

**Additional Practice**

5.01

**Problems 1–2:** Here is a shape puzzle. The sum of each row and column is shown.

1. Select *all* the true statements.

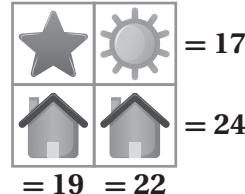
A. + = 22

B. + = 14

C. + = 15

D. = 12

E. + = 19



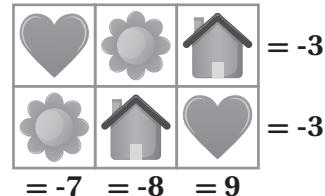
2. Show or explain why this statement is *false*: = 8

**Responses vary.** Since two houses equal 24, we know that one house is 12. According to the puzzle, one house and one star add up to 19. This could make the star equal to 19 minus 12, which is 7, not 8.

**Problems 3–4:** Here is a shape puzzle.

3. Determine the solution for this puzzle.

Shape	Value
Heart	5
Flower	-12
House	4



4. Explain or show your thinking.

**Explanations vary.** The house and the heart must both be positive numbers that add up to 9 and the house must be 1 more than the heart, based on the sums of columns 1 and 2. Therefore, the house must be 5 and the heart must be 4. Therefore, I used those values to determine that the flower must be -12.

**Problems 5–6:** Use these two equations:

$$x + y + y = 25$$

$$x + x + y = 20$$



5. Draw a shape puzzle to represent these equations.

Responses vary.

6. Determine the values of  $x$  and  $y$ .

$$x = \underline{\quad 5 \quad}$$

$$y = \underline{\quad 10 \quad}$$

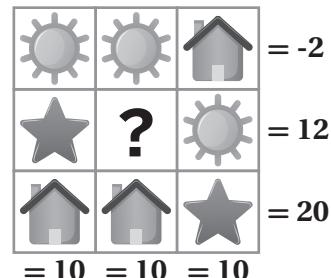
**Problems 7–9:** Here is a shape puzzle.

7. Determine the missing shape in the center of this puzzle.  
Circle your choice.

Sun      Star      House

8. Show or explain your thinking.

Explanations vary. Based on the three columns all adding up to the same value, I know that all three different shapes add up to 10. The middle column must be all three different shapes. Since the star is the shape not represented in this column, the shape must be a star.



9. If the missing shape has a value of 8, what are the values of the other two shapes?

The sun has a value of  $-4$  and the house has a value of  $6$ .

# Additional Practice | Answer Key

## Unit 5 | Lesson 1

Name: ..... Date: ..... Period: .....

### Additional Practice

**5.01**

**Problems 1–2:** Here is a shape puzzle. The sum of each row and column is shown.

1. Select all the true statements.

A.  +  = 22  
 B.  +  = 14  
 C.  +  = 15  
 D.  = 12  
 E.  +  = 19

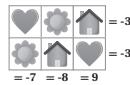
  
 $\begin{array}{c} \star \quad \text{House} \\ \text{House} \quad \star \\ \hline \star \end{array} = 17$   
 $\begin{array}{c} \star \quad \text{House} \\ \text{House} \quad \star \\ \hline \star \end{array} = 24$   
 $= 19 = 22$

2. Show or explain why this statement is false:  = 8  
**Responses vary.** Since two houses equal 24, we know that one house is 12. According to the puzzle, one house and one star add up to 19. This could make the star equal to 19 minus 12, which is 7, not 8.

**Problems 3–4:** Here is a shape puzzle.

3. Determine the solution for this puzzle.

Shape	Value
Heart	5
Flower	-12
House	4

  
 $\begin{array}{c} \text{Heart} \quad \text{Flower} \quad \text{House} \\ \text{Flower} \quad \text{House} \quad \text{Heart} \\ \hline \text{Heart} \end{array} = -3$   
 $= -7 = -8 = 9$

4. Explain or show your thinking.  
**Explanations vary.** The house and the heart must both be positive numbers that add up to 9 and the house must be 1 more than the heart, based on the sums of columns 1 and 2. Therefore, the house must be 5 and the heart must be 4. Therefore, I used those values to determine that the flower must be -12.

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Name: ..... Date: ..... Period: .....

**Problems 5–6:** Use these two equations:

$$x + y + y = 25$$

$$x + x + y = 20$$

5. Draw a shape puzzle to represent these equations.  
**Responses vary.**

6. Determine the values of  $x$  and  $y$ .  
 $x = 5$        $y = 10$

**Problems 7–9:** Here is a shape puzzle.

7. Determine the missing shape in the center of this puzzle. Circle your choice.

Sun       Star      House

8. Show or explain your thinking.  
**Explanations vary.** Based on the three columns all adding up to the same value, I know that all three different shapes add up to 10. The middle column must be all three different shapes. Since the star is the shape not represented in this column, the shape must be a star.

9. If the missing shape has a value of 8, what are the values of the other two shapes?  
**The sun has a value of -4 and the house has a value of 6.**

Unit 5 Lesson 1      124      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.REI.C.6
2	2	HSA.REI.C.6
3	1	HSA.REI.C.6
4	2	HSA.REI.C.6
5	1	HSA.REI.C.6
6	1	HSA.REI.C.6
7	1	HSA.REI.C.6
8	2	HSA.REI.C.6
9	1	HSA.REI.C.6

**Notes:**

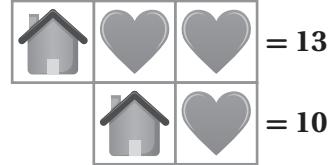
**Additional Practice****5.02**

- 1.** Solve this system of equations. Use the shape puzzle if it helps with your thinking.

$$\begin{aligned} 2x + y &= 13 \\ x + y &= 10 \end{aligned}$$

$x = \dots \textcolor{red}{3}$

$y = \dots \textcolor{red}{7}$



- 2.** Which equation is the result of adding these two equations?

$$\begin{aligned} -3x + 2y &= 1 \\ 3x + 5y &= -15 \end{aligned}$$

A.  $7y = -14$

B.  $7y = 16$

C.  $-6x + 7y = 16$

D.  $6x + 7y = -14$

- 3.** Which system(s) of equations is most efficiently solved using elimination by addition?

A.  $\begin{aligned} -x + 4y &= 5 \\ 4x - y &= 12 \end{aligned}$

B.  $\begin{aligned} -4x + 3y &= -16 \\ -2x + 3y &= 12 \end{aligned}$

C.  $\begin{aligned} 5x - y &= 7 \\ 5x - 2y &= 14 \end{aligned}$

D.  $\begin{aligned} -6x + 2y &= 12 \\ 6x + 7y &= 3 \end{aligned}$

- 4.** Which ordered pair is the solution to this system of equations?

$$\begin{aligned} -2x + y &= 11 \\ 2x - 3y &= -25 \end{aligned}$$

A.  $(-3, 8)$

B.  $(-2, 7)$

C.  $(2, -7)$

D.  $(4, 7)$

**Problems 5–8:** Determine the solution for each system of equations. Show your thinking.

5.  $4x - 7y = -3$

$$4x + 7y = 67$$

**Methods vary.**

$$8x = 64$$

$$x = 8$$

$$4(8) - 7y = -3$$

$$32 - 7y = -3$$

$$-7y = -35$$

$$y = 5$$

$$x = \underline{\quad 8 \quad}$$

$$y = \underline{\quad 5 \quad}$$

6.  $5x - y = 4$

$$-5x + 3y = -3$$

**Methods vary.**

$$2y = 1$$

$$y = 0.5, \text{ or equivalent}$$

$$5x - 0.5 = 4$$

$$5x = 4.5$$

$$x = 0.9$$

$$y = 5$$

$$x = \underline{\quad 0.5 \quad} \qquad y = \underline{\quad 0.9 \quad}$$

7.  $-x + 8y = 18$

$$-3x + 8y = 6$$

**Methods vary.**

$$-x + 8y = 18$$

$$-( -3x + 8y = 6)$$

$$2x = 12$$

$$x = 6$$

$$-(6) + 8y = 18$$

$$8y = 24$$

$$y = 4$$

$$x = \underline{\quad 6 \quad}$$

$$y = \underline{\quad 4 \quad}$$

8.  $5x - 3y = -26$

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

**Methods vary.**

$$5x - 3y = -26$$

$$-(5x + 4y = -12)$$

$$-7y = -14$$

$$y = 2$$

$$5x - 6 = -26$$

$$5x = -20$$

$$x = -4$$

$$x = \underline{\quad -4 \quad} \qquad y = \underline{\quad 2 \quad}$$

# Additional Practice | Answer Key

## Unit 5 | Lesson 2

Name: ..... Date: ..... Period: .....

**Additional Practice** **5.02**

1. Solve this system of equations. Use the shape puzzle if it helps with your thinking.

$$\begin{aligned} 2x + y &= 13 \\ x + y &= 10 \end{aligned}$$

$x = \underline{\quad 3 \quad}$        $y = \underline{\quad 7 \quad}$

2. Which equation is the result of adding these two equations?

$$\begin{aligned} -3x + 2y &= 1 \\ 3x + 5y &= -15 \end{aligned}$$

A.  $7y = -14$       B.  $7y = 16$   
 C.  $-6x + 7y = 16$       D.  $6x + 7y = -14$

3. Which system(s) of equations is most efficiently solved using elimination by addition?

$$\begin{aligned} \text{A. } -x + 4y &= 5 \\ 4x - y &= 12 \end{aligned}$$

$$\begin{aligned} \text{B. } -4x + 3y &= -16 \\ -2x + 3y &= 12 \end{aligned}$$

$$\begin{aligned} \text{C. } 5x - y &= 7 \\ 5x - 2y &= 14 \end{aligned}$$

$$\begin{aligned} \text{D. } -6x + 2y &= 12 \\ 6x + 7y &= 3 \end{aligned}$$

4. Which ordered pair is the solution to this system of equations?

$$\begin{aligned} -2x + y &= 11 \\ 2x - 3y &= -25 \end{aligned}$$

A.  $(-3, 8)$       B.  $(-2, 7)$   
 C.  $(2, -7)$       D.  $(4, 7)$

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Name: ..... Date: ..... Period: .....

**Problems 5–8:** Determine the solution for each system of equations. Show your thinking.

5.  $4x - 7y = -3$   
 $4x + 7y = 67$   
**Methods vary.**  
 $8x = 64$   
 $x = 8$   
 $4(8) - 7y = -3$   
 $32 - 7y = -3$   
 $-7y = -35$   
 $y = 5$

$x = \underline{\quad 8 \quad}$        $y = \underline{\quad 5 \quad}$

6.  $5x - y = 4$   
 $-5x + 3y = -3$   
**Methods vary.**  
 $2y = 1$   
 $y = 0.5, \text{ or equivalent}$   
 $5x - 0.5 = 4$   
 $5x = 4.5$   
 $x = 0.9$   
 $y = 5$

$x = \underline{\quad 0.5 \quad}$        $y = \underline{\quad 0.9 \quad}$

7.  $-x + 8y = 18$   
 $-3x + 8y = 6$   
**Methods vary.**  
 $-x + 8y = 18$   
 $-( -3x + 8y = 6)$   
 $2x = 12$   
 $x = 6$   
 $- (6) + 8y = 18$   
 $8y = 24$   
 $y = 3$

$x = \underline{\quad 6 \quad}$        $y = \underline{\quad 3 \quad}$

8.  $5x - 3y = -26$   
 $5x + 4y = -12$   
**Methods vary.**  
 $5x - 3y = -26$   
 $-(5x + 4y = -12)$   
 $-7y = -14$   
 $y = 2$   
 $5x - 6 = -26$   
 $5x = -20$   
 $x = -4$

$x = \underline{\quad -4 \quad}$        $y = \underline{\quad 2 \quad}$

Unit 5 Lesson 2      126      Additional Practice

**Practice Problem Analysis**

Problem	DOK	Standard(s)
1	1	HSA.REI.C.6
2	1	HSA.REI.C.6
3	1	HSA.REI.C.6
4	1	HSA.REI.C.6
5	1	HSA.REI.C.6
6	1	HSA.REI.C.6
7	1	HSA.REI.C.6
8	1	HSA.REI.C.6

**Notes:**

**Additional Practice****5.03**

- 1.** Select all expressions that are equivalent to  $2x - 9y = -5$ .

- A.  $-2x + 9y = 5$        B.  $4x + 18y = 10$   
 C.  $-6x + 27y = 15$        D.  $6x + 27y = -15$   
 E.  $4x - 18y = -10$

- 2.** Diondre and Gia are solving this system of equations. They disagree about what the first step should be to eliminate a variable.

$$\begin{aligned} 5x - 3y &= -13 \\ -10x + y &= -21 \end{aligned}$$

**Diondre's strategy:** Multiply  $5x - 3y = -13$  by  $-2$  and then add the equations.

**Gia's strategy:** Multiply  $-10x + y = -21$  by  $3$  and then add the equations.

Whose strategy will eliminate a variable once the equations are added?  
Circle your choice.

- A. Diondre's       B. Gia's      C. Both      D. Neither

Explain your thinking.

**Explanations vary. Gia's strategy will create a term that can be eliminated**

**by adding the equations together because the  $-3y$  in the first equation and the  $3y$  in the new second equation will eliminate the  $y$  when added. If Diondre multiplied the first equation by  $-2$ , this will result in both  $x$ -values having the coefficient of  $-10$ . The equations will need to be subtracted to eliminate the  $x$ -value, not added.**

- 3.** Select all of the following equations that would result from multiplying one of the equations by a constant term and then adding them together.

$$\begin{aligned} 6x - 4y &= 40 \\ -2x + 12y &= 8 \end{aligned}$$

- A.  $4x + 8y = 48$        B.  $20x = 112$   
 C.  $16x = 128$        D.  $12y = 24$   
 E.  $20y = 56$

**Problems 4–5:** Determine the solution for each system of equations. Show your thinking.

4.  $-2x + 9y = 24$

$$8x - 3y = -30$$

**Methods vary.**

$$4(-2x + 9y = 24)$$

$$8x - 3y = -30$$

$$-8x + 36y = 96$$

$$\underline{8x - 3y = -30}$$

$$33y = 66$$

$$y = 2$$

$$8x - 3(2) = -30$$

$$8x - 6 = -30$$

$$8x = -24$$

$$x = -3$$

$$x = \textcolor{red}{-3}$$

$$y = \textcolor{red}{2}$$

5.  $-x + 4y = -30$

$$3x - 2y = 20$$

**Methods vary.**

$$3(-x + 4y = -30)$$

$$3x - 2y = 20$$

$$-3x + 12y = -90$$

$$\underline{3x - 2y = 20}$$

$$10y = -70$$

$$y = -7$$

$$3x - 2(-7) = 20$$

$$3x + 14 = 20$$

$$3x = 6$$

$$x = 2$$

$$x = \textcolor{red}{2} \quad y = \textcolor{red}{-7}$$

6. Solve the system of equations using the methods below.

$$-x + 6y = 21$$

$$4x - y = 31$$

Eliminate the  $x$ -term first.

$$4(-x + 6y = 21)$$

$$4x - y = 31$$

$$-4x + 24y = 84$$

$$\underline{4x - y = 31}$$

$$23y = 115$$

$$y = 5$$

$$4x - (5) = 31$$

$$4x = 36$$

$$x = 9$$

Eliminate the  $y$ -term first.

$$-x + 6y = 21$$

$$6(4x - y = 31)$$

$$-x + 6y = 21$$

$$\underline{24x - 6y = 186}$$

$$23x = 207$$

$$x = 9$$

$$-(9) + 6y = 31$$

$$-9 + 6y = 21$$

$$6y = 30$$

$$y = 5$$

The solution is ( $\textcolor{red}{9}$ ,  $\textcolor{red}{5}$ ).

The solution is ( $\textcolor{red}{9}$ ,  $\textcolor{red}{5}$ ).

# Additional Practice | Answer Key

## Unit 5 | Lesson 3

Name: ..... Date: ..... Period: .....

**Additional Practice**

5.03

1. Select all expressions that are equivalent to  $2x - 9y = -5$ .

A.  $-2x + 9y = 5$        B.  $4x + 18y = 10$   
 C.  $-6x + 27y = 15$        D.  $6x + 27y = -15$   
 E.  $4x - 18y = -10$

2. Diondre and Gia are solving this system of equations. They disagree about what the first step should be to eliminate a variable.

$5x - 3y = -13$   
 $-10x + y = -21$

Diondre's strategy: Multiply  $5x - 3y = -13$  by  $-2$  and then add the equations.

Gia's strategy: Multiply  $-10x + y = -21$  by  $3$  and then add the equations.

Whose strategy will eliminate a variable once the equations are added?  
Circle your choice.

A. Diondre's       B. Gia's      C. Both      D. Neither

Explain your thinking.

**Explanations vary.** Gia's strategy will create a term that can be eliminated by adding the equations together because the  $-3y$  in the first equation and the  $3y$  in the new second equation will eliminate the  $y$  when added. If Diondre multiplied the first equation by  $-2$ , this will result in both  $x$ -values having the coefficient of  $-10$ . The equations will need to be subtracted to eliminate the  $x$ -value, not added.

3. Select all of the following equations that would result from multiplying one of the equations by a constant term and then adding them together.

$6x - 4y = 40$   
 $-2x + 12y = 8$

A.  $4x + 8y = 48$        B.  $20x = 112$   
 C.  $16x = 128$        D.  $12y = 24$   
 E.  $20y = 56$

Unit 5 Lesson 3

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Name: ..... Date: ..... Period: .....

Problems 4–5: Determine the solution for each system of equations. Show your thinking.

4.  $-2x + 9y = 24$   
 $8x - 3y = -30$

**Methods vary.**  
 $4(-2x + 9y = 24)$   
 $8x - 3y = -30$

$-8x + 36y = 96$   
 $8x - 3y = -30$

$33y = 66$   
 $y = 2$

$8x - 3(2) = -30$   
 $8x - 6 = -30$   
 $8x = -24$   
 $x = -3$

$x = \underline{-3}$        $y = \underline{2}$

5.  $-x + 4y = -30$   
 $3x - 2y = 20$

**Methods vary.**  
 $3(-x + 4y = -30)$   
 $3x - 2y = 20$

$-3x + 12y = -90$   
 $3x - 2y = 20$

$10y = -70$   
 $y = -7$

$3x - 2(-7) = 20$   
 $3x + 14 = 20$   
 $3x = 6$   
 $x = 2$

$x = \underline{2}$        $y = \underline{-7}$

6. Solve the system of equations using the methods below.

$-x + 6y = 21$   
 $4x - y = 31$

Eliminate the  $x$ -term first.      Eliminate the  $y$ -term first.

$4(-x + 6y = 21)$   
 $4x - y = 31$

$-4x + 24y = 84$   
 $4x - y = 31$

$23y = 115$   
 $y = 5$

$4x - (5) = 31$   
 $4x = 36$   
 $x = 9$

$-x + 6y = 21$   
 $6(4x - y = 31)$

$24x - 6y = 186$   
 $23x = 207$   
 $x = 9$

$6y = 30$   
 $y = 5$

The solution is  $(\underline{9}, \underline{5})$ .      The solution is  $(\underline{9}, \underline{5})$ .

Unit 5 Lesson 3

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Additional Practice

## Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.REI.C.5, HSA.REI.C.6
2	2	HSA.REI.C.5, HSA.REI.C.6
3	1	HSA.REI.C.5, HSA.REI.C.6
4	1	HSA.REI.C.5, HSA.REI.C.6
5	1	HSA.REI.C.5, HSA.REI.C.6
6	1	HSA.REI.C.5, HSA.REI.C.6

Notes:

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**Additional Practice****5.04**

- 1.** Identify the solution to this system of equations.

$$\begin{cases} y = x + 5 \\ y = -x + 9 \end{cases}$$

A.  $(-2, 3)$

B.  $(0, 9)$

C.  $(2, 7)$

D.  $(4, 5)$

- 2.** Identify the solution to this system of equations.

$$\begin{cases} x - y = -6 \\ -3x - 2y = 8 \end{cases}$$

A.  $(-4, 2)$

B.  $(-3, 3)$

C.  $(-1, 5)$

D.  $(4, -2)$

- 3.** Solve each system of equations. Show your thinking.

a.  $\begin{cases} 3x - 2y = -13 \\ y = 5 \end{cases}$

$(-1, 5)$

b.  $\begin{cases} y = -4x + 12 \\ 6x + 5y = 11 \end{cases}$

$(3.5, -2)$  (or equivalent)

- 4.** Which system of equations is most efficiently solved by substitution? Explain or show your thinking.

**System A**

$$\begin{cases} 2x - 3y = 9 \\ 5x - 4y = 11 \end{cases}$$

**System B**

$$\begin{cases} y = 4x - 3 \\ -3x + y = 7 \end{cases}$$

**System B; Sample response:** The first equation has the variable  $y$  already isolated and can be substituted into the second equation without any additional manipulation. In System A, both equations are in standard form, so the  $x$ - and  $y$ -intercepts are readily identifiable, which makes the system most efficiently solved by elimination.

5. Solve each system of equations. Show your thinking.

a. 
$$\begin{cases} 3x - 5y = 18 \\ 3x = 4y + 15 \end{cases}$$

(1, -3)

b. 
$$\begin{cases} 4x + 2y = 21 \\ 2y = 25 - 5x \end{cases}$$

(4, 2.5) (or equivalent)

6. Match each system of equations with its solution.

**System of equations**

**Solution**

a. 
$$\begin{cases} 3f - 2g = 11 \\ g = 3f - 13 \end{cases}$$

a. .... (5, 2)

b. 
$$\begin{cases} m + 8n = -1 \\ 2m - 6n = -13 \end{cases}$$

c. ....  $\left(2, -\frac{2}{3}\right)$

c. 
$$\begin{cases} 4s = -12t \\ 10 + 6t = 3s \end{cases}$$

b. ....  $\left(-5, \frac{1}{2}\right)$

7. Bard is solving this system of equations: 
$$\begin{cases} -3x + 2y = 16 \\ 5x - 3y = -18 \end{cases}$$

Bard begins by rearranging the first equation to isolate the  $y$  variable:  $y = 8 + 1.5x$ . Then Bard substitutes the expression  $8 + 1.5x$  for  $y$  in the second equation, as shown:

$$5x - 3(8 + 1.5x) = -18 \quad y = 8 + 1.5x$$

$$5x - 24 - 4.5x = -18 \quad y = 8 + 1.5(-84)$$

$$0.5x - 24 = -18 \quad y = -118$$

$$0.5x = -42$$

$$x = -84$$

- a. Does Bard's solution of  $(-84, -118)$  make both equations in the system true? Explain your thinking.

**No; Sample response: When I substitute  $(-84, -118)$  into  $5x - 3y$ , the result is not  $-18$ .**

- b. If your answer to part a was "no," find and explain Bard's mistake. If your answer was "yes," graph the equations to verify the solution to the system.

**In the fourth step, Bard added 24 to the left side of the equation, but subtracted 24 from the right side. The solution should be  $(12, 26)$ .**

# Additional Practice | Answer Key

## Unit 5 | Lesson 4

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

5.04

**1.** Identify the solution to this system of equations.  
 $\begin{cases} y = x + 5 \\ y = -x + 9 \end{cases}$   
 A.  $(-2, 3)$       B.  $(0, 9)$   
 C.  $(2, 7)$       D.  $(4, 5)$

**2.** Identify the solution to this system of equations.  
 $\begin{cases} x - y = -6 \\ -3x - 2y = 8 \end{cases}$   
 A.  $(-4, 2)$       B.  $(-3, 3)$   
 C.  $(-1, 5)$       D.  $(4, -2)$

**3.** Solve each system of equations. Show your thinking.  
 a.  $\begin{cases} 3x - 2y = -13 \\ y = 5 \end{cases}$       b.  $\begin{cases} y = -4x + 12 \\ 6x + 5y = 11 \end{cases}$   
 (-1, 5)      (3.5, -2) (or equivalent)

**4.** Which system of equations is most efficiently solved by substitution? Explain or show your thinking.  
**System A**  
 $\begin{cases} 2x - 3y = 9 \\ 5x - 4y = 11 \end{cases}$   
**System B**  
 $\begin{cases} y = 4x - 3 \\ -3x + y = 7 \end{cases}$

**System B:** Sample response: The first equation has the variable  $y$  already isolated and can be substituted into the second equation without any additional manipulation. In System A, both equations are in standard form, so the  $x$ - and  $y$ -intercepts are readily identifiable, which makes the system most efficiently solved by elimination.

