 3$	Subtract 3 from each side.
$-9 \le -2x \le 6$	Simplify.
$\dfrac{-9}{-2} \ge \dfrac{-2x}{-2} \ge \dfrac{6}{-2}$	Divide each side by -2 and change $\le$ to $\ge$.
$\dfrac{9}{2} \ge x \ge -3$	Simplify.

$\frac{9}{2}-1 \geq x-1 \geq -3-1$ Subtract 1 from each side.

$\frac{7}{2} \geq x-1 \geq -4$ Simplify.

The greatest possible value of $x-1$ is $\frac{7}{2}$.

12. 5 or 6

$4x-2>17$ and $3x+5<24$

$4x>19$ and $3x<19$

$x>\frac{19}{4}$ and $x<\frac{19}{3}$

Since x is between $\frac{19}{4}(=4.75)$ and $\frac{19}{3}(\approx 6.33)$, the integer value of x is 5 or 6.