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**5.** Solve each system of equations. Show your thinking.  
 a.  $\begin{cases} 3x - 5y = 18 \\ 3x = 4y + 15 \end{cases}$       b.  $\begin{cases} 4x + 2y = 21 \\ 2y = 25 - 5x \end{cases}$   
 (1, -3)      (4, 2.5) (or equivalent)

**6.** Match each system of equations with its solution.  

System of equations	Solution
a. $\begin{cases} 3f - 2g = 11 \\ g = 3f - 13 \end{cases}$	a. _____ $(5, 2)$
b. $\begin{cases} m + 8n = -1 \\ 2m - 6n = -13 \end{cases}$	c. _____ $(2, -\frac{2}{3})$
c. $\begin{cases} 4t = -12t \\ 10 + 6t = 3t \end{cases}$	b. _____ $(-5, \frac{1}{2})$

**7.** Bard is solving this system of equations:  $\begin{cases} -3x + 2y = 16 \\ 5x - 3y = -18 \end{cases}$   
 Bard begins by rearranging the first equation to isolate the  $y$  variable:  $y = 8 + 1.5x$ . Then Bard substitutes the expression  $8 + 1.5x$  for  $y$  in the second equation, as shown:  
 $5x - 3(8 + 1.5x) = -18$   
 $5x - 24 - 4.5x = -18$   
 $0.5x - 24 = -18$   
 $0.5x = -42$   
 $x = -84$

a. Does Bard's solution of  $(-84, -118)$  make both equations in the system true?  
 Explain your thinking.  
**No; Sample response:** When I substitute  $(-84, -118)$  into  $5x - 3y$ , the result is not  $-18$ .

b. If your answer to part a was "no," find and explain Bard's mistake. If your answer was "yes," graph the equations to verify the solution to the system.  
**In the fourth step, Bard added 24 to the left side of the equation, but subtracted 24 from the right side. The solution should be  $(12, 26)$ .**

Unit 5 Lesson 4      130      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.REI.C.6
2	1	HSA.REI.C.6
3	2	HSA.REI.C.6
4	2	HSA.REI.C.6
5	2	HSA.REI.C.6
6	2	HSA.REI.C.6
7	3	HSA.REI.C.6

### Notes:

**Additional Practice****5.05**

- 1.** Select all of the equations that have  $(2, 1)$  as a solution.

- A.  $y = -x + 4$        B.  $y = -2x + 3$   
 C.  $y = \frac{1}{2}x - \frac{1}{2}$        D.  $y = x - 1$   
 E.  $y = 3x - 5$

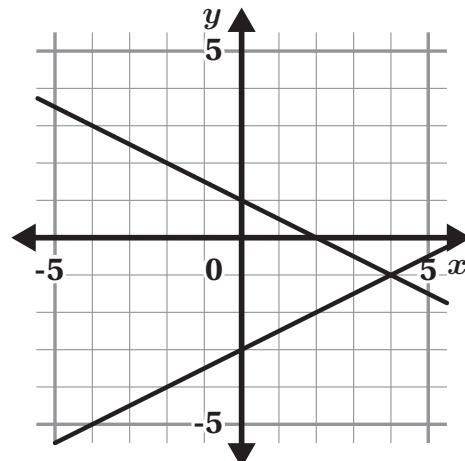
- 2.** The graph represent the system of equations:

$$y = -\frac{1}{2}x + 1$$

$$y = \frac{1}{2}x - 3$$

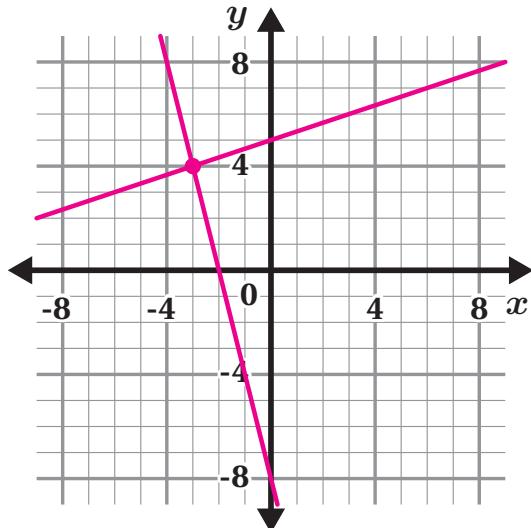
Which is the solution to the system of equations?

- A.  $(0, -3)$   
B.  $(0, 1)$   
C.  $(2, 0)$   
 D.  $(4, -1)$



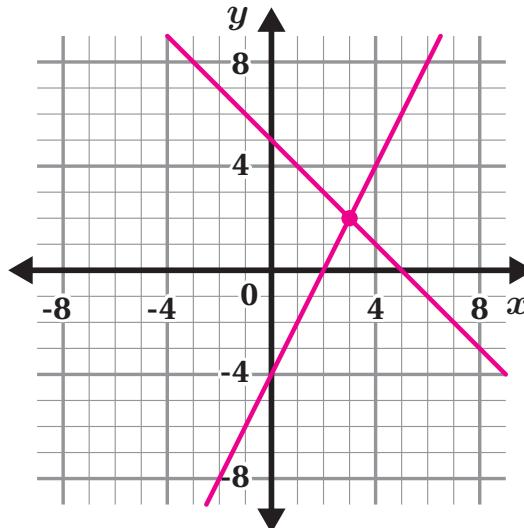
**Problems 3–4:** Solve this system of equations. Write the solution as a coordinate pair.

**3.**  $y = -3x - 4$   
 $y = \frac{1}{3}x + 5$



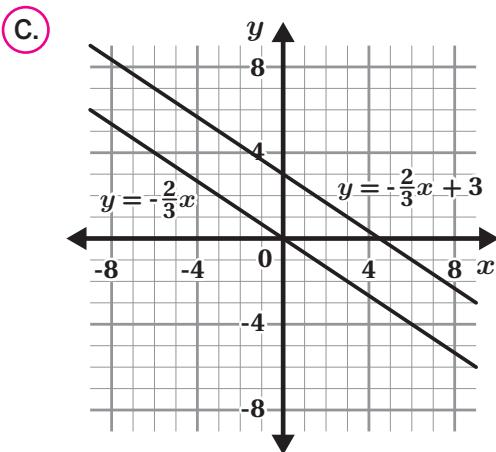
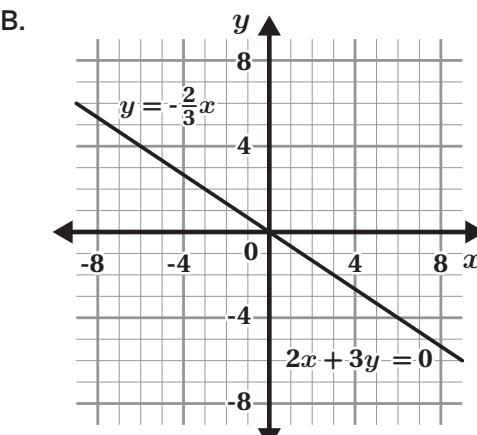
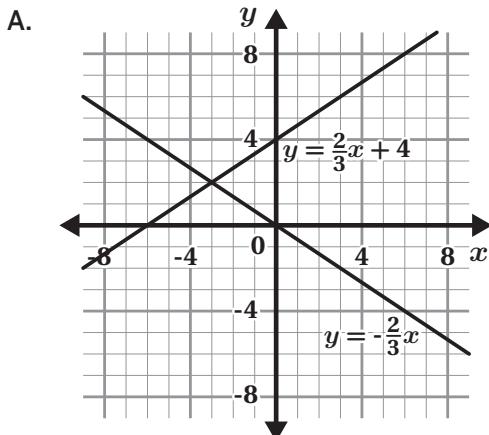
Solution:  $\underline{\quad(-3, 4)\quad}$

**4.**  $y = 2x - 4$   
 $y = -x + 5$



Solution:  $\underline{\quad(3, 2)\quad}$

5. Which graph shows a system of equations that has no solutions?



6. Match each system of equations to the number of solutions it has.

**Equation**

**Solution**

a.  $y = -3x + 4$   
 $y = 3x + 4$

b. .... no solutions

b.  $3x + y = 4$   
 $y = -3x - 4$

a. .... one solution

c.  $3x + y = 4$   
 $y = -3x + 4$

c. .... infinitely many solutions

7. A system of equations has infinitely many solutions. Select *all* of the statements that must be true about the equations in this system.

A. The equations have different slopes.

B. The equations have the same slope.

C. The equations have different  $y$ -intercepts.

D. The equations have the same  $y$ -intercept.

# Additional Practice | Answer Key

## Unit 5 | Lesson 5

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Additional Practice** **5.05**

1. Select all of the equations that have  $(2, 1)$  as a solution.

A.  $y = -x + 4$        B.  $y = -2x + 3$   
 C.  $y = \frac{1}{2}x - \frac{1}{2}$        D.  $y = x - 1$   
 E.  $y = 3x - 5$

2. The graph represent the system of equations:

$y = -\frac{1}{2}x + 1$   
 $y = \frac{1}{2}x - 3$

Which is the solution to the system of equations?

A.  $(0, -3)$   
B.  $(0, 1)$   
C.  $(2, 0)$   
 D.  $(4, -1)$

Problems 3–4: Solve this system of equations. Write the solution as a coordinate pair.

3.  $y = -3x - 4$   
 $y = \frac{1}{3}x + 5$

Solution:  $(-3, 4)$ .

4.  $y = 2x - 4$   
 $y = -x + 5$

Solution:  $(3, 2)$ .

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

5. Which graph shows a system of equations that has no solutions?

A.

B.

C.

D.

6. Match each system of equations to the number of solutions it has.

Equation	Solution
a. $y = -3x + 4$ $y = 3x + 4$	<input type="checkbox"/> b. _____ no solutions
b. $3x + y = 4$ $y = -3x - 4$	<input type="checkbox"/> a. _____ one solution
c. $3x + y = 4$ $y = -3x + 4$	<input type="checkbox"/> c. _____ infinitely many solutions

7. A system of equations has infinitely many solutions. Select all of the statements that must be true about the equations in this system.

A. The equations have different slopes.  
 B. The equations have the same slope.  
 C. The equations have different  $y$ -intercepts.  
 D. The equations have the same  $y$ -intercept.

Unit 5 Lesson 5      132      Additional Practice

**Practice Problem Analysis**

Problem	DOK	Standard(s)
1	1	HSA.REI.C.6, HSA.REI.D.11
2	1	HSA.REI.C.6, HSA.REI.D.11
3	1	HSA.REI.C.6, HSA.REI.D.11
4	1	HSA.REI.C.6, HSA.REI.D.11
5	1	HSA.REI.C.6
6	1	HSA.REI.C.6
7	1	HSA.REI.C.6

### Notes:

**Additional Practice****5.08**

**Problems 1–3:** Show or Explain what your *first* step would be to solve each system of equations.

1.  $7x - 12y = 20$   
 $15x + 12y = -9$

Responses vary.  
 Add the two equations and eliminate the  $y$ -term.

2.  $y = \frac{1}{2}x - 8$   
 $y = -\frac{2}{3}x + 6$

Responses vary.  
 Graph the two equations and see where they intersect.

3.  $5x - 9y = 21$   
 $x = -6$

Responses vary.  
 Substitute  $-6$  for  $x$  in the first equation and solve for  $y$ .

**Problems 4–5:** Solve each system of equations. Write the solution as a coordinate pair. Show your thinking.

4.  $5x - 10y = 40$   
 $3x + 10y = 8$   
 (6, -1) Methods vary.

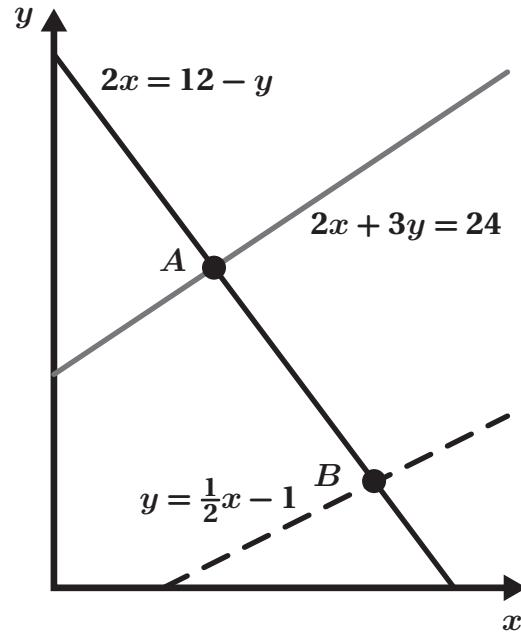
5.  $8x + 2y = 18$   
 $x = 2y + 9$   
 (3, -3) Methods vary.

6. Determine the coordinates of points  $A$  and  $B$ , the intersections of the lines on the graph. Show your thinking.

$A = \underline{\hspace{2cm}}(3, 6)\underline{\hspace{2cm}}$

$B = \underline{\hspace{2cm}}(6, 2)\underline{\hspace{2cm}}$

Methods vary.



7. Consider the equation  $4x - 3y = 12$ . Match each description with an equation that would make a system of equations with the given number of solutions. Show your thinking.

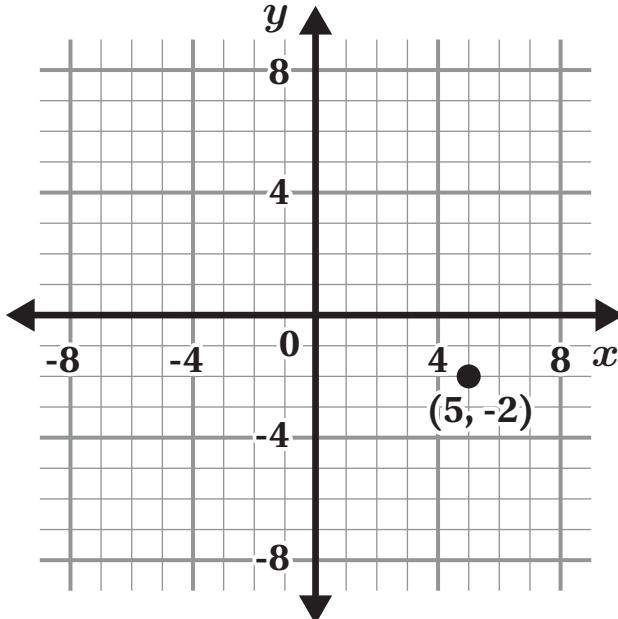
Description	Equation
a. One solution	b. .... $4x - 3y = 6$
b. No solution	c. .... $y = \frac{4}{3}x - 4$
c. Infinitely many solutions	a. .... $4x + y = 20$

**Responses vary.** If I rewrite the equation  $4x - 3y = 12$  on slope-intercept form, I get  $y = \frac{4}{3}x - 4$ . The second equation  $y = \frac{4}{3}x - 4$  is the same line, therefore, the system of these two lines would have infinitely many solutions. The first equation  $4x - 3y = 6$  in slope intercept form is  $y = \frac{4}{3}x - 2$ . It has the same slope but different  $y$ -intercept as the equation  $y = \frac{4}{3}x - 4$ . Therefore, they will be parallel lines and have no solution. The last equation  $4x + y = 20$  in slope intercept form is  $y = -4x + 20$ . It has a different slope and different  $y$ -intercept than the given equation so these lines will intersect once and have one solution.

8. Write a system of equations where  $(5, -2)$  is the solution. Use the graph if it helps your thinking. Show your thinking.

**Answers vary. Sample answer:**

$$y = -\frac{6}{5}x + 4 \text{ and } y = -2$$



# Additional Practice | Answer Key

## Unit 5 | Lesson 8

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice 5.08

**Problems 1–3:** Show or Explain what your first step would be to solve each system of equations.

1.  $7x - 12y = 20$   
 $15x + 12y = -9$   
**Responses vary.** Add the two equations and eliminate the  $y$ -term.

2.  $y = \frac{1}{2}x - 8$   
 $y = -\frac{2}{3}x + 6$   
**Responses vary.** Graph both equations and see where they intersect.

3.  $5x - 9y = 21$   
 $x = -6$   
**Responses vary.** Substitute  $-6$  for  $x$  in the first equation and solve for  $y$ .

**Problems 4–5:** Solve each system of equations. Write the solution as a coordinate pair. Show your thinking.

4.  $5x - 10y = 40$   
 $3x + 10y = 8$   
**(6, -1)** Methods vary.

5.  $8x + 2y = 18$   
 $x = 2y + 9$   
**(3, -3)** Methods vary.

6. Determine the coordinates of points  $A$  and  $B$ , the intersections of the lines on the graph. Show your thinking.

$A = \underline{(3, 6)}$        $B = \underline{(6, 2)}$   
**Methods vary.**

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

7. Consider the equation  $4x - 3y = 12$ . Match each description with an equation that would make a system of equations with the given number of solutions. Show your thinking.

Description	Equation
a. One solution	_____ b. $4x - 3y = 6$
b. No solution	_____ c. $y = \frac{4}{3}x - 4$
c. Infinitely many solutions	_____ a. $4x + y = 20$

**Responses vary.** If I rewrite the equation  $4x - 3y = 12$  on slope-intercept form, I get  $y = \frac{4}{3}x - 4$ . The second equation  $y = \frac{4}{3}x - 4$  is the same line, therefore, the system of these two lines would have infinitely many solutions. The first equation  $4x - 3y = 6$  in slope-intercept form is  $y = \frac{4}{3}x - 2$ . It has the same slope but different  $y$ -intercept as the equation  $y = \frac{4}{3}x - 4$ . Therefore, they will be parallel lines and have no solution. The last equation  $4x + y = 20$  in slope intercept form is  $y = -4x + 20$ . It has a different slope and different  $y$ -intercept than the given equation so these lines will intersect once and have one solution.

8. Write a system of equations where  $(5, -2)$  is the solution. Use the graph if it helps your thinking. Show your thinking.

**Answers vary.** Sample answer:  
 $y = -\frac{6}{5}x + 4$  and  $y = -2$

Unit 5 Lesson 8      138      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.REI.C.6
2	1	HSA.REI.C.6
3	1	HSA.REI.C.6
4	1	HSA.REI.C.6
5	1	HSA.REI.C.6
6	1	HSA.REI.C.6
7	2	HSA.REI.C.6
8	2	HSA.REI.C.6

### Notes:

**Additional Practice****5.09**

- 1.** A party planner needs at least 18 flower centerpieces for an event. A vase of flowers  $x$  costs \$90 and a bowl of flowers  $y$  costs \$120. She wants to have both types of centerpieces for the event, and to spend no more than \$1,800. Which inequalities represent these constraints? Select *all* that apply.
- A.  $x > 0$        B.  $y > 0$        C.  $x + y < 18$   
 D.  $x + y \geq 18$        E.  $90x + 120y < 1800$        F.  $90x + 120y \leq 1800$

**Refer to the following information for Problems 2 and 3.**

Festival organizers are planning to grill at least 270 veggie burgers and turkey burgers during the festival. Veggie burgers are sold in packages of 10 and turkey burgers are sold in packages of 18. Organizers have a budget of \$330 for these two items. The following system of inequalities represents these constraints.

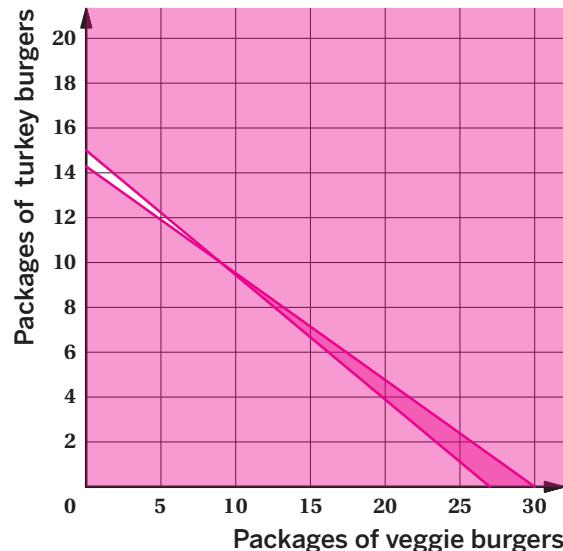
$$\begin{cases} 10x + 18y \geq 270 \\ 11x + 23y \leq 330 \end{cases}$$

- 2.** What does the second inequality in the system tell you about the situation?

- A. Veggie burgers cost \$11 per package and turkey burgers cost \$23 per package.
- B. Veggie burgers cost \$23 per package and turkey burgers cost \$11 per package.
- C. Organizers are buying 11 packages of veggie burgers and 23 packages of turkey burgers.
- D. Organizers are buying 23 packages of veggie burgers and 11 packages of turkey burgers.

- 3.** Refer to Problem 2.

- a Graph the solution set to the system of inequalities.
- b Which of the following combinations of veggie burgers and turkey burgers could the organizers buy?
  - A. 0 veggie burgers, 15 turkey burgers
  - B. 10 veggie burgers, 12 turkey burgers
  - C. 15 veggie burgers, 8 turkey burgers
  - D. 25 veggie burgers, 2 turkey burgers



- 4.** Andre needs to buy batteries for his business. AA batteries come in packs of 24 and cost \$15 per pack. D batteries come in packs of 12 and cost \$15 per pack. Andre wants to buy at least 180 batteries and spend no more than \$150.

- a Create a system of inequalities that describes the constraints in this situation. Let  $x$  represent the number of packages AA batteries and let  $y$  represent the number of packages D batteries.

$$\begin{cases} 24x + 12y \geq 180 \\ 15x + 15y \leq 150 \end{cases} \text{(or equivalent)}$$

- b Graph the solution set to the system of inequalities.

- c Is (7, 2) a solution? If yes, explain what it means. If no, explain why it is not a solution.

**Yes. Sample response:** The point (7, 2) is in the overlap of the graphs, so it satisfies both inequalities. The ordered pair means Andre can buy 7 packs of AA batteries and 2 packs of D batteries.

- 5.** A dog groomer charges \$24 to give a small dog a bath and \$30 to give a large dog a bath. A bath takes 30 minutes for a small dog and 1.25 hours for a large dog. The groomer works up to 6 hours each day, and she needs to earn at least \$180 a day.

- a Create a system of inequalities that describes the constraints in this situation, where  $x$  represents the number of small dog baths that she gives and  $y$  represents the number of large dog baths that she gives.

$$\begin{cases} 24x + 30y \geq 180 \\ 0.5x + 1.25y \leq 6 \end{cases} \text{(or equivalent)}$$

- b Graph the inequalities and show the solution set.

- c Identify which of the following points meets the groomer's requirements. Explain your thinking.

A. (4, 4)

B. (6, 2)

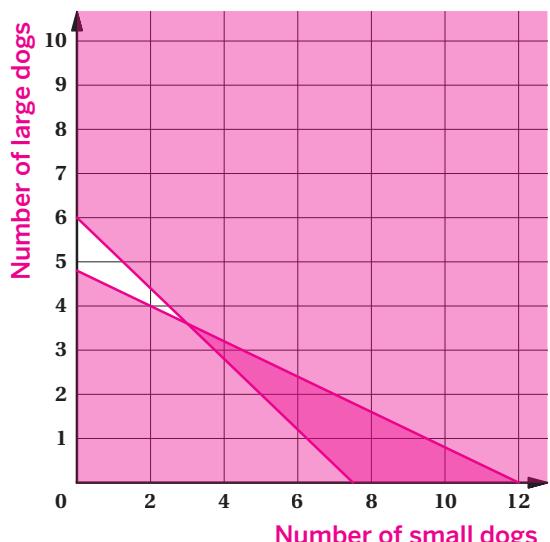
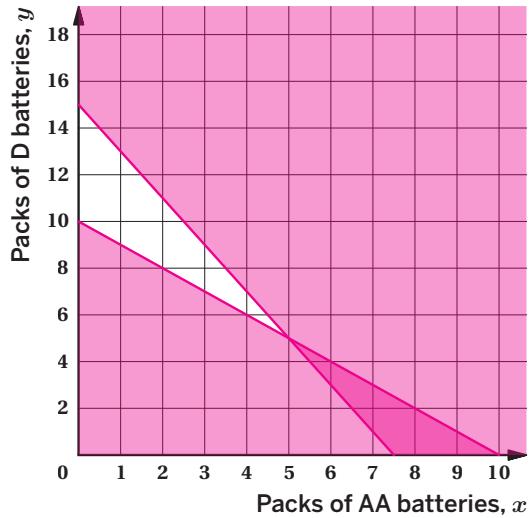
C. (7, 3)

D. (9, 2)

**B; Sample response:** The point (6, 2) represents giving 6 small dog baths and 2 large dog baths, which will take less than 6 hours and generate more than \$180 in income.

- d Identify which point is a solution to the system but is not possible or not likely in the situation: (4, 3), (7, 1), or (8, 1.5). Explain your thinking.

**(8, 1.5); Sample response:** The point (8, 1.5) is in the solution region of the system, but it is not possible to give a fractional number of dog baths.



# Additional Practice | Answer Key

## Unit 5 | Lesson 9

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

**5.09**

1. A party planner needs at least 18 flower centerpieces for an event. A vase of flowers  $x$  costs \$90 and a bowl of flowers  $y$  costs \$120. She wants to have both types of centerpieces for the event, and to spend no more than \$1,800. Which inequalities represent these constraints? Select all that apply.

A.  $x > 0$      B.  $y > 0$      C.  $x + y < 18$   
 D.  $x + y \geq 18$      E.  $90x + 120y < 1800$      F.  $90x + 120y \leq 1800$

**Refer to the following information for Problems 2 and 3.**  
Festival organizers are planning to grill at least 270 veggie burgers and turkey burgers during the festival. Veggie burgers are sold in packages of 10 and turkey burgers are sold in packages of 18. Organizers have a budget of \$330 for these two items. The following system of inequalities represents these constraints.

$$\begin{cases} 10x + 18y \geq 270 \\ 11x + 23y \leq 330 \end{cases}$$

2. What does the second inequality in the system tell you about the situation?

A. Veggie burgers cost \$11 per package and turkey burgers cost \$23 per package.  
B. Veggie burgers cost \$23 per package and turkey burgers cost \$11 per package.  
C. Organizers are buying 11 packages of veggie burgers and 23 packages of turkey burgers.  
D. Organizers are buying 23 packages of veggie burgers and 11 packages of turkey burgers.

3. Refer to Problem 2.

a. Graph the solution set to the system of inequalities.  
b. Which of the following combinations of veggie burgers and turkey burgers could the organizers buy?  
A. 0 veggie burgers, 15 turkey burgers  
B. 10 veggie burgers, 12 turkey burgers  
C. 15 veggie burgers, 8 turkey burgers  
D. 25 veggie burgers, 2 turkey burgers

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

4. Andre needs to buy batteries for his business. AA batteries come in packs of 24 and cost \$15 per pack. D batteries come in packs of 12 and cost \$15 per pack. Andre wants to buy at least 180 batteries and spend no more than \$150.

a. Create a system of inequalities that describes the constraints in this situation. Let  $x$  represent the number of packages AA batteries and let  $y$  represent the number of packages D batteries.  

$$\begin{cases} 24x + 12y \geq 180 \\ 15x + 15y \leq 150 \end{cases}$$
 (or equivalent)

b. Graph the solution set to the system of inequalities.  
c. Is (7, 2) a solution? If yes, explain what it means. If no, explain why it is not a solution.  
Yes. Sample response: The point (7, 2) is in the overlap of the graphs, so it satisfies both inequalities. The ordered pair means Andre can buy 7 packs of AA batteries and 2 packs of D batteries.

5. A dog groomer charges \$24 to give a small dog a bath and \$30 to give a large dog a bath. A bath takes 30 minutes for a small dog and 1.25 hours for a large dog. The groomer works up to 6 hours each day, and she needs to earn at least \$180 a day.

a. Create a system of inequalities that describes the constraints in this situation, where  $x$  represents the number of small dog baths that she gives and  $y$  represents the number of large dog baths that she gives.  

$$\begin{cases} 24x + 30y \geq 180 \\ 0.5x + 1.25y \leq 6 \end{cases}$$
 (or equivalent)

b. Graph the inequalities and show the solution set.  
c. Identify which of the following points meets the groomer's requirements. Explain your thinking.  
A. (4, 4)    B. (6, 2)  
C. (7, 3)    D. (9, 2)  
B. Sample response: The point (6, 2) represents giving 6 small dog baths and 2 large dog baths, which will take less than 6 hours and generate more than \$180 in income.  
d. Identify which point is a solution to the system but is not possible or not likely in the situation: (4, 3), (7, 1), or (8, 1.5). Explain your thinking.  
(8, 1.5); Sample response: The point (8, 1.5) is in the solution region of the system, but it is not possible to give a fractional number of dog baths.

**Unit 5 Lesson 9**    **140**    Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.CED.A.3
2	1	HSA.CED.A.3
3	2	HSA.CED.A.3
4	2	HSA.CED.A.3
5	3	HSA.CED.A.3

### Notes:

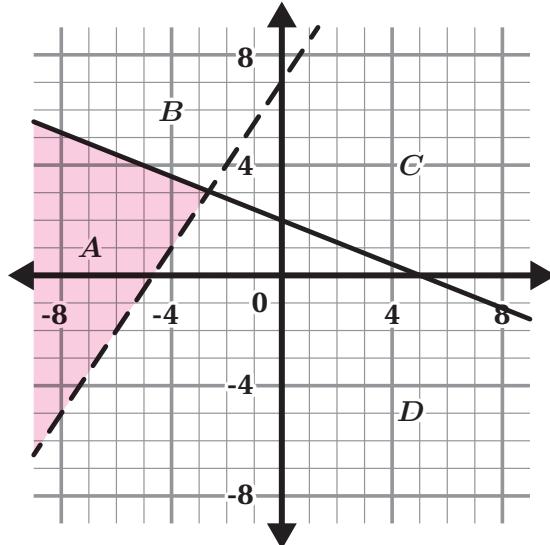
**Additional Practice****5.10**

**Problems 1–4:** Here is the graph of a system of inequalities.

$$2x + 5y \leq 10$$

$$2y > 3x + 14$$

1. Complete the graph of the inequalities by shading in the solution region.
2. Which letter represents the solution region to the system of inequalities? Circle one:  
**A**      **B**      **C**      **D**
3. Is the point  $(4, -5)$  a solution to this system?  
Circle one:  
Yes      **No**

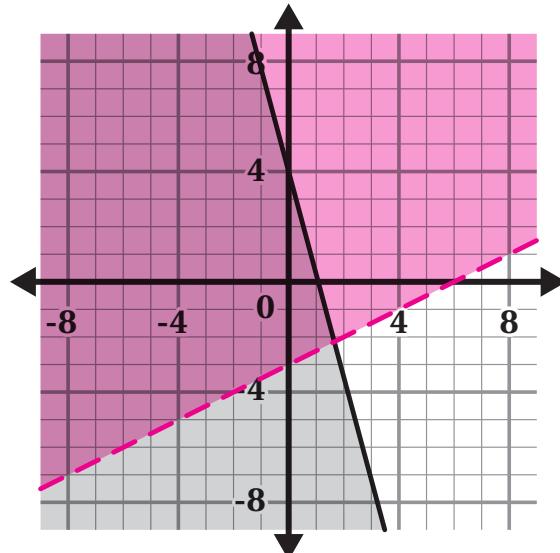


**Problems 4–6:** Taryn graphed the first inequality and the boundary line of the second inequality.

$$y \leq -4x + 5$$

$$y > \frac{1}{2}x - 3$$

4. Complete the graph of the second inequality.
5. Explain how you knew where to shade the second inequality.  
**Explanations vary. I shaded toward the test point  $(0, 0)$  because it made the second inequality true.**



6. Is  $(0, -3)$  a solution to this system? Explain your thinking.

**No. Explanations vary. The point  $(0, -3)$  does not make the second inequality true:**

$$-3 > \frac{1}{2}(0) - 3$$

$$-3 > -3 \quad \text{False}$$

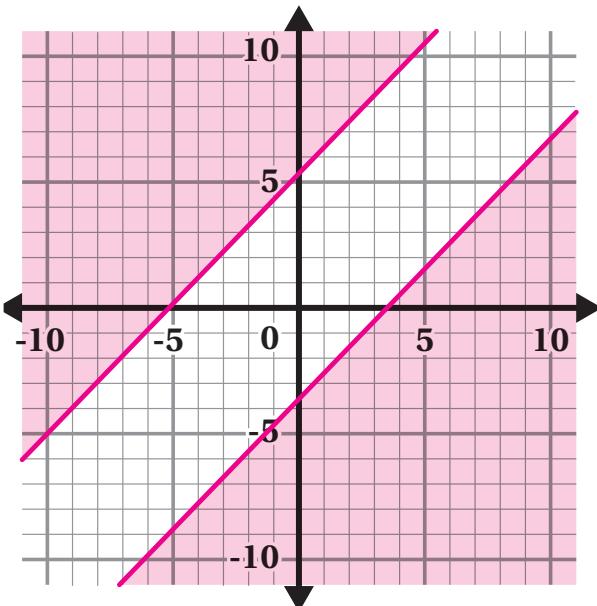
**Problems 7–8:** A coordinate plane is provided.

7. Make a graph of a system of inequalities that has no solutions.

**Solutions vary.**

8. Explain how you know it has no solution.

**Explanations vary. If the inequalities are parallel lines which shade away from each other, their solution regions will never intersect.**



**Problems 9–10:** Randall graphed the boundary lines of this system of inequalities:

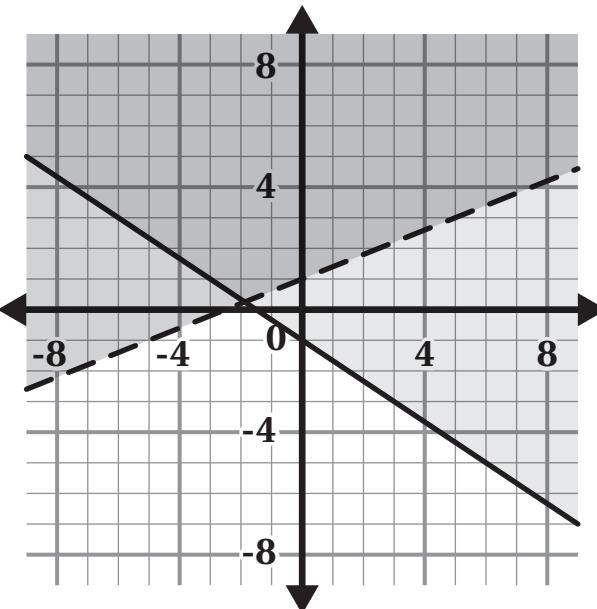
9. Complete the graph of the system of inequalities.

$$y > \frac{2}{5}x + 1$$

$$y \geq -\frac{2}{3}x - 1$$

10. Identify a coordinate pair that is in the solution region.

**Solutions vary. Sample solution (2, 6).**



Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

**5.10**

**Problems 1–4:** Here is the graph of a system of inequalities.

$$2x + 5y \leq 10$$

$$2y > 3x + 14$$

1. Complete the graph of the inequalities by shading in the solution region.  
 2. Which letter represents the solution region to the system of inequalities? Circle one:  
 A  B  C  D  
 3. Is the point  $(4, -5)$  a solution to this system?  
 Circle one:  
 Yes  No

**Problems 4–6:** Taryn graphed the first inequality and the boundary line of the second inequality.

$$y \leq -4x + 5$$

$$y > \frac{1}{2}x - 3$$

4. Complete the graph of the second inequality.  
 5. Explain how you knew where to shade the second inequality.  
 Explanations vary. I shaded toward the test point  $(0, 0)$  because it made the second inequality true.  
 6. Is  $(0, -3)$  a solution to this system? Explain your thinking.  
 No. Explanations vary. The point  $(0, -3)$  does not make the second inequality true:  
 $-3 > \frac{1}{2}(0) - 3$   
 $-3 > -3$  False

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Problems 7–8:** A coordinate plane is provided.

7. Make a graph of a system of inequalities that has no solutions.  
 Solutions vary.

8. Explain how you know it has no solution.  
 Explanations vary. If the inequalities are parallel lines which shade away from each other, their solution regions will never intersect.

**Problems 9–10:** Randall graphed the boundary lines of this system of inequalities.

9. Complete the graph of the system of inequalities.

$$y > \frac{2}{5}x + 1$$

$$y \geq -\frac{2}{3}x - 1$$

10. Identify a coordinate pair that is in the solution region.  
 Solutions vary. Sample solution  $(2, 6)$ .

Unit 5 Lesson 10      142      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.REI.D.12
2	1	HSA.REI.D.12
3	1	HSA.REI.D.12
4	1	HSA.REI.D.12
5	2	HSA.REI.D.12
6	2	HSA.REI.D.12
7	2	HSA.REI.D.12
8	2	HSA.REI.D.12
9	1	HSA.REI.D.12
10	1	HSA.REI.D.12

Notes:

# Additional Practice

6.01

**Problems 1–3:** Wendy is observing a colony of mice in which its population doubles every week. The table shows the population of mice over time, in weeks.

1. What was the population of the mice at the beginning of the experiment?

**6 mice**

2. What will the population of mice be after 6 weeks?

**384 mice**

Time (weeks)	Population
0	?
1	12
2	24
3	48
4	96
...	...
6	?

3. Ricardo observed a different colony of mice that he believes populates at a rate slower than Wendy's mice. He wrote this equation:  $p = 12 \cdot 1.5^t$ . He used  $p$  to represent the population of mice in his colony and  $t$  for time, in weeks. Explain what the 12 and 1.5 mean in this situation.

**The 12 represents the number of mice in Ricardo's colony, at the start of his observation, and the 1.5 is the rate at which they are growing each week.**

4. In the table,  $x$  represents the number of minutes and  $y$  represents the number of bacteria cells in a sample.

<b><math>x</math></b>	0	8	16	24	32	40	48	56
<b><math>y</math></b>	4	8	16	32	64	128	256	512

Select *all* the statements that describe the growth.

- A. Every 8 minutes, the number of bacteria cells doubles.
- B. Every 4 minutes, the number of bacteria cells increases by 8.
- C. At the end of the experiment, there are 56 bacteria cells in the sample.
- D. At the beginning of the experiment, there are 4 bacteria cells in the sample.
- E. At the beginning of the experiment, there are 8 bacteria cells in the sample.

**Problems 5–7:** Caroline has a new toy fish whose mass quadruples every hour when you add water. The fish's weight was initially 2 grams.

5. Select *all* the expressions that represent the weight of Caroline's toy fish, in grams, after 3 hours?
- |  |   |  |
|--|---|--|
| <input checked="" type="checkbox"/> A. $2 \cdot 4 \cdot 4 \cdot 4$ | <input type="checkbox"/> B. $2 \cdot 2 \cdot 2$ | <input checked="" type="checkbox"/> C. $2 \cdot 4^3$ |
| <input type="checkbox"/> D. $2 + 4 \cdot 4 \cdot 4$                | <input type="checkbox"/> E. $2 \cdot 3^4$       | <input type="checkbox"/> F. $2 + 4^3$                |

6. Complete the table.

Time (hrs)	0	1	2	3	4
Weight (grams)	2	8	32	128	512

**Problems 7–8:** Dion is reading a book about a zombie apocalypse. The story begins when 10 zombies enter a convention center where people are attending a concert. The total number of infected people is increasing by 25% each minute.

7. Write an equation that represents this situation where  $n$  represents the total number of people infected by the zombies and  $t$  represents the number of hours that have passed since the apocalypse began.

$$n = 10(1.25)^t, \text{ or equivalent}$$

8. Approximately, how many people will be infected after 4 minutes have passed? Show or explain your thinking.

**About 24 people.**

**Methods vary.  $10(1.25)^4 \approx 24.4$**

# Additional Practice | Answer Key

## Unit 6 | Lesson 1

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice 6.01

**Problems 1–3:** Wendy is observing a colony of mice in which its population doubles every week. The table shows the population of mice over time, in weeks.

- What was the population of the mice at the beginning of the experiment?  
**6 mice**
- What will the population of mice be after 6 weeks?  
**384 mice**
- Ricardo observed a different colony of mice that he believes populates at a rate slower than Wendy's mice. He wrote this equation:  $p = 12 \cdot 1.5^t$ . He used  $p$  to represent the population of mice in his colony and  $t$  for time, in weeks. Explain what the 12 and 1.5 mean in this situation.  
**The 12 represents the number of mice in Ricardo's colony, at the start of his observation, and the 1.5 is the rate at which they are growing each week.**
- In the table,  $x$  represents the number of minutes and  $y$  represents the number of bacteria cells in a sample.

$x$	0	8	16	24	32	40	48	56
$y$	4	8	16	32	64	128	256	512

Select all the statements that describe the growth.

A. Every 8 minutes, the number of bacteria cells doubles.  
 B. Every 4 minutes, the number of bacteria cells increases by 8.  
 C. At the end of the experiment, there are 56 bacteria cells in the sample.  
 D. At the beginning of the experiment, there are 4 bacteria cells in the sample.  
 E. At the beginning of the experiment, there are 8 bacteria cells in the sample.

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Problems 5–7:** Caroline has a new toy fish whose mass quadruples every hour when you add water. The fish's weight was initially 2 grams.

- Select all the expressions that represent the weight of Caroline's toy fish, in grams, after 3 hours?

A.  $2 \cdot 4 \cdot 4 \cdot 4$   
 B.  $2 \cdot 2 \cdot 2$   
 C.  $2 \cdot 4^3$   
 D.  $2 + 4 \cdot 4 \cdot 4$   
 E.  $2 \cdot 3^3$   
 F.  $2 + 4^3$

- Complete the table.

Time (hrs)	0	1	2	3	4
Weight (grams)	2	8	32	128	512

**Problems 7–8:** Dion is reading a book about a zombie apocalypse. The story begins when 10 zombies enter a convention center where people are attending a concert. The total number of infected people is increasing by 25% each minute.

- Write an equation that represents this situation where  $n$  represents the total number of people infected by the zombies and  $t$  represents the number of hours that have passed since the apocalypse began.  
 **$n = 10(1.25)^t$ , or equivalent**
- Approximately, how many people will be infected after 4 minutes have passed? Show or explain your thinking.  
**About 24 people.**  
**Methods vary.  $10(1.25)^4 \approx 24.4$**

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### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSF.BF.A.1A
2	1	HSF.BF.A.1A
3	2	HSF.BF.A.1A
4	2	HSF.BF.A.1A
5	2	HSF.LE.B.5
6	1	HSF.BF.A.1A
7	1	HSF.BF.A.1A
8	1	HSF.LE.B.5

**Notes:**

**Additional Practice****6.02**

**Problems 1–3:** These tables show the number of blue and green globs each day.

Day	0	1	2	3	4
Blue Globs	4	8	16	32	

Day	0	1	2	3	4
Green Globs	12	24	36	48	

1. How many of each type of glob will there be on Day 4?

There will be 32(2) or 64 blue globs and  $48 + 12 = 60$  green globs on Day 4.

2. Will there be more blue or green globs on day 10? Show or explain your thinking.

There will be more blue globs on day 4 because they are increasing at a faster rate than the green globs.

3. Which group of globs changes by a constant rate of change? Show or explain how you know.

The green globs are increasing at a constant rate of 12 globs per day.

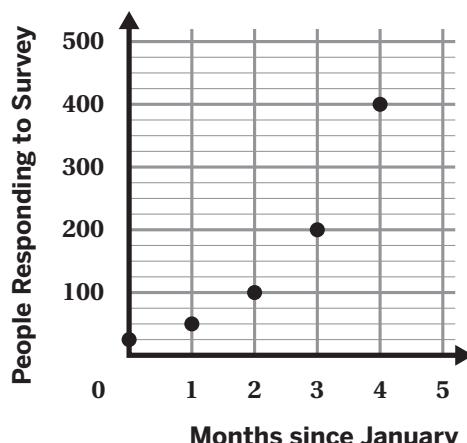
**Problems 4–5:** This graph shows the number of people who responded to an online survey about a new neighborhood park since January.

4. How many people completed the survey in January?

About 25 people

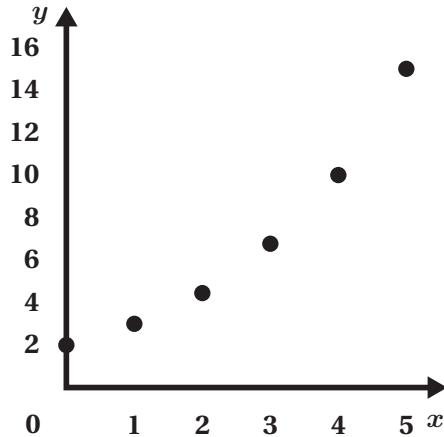
5. Does the number of people responding to the survey grow by a constant difference? Show or explain how you know.

No. Explanations vary. The graph of this relationship is a curve that is growing steeper with each passing month.

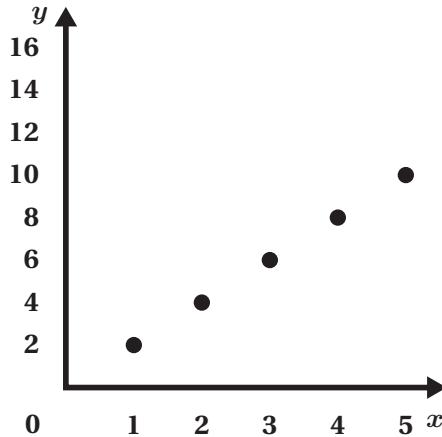


**Problems 6–7:** Determine whether each graph shows a constant rate of change or a constant growth rate. Circle your choice.

6.

Constant rate  
of change

7.

Constant growth  
rateConstant rate  
of changeConstant growth  
rate

**Problems 8–9:** Determine whether each table shows a linear or exponential function. Circle your choice.

8.

x	1	2	3	4
y	1	8	15	22

Linear

Exponential

9.

x	1	2	3	4
y	9	18	36	72

Linear

Exponential

# Additional Practice | Answer Key

## Unit 6 | Lesson 2

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice 6.02

**Problems 1–3:** These tables show the number of blue and green globs each day.

Day	0	1	2	3	4
Blue Globs	4	8	16	32	

Day	0	1	2	3	4
Green Globs	12	24	36	48	

1. How many of each type of glob will there be on Day 4?  
There will be 32(2) or 64 blue globs and  $48 + 12 = 60$  green globs on Day 4.

2. Will there be more blue or green globs on day 10? Show or explain your thinking.  
There will be more blue globs on day 4 because they are increasing at a faster rate than the green globs.

3. Which group of globs changes by a constant rate of change? Show or explain how you know.  
The green globs are increasing at a constant rate of 12 globs per day.

**Problems 4–5:** This graph shows the number of people who responded to an online survey about a new neighborhood park since January.

4. How many people completed the survey in January?  
About 25 people

5. Does the number of people responding to the survey grow by a constant difference? Show or explain how you know.  
No. Explanations vary. The graph of this relationship is a curve that is growing steeper with each passing month.

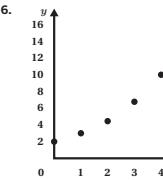
People Responding to Survey

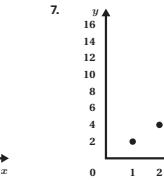
Months since January

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Problems 6–7:** Determine whether each graph shows a constant rate of change or a constant growth rate. Circle your choice.

6.  Constant rate of change

7.  Constant growth rate

Constant rate of change

**Problems 8–9:** Determine whether each table shows a linear or exponential function. Circle your choice.

8.  Linear

9.  Exponential

Linear Exponential Linear Exponential

Unit 6 Lesson 2 150 Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSF.IF.B.4
2	2	HSF.LE.A.3
3	2	HSF.LE.A.3
4	1	HSF.IF.B.4
5	2	HSF.LE.A.3
6	1	HSF.LE.A.3
7	1	HSF.LE.A.3
8	1	HSF.LE.A.3
9	1	HSF.LE.A.3

Notes:

**Additional Practice**

6.03

**Problems 1–3:** Determine the value of each expression when  $x = 3$ .

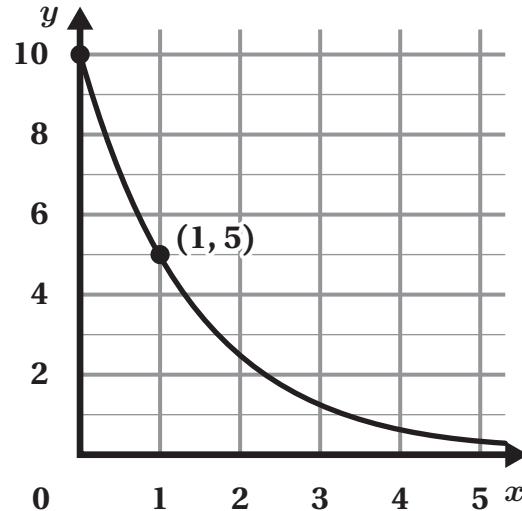
1.  $4^x$  **64**

2.  $\left(\frac{1}{2}\right)^x$   **$\frac{1}{8}$ , or equivalent**

3.  $4(2)^x$  **32**

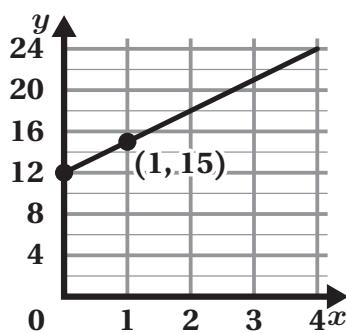
4. Here is a graph of  $y = 10\left(\frac{1}{2}\right)^x$ . Explain where you can see the 10 and the  $\frac{1}{2}$  in the graph.

The 10 is the  $y$ -intercept of the function. The  $\frac{1}{2}$  is the growth rate because at  $x = 1$ , the  $y$ -value is 5, which is  $\frac{1}{2}$  of 10.

**Problems 5–7:** Match each equation to the graph that represents it.**Equation A**

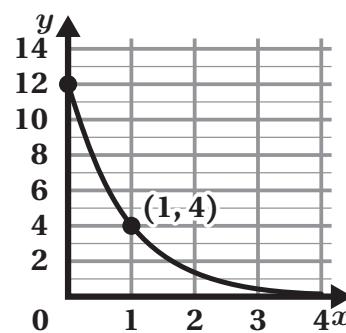
$$y = 12\left(\frac{1}{3}\right)^x$$

5.

Equation **C****Equation B**

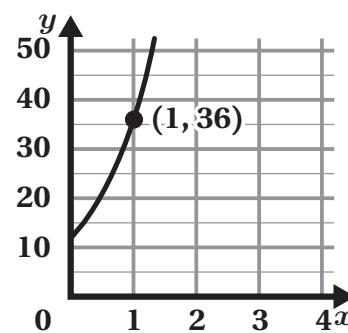
$$y = 12(3)^x$$

6.

Equation **A****Equation C**

$$y = 12 + 3x$$

7.

Equation **B**

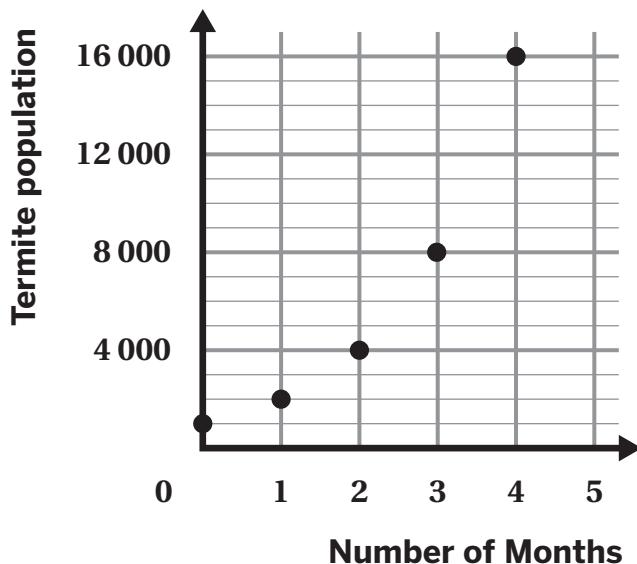
8. Explain how you determined which equation to match with the graph in Problem 7.

Responses vary. I looked for the function that had a positive growth rate and not a constant rate of change.

**Problems 9–10:** The number of termites in a colony is measured each month and the results are plotted on the graph.

9. What was the termite population when it was first measured?

Approximately 1000 termites



10. What equation represents the termite population,  $t$ , for  $m$  months after it was first measured?

$$t = 1000(2)^m$$

# Additional Practice | Answer Key

## Unit 6 | Lesson 3

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

**6.03**

**Problems 1–3:** Determine the value of each expression when  $x = 3$ .

1.  $4^x$  **64**
2.  $(\frac{1}{2})^x$   **$\frac{1}{8}$ , or equivalent**
3.  $4(2)^x$  **32**

**4.** Here is a graph of  $y = 10(\frac{1}{2})^x$ . Explain where you can see the 10 and the  $\frac{1}{2}$  in the graph.  
**The 10 is the  $y$ -intercept of the function. The  $\frac{1}{2}$  is the growth rate because at  $x = 1$ , the  $y$ -value is 5, which is  $\frac{1}{2}$  of 10.**

**Problems 5–7:** Match each equation to the graph that represents it.

<b>Equation A</b> $y = 12(\frac{1}{3})^x$	<b>Equation B</b> $y = 12(3)^x$	<b>Equation C</b> $y = 12 + 3x$
Equation <b>C</b>	Equation <b>A</b>	Equation <b>B</b>

**8.** Explain how you determined which equation to match with the graph in Problem 7.  
**Responses vary. I looked for the function that had a positive growth rate and not a constant rate of change.**

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Problems 9–10:** The number of termites in a colony is measured each month and the results are plotted on the graph.

**9.** What was the termite population when it was first measured?  
**Approximately 1000 termites**

**10.** What equation represents the termite population,  $t$ , for  $m$  months after it was first measured?  
 **$t = 1000(2)^m$**

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### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSN.Q.A.1
2	1	HSN.Q.A.1
3	1	HSN.Q.A.1
4	1	HSF.IF.B4
5	1	HSF.LE.A.2, HSF.LE.A.3, HSF.IF.B4
6	1	HSF.LE.A.2, HSF.LE.A.3, HSF.IF.B4
7	1	HSF.LE.A.2, HSF.LE.A.3, HSF.IF.B4
8	2	HSF.IF.B4
9	1	HSF.IF.B4
10	1	HSF.LE.A.2; HSA.CED.A.2

Notes:

**Additional Practice****6.05**

- 1.** Which equation best models the data in the table?

- A.  $f(x) = 50(1.25)^x$
- B.  $f(x) = 32 + 1.25$
- C.  $f(x) = 32(1.25)^x$
- D.  $f(x) = 40(1.25)^x$

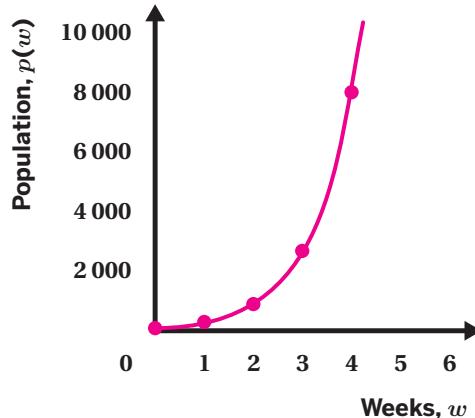
$x$	$f(x)$
1	40
2	50
3	62.5
4	78.125

**Problems 2–4:** The equation  $p(w) = 100 \cdot 3^w$  models the butterfly population,  $p(w)$ , where  $w$  is the number of weeks after the population was first measured.

- 2.** Complete the table.

Weeks, $w$	Population $p(w)$
0	100
1	300
2	900
3	2,700
4	8,100

- 3.** Graph the situation.



- 4.** Where on the graph do you see the 100 from the equation?

The 100 in the equation is represented by the  $y$ -intercept.

- 5.** Determine the value of  $p(-3)$  and explain what it means in this situation.

$p(-3) \approx 3.7$ . This means that 3 weeks before the population was initially measured, there were around 3–4 butterflies.

**Problems 6–8:** A walrus population,  $p(t)$ , is modeled by the equation  $p(t) = 300 \cdot \left(\frac{4}{3}\right)^t$  where  $t$  is the time, in years, since the population was first measured in 2018.

6. How many walrus were in the population in 2018? Explain your thinking.

300 walrus; Explanations vary. I substituted 0 for  $t$  in the equation.

$$p(0) = 300 \cdot \left(\frac{4}{3}\right)^0 = 300 \text{ walrus}$$

7. How many walrus were in the population in 2022? Show or explain your thinking.

948 walrus; Explanations vary. I substituted 4 for  $t$  in the equation.

$$p(4) = 300 \cdot \left(\frac{4}{3}\right)^4 \approx 948 \text{ walrus.}$$

8. How many walruses were in the population in 2016? Show or explain your thinking.

≈169 walrus; Explanations vary. I substituted –2 for  $t$  in the equation.

$$p(-2) = 169 \text{ walrus.}$$

# Additional Practice | Answer Key

## Unit 6 | Lesson 5

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

6.05

**1.** Which equation best models the data in the table?

- $f(x) = 50(1.25)^x$
- $f(x) = 32 + 1.25$
- $f(x) = 32(1.25)^x$  (C)
- $f(x) = 40(1.25)^x$

$x$	$f(x)$
1	40
2	50
3	62.5
4	78.125

**Problems 2–4:** The equation  $p(w) = 100 \cdot 3^w$  models the butterfly population,  $p(w)$ , where  $w$  is the number of weeks after the population was first measured.

**2.** Complete the table.

Weeks, $w$	Population $p(w)$
0	100
1	300
2	900
3	2,700
4	8,100

**3.** Graph the situation.

**4.** Where on the graph do you see the 100 from the equation?  
The 100 in the equation is represented by the  $y$ -intercept.

**5.** Determine the value of  $p(-3)$  and explain what it means in this situation.  
 $p(-3) \approx 3.7$ . This means that 3 weeks before the population was initially measured, there were around 3–4 butterflies.

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Problems 6–8:** A walrus population,  $p(t)$ , is modeled by the equation  $p(t) = 300 \cdot \left(\frac{4}{3}\right)^t$  where  $t$  is the time, in years, since the population was first measured in 2018.

- How many walruses were in the population in 2018? Explain your thinking.  
300 walrus; Explanations vary. I substituted 0 for  $t$  in the equation.  
 $p(0) = 300 \cdot \left(\frac{4}{3}\right)^0 = 300$  walrus
- How many walruses were in the population in 2022? Show or explain your thinking.  
948 walrus; Explanations vary. I substituted 4 for  $t$  in the equation.  
 $p(4) = 300 \cdot \left(\frac{4}{3}\right)^4 \approx 948$  walrus.
- How many walruses were in the population in 2016? Show or explain your thinking.  
≈169 walrus; Explanations vary. I substituted -2 for  $t$  in the equation.  
 $p(-2) = 169$  walrus.

Unit 6 Lesson 5      156      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSF.IF.B.5
2	1	HSF.IF.A.2
3	1	HSF.IF.B.5
4	1	HSF.IF.B.5
5	2	HSF.IF.A.2
6	2	HSF.IF.A.2
7	2	HSF.IF.A.2
8	2	HSF.IF.A.2

Notes:

# Additional Practice

6.07

**Problems 1–3:** A group of ornithologists were researching the hummingbird population in Ohio over several weeks. There were 500 hummingbirds when they first started keeping track. The population has increased by 20% each week.

1. How many hummingbirds are in Ohio 1 week after the ornithologists first counted?  
Show or explain your thinking.

**600 hummingbirds Methods vary.  $500(1.20) = 600$**

2. Write an expression that represents the hummingbird population after 3 weeks.

**Responses vary.  $500(1.20)^3$**

3. Write an expression that represents the hummingbird population after  $n$  weeks.

**Responses vary.  $500(1.20)^n$**

4. In one year, the attendance at a waterpark was 825,000 people. In the second year, attendance increased by 7%. Select *all* the expressions that represent the attendance at the waterpark in the second year.

- A.  $825,000 + 0.07$
- B.  $825,000(1.07)$
- C.  $825,000(1 + 0.07)$
- D.  $825,000(1 - 0.07)$
- E.  $825,000 + 0.07(825,000)$

**Problems 5–6:** Kendra deposited \$1200 in her savings account with an annual interest rate of 3.5%.

5. Write a function,  $f(t)$ , to represent the amount Kendra will have in her account after  $t$  years.

$$f(x) = 1200(1.035)^t$$

6. Complete the table to determine how much money Kendra will have in her savings account over time, if no further deposits or withdrawals are made.

Time (yr) <sup>t</sup>	Amount in Account (\$), $f(t)$
0	1200
1	1242
2	1285.47
3	1330.46
4	1377.03

**Problems 7–9:** Three cities have the same initial population and different percent increases each year. Match each function  $p(t)$ , representing the population after  $t$  years, with its correct description.

$$p(t) = 12,000(1.45)^t$$

7. City A has a 4.5% annual increase in population.

$$p(t) = 12,000(1.045)^t$$

$$p(t) = 12,000(1.045)^t$$

8. City B has a 0.45% annual increase in population.

$$p(t) = 12,000(1.0045)^t$$

9. City C has a 45% annual increase in population.

$$p(t) = 12,000(1.45)^t$$

# Additional Practice | Answer Key

## Unit 6 | Lesson 7

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

6.07

**Problems 1–3:** A group of ornithologists were researching the hummingbird population in Ohio over several weeks. There were 500 hummingbirds when they first started keeping track. The population has increased by 20% each week.

- How many hummingbirds are in Ohio 1 week after the ornithologists first counted?  
Show or explain your thinking.  
**600 hummingbirds** Methods vary.  $500(1.20) = 600$
- Write an expression that represents the hummingbird population after 3 weeks.  
**Responses vary.  $500(1.20)^3$**
- Write an expression that represents the hummingbird population after  $n$  weeks.  
**Responses vary.  $500(1.20)^n$**

4. In one year, the attendance at a waterpark was 825,000 people. In the second year, attendance increased by 7%. Select all the expressions that represent the attendance at the waterpark in the second year.

A.  $825,000 + 0.07$   
 B.  $825,000(1.07)$   
 C.  $825,000(1 + 0.07)$   
 D.  $825,000(1 - 0.07)$   
 E.  $825,000 + 0.07(825,000)$

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Problems 5–6:** Kendra deposited \$1200 in her savings account with an annual interest rate of 3.5%.

- Write a function,  $f(t)$ , to represent the amount Kendra will have in her account after  $t$  years.  
 **$f(x) = 1200(1.035)^x$**
- Complete the table to determine how much money Kendra will have in her savings account over time, if no further deposits or withdrawals are made.

Time (yr)	Amount in Account (\$), $f(t)$
0	1200
1	<b>1242</b>
2	<b>1285.47</b>
3	<b>1330.46</b>
4	<b>1377.03</b>

**Problems 7–9:** Three cities have the same initial population and different percent increases each year. Match each function  $p(t)$ , representing the population after  $t$  years, with its correct description.

**7.** City A has a 4.5% annual increase in population.  
 **$p(t) = 12,000(1.045)^t$**

**8.** City B has a 0.45% annual increase in population.  
 **$p(t) = 12,000(1.0045)^t$**

**9.** City C has a 45% annual increase in population.  
 **$p(t) = 12,000(1.45)^t$**

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### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.SSE.A.1.A
2	1	HSA.SSE.A.1.A
3	1	HSF.BF.A.1, HSF.LE.A.2
4	2	HSA.SSE.A.1.A, HSA.SSE.A.1.B
5	1	HSF.BF.A.1, HSF.LE.A.2
6	1	HSF.LE.A.1.C
7	1	HSA.SSE.A.1.A, HSA.SSE.A.1.B
8	1	HSA.SSE.A.1.A, HSA.SSE.A.1.B
9	1	HSA.SSE.A.1.A, HSA.SSE.A.1.B

### Notes:

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**Additional Practice**

6.10

1. Here is a graph of  $f(x) = 3 \cdot 2^x$ .

Match each function with its graph.

Equation

Solution

$$f(x) = 3 \cdot 2^x - 5$$

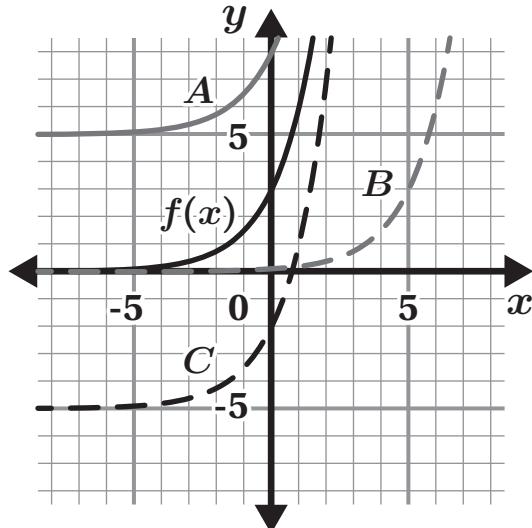
C

$$f(x) = 3 \cdot 2^x + 5$$

A

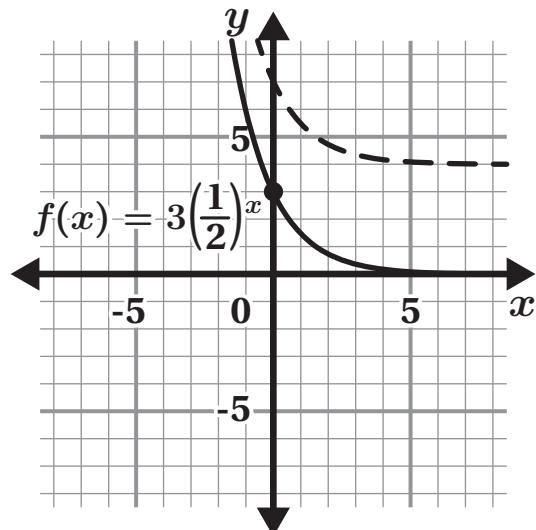
$$f(x) = 3 \cdot 2^{x-5}$$

B



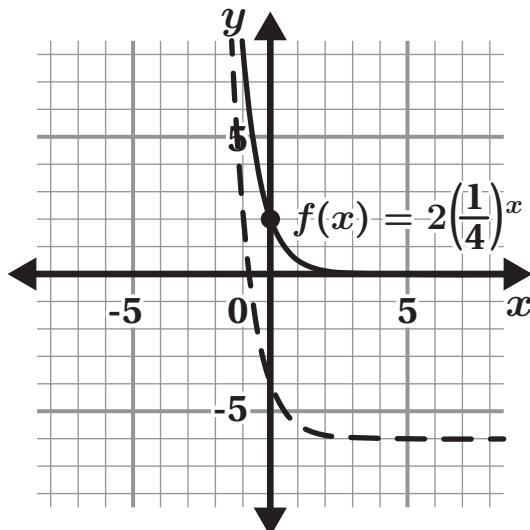
**Problems 2–3:** For each set of graphs shown, write an equation for the dotted curve,  $g(x)$ .

2.  $f(x) = 3\left(\frac{1}{2}\right)^x$



$$g(x) = 3\left(\frac{1}{2}\right)^x + 4$$

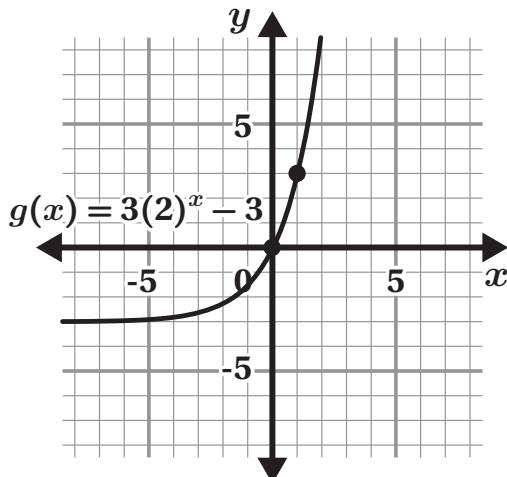
3.  $f(x) = 2\left(\frac{1}{4}\right)^x$



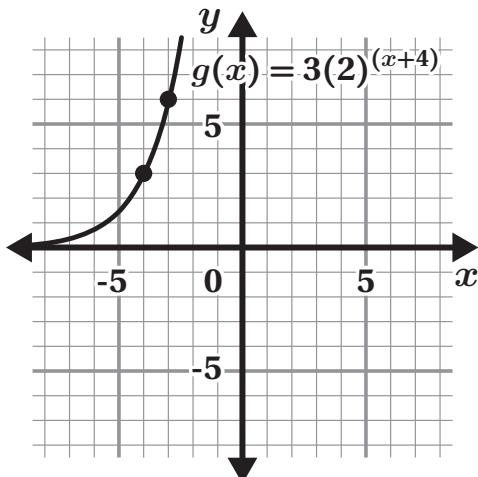
$$g(x) = 2\left(\frac{1}{4}\right)^x - 6$$

**Problems 4–5:** The function  $g(x)$  is a transformation of  $f(x) = 3 \cdot 2^x$ .

4. Graph  $g(x) = 3(2)^x - 3$



5. Graph  $g(x) = 3(2)^{(x+4)}$



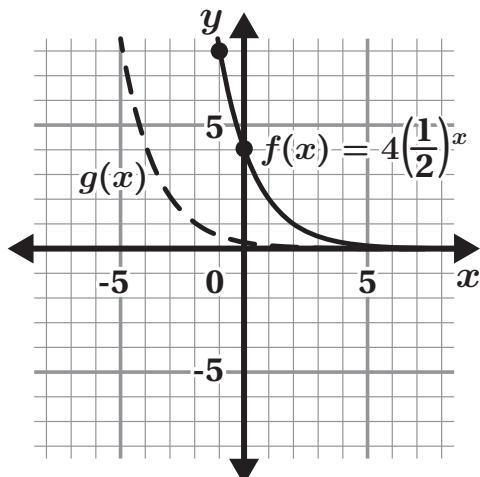
**Problems 6–8:** The function  $g(x)$  is a transformation of  $f(x) = 4\left(\frac{1}{2}\right)^x$ .

6. Melanie says  $g(x) = 4\left(\frac{1}{2}\right)^{x-4}$  because it is a horizontal translation 4 units to the left. Explain why Melanie's thinking is incorrect.

**Responses vary.** The function  $g(x)$  is a horizontal translation 4 units to the left but this would result in an exponent of  $(x - h)$  or  $(x - (-4))$ , which results in  $(x + 4)$ .

7. Yousef says  $f(x)$  is a vertical transformation because the  $y$ -intercept shifted down about 3.5 units. Explain why Yousef's thinking is incorrect.

**Responses vary.** The function  $g(x)$  is a horizontal translation 4 units to the left. The initial point  $(0, 4)$  is translated 4 units to the left (not down) to point  $(-4, 4)$ .



8. Write the correct equation for  $g(x)$ .

$$g(x) = 4\left(\frac{1}{2}\right)^{x+4}$$

# Additional Practice | Answer Key

## Unit 6 | Lesson 10

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

**6.10**

1. Here is a graph of  $f(x) = 3 \cdot 2^x$ . Match each function with its graph.

Equation	Solution
$f(x) = 3 \cdot 2^x - 5$	C
$f(x) = 3 \cdot 2^x + 5$	A
$f(x) = 3 \cdot 2^{-x}$	B

Problems 2–3: For each set of graphs shown, write an equation for the dotted curve,  $g(x)$ .

2.  $f(x) = 3\left(\frac{1}{2}\right)^x$

$g(x) = 3\left(\frac{1}{2}\right)^x + 4$

3.  $f(x) = 2\left(\frac{1}{4}\right)^x$

$g(x) = 2\left(\frac{1}{4}\right)^x - 6$

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

Problems 4–5: The function  $g(x)$  is a transformation of  $f(x) = 3 \cdot 2^x$ .

4. Graph  $g(x) = 3(2)^x - 3$

5. Graph  $g(x) = 3(2)^{(x+4)}$

Problems 6–8: The function  $g(x)$  is a transformation of  $f(x) = 4\left(\frac{1}{2}\right)^x$ .

6. Melanie says  $g(x) = 4\left(\frac{1}{2}\right)^{x-4}$  because it is a horizontal translation 4 units to the left. Explain why Melanie's thinking is incorrect.  
Responses vary. The function  $g(x)$  is a horizontal translation 4 units to the left but this would result in an exponent of  $(x-h)$  or  $(x-(-4))$ , which results in  $(x+4)$ .

7. Yousef says  $f(x)$  is a vertical transformation because the  $y$ -intercept shifted down about 3.5 units. Explain why Yousef's thinking is incorrect.  
Responses vary. The function  $g(x)$  is a horizontal translation 4 units to the left. The initial point  $(0, 4)$  is translated 4 units to the left (not down) to point  $(-4, 4)$ .

8. Write the correct equation for  $g(x)$ .  
 $g(x) = 4\left(\frac{1}{2}\right)^{x+4}$

Unit 6 Lesson 10      166      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSF.BF.3, HSF.IF.7.E
2	1	HSF.BF.3, HSF.IF.7.E
3	1	HSF.BF.3, HSF.IF.7.E
4	1	HSF.BF.3, HSF.IF.7.E
5	1	HSF.BF.3, HSF.IF.7.E
6	2	HSF.BF.3, HSF.IF.7.E, HSF.IF.4
7	2	HSF.BF.3, HSF.IF.7.E, HSF.IF.4
8	1	HSF.BF.3, HSF.IF.7.E

Notes:

**Additional Practice**

6.13

**Problems 1–4:** Determine if each equation or table represents simple or compound interest. Circle your choice.

1.  $b(t) = 500 + 25t$

Simple

Compound

2.  $b(t) = 500(1.05)^t$

Simple

Compound

3.

Time (yr)	Account Balance (\$)
0	100
1	125
2	156.25

Simple

Compound

4.

Time (yr)	Account Balance (\$)
0	100
1	125
2	150

Simple

Compound

**Problems 5–7:** Helen invests \$2000 in an account that earns 3.5% compound interest per year.

5. Complete the table.

Time (yr)	Account Balance (\$)
0	2000
1	2070
2	2142.45
3	2217.44
4	2295.05

6. Which function represents the amount of money in Helen's account after
- $x$
- years?

- A.  $f(x) = 2000 + 1.035x$
- B.  $f(x) = 2000(1.035x)$
- C.  $f(x) = 2000 + 1.035^x$
- D.  $f(x) = 2000(1.035)^x$

7. What will the balance of the account be after 8 years? Show or explain your thinking.

**Methods vary.**  $f(8) = 2000(1.035)^8 = \$2633.62$

**Problems 8–9:** Samuel invests \$500 in an account that earns 4% compound interest per year. The graph shows the function  $f(t) = 500(1.04)^t$ , which gives Samuel's account balance after  $t$  years.

8. About how many years will it take for his account balance to reach \$1000?

**Responses vary. About 18 years.**

9. Use the graph to determine the value of  $f(12)$ .

**\$800**

What does that tell you about the situation?

**After 12 years, there will be about \$800 in the account.**

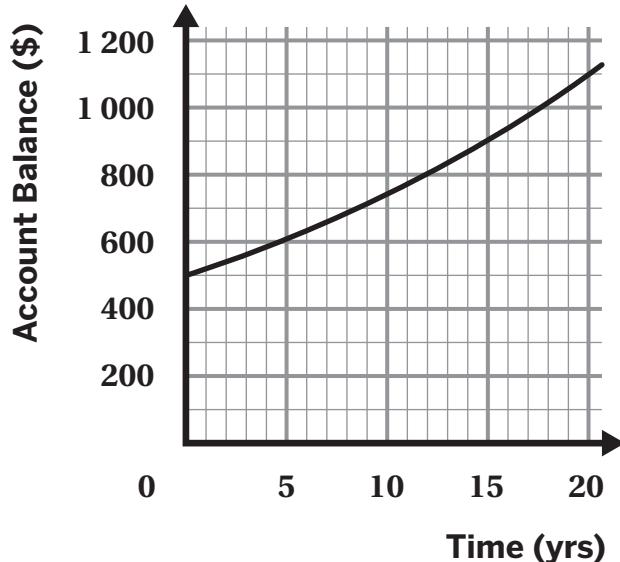
10. You have won a contest and have two prize options:

**Option A:** Getting a penny that doubles every day for a month (30 days)

**Option B:** \$10 million dollars

Which option would you choose? Explain your choice.

**Option A. Explanations vary. Option A will result in a sum of \$10,737,418.24 after 30 days, which is more than Option B.**



# Additional Practice | Answer Key

## Unit 6 | Lesson 13

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

**6.13**

**Problems 1–4:** Determine if each equation or table represents simple or compound interest. Circle your choice.

1.  $b(t) = 500 + 25t$  Simple  
2.  $b(t) = 500(1.05)^t$  Compound

3. 

Time (yr)	Account Balance (\$)
0	100
1	125
2	156.25

 Simple  
4. 

Time (yr)	Account Balance (\$)
0	100
1	125
2	150

 Simple Compound

**Problems 5–7:** Helen invests \$2000 in an account that earns 3.5% compound interest per year.

5. Complete the table.

6. Which function represents the amount of money in Helen's account after  $x$  years?

A.  $f(x) = 2000 + 1.035x$   
B.  $f(x) = 2000(1.035x)$   
C.  $f(x) = 2000 + 1.035^x$   
D.  $f(x) = 2000(1.035)^x$

7. What will the balance of the account be after 8 years? Show or explain your thinking.  
**Methods vary.**  $f(8) = 2000(1.035)^8 = \$2633.62$

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Problems 8–9:** Samuel invests \$500 in an account that earns 4% compound interest per year. The graph shows the function  $f(t) = 500(1.04)^t$ , which gives Samuel's account balance after  $t$  years.

8. About how many years will it take for his account balance to reach \$1000?  
**Responses vary. About 18 years.**

9. Use the graph to determine the value of  $f(12)$ .  
**\$800**  
What does that tell you about the situation?  
**After 12 years, there will be about \$800 in the account.**

10. You have won a contest and have two prize options:  
**Option A:** Getting a penny that doubles every day for a month (30 days)  
**Option B:** \$10 million dollars  
Which option would you choose? Explain your choice.  
**Option A. Explanations vary. Option A will result in a sum of \$10,737,418.24 after 30 days, which is more than Option B.**

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### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSF.LE.A.1, HSF.LE.A.3
2	1	HSF.LE.A.1, HSF.LE.A.3
3	1	HSF.LE.A.1, HSF.LE.A.3
4	1	HSF.LE.A.1, HSF.LE.A.3
5	1	HSF.LE.A.3
6	1	HSF.LE.A.2
7	1	HSF.LE.A.3, HSF.LE.B.5
8	1	HSF.LE.A.3
9	2	HSF.LE.A.3, HSF.LE.B.5; HSF.IF.A.2
10	2	HSF.LE.A.3, HSF.LE.B.5

**Notes:**

**Additional Practice****6.14**

**Problems 1–2:** Sree takes out a \$2500 loan with a monthly interest rate of 4.5%. She makes no additional payments, deposits, or withdrawals.

1. Select *all* the expressions that can be used to calculate her balance after  $t$  years.

- A.  $2500 \cdot 1.045^t$
- B.  $2500 \cdot (1.045^{12})^t$
- C.  $2500 \cdot 1.045^{12t}$
- D.  $2500(1.6959)$
- E.  $2500 \cdot 1.6959^t$

2. What was the annual interest rate for this loan?

**69.59%**

**Problems 3–7:** Aki invests money into a savings account to purchase a car in the future. He writes the expression  $2000(1.055^{12})^4$  to help him calculate what the account balance will be in 4 years.

3. Explain what 2000 represents in the expression.

**This is the amount of money Aki initially invested in the account.**

4. Explain what 1.055 represents in the expression.

**The money will be growing exponentially at a monthly interest rate of 5.5%.**

5. Explain what 12 represents in the expression.

**The money in the account is compounded each month, or 12 times a year.**

6. Explain what 4 represents in the expression.

**This is the number of years that Aki will be investing his money.**

7. Write an equivalent expression that could represent Aki's account balance in 4 years.

**$2000(1.055^{12})^4 = \$26,130.52$**

**Problems 8–9:** Jaxson is considering taking out a \$100 credit card loan that has a 24% monthly interest rate.

8. Complete the table.

Monthly Interest Rate (%)	24
Monthly Growth Factor	1.24
Growth Factor per Year	13.2148
Interest Rate per Year (%)	1221.48

9. If Jaxson takes out a \$100 credit card loan, how much will he owe after 3 years, if he made no additional payments? Show your thinking.

$$\$230,770.70 \text{ Methods vary. } 100 \cdot 1.24^{12(3)} = 230,770.70$$

10. Varsha needs \$10,000 for tuition and supplies for college this year. She has the choice between two different loan options.

**Option A:** A federal student loan with a monthly interest rate of 6.53% that she can start paying off in 4 years.

**Option B:** A loan through her bank with a monthly interest rate of 4.5% that she can start paying off in 6 years.

Which option would you recommend she choose? Show or explain your reasoning.

**Option A: Explanations vary. The total amount of Option A loan is  $10,000(1.0653)^{48} = \$208,282.36$  and the total amount of Option B loan is  $10,000(1.045)^{72} = \$237,888.21$ . She will have to pay back about \$29,606 less if she goes with Option A.**

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice 6.14

**Problems 1–2:** Sree takes out a \$2500 loan with a monthly interest rate of 4.5%. She makes no additional payments, deposits, or withdrawals.

- Select all the expressions that can be used to calculate her balance after  $t$  years.
  - A.  $2500 \cdot 1.045^t$
  - B.  $2500 \cdot (1.045^t)^2$
  - C.  $2500 \cdot 1.045^{12t}$
  - D.  $2500(1.045^t)$
  - E.  $2500 \cdot 1.045^{12t}$
- What was the annual interest rate for this loan?  
69.59%

**Problems 3–7:** Aki invests money into a savings account to purchase a car in the future. He writes the expression  $2000(1.055^{12})^4$  to help him calculate what the account balance will be in 4 years.

- Explain what 2000 represents in the expression.  
*This is the amount of money Aki initially invested in the account.*
- Explain what 1.055 represents in the expression.  
*The money will be growing exponentially at a monthly interest rate of 5.5%.*
- Explain what 12 represents in the expression.  
*The money in the account is compounded each month, or 12 times a year.*
- Explain what 4 represents in the expression.  
*This is the number of years that Aki will be investing his money.*
- Write an equivalent expression that could represent Aki's account balance in 4 years.  
 $2000(1.055^{12})^4 = \$26,130.52$

Unit 6 Lesson 14

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Problems 8–9:** Jaxson is considering taking out a \$100 credit card loan that has a 24% monthly interest rate.

- Complete the table.

Monthly Interest Rate (%)	24
Monthly Growth Factor	1.24
Growth Factor per Year	13.2148
Interest Rate per Year (%)	1221.48

- If Jaxson takes out a \$100 credit card loan, how much will he owe after 3 years, if he made no additional payments? Show your thinking.  
 $\$230,770.70$  Methods vary.  $100 \cdot 1.24^{36} = 230,770.70$
- Varsha needs \$10,000 for tuition and supplies for college this year. She has the choice between two different loan options.
  - Option A:** A federal student loan with a monthly interest rate of 6.53% that she can start paying off in 4 years.
  - Option B:** A loan through her bank with a monthly interest rate of 4.5% that she can start paying off in 6 years.
 Which option would you recommend she choose? Show or explain your reasoning.
 

**Option A:** Explanations vary. The total amount of Option A loan is  $10,000(1.0653)^4 = \$20,282.36$  and the total amount of Option B loan is  $10,000(1.045)^6 = \$237,888.21$ . She will have to pay back about \$29,606 less if she goes with Option A.

Unit 6 Lesson 14

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Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.SSE.B.3. HSF.IF.C.8.B
2	1	HSF.LE.A.3, HSF.LE.B.5
3	1	HSA.SSE.A.1.A; HSA.SSE.A.2
4	1	HSA.SSE.A.1.A; HSA.SSE.A.2
5	1	HSA.SSE.A.1.A; HSA.SSE.A.2
6	1	HSA.SSE.A.1.A; HSA.SSE.A.2
7	1	HSF.LE.A.3, HSF.LE.B.5
8	1	HSF.IF.C.8.B
9	1	HSF.LE.A.3, HSF.LE.B.5
10	2	HSF.LE.A.3, HSF.LE.B.5

Notes:

**Additional Practice**

6.15

- 1.** Meegan put \$3000 into a savings account with a 3.25% annual interest rate, compounded quarterly. She made no additional payments, deposits, or withdrawals.

Select *all* the expressions that can be used to calculate his balance after 5 years.

**A.**  $3000(1 + 0.0325)^5$

**D.**  $3000(1.0008)^{4 \cdot 5}$

**B.**  $3000(1 + 0.0325)^{20}$

**E.**  $3000\left(1 + \frac{0.0325}{4}\right)^4$

**C.**  $3000\left(1 + \frac{0.0325}{4}\right)^{20}$

- Problems 2–4:** Amir wants to take out a \$1200 loan to pay for a new bike. The bank offers him the loan with a 12.5% annual interest rate, compounded daily.

Amir wrote this expression to calculate the balance of the loan in 3 years, but he made an error.

$$1200\left(1 + \frac{0.125}{365}\right)^3$$

- 2.** Find the error and explain why it is incorrect.

**Because the loan is compounded daily, the exponent should be  $3 \cdot 365$ , or 1095.**

- 3.** Write a correct expression to represent Amir's balance after 3 years.

**$1200\left(1 + \frac{0.125}{365}\right)^{1095}$ , or equivalent**

- 4.** What will his balance be in 3 years?

**\$1745.88**

- Problems 5–6:** A credit card company load offers a \$2500 loan with a 28.8% annual interest rate.

- 5.** If no other charges or payments are made, what will the balance of the loan be after 1 year at each compounding period?

Compounding Period	Balance (\$)
Annually	<b>\$3220</b>
Semiannually	<b>\$3271.84</b>
Quarterly	<b>\$3301.56</b>

- 6.** Describe how changing the compounding period affects the balance of the loan.

*Explanations vary. The more often the money is compounded, the greater the amount of the loan.*

**Problems 7–8:** Hannah has \$3,000 to invest and is choosing between three investment options:

**Option A:** 11.5% annual interest rate, compounded quarterly.

**Option B:** 11.25% annual interest rate, compounded monthly.

**Option C:** 10.5% annual interest rate, compounded daily.

- 7.** Express each of the options as a function of the money earned in terms of  $t$  time.

$$\text{Option A: } f(t) = 3000 \left(1 + \frac{0.115}{4}\right)^{4t}, \text{ or equivalent}$$

$$\text{Option B: } g(t) = 3000 \left(1 + \frac{0.1125}{12}\right)^{12t}, \text{ or equivalent}$$

$$\text{Option C: } h(t) = 3000 \left(1 + \frac{0.105}{365}\right)^{365t}, \text{ or equivalent}$$

- 8.** If she makes no deposits and no withdrawals for 6 years, which option will give her the largest balance after 6 years? Show or explain your thinking.

$$\text{Option A. Methods vary. Option A: } 3000 \left(1 + \frac{0.115}{4}\right)^{24} = \$5923.22;$$

$$\text{Option B: } 3000 \left(1 + \frac{0.1125}{12}\right)^{72} = \$5873.60$$

$$\text{Option C: } 3000 \left(1 + \frac{0.105}{365}\right)^{2190} = \$5632.32$$

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice 6.15

**1.** Meegan put \$3000 into a savings account with a 3.25% annual interest rate, compounded quarterly. She made no additional payments, deposits, or withdrawals. Select all the expressions that can be used to calculate his balance after 5 years.

A.  $3000(1 + 0.0325)^5$

D.  $3000(1.0008)^{45}$

B.  $3000(1 + 0.0325)^{20}$

E.  $3000\left(1 + \frac{0.0325}{4}\right)^5$

C.  $3000\left(1 + \frac{0.0325}{4}\right)^{20}$

**Problems 2–4:** Amir wants to take out a \$1200 loan to pay for a new bike. The bank offers him the loan with a 12.5% annual interest rate, compounded daily.

Amir wrote this expression to calculate the balance of the loan in 3 years, but he made an error.

$$1200\left(1 + \frac{0.125}{365}\right)^3$$

**2.** Find the error and explain why it is incorrect.  
Because the loan is compounded daily, the exponent should be  $3 \cdot 365$ , or 1095.

**3.** Write a correct expression to represent Amir's balance after 3 years.  
 $1200\left(1 + \frac{0.125}{365}\right)^{1095}$ , or equivalent

**4.** What will his balance be in 3 years?  
**\$1745.88**

**Problems 5–6:** A credit card company loan offers a \$2500 loan with a 28.8% annual interest rate.

Compounding Period	Balance (\$)
Annually	<b>\$3220</b>
Semiannually	<b>\$3271.84</b>
Quarterly	<b>\$3301.56</b>

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Problem	DOK	Standard(s)
1	1	HSA.SSE.B.3. HSF.IF.C.8.B
2	2	HSA.SSE.B.3. HSF.IF.C.8.B
3	1	HSF.LE.A.3, HSF.LE.B.5
4	1	HSF.LE.A.3, HSF.LE.B.5
5	1	HSF.LE.A.3, HSF.LE.B.5
6	2	HSF.LE.A.1, HSF.LE.A.3
7	1	HSF.LE.A.3, HSF.LE.B.5
8	1	HSF.LE.A.3, HSF.LE.B.5

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**6.** Describe how changing the compounding period affects the balance of the loan.  
*Explanations vary. The more often the money is compounded, the greater the amount of the loan.*

**Problems 7–8:** Hannah has \$3,000 to invest and is choosing between three investment options:

**Option A:** 11.5% annual interest rate, compounded quarterly.

**Option B:** 11.25% annual interest rate, compounded monthly.

**Option C:** 10.5% annual interest rate, compounded daily.

**7.** Express each of the options as a function of the money earned in terms of  $t$  time.

**Option A:**  $f(t) = 3000\left(1 + \frac{0.115}{4}\right)^t$ , or equivalent

**Option B:**  $g(t) = 3000\left(1 + \frac{0.1125}{12}\right)^{12t}$ , or equivalent

**Option C:**  $h(t) = 3000\left(1 + \frac{0.105}{365}\right)^{365t}$ , or equivalent

**8.** If she makes no deposits and no withdrawals for 6 years, which option will give her the largest balance after 6 years? Show or explain your thinking.

**Option A:** Methods vary. Option A:  $3000\left(1 + \frac{0.115}{4}\right)^{24} = \$5923.22$ ;

**Option B:**  $3000\left(1 + \frac{0.1125}{12}\right)^{72} = \$5873.60$

**Option C:**  $3000\left(1 + \frac{0.105}{365}\right)^{2190} = \$5632.32$

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### Practice Problem Analysis

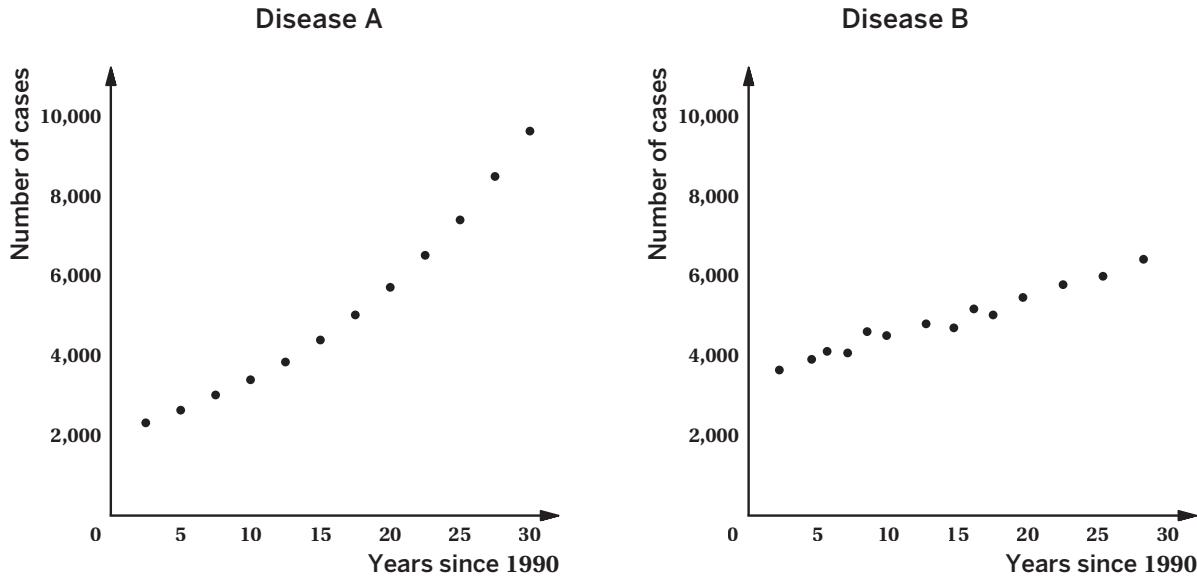
#### Problem DOK Standard(s)

- 1 1 HSA.SSE.B.3. HSF.IF.C.8.B
- 2 2 HSA.SSE.B.3. HSF.IF.C.8.B
- 3 1 HSF.LE.A.3, HSF.LE.B.5
- 4 1 HSF.LE.A.3, HSF.LE.B.5
- 5 1 HSF.LE.A.3, HSF.LE.B.5
- 6 2 HSF.LE.A.1, HSF.LE.A.3
- 7 1 HSF.LE.A.3, HSF.LE.B.5
- 8 1 HSF.LE.A.3, HSF.LE.B.5

#### Notes:

**Additional Practice****6.16**

- 1.** Each graph models the spread of a disease.



- a** What kind of function would best model the data for Disease A — *linear, exponential, or neither*? Disease B? Explain your thinking.

**Disease A: exponential** **Disease B: linear;** **Sample response:** For Disease A, the number of cases increases by a greater number as time goes on. For Disease B, the number of cases appears to follow along a straight line.

- b** Which function would be a better model for Disease A:  $f(x) = 2000 + 200x$  or  $g(x) = 2000 \cdot (1.05)^x$ ?
- $g(x)$**

- 2.** The table shows the population of a city each year for 6 years.

Year	2015	2016	2017	2018	2019	2020
Number of people	9,000	9,720	10,498	11,337	12,244	13,324

- a** Does the population appear to be increasing by a common difference or by a common factor? Explain your thinking.

**Common factor;** **Sample response:** Each year, the population is approximately 1.08 times greater than the population in the previous year.

- b** Would a *linear* or *exponential* function be more appropriate for modeling the growth? Explain your thinking.

**Exponential;** **Sample response:** The population has been growing more and more rapidly since 2015, indicating that its growth might be exponential, rather than linear.

3. The number of people infected by a virus is modeled by the function  $f(x) = 240 \cdot (1.29)^x$ , where  $x$  represents the number of days since the virus outbreak was identified.

- a At what rate is the virus spreading per day?

**29% per day**

- b How many infections were there four days before the virus outbreak was identified, based on the model? Explain your thinking.

**87 infections; Sample response:  $x = -4$ , so  $f(x) \approx 86.67$**

4. The table shows the population of jellyfish in a certain area of the ocean each year for several years.

Year	2014	2015	2016	2017	2018	2019	2020
Number of jellyfish	700	784	878	983	1,102	1,234	1,382

- a What kind of function would best model the data for jellyfish population — *linear, exponential, or neither*? Explain your thinking.

**Exponential; Sample response: The population has been growing more and more rapidly since 2014, indicating that its growth might be exponential.**

- b Write a function that models the number of jellyfish  $f(x)$ ,  $x$  years after 2014.

**$f(x) = 700 \cdot (1.12)^x$  (or equivalent)**

- c Approximately how many years did it take for the jellyfish population to double?

**6 years**

- d Use your function to predict the number of jellyfish that will be in that area of the ocean in 2025.

**2,435 jellyfish**

5. The table shows the number of virus infections for different dates in one year. Which time period had the greatest average rate of change: January 15 to 22nd, January 15 to 28, or January 15 to 29? Explain your thinking.

Date	Jan. 6	Jan. 15	Jan. 22	Jan. 26	Jan. 28	Jan. 30
Number of infections	50	850	7,700	27,126	50,912	95,557

**January 15 to 29; Sample response: The average rate of change for January 15 to 22 was about 978 cases per day. The average rate of change for January 15 to 28 was about 3,851 cases per day. The average rate of change for January 15 to 29 was about 6,314 cases per day.**

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

**6.16**

1. Each graph models the spread of a disease.

Disease A: Number of cases vs Years since 1990. Data points approximately at (0, 2000), (5, 3000), (10, 4000), (15, 5000), (20, 6000), (25, 7000), (30, 8000). Disease B: Number of cases vs Years since 1990. Data points approximately at (0, 3000), (5, 3500), (10, 4000), (15, 4500), (20, 5000), (25, 5500), (30, 6000).

a. What kind of function would best model the data for Disease A — linear, exponential, or neither? Disease B? Explain your thinking.  
**Disease A: exponential** **Disease B: linear**; Sample response: For Disease A, the number of cases increases by a greater number as time goes on. For Disease B, the number of cases appears to follow along a straight line.

b. Which function would be a better model for Disease A:  $f(x) = 2000 + 200x$  or  $g(x) = 2000 \cdot (1.05)^x$ ?  
**g(x)**

2. The table shows the population of a city each year for 6 years.

Year	2015	2016	2017	2018	2019	2020
Number of people	9,000	9,720	10,498	11,337	12,244	13,324

a. Does the population appear to be increasing by a common difference or by a common factor? Explain your thinking.  
**Common factor**; Sample response: Each year, the population is approximately 1.08 times greater than the population in the previous year.

b. Would a linear or exponential function be more appropriate for modeling the growth? Explain your thinking.  
**Exponential**; Sample response: The population has been growing more and more rapidly since 2015, indicating that its growth might be exponential, rather than linear.

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

3. The number of people infected by a virus is modeled by the function  $f(x) = 240 \cdot (1.29)^x$ , where  $x$  represents the number of days since the virus outbreak was identified.

a. At what rate is the virus spreading per day?  
**29% per day**

b. How many infections were there four days before the virus outbreak was identified, based on the model? Explain your thinking.  
**87 infections**; Sample response:  $x = -4$ , so  $f(x) = 86.67$

4. The table shows the population of jellyfish in a certain area of the ocean each year for several years.

Year	2014	2015	2016	2017	2018	2019	2020
Number of jellyfish	700	784	878	983	1,102	1,234	1,382

a. What kind of function would best model the data for jellyfish population — linear, exponential, or neither? Explain your thinking.  
**Exponential**; Sample response: The population has been growing more and more rapidly since 2014, indicating that its growth might be exponential.

b. Write a function that models the number of jellyfish  $f(x)$ ,  $x$  years after 2014.  
 **$f(x) = 700 \cdot (1.12)^x$  (or equivalent)**

c. Approximately how many years did it take for the jellyfish population to double?  
**6 years**

d. Use your function to predict the number of jellyfish that will be in that area of the ocean in 2025.  
**2,435 jellyfish**

5. The table shows the number of virus infections for different dates in one year. Which time period had the greatest average rate of change: January 15 to 22nd, January 15 to 28, or January 15 to 29? Explain your thinking.

Date	Jan. 6	Jan. 15	Jan. 22	Jan. 26	Jan. 28	Jan. 30
Number of infections	50	850	7,700	27,126	50,912	95,557

January 15 to 29; Sample response: The average rate of change for January 15 to 22 was about 978 cases per day. The average rate of change for January 15 to 28 was about 3,851 cases per day. The average rate of change for January 15 to 29 was about 6,314 cases per day.

Unit 6 Lesson 16      178      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSS.ID.B.6.A
2	1	HSS.ID.B.6.A
3	2	HSS.ID.B.6.A
4	2	HSS.ID.B.6.A
5	3	HSS.ID.B.6.A

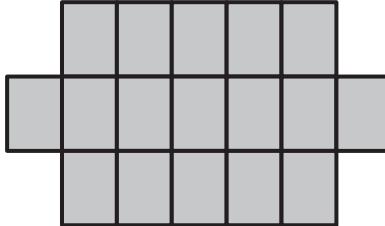
### Notes:

## Additional Practice

7.01

1. Select *all* of the expressions that could represent the number of tiles in this diagram.

- A.  $7 \cdot 3$
- B.  $7 \cdot 3 - 4$
- C.  $5 \cdot 3 + 4$
- D.  $5 \cdot 3 + 2$
- E.  $2(5) + 1(7)$



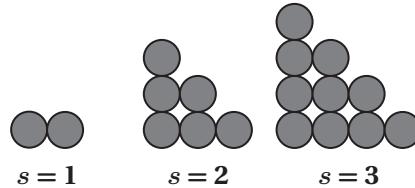
2. Here are the first three steps in a pattern.

How many dots will there be when  $s = 8$ ?

30

Explain your thinking.

Responses vary. The pattern increases by 4 each time so I kept adding 4 to the previous total for each next step.



3. What type of relationship does the pattern in the table represent? Circle one.

Linear      Exponential      Neither

Explain your thinking.

Neither the difference between each step is the same nor is the growth factor.

$s$	Number of tiles
1	5
2	20
3	45
4	80

**Problems 4–6:** A teacher gives her class a table with only the first two rows in a tile pattern.

4. Momo says the pattern is a linear relationship.  
 Gerald says there is not enough information to be sure.  
 Whose thinking is correct? Explain your thinking.

Gerald is correct. It could be linear but we need another step to know for sure.

<i>s</i>	Number of tiles
1	1
2	8

5. How many tiles would there be in the next step if the relationship were linear?

$8 + 7 = 15$  tiles

6. How many tiles would there be in the next step if the relationship were exponential?

$3^3 = 27$  tiles

**Problems 7–8:** The table shows the relationship between the figure number, *s*, and number of tiles in a pattern.

Heather notices that the number of tiles is increasing in an interesting pattern - the number of tiles increase by 3, then 5, then 7, and then 9.

Aaron notices that the number of tiles in each row is the square of the figure number.

<i>s</i>	Number of tiles
1	1
2	4
3	9
4	16
5	25

7. Based on these observations, is this pattern linear, exponential or neither? Explain your thinking.

Neither. The difference between each step is not the same value nor is the growth factor.

8. Use both Aaron and Heather's observations to predict the next number in this pattern. Is it the same value? Show or explain your thinking.

Heather's pattern would make the next number increase by 11 from the previous one, which would make it  $25 + 11$  or 36. Aaron's pattern would make the next number the square of 6, which would also be 36.

# Additional Practice | Answer Key

## Unit 7 | Lesson 1

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

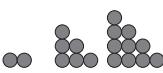
**7.01**

1. Select all of the expressions that could represent the number of tiles in this diagram.

A.  $7 \cdot 3$   
 B.  $7 \cdot 3 - 4$   
 C.  $5 \cdot 3 + 4$   
 D.  $5 \cdot 3 + 2$   
 E.  $2(5) + 1(7)$



2. Here are the first three steps in a pattern. How many dots will there be when  $s = 8$ ?  
 $30$   
 Explain your thinking.  
 Responses vary. The pattern increases by 4 each time so I kept adding 4 to the previous total for each next step.



3. What type of relationship does the pattern in the table represent? Circle one.

Linear   Exponential    Neither

<i>s</i>	Number of tiles
1	5
2	20
3	45
4	80

Explain your thinking.  
 Neither the difference between each step is the same nor is the growth factor.

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Problems 4–6:** A teacher gives her class a table with only the first two rows in a tile pattern.

<i>s</i>	Number of tiles
1	1
2	8

4. Momo says the pattern is a linear relationship. Gerald says there is not enough information to be sure. Whose thinking is correct? Explain your thinking.  
 Gerald is correct. It could be linear but we need another step to know for sure.

5. How many tiles would there be in the next step if the relationship were linear?  
 $8 + 7 = 15$  tiles

6. How many tiles would there be in the next step if the relationship were exponential?  
 $3^3 = 27$  tiles

**Problems 7–8:** The table shows the relationship between the figure number, *s*, and number of tiles in a pattern.

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Aaron notices that the number of tiles in each row is the square of the figure number.

7. Based on these observations, is this pattern linear, exponential or neither? Explain your thinking.  
 Neither. The difference between each step is not the same value nor is the growth factor.

8. Use both Aaron and Heather's observations to predict the next number in this pattern. Is it the same value? Show or explain your thinking.  
 Heather's pattern would make the next number increase by 11 from the previous one, which would make it 25 + 11 or 36. Aaron's pattern would make the next number the square of 6, which would also be 36.

Unit 7 Lesson 1      182      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	2	HSF.BF.A.1.A
2	2	HSF.BF.A.1.A
3	2	HSF.BF.A.1.A
4	2	HSF.BF.A.1.A
5	1	HSF.BF.A.1.A
6	1	HSF.BF.A.1.A
7	1	HSF.BF.A.1.A
8	2	HSF.BF.A.1.A

Notes:

**Additional Practice****7.02**

- 1.** Refer to the pattern of dots. By how many dots does the pattern grow in each successive figure?

**4 dots****Figure 0    Figure 1    Figure 2    Figure 3**

- 2.** The table shows the relationship between the figure number and number of dots in a pattern.

Figure number	1	2	3	4	5
Number of dots	1	4	9	16	25

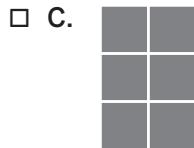
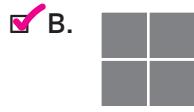
- a** What is the difference between the number of dots in each figure?

**3, 5, 7, 9**

- b** What is the difference between the differences in part a?

**2, 2, 2**

- 3.** In a pattern, the number of squares in each figure is the square of the figure number  $n$ . Which could be figures in the pattern? Select *all* that apply.



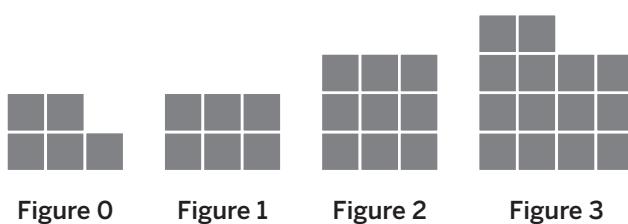
- 4.** Refer to the pattern of dots. If the pattern continues, how many dots will be in Figure 5?

**Figure 1    Figure 2    Figure 3****A. 17****B. 25****C. 26****D. 28**

5. Refer to the pattern of squares.

a. Complete the table.

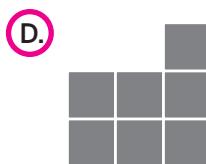
Figure	Number of squares
0	5
1	6
2	9
3	14



b. How many squares will there be in Figure 4?

**21 squares**

6. In a pattern, the number of squares in each figure equals the figure number  $n$  squared plus 3. Which could represent Figure 2?



7. Examine the pattern.

a. How many dots will there be in Figure 8 of the pattern?

**68 dots**

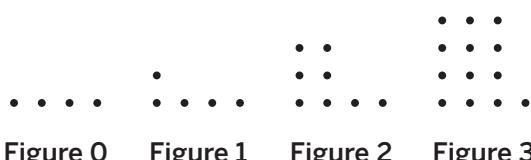


Figure 0    Figure 1    Figure 2    Figure 3

b. Does the pattern show a *linear*, *quadratic*, or *exponential* relationship between the figure number and the number of dots? Explain your thinking.

**Quadratic; Sample response: The number of dots can be determined by squaring the figure number and adding 4.**

c. How many dots will there be in Figure  $n$ ?

**$n^2 + 4$  (or equivalent) dots**

# Additional Practice | Answer Key

## Unit 7 | Lesson 2

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

7.02

1. Refer to the pattern of dots. By how many dots does the pattern grow in each successive figure?  
**4 dots**

Figure 0    Figure 1    Figure 2    Figure 3

2. The table shows the relationship between the figure number and number of dots in a pattern.

Figure number	1	2	3	4	5
Number of dots	1	4	9	16	25

a. What is the difference between the number of dots in each figure?  
**3, 5, 7, 9**

b. What is the difference between the differences in part a?  
**2, 2, 2**

3. In a pattern, the number of squares in each figure is the square of the figure number  $n$ . Which could be figures in the pattern? Select all that apply.

A.   D. 

B.   E. 

C.   F. 

4. Refer to the pattern of dots. If the pattern continues, how many dots will be in Figure 5?  
**17**

Figure 1    Figure 2    Figure 3

A. 17  
B. 25  
C. 26  
D. 28

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

5. Refer to the pattern of squares.

a. Complete the table.

Figure	Number of squares
0	5
1	6
2	9
3	14

Figure 0    Figure 1    Figure 2    Figure 3

b. How many squares will there be in Figure 4?  
**21 squares**

6. In a pattern, the number of squares in each figure equals the figure number  $n$  squared plus 3. Which could represent Figure 2?

A.       C. 

B.       D. 

7. Examine the pattern.

a. How many dots will there be in Figure 8 of the pattern?  
**68 dots**

b. Does the pattern show a linear, quadratic, or exponential relationship between the figure number and the number of dots? Explain your thinking.  
**Quadratic; Sample response: The number of dots can be determined by squaring the figure number and adding 4.**

c. How many dots will there be in Figure  $n$ ?  
 **$n^2 + 4$  (or equivalent) dots**

Figure 0    Figure 1    Figure 2    Figure 3

Unit 7 Lesson 2    184    Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.SSE.A.1
2	1	HSF.BF.A.1.A
3	2	HSA.SSE.A.1
4	2	HSF.BF.A.1.A
5	2	HSF.BF.A.1.A
6	2	HSF.BF.A.1.A
7	3	HSA.SSE.A.1, HSF.BF.A.1.A

### Notes:

**Additional Practice**

7.04

**Problems 1–3:** For each pair of symmetrical points on a parabola, determine the equation for the line of symmetry.

1.  $(0, 0)$  and  $(-12, 0)$

$x = \underline{\hspace{2cm}} -6 \underline{\hspace{2cm}}$

2.  $(5, 8)$  and  $(21, 8)$

$x = \underline{\hspace{2cm}} 13 \underline{\hspace{2cm}}$

3.  $(10, -3)$  and  $(-13, -3)$

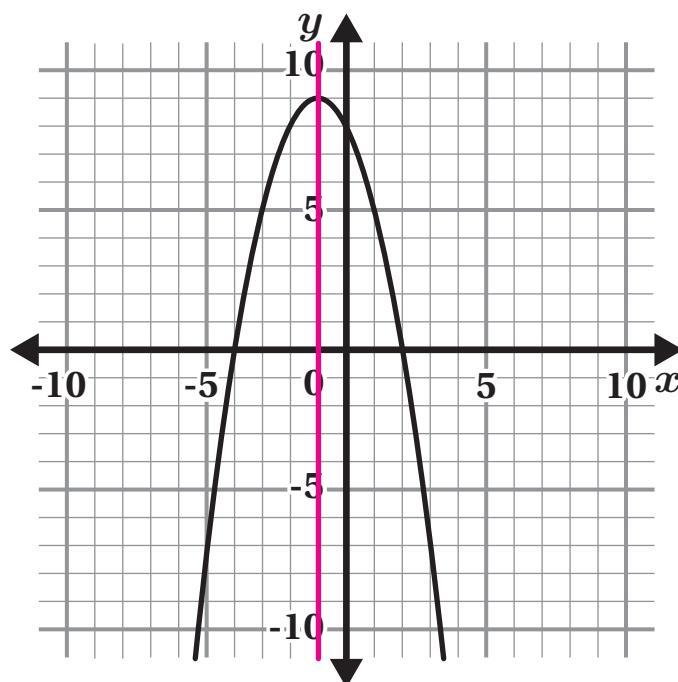
$x = \underline{\hspace{2cm}} -1.5 \underline{\hspace{2cm}}$

**Problems 4–5:** Here is a graph of a parabola.

4. Draw the *line of symmetry* where you think it is located on this parabola.

5. Write the equation for the line of symmetry.

$x = \underline{\hspace{2cm}} -1 \underline{\hspace{2cm}}$



**Problems 6–7:** Here is an incomplete table that could represent several types of functions.

**Answers vary.**

6. Select a function type and determine the number of tiles that would be in Figure 2. Circle one.

Linear

Quadratic

Exponential

Figure	Number of Tiles
1	1
2	6
3	11

7. Draw three figures to match the pattern in the table.

**Answers vary.**

**Problems 6–8:** Here are a few points that belong to a function  $f(x)$ .

8. Does  $f(x)$  represent a quadratic relationship?  
Circle your choice.

Yes

No

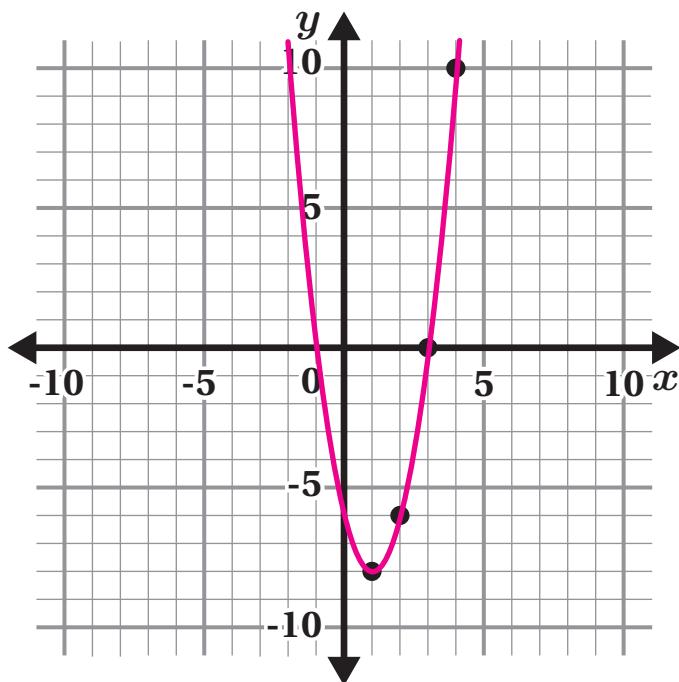
Not enough information

Explain your thinking.

**Explanations vary. The second difference of the pattern is growing at a constant rate of 4.**

9. Complete the table for  $f(x)$  and plot the new points on the graph, if possible.

$x$	$f(x)$
-1	0
0	-6
1	-8
2	-6
3	0
4	10
5	24
6	42
7	64



10. Write the equation for the line of symmetry.

$$x = \underline{\hspace{2cm}} \quad \text{1}$$

# Additional Practice | Answer Key

## Unit 7 | Lesson 4

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice 7.04

**Problems 1–3:** For each pair of symmetrical points on a parabola, determine the equation for the line of symmetry.

1. (0, 0) and (-12, 0)  $x = \underline{-6}$
2. (5, 8) and (21, 8)  $x = \underline{13}$
3. (10, -3) and (-13, -3)  $x = \underline{-1.5}$

**Problems 4–5:** Here is a graph of a parabola.

4. Draw the line of symmetry where you think it is located on this parabola.

5. Write the equation for the line of symmetry.  
 $x = \underline{-1}$

**Problems 6–7:** Here is an incomplete table that could represent several types of functions. Answers vary.

Figure	Number of Tiles
1	1
2	6
3	11

6. Select a function type and determine the number of tiles that would be in Figure 2. Circle one.

Linear       Quadratic       Exponential

7. Draw three figures to match the pattern in the table.

Answers vary.

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Problems 6–8:** Here are a few points that belong to a function  $f(x)$ .

8. Does  $f(x)$  represent a quadratic relationship? Circle your choice.

Yes       No      Not enough information

Explain your thinking.  
Explanations vary. The second difference of the pattern is growing at a constant rate of 4.

9. Complete the table for  $f(x)$  and plot the new points on the graph, if possible.

$x$	$f(x)$
-1	0
0	-6
1	-8
2	-6
3	0
4	10
5	24
6	42
7	64

10. Write the equation for the line of symmetry.  
 $x = \underline{1}$

Unit 7 Lesson 4      188      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSF.IF.B.4
2	1	HSF.IF.B.4
3	1	HSF.IF.B.4
4	1	HSN.Q.A.3, HSF.IF.B.4
5	1	HSF.IF.B.4
6	2	HSF.LE.A.1
7	2	HSF.LE.A.1
8	2	HSF.LE.A.1
9	1	HSN.Q.A.1
10	1	HSF.IF.B.4

Notes:

**Additional Practice****7.05**

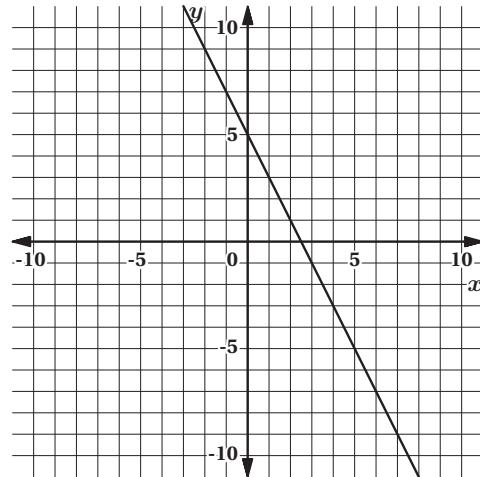
- 1.** The graph represents the equation  $y = -2x + 5$ .

- a** What is the  $y$ -intercept of the graph? How is it related to the equation?

**5; This is the value of  $y$  when  $x = 0$ .**

- b** What is the  $x$ -intercept of the graph? How is it related to the equation?

**2.5; This is the value of  $x$  when  $y = 0$ .**

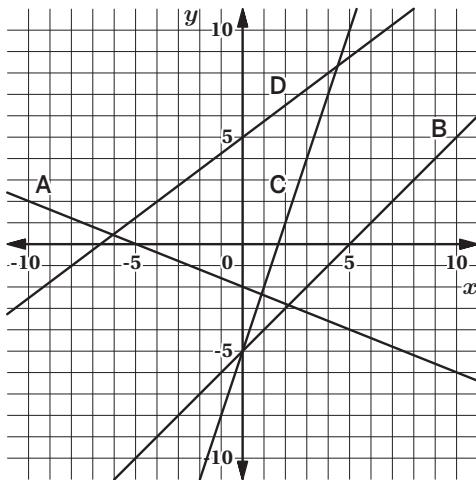


- 2.** Which of the following is true concerning the  $x$ -intercept of the linear equation  $y = 0.5x - 8$ ? Select all that apply.

- A. It is the value of  $y$  when  $x = 0$ .
- B. It is the value of  $x$  when  $y = 0$ .
- C. It is the point at which the graph of the equation crosses the  $x$ -axis.
- D. It is the point at which the graph of the equation crosses the  $y$ -axis.

- 3.** Which graph has a  $y$ -intercept of 5?

**Graph D**



4. In a game, Diego tosses a bean bag up in the air toward a board lying on the ground 30 ft away. Which of the following best describes the path of the bean bag when it is in the air?

- A. A straight line that goes up.
- B. A straight horizontal line.
- C.** A curved line that goes up and then down.
- D. A curved line that goes down and then up.

5. Shawn throws a ball up in the air. The graph shows the height of the ball, in feet, above the ground as a function of time, in seconds.

- a How high above the ground was the ball when Shawn threw it?

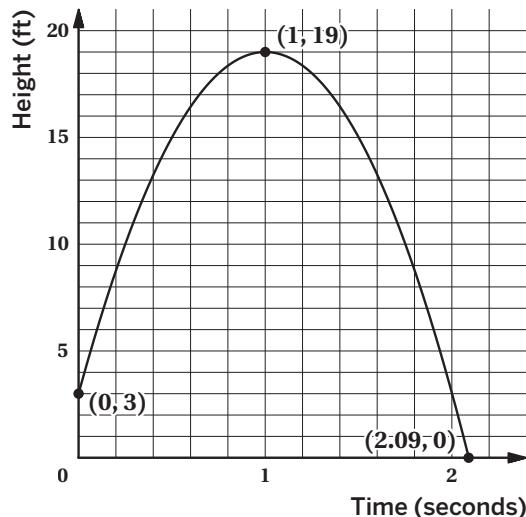
**3 ft**

- b When did the ball reach its maximum height? How high was it?

**1 second; 19 ft**

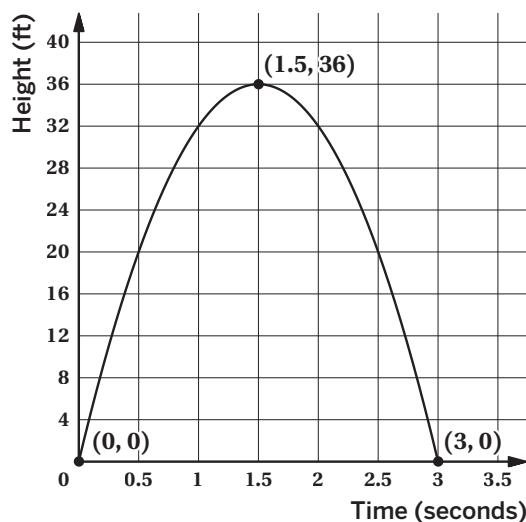
- c When did the ball hit the ground?

**2.09 seconds**



6. A disc is launched into the air. The graph shows the height of the disc, in feet, above the ground as a function of time, in seconds. Select *all* the true statements about the situation.

- A. The disc was launched from the ground.
- B. The disc was launched 4 ft from the ground.
- C. The maximum height of the disc was 36 ft.
- D. The disc was in the air for 3 seconds.
- E. The disc was in the air for 36 seconds.
- F. The disc reached its maximum height 1.5 seconds after it was launched.



# Additional Practice | Answer Key

## Unit 7 | Lesson 5

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

**7.05**

1. The graph represents the equation  $y = -2x + 5$ .

a. What is the  $y$ -intercept of the graph? How is it related to the equation?  
**5: This is the value of  $y$  when  $x = 0$ .**

b. What is the  $x$ -intercept of the graph? How is it related to the equation?  
**2.5: This is the value of  $x$  when  $y = 0$ .**

2. Which of the following is true concerning the  $x$ -intercept of the linear equation  $y = 0.5x - 8$ ? Select all that apply.

A. It is the value of  $y$  when  $x = 0$ .  
 B. It is the value of  $x$  when  $y = 0$ .  
 C. It is the point at which the graph of the equation crosses the  $x$ -axis.  
 D. It is the point at which the graph of the equation crosses the  $y$ -axis.

3. Which graph has a  $y$ -intercept of 5?

**Graph D**

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

4. In a game, Diego tosses a bean bag up in the air toward a board lying on the ground 30 ft away. Which of the following best describes the path of the bean bag when it is in the air?

A. A straight line that goes up.  
B. A straight horizontal line.  
 C. A curved line that goes up and then down.  
D. A curved line that goes down and then up.

5. Shawn throws a ball up in the air. The graph shows the height of the ball, in feet, above the ground as a function of time, in seconds.

a. How high above the ground was the ball when Shawn threw it?  
**3 ft**

b. When did the ball reach its maximum height? How high was it?  
**1 second; 19 ft**

c. When did the ball hit the ground?  
**2.09 seconds**

6. A disc is launched into the air. The graph shows the height of the disc, in feet, above the ground as a function of time, in seconds. Select all the true statements about the situation.

A. The disc was launched from the ground.  
 B. The disc was launched 4 ft from the ground.  
 C. The maximum height of the disc was 36 ft.  
 D. The disc was in the air for 3 seconds.  
 E. The disc was in the air for 36 seconds.  
 F. The disc reached its maximum height 1.5 seconds after it was launched.

Unit 7 Lesson 5      190      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.REI.D.10
2	1	HSA.REI.D.10
3	2	HSA.REI.D.10
4	2	HSF.IF.B.6
5	2	HSF.IF.B.6
6	2	HSF.IF.B.6

Notes:

**Additional Practice**

7.06

1. The key features of this parabola are labeled  $A, B, C$ , and  $D$ .

Match each key feature with a term from the word bank.

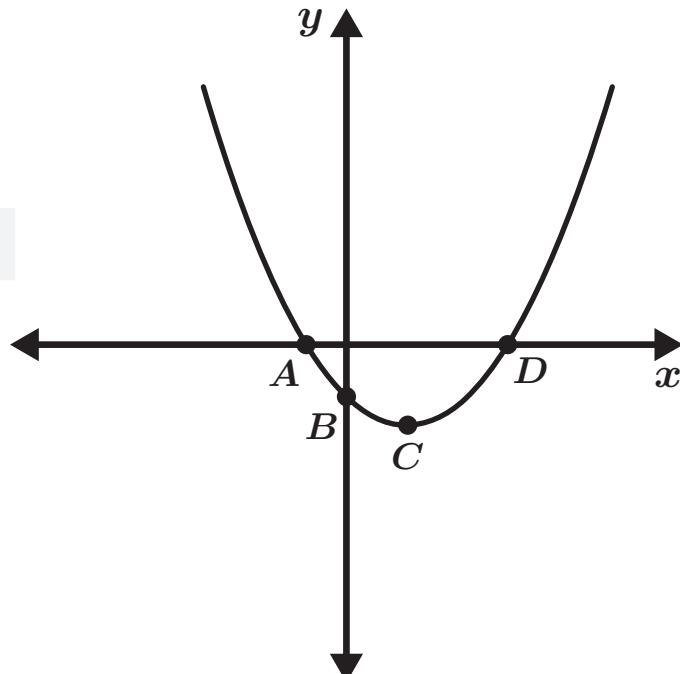
vertex       $x$ -intercept       $y$ -intercept

A.  $x$ -intercept

B.  $y$ -intercept

C. vertex

D.  $x$ -intercept



**Problems 2–4:** Use the graph to determine the coordinates of each key feature.

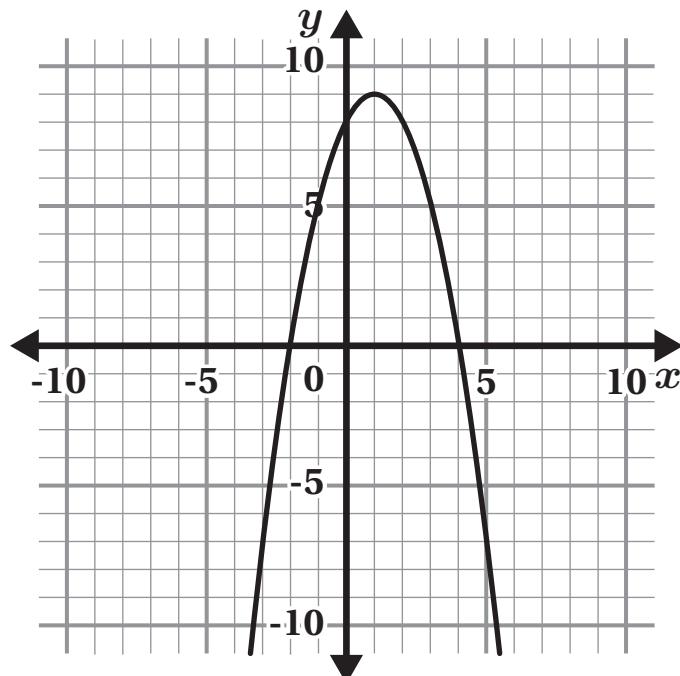
2. vertex: (1,9)

3.  $x$ -intercepts: (-2,0) and (4,0)

4.  $y$ -intercept: (0,8)

5. A parabola has a vertex at  $(-6,-2)$ . Give two possible coordinates for its  $x$ -intercepts.

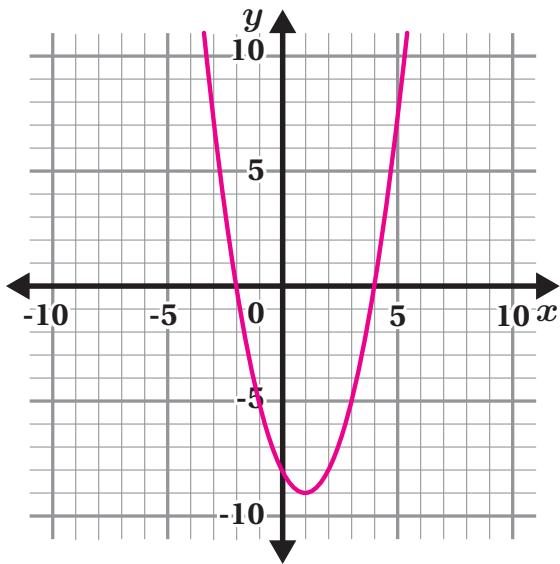
**Responses vary.** (-5,0) and (-7,0); (-4,0) and (-8,0)



**Problems 6–9:** Graph a parabola that fits each description.

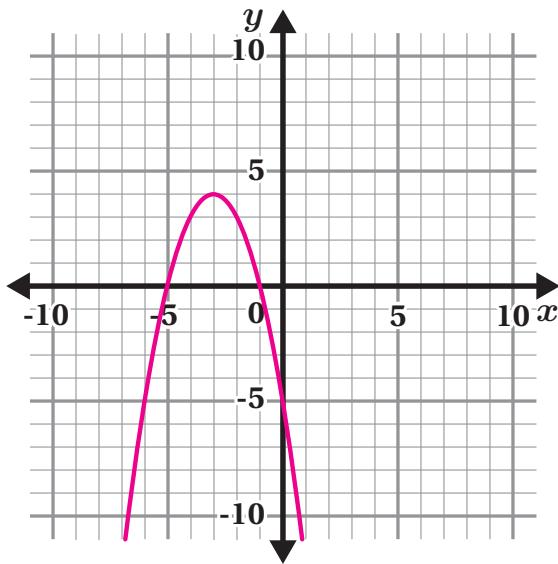
6. Concave up with a negative  $y$ -intercept

**Answers vary.**



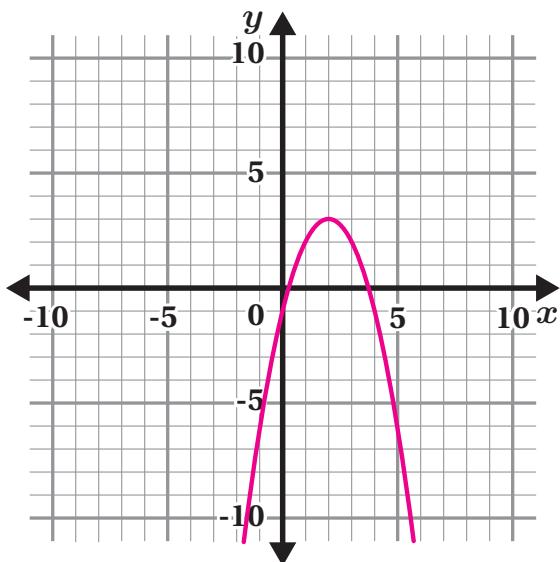
7. Concave down with a vertex at  $(-3, 4)$

**Answers vary.**



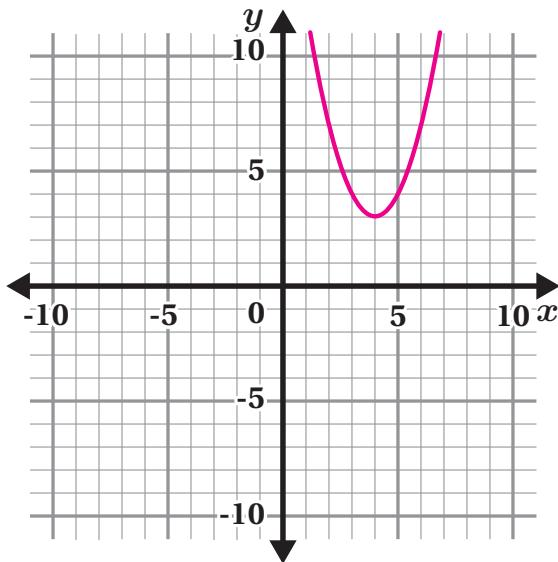
8. Concave down with line of symmetry of  $x = 2$

**Answers vary.**



9. Concave up with no  $x$ -intercepts

**Answers vary.**



# Additional Practice | Answer Key

## Unit 7 | Lesson 6

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

7.06

1. The key features of this parabola are labeled A,B,C, and D.

Match each key feature with a term from the word bank.

vertex	x-intercept	y-intercept
--------	-------------	-------------

A. x-intercept  
B. y-intercept  
C. vertex  
D. x-intercept

**Problems 2–4:** Use the graph to determine the coordinates of each key feature.

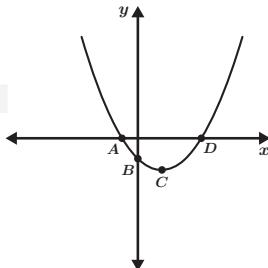
2. vertex: (1,9)

3. x-intercepts: (-2,0) and (4,0)

4. y-intercept: (0,8)

5. A parabola has a vertex at  $(-6,-2)$ . Give two possible coordinates for its x-intercepts.  
**Responses vary.**  $(-5,0)$  and  $(-7,0)$ ;  $(-4,0)$  and  $(-8,0)$

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Problems 6–9:** Graph a parabola that fits each description.

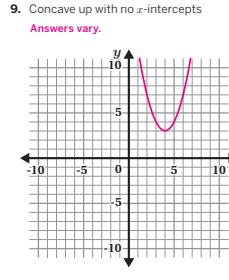
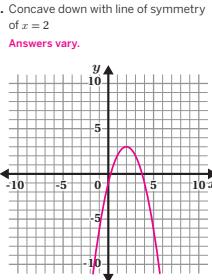
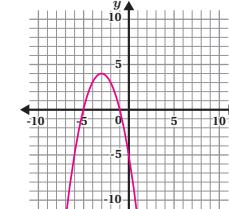
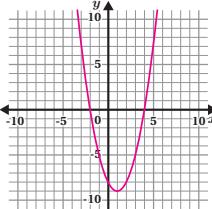
6. Concave up with a negative y-intercept  
**Answers vary.**

7. Concave down with a vertex at  $(-3,4)$   
**Answers vary.**

8. Concave down with line of symmetry of  $x=2$   
**Answers vary.**

9. Concave up with no x-intercepts  
**Answers vary.**

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### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSF.IF.B.4
2	1	HSF.IF.B.4
3	1	HSF.IF.B.4
4	1	HSF.IF.B.4
5	2	HSF.IF.B.4
6	2	HSF.IF.B.4
7	2	HSF.IF.B.4
8	2	HSF.IF.B.4
9	2	HSF.IF.B.4

Notes:

**Additional Practice**

7.10

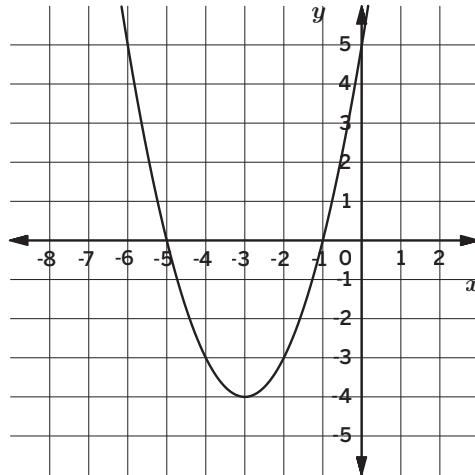
1. The graph of  $k(x) = (x + 1)(x + 5)$  is shown.

a. What are the  $x$ -intercepts?

( **$-5, 0$**  and  **$-1, 0$** )

b. What is the  $y$ -intercept?

( **$0, 5$** )



2. What is the  $y$ -intercept of the graph of the function  $j(x) = x^2 + 4$ ?

A.  $(0, -4)$

C.  $(0, 1)$

B.  $(0, 0)$

**D.**  $(0, 4)$

3. Where are the  $x$ -intercepts located on the graph of the function  $f(x) = (x + 3)(x - 1)$ ?

A.  $(3, 0)$  and  $(1, 0)$

C.  $(3, 0)$  and  $(-1, 0)$

**B.**  $(-3, 0)$  and  $(1, 0)$

D.  $(-3, 0)$  and  $(-1, 0)$

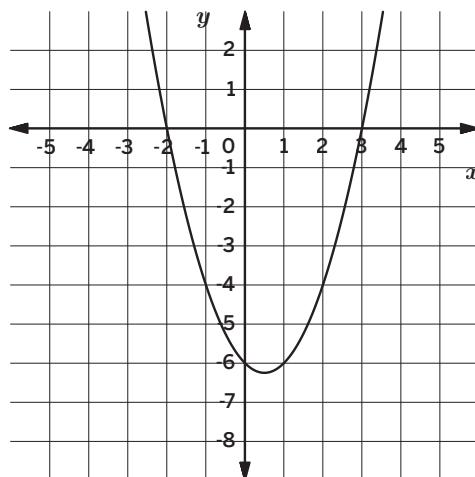
4. The graph of a quadratic function is shown. Which of the following could define this function?

A.  $g(x) = (x - 2)(x - 3)$

B.  $g(x) = (x - 2)(x + 3)$

**C.**  $g(x) = (x + 2)(x - 3)$

D.  $g(x) = (x + 2)(x + 3)$



- 5.** Which quadratic functions have a  $y$ -intercept located at  $(0, -9)$ ?  
Select all that apply.

- A.  $f(x) = x(x - 9)$        D.  $f(x) = (x - 3)(x + 3)$   
 B.  $f(x) = x^2 + 6x + 9$        E.  $f(x) = (x - 1)(x + 9)$   
 C.  $f(x) = x^2 - 5x - 9$

- 6.** Consider the function  $f(x) = x^2 - 2x - 24$ .

a What is the  $y$ -intercept of the graph of the function?

**(0, -24)**

b An equivalent way of writing this function is  $f(x) = (x - 6)(x + 4)$ .  
What are the  $x$ -intercepts of this function's graph?

**(6, 0) and (-4, 0)**

- 7.** Without graphing, determine the  $x$ - and  $y$ -intercepts of the graph of the quadratic function  $p(x) = (x - 5)(x + 5)$ . Explain your thinking.

**Sample response:** The  $x$ -intercepts are  $(5, 0)$  and  $(-5, 0)$ . The  $y$ -intercept is  $(0, -25)$ . The function is in factored form, which tells me the  $x$ -intercepts. When the function is written in standard form,  $f(x) = x^2 - 25$ , the constant term  $-25$  tells me the  $y$ -intercept of the graph.

- 8.** Consider the quadratic function  $r(x) = x(6 - x)$ . The table shows where Jada and Elena think the  $x$ - and  $y$ -intercepts of the graph of the function are located. Is either person correct? Explain your thinking.

	$x$ -intercepts	$y$ -intercept
Jada	$(-6, 0)$ and $(6, 0)$	$(0, 0)$
Elena	$(0, 0)$ and $(6, 0)$	$(0, -6)$

Neither person is completely correct. Jada is correct in that the  $y$ -intercept of the graph is located at  $(0, 0)$ . Elena is correct in that the  $x$ -intercepts are located at  $(0, 0)$  and  $(6, 0)$ .

# Additional Practice | Answer Key

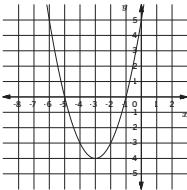
## Unit 7 | Lesson 10

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

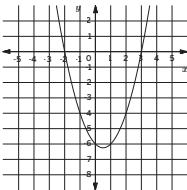
7.10

**1.** The graph of  $k(x) = (x + 1)(x + 5)$  is shown.  
 a. What are the  $x$ -intercepts?  
**(-5, 0) and (-1, 0)**  
 b. What is the  $y$ -intercept?  
**(0, 5)**



**2.** What is the  $y$ -intercept of the graph of the function  $j(x) = x^2 + 47$ ?  
 A.  $(0, -4)$       C.  $(0, 1)$   
 B.  $(0, 0)$       D.  $(0, 4)$

**3.** Where are the  $x$ -intercepts located on the graph of the function  $f(x) = (x + 3)(x - 1)$ ?  
 A.  $(3, 0)$  and  $(1, 0)$       C.  $(3, 0)$  and  $(-1, 0)$   
 B.  $(-3, 0)$  and  $(1, 0)$       D.  $(-3, 0)$  and  $(-1, 0)$



**4.** The graph of a quadratic function is shown. Which of the following could define this function?  
 A.  $g(x) = (x - 2)(x - 3)$   
 B.  $g(x) = (x - 2)(x + 3)$   
 C.  $g(x) = (x + 2)(x - 3)$   
 D.  $g(x) = (x + 2)(x + 3)$

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**5.** Which quadratic functions have a  $y$ -intercept located at  $(0, -9)$ ? Select all that apply.  
 A.  $f(x) = x(x - 9)$        D.  $f(x) = (x - 3)(x + 3)$   
 B.  $f(x) = x^2 + 6x + 9$        E.  $f(x) = (x - 1)(x + 9)$   
 C.  $f(x) = x^2 - 5x - 9$

**6.** Consider the function  $f(x) = x^2 - 2x - 24$ .  
 a. What is the  $y$ -intercept of the graph of the function?  
**(0, -24)**  
 b. An equivalent way of writing this function is  $f(x) = (x - 6)(x + 4)$ . What are the  $x$ -intercepts of this function's graph?  
**(6, 0) and (-4, 0)**

**7.** Without graphing, determine the  $x$ - and  $y$ -intercepts of the graph of the quadratic function  $p(x) = (x - 5)(x + 5)$ . Explain your thinking.  
**Sample response:** The  $x$ -intercepts are  $(5, 0)$  and  $(-5, 0)$ . The  $y$ -intercept is  $(0, -25)$ . The function is in factored form, which tells me the  $x$ -intercepts. When the function is written in standard form,  $f(x) = x^2 - 25$ , the constant term  $-25$  tells me the  $y$ -intercept of the graph.

**8.** Consider the quadratic function  $r(x) = x(6 - x)$ . The table shows where Jada and Elena think the  $x$ - and  $y$ -intercepts of the graph of the function are located. Is either person correct? Explain your thinking.

	$x$ -intercepts	$y$ -intercept
Jada	$(-6, 0)$ and $(6, 0)$	$(0, 0)$
Elena	$(0, 0)$ and $(6, 0)$	$(0, -6)$

Neither person is completely correct. Jada is correct in that the  $y$ -intercept of the graph is located at  $(0, 0)$ . Elena is correct in that the  $x$ -intercepts are located at  $(0, 0)$  and  $(6, 0)$ .

Unit 7 Lesson 10      200      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSF.IF.B.4
2	1	HSF.IF.B.4
3	2	HSF.IF.B.4
4	2	HSF.IF.B.4
5	2	HSF.IF.B.4
6	2	HSF.IF.B.4
7	3	HSA.SSE.B.3
8	3	HSA.SSE.B.3

### Notes:

**Additional Practice**

7.11

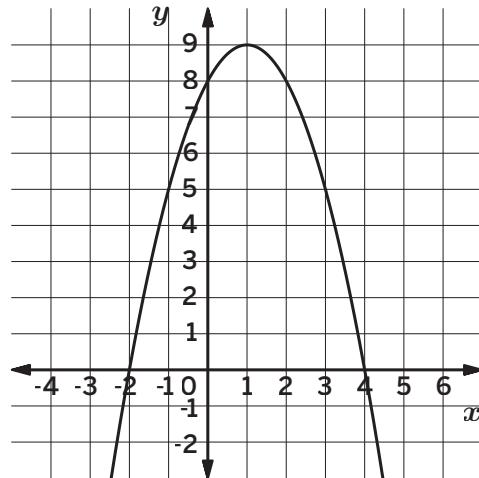
- 1.** Consider the function shown in the graph.

**a** What are the coordinates of the vertex?

(1, 9)

**b** What is the equation of the line of symmetry?

$x = 1$



- 2.** The graph of a quadratic function has its vertex at  $(-2, -8)$ .

What is the equation of the line of symmetry?

- A.  $x = -2$
- B.  $x = -8$
- C.  $x = 2$
- D.  $x = 8$

- 3.** Select *all* the true statements about the graph that represents the function  $f(x) = x(x + 10)$ .

- A. The  $x$ -coordinate of its vertex is  $-5$ .
- B. The  $x$ -coordinate of its vertex is  $5$ .
- C. The  $x$ -coordinate of its vertex is  $10$ .
- D. It has exactly two  $x$ -intercepts.
- E. The  $x$ -intercepts are located at  $(-1, 0)$  and  $(-10, 0)$ .
- F. The  $x$ -intercepts are located at  $(0, 0)$  and  $(-10, 0)$ .
- G. The  $x$ -intercept is located at  $(10, 0)$ .

- 4.** Select *all* the functions whose graphs have a vertex with an  $x$ -coordinate of  $-3$ .

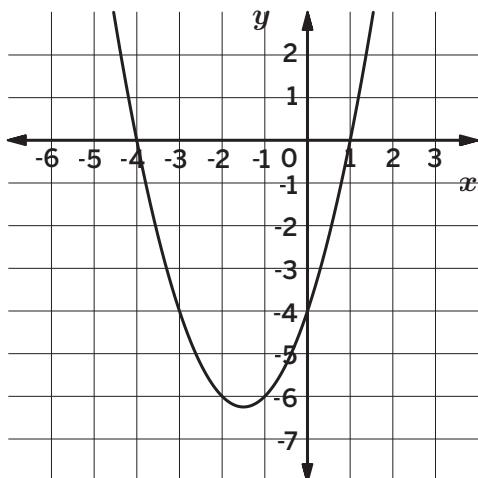
- |  |  |
|--|--|
| <input type="checkbox"/> A. $g(x) = (x - 3)(x + 3)$            | <input checked="" type="checkbox"/> D. $g(x) = x(x + 6)$ |
| <input checked="" type="checkbox"/> B. $g(x) = (x + 2)(x + 4)$ | <input type="checkbox"/> E. $g(x) = x(x - 6)$            |
| <input type="checkbox"/> C. $g(x) = (x - 1)(x - 5)$            |  |

5. The functions  $j(x)$ ,  $k(x)$ , and  $m(x)$  are defined in the following table. Without graphing, determine the  $x$ -intercepts, the  $x$ -coordinate of the vertex, and the equation of the axis of symmetry for each function.

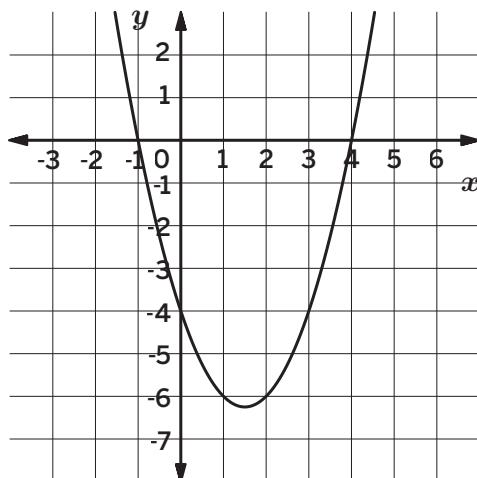
Function	$x$ -intercepts	$x$ -coordinate of the vertex	Line of symmetry
$j(x) = (x + 6)(x + 2)$	(-6, 0), (-2, 0)	-4	$x = -4$
$k(x) = 2x(x - 4)$	(0, 0), (4, 0)	2	$x = 2$
$m(x) = (x + 7)(x - 7)$	(-7, 0), (7, 0)	0	$x = 0$

6. Which is the graph of the quadratic function  $w(x) = (x + 4)(x - 1)$ ? Explain your thinking.

Graph A



Graph B



Graph A, because the  $x$ -intercepts are -4 and 1.

7. The quadratic function  $r(x)$  has  $x$ -intercepts at  $(-6, 0)$  and  $(1, 0)$ . What is the equation for the axis of symmetry? Explain your thinking.

$x = -2.5$ ; The graph is symmetric with respect to the axis of symmetry, so the axis of symmetry is halfway between the  $x$ -intercepts. The point  $(-2.5, 0)$  is the same distance from  $(-6, 0)$  as  $(1, 0)$ .

8. Consider the two quadratic functions:

$$f(x) = (x + 3)(x - 11) \quad g(x) = 2x(x - 8)$$

Kiran claims that the axis of symmetry for the graphs of both functions is  $x = 4$ . Do you agree with Kiran? Explain your thinking.

Yes; For  $f(x)$ ,  $x = -\frac{b}{2a} = -\frac{(-8)}{2(1)} = 4$ .

For  $g(x)$ ,  $x = -\frac{b}{2a} = -\frac{(-16)}{2(2)} = 4$ .

# Additional Practice | Answer Key

## Unit 7 | Lesson 11

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

7.11

1. Consider the function shown in the graph.

- What are the coordinates of the vertex?  
**(1, 9)**
- What is the equation of the line of symmetry?  
 **$x = 1$**

2. The graph of a quadratic function has its vertex at  $(-2, -8)$ . What is the equation of the line of symmetry?

A.  $x = -2$   
 B.  $x = -8$   
 C.  $x = 2$   
 D.  $x = 8$

3. Select all the true statements about the graph that represents the function  $f(x) = x(x + 10)$ .

A. The  $x$ -coordinate of its vertex is  $-5$ .  
 B. The  $x$ -coordinate of its vertex is  $5$ .  
 C. The  $x$ -coordinate of its vertex is  $10$ .  
 D. It has exactly two  $x$ -intercepts.  
 E. The  $x$ -intercepts are located at  $(-1, 0)$  and  $(-10, 0)$ .  
 F. The  $x$ -intercepts are located at  $(0, 0)$  and  $(-10, 0)$ .  
 G. The  $x$ -intercept is located at  $(10, 0)$ .

4. Select all the functions whose graphs have a vertex with an  $x$ -coordinate of  $-3$ .

A.  $g(x) = (x - 3)(x + 3)$   
 D.  $g(x) = x(x + 6)$   
 B.  $g(x) = (x + 2)(x + 4)$   
 E.  $g(x) = x(x - 6)$   
 C.  $g(x) = (x - 1)(x - 5)$

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

5. The functions  $j(x)$ ,  $k(x)$ , and  $m(x)$  are defined in the following table. Without graphing, determine the  $x$ -intercepts, the  $x$ -coordinate of the vertex, and the equation of the axis of symmetry for each function.

Function	$x$ -intercepts	$x$ -coordinate of the vertex	Line of symmetry
$j(x) = (x + 6)(x + 2)$	$(-6, 0), (-2, 0)$	$-4$	$x = -4$
$k(x) = 2x(x - 4)$	$(0, 0), (4, 0)$	$2$	$x = 2$
$m(x) = (x + 7)(x - 7)$	$(-7, 0), (7, 0)$	$0$	$x = 0$

6. Which is the graph of the quadratic function  $w(x) = (x + 4)(x - 1)$ ? Explain your thinking.

**Graph A**

**Graph B**

Graph A, because the  $x$ -intercepts are  $-4$  and  $1$ .

7. The quadratic function  $r(x)$  has  $x$ -intercepts at  $(-6, 0)$  and  $(1, 0)$ . What is the equation for the axis of symmetry? Explain your thinking.

$x = -2.5$ : The graph is symmetric with respect to the axis of symmetry, so the axis of symmetry is halfway between the  $x$ -intercepts. The point  $(-2.5, 0)$  is the same distance from  $(-6, 0)$  as  $(1, 0)$ .

8. Consider the two quadratic functions:

$f(x) = (x + 3)(x - 11)$        $g(x) = 2x(x - 8)$

Kiran claims that the axis of symmetry for the graphs of both functions is  $x = 4$ . Do you agree with Kiran? Explain your thinking.

Yes: For  $f(x)$ ,  $x = -\frac{b}{2a} = -\frac{(-8)}{2(1)} = 4$ .  
For  $g(x)$ ,  $x = -\frac{b}{2a} = -\frac{(-16)}{2(2)} = 4$ .

Unit 7 Lesson 11      202      Additional Practice

### Practice Problem Analysis

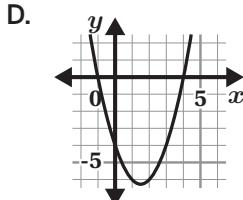
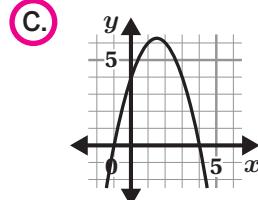
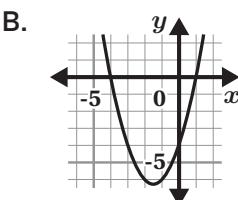
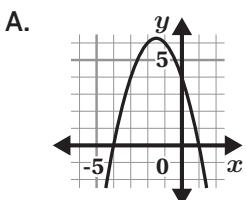
Problem	DOK	Standard(s)
1	1	HSF.IF.C.7.A
2	2	HSF.IF.C.7.A
3	2	HSF.IF.C.7.A
4	2	HSF.IF.C.7.A
5	2	HSF.IF.C.7.A
6	2	HSF.IF.C.7.A
7	3	HSF.IF.C.7.A
8	3	HSF.IF.C.7.A

### Notes:

**Additional Practice**

7.12

1. Which graph shows the function  $y = -(x - 4)(x + 1)$ ?



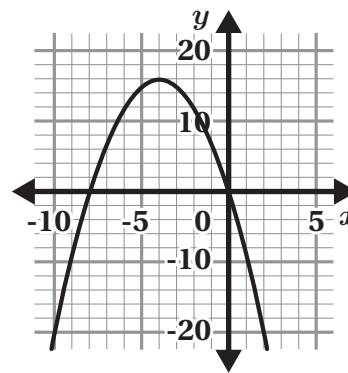
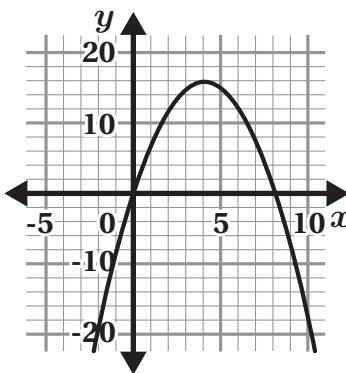
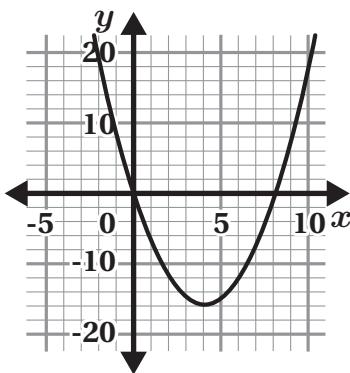
2. Match each equation to the graph it represents. One equation will have no match.

$$y = -x(x - 8)$$

$$y = x(x - 8)$$

$$y = x(x + 8)$$

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



$$y = x(x - 8)$$

$$y = -x(x - 8)$$

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

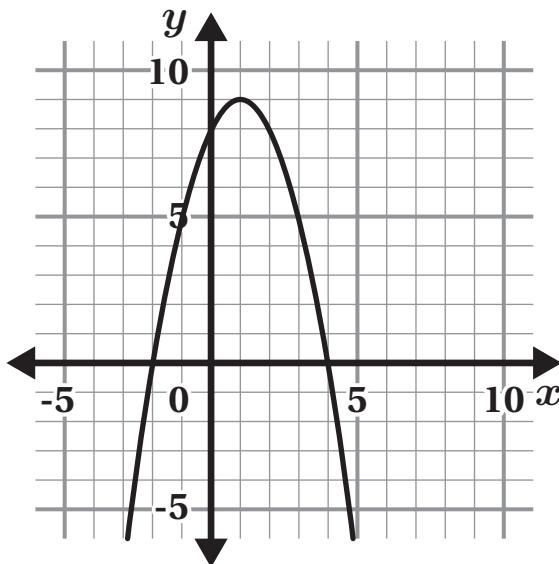
**Problems 3–4:** Here is a graph of  $y = -1(x + 2)(x - 4)$ . Change the equation so the vertex goes through:

3.  $(1, -9)$

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

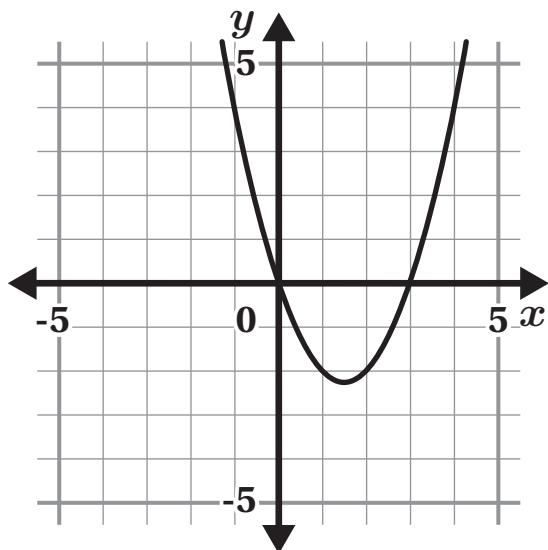
4.  $(1, 4)$

$$y = -\frac{1}{2}(x + 2)(x - 4)$$

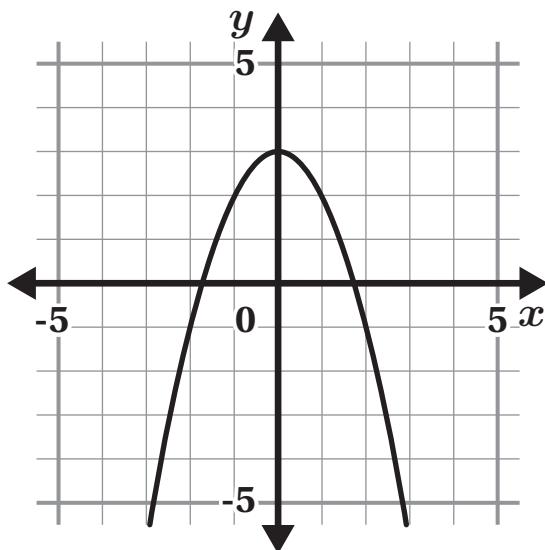


**Problems 5–6:** Write an equation to match each graph.

5. Equation:  $y = x(x - 3)$



6. Equation:  $y = -x^2 + 3$



7. Write the equations of three different quadratic functions that have the same  $x$ -intercepts but different  $y$ -intercepts.

Answers vary.

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

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

7.12

1. Which graph shows the function  $y = -(x - 4)(x + 1)$ ?

A. B. C. D.

2. Match each equation to the graph it represents. One equation will have no match.

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

Problems 3–4: Here is a graph of  $y = -1(x + 2)(x - 4)$ . Change the equation so the vertex goes through:

3.  $(1, -9)$   
 $y = (x + 2)(x - 4)$

4.  $(1, 4)$   
 $y = -\frac{1}{2}(x + 2)(x - 4)$

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Problems 5–6: Write an equation to match each graph.

5. Equation:  $y = x(x - 3)$

6. Equation:  $y = -x^2 + 3$

$y = x(x - 3)$

$y = -x^2 + 3$

7. Write the equations of three different quadratic functions that have the same  $x$ -intercepts but different  $y$ -intercepts.  
**Answers vary.**

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

Unit 7 Lesson 12      204      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSF.IF.C.7a, HSF.IF.B.4
2	1	HSF.IF.C.7a, HSF.IF.B.4
3	2	HSF.BF.A.1, HSF.IF.C.7a, HSF.IF.B.4
4	2	HSF.BF.A.1, HSF.IF.C.7a, HSF.IF.B.4
5	1	HSF.IF.C.7a, HSF.IF.B.4
6	1	HSF.IF.C.7a, HSF.IF.B.4
7	2	HSF.BF.A.1

Notes:

**Additional Practice**

7.14

- 1.** Select *all* the quadratic expressions written in vertex form.

- A.  $x(x - 2)$        D.  $(x + 6)(x - 6)$   
 B.  $(x + 3)^2 + 7$        E.  $(x - 4)^2$   
 C.  $(x - 1)^2 + 2$        F.  $x^2 + 5$

- 2.** For which function are the coordinates of the vertex  $(7, -3)$ ?

- A.  $f(x) = (x + 7)^2 - 3$   
B.  $f(x) = (x - 7)^2 + 3$   
C.  $f(x) = (x + 7)^2 + 3$   
D.  $f(x) = (x - 7)^2 - 3$

- 3.** Consider the function  $f(x) = (x - 2)^2 + 5$ .

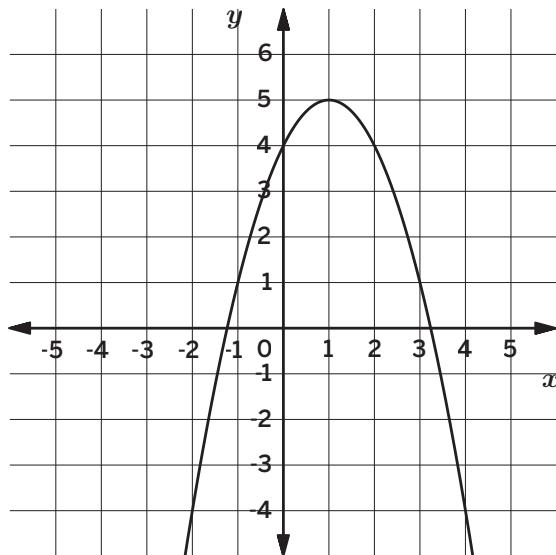
- a. What are the coordinates of the vertex of the graph of  $f(x)$ ?  
(2, 5)

- b. Is the graph concave up or concave down? Explain your thinking.

The graph opens upward because the squared variable term has a positive coefficient, 1.

- 4.** Which function is represented by the graph?

- A.  $f(x) = -(x + 1)^2 - 5$   
B.  $f(x) = -(x - 1)^2 + 5$   
C.  $f(x) = (x + 1)^2 - 5$   
D.  $f(x) = (x - 1)^2 + 5$

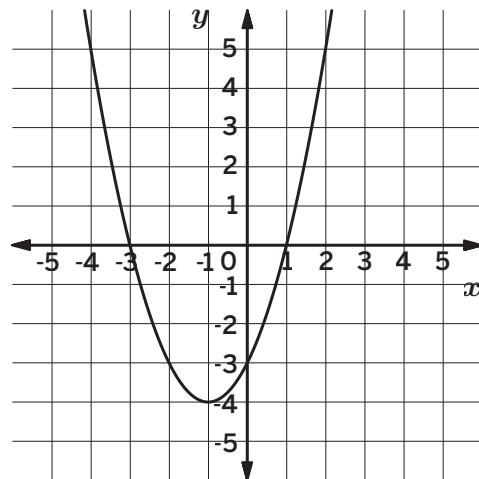


5. Which function has a graph that opens upward and has a vertex at  $(-9, -2)$ ?

- A.  $h(x) = (x + 9)^2 - 2$   
 B.  $h(x) = (x - 9)^2 + 2$   
 C.  $h(x) = (x - 9)^2 - 2$   
 D.  $h(x) = -(x + 9)^2 - 2$

6. The graph of function  $h(x)$  is shown. Which of the following functions have a graph with a higher vertex than the graph of  $h(x)$ ?

- A.  $m(x) = (x + 1)^2 - 4$   
 B.  $m(x) = (x + 2)^2 - 4$   
 C.  $m(x) = (x + 3)^2 - 2$   
 D.  $m(x) = (x + 4)^2 - 5$



7. Function  $p(x)$  opens upward and its vertex is located at  $(2, 8)$ . Write an equation that represents the function.

$$p(x) = (x - 2)^2 + 8 \text{ (or equivalent)}$$

8. Consider the two quadratic functions:

$$f(x) = (x + 6)(x + 4) \qquad g(x) = (x + 5)^2 - 1$$

- a Are the functions equivalent? Explain your thinking.

**Yes; The expressions in both functions are equivalent to  $x^2 + 10x + 24$ .**

- b What are the  $x$ -intercepts of the graph of  $g(x)$ ? Explain your thinking.

**$(-6, 0)$  and  $(-4, 0)$ ; The graphs are the same, so the zeros of  $f(x)$ , which are  $-6$  and  $-4$ , are the same as the  $x$ -intercepts of the graph of  $g(x)$ .**

- c What is the vertex of the graph of  $f(x)$ ? Explain your thinking.

**$(-5, -1)$ ; Because the functions are equivalent, the graphs are the same, so the vertex of  $g(x)$  is also the vertex of  $f(x)$ .**

# Additional Practice | Answer Key

## Unit 7 | Lesson 14

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

7.14

1. Select all the quadratic expressions written in vertex form.

A.  $x(x - 2)$        D.  $(x + 6)(x - 6)$   
 B.  $(x + 3)^2 + 7$        E.  $(x - 4)^2$   
 C.  $(x - 1)^2 + 2$        F.  $x^2 + 5$

2. For which function are the coordinates of the vertex  $(7, -3)$ ?

A.  $f(x) = (x + 7)^2 - 3$   
B.  $f(x) = (x - 7)^2 + 3$   
C.  $f(x) = (x + 7)^2 + 3$   
D.  $f(x) = (x - 7)^2 - 3$

3. Consider the function  $f(x) = (x - 2)^2 + 5$ .

a. What are the coordinates of the vertex of the graph of  $f(x)$ ?  
**(2, 5)**

b. Is the graph concave up or concave down? Explain your thinking.  
**The graph opens upward because the squared variable term has a positive coefficient.**

4. Which function is represented by the graph?

A.  $f(x) = -(x + 1)^2 - 5$   
 B.  $f(x) = -(x - 1)^2 + 5$   
C.  $f(x) = (x + 1)^2 - 5$   
D.  $f(x) = (x - 1)^2 + 5$

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

5. Which function has a graph that opens upward and has a vertex at  $(-9, -2)$ ?

A.  $h(x) = (x + 9)^2 - 2$       C.  $h(x) = (x - 9)^2 - 2$   
B.  $h(x) = (x - 9)^2 + 2$       D.  $h(x) = -(x + 9)^2 - 2$

6. The graph of function  $h(x)$  is shown. Which of the following functions have a graph with a higher vertex than the graph of  $h(x)$ ?

A.  $m(x) = (x + 1)^2 - 4$   
B.  $m(x) = (x + 2)^2 - 4$   
 C.  $m(x) = (x + 3)^2 - 2$   
D.  $m(x) = (x + 4)^2 - 5$

7. Function  $p(x)$  opens upward and its vertex is located at  $(2, 8)$ . Write an equation that represents the function.  
 **$p(x) = (x - 2)^2 + 8$  (or equivalent)**

8. Consider the two quadratic functions:  
 $f(x) = (x + 6)(x + 4)$        $g(x) = (x + 5)^2 - 1$

a. Are the functions equivalent? Explain your thinking.  
**Yes; The expressions in both functions are equivalent to  $x^2 + 10x + 24$ .**

b. What are the  $x$ -intercepts of the graph of  $g(x)$ ? Explain your thinking.  
 **$(-6, 0)$  and  $(-4, 0)$ ; The graphs are the same, so the zeros of  $f(x)$ , which are  $-6$  and  $-4$ , are the same as the  $x$ -intercepts of the graph of  $g(x)$ .**

c. What is the vertex of the graph of  $f(x)$ ? Explain your thinking.  
 **$(-5, -1)$ ; Because the functions are equivalent, the graphs are the same, so the vertex of  $g(x)$  is also the vertex of  $f(x)$ .**

Unit 7 Lesson 14      208      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSF.BF.B.3
2	2	HSF.BF.B.3
3	2	HSF.BF.B.3
4	2	HSF.BF.B.3
5	2	HSF.BF.B.3
6	2	HSF.BF.B.3
7	2	HSF.BF.B.3
8	3	HSF.BF.B.3

Notes:

**Additional Practice**

7.15

**Problems 1–3:** Here's the graph of  $y = -2x^2$ . Change one number to make the graph:

1. Wider:

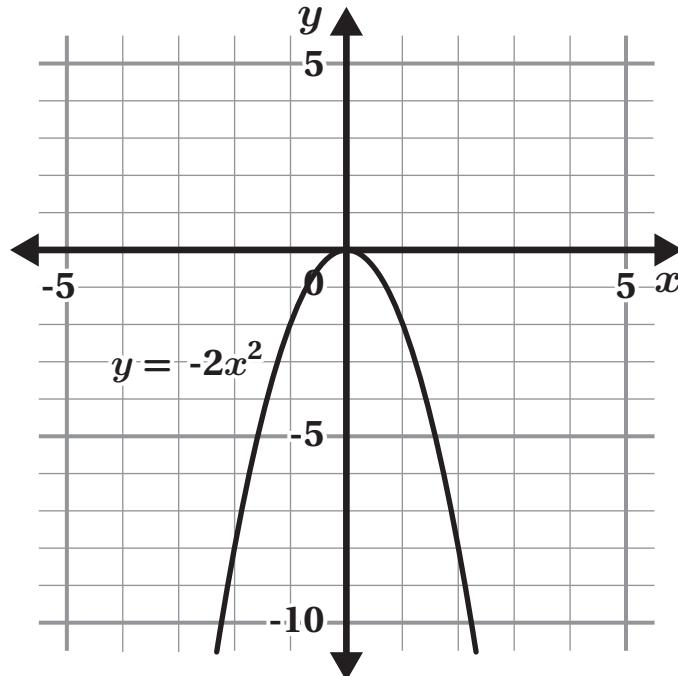
**Answers vary.**  $y = -x^2$

2. Narrower:

**Answers vary.**  $y = -4x^2$

3. Open up:

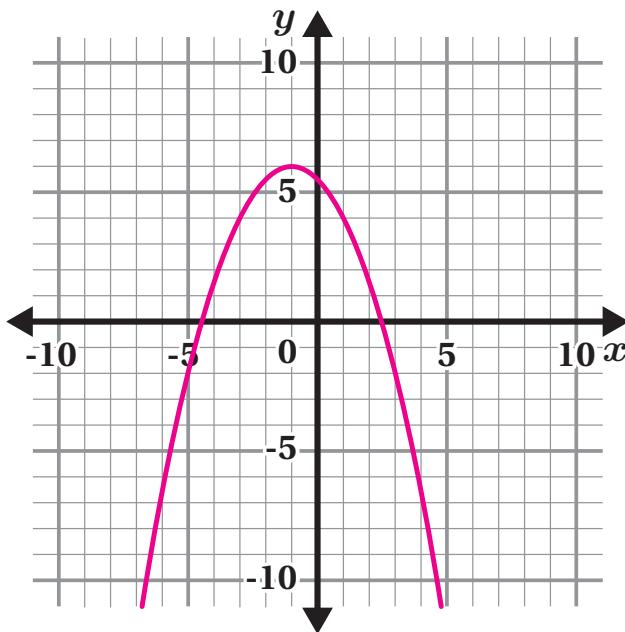
**Answers vary.**  $y = 2x^2$



4. Describe how the graph of  $f(x) = x^2$  compares to the graph of  $g(x) = 3(x + 1)^2 - 4$ .

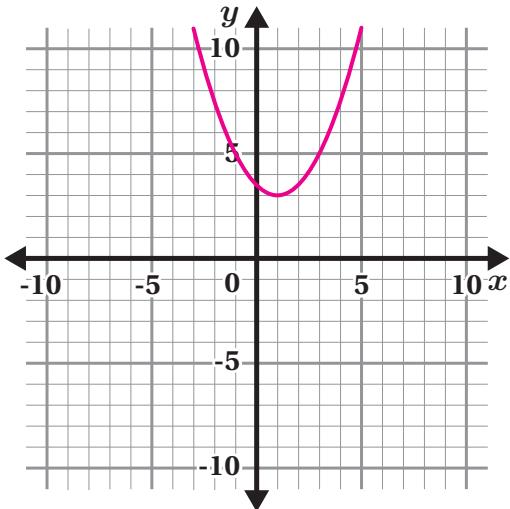
**The graph of  $f(x)$  was vertically stretched by a factor of 3. Then, it was translated left 1 unit and down 4 units to make  $g(x) = 3(x + 1)^2 - 4$ .**

5. Draw the graph of a parabola that has a vertex at  $(-1, 6)$  and is vertically stretched by a factor of  $-\frac{1}{2}$ .

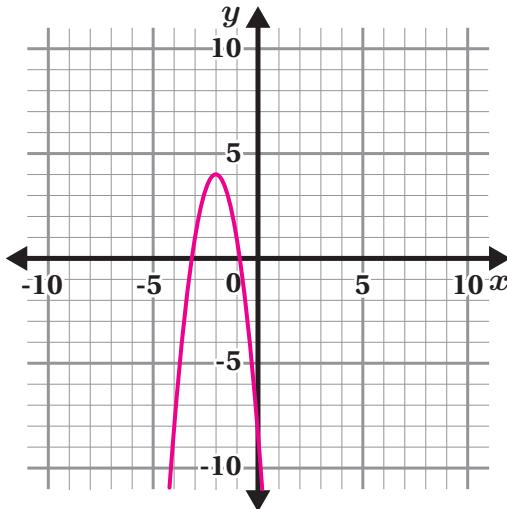


**Problems 6–7:** Draw a graph for each situation.

6.  $c(x) = 0.5(x - 1)^2 + 3$



7.  $d(x) = -3(x + 2)^2 + 4$



8. The graph of  $h(x) = x^2$  is modified so that its new equation is  $j(x) = -2(x - 9)^2 + 6$ . Select all of the following statements that are true.
- A. The graph of  $j(x)$  is concave up.
  - B. The graph of  $j(x)$  is concave down.
  - C. The graph of  $j(x)$  is narrower than  $h(x)$ .
  - D. The graph of  $j(x)$  is wider than  $h(x)$ .
  - E. The vertex of  $j(x)$  is translated 9 units to the right and 6 units down from the location of the vertex of  $h(x)$ .
  - F. The vertex of  $j(x)$  is translated 9 units to the left and 6 units down from the location of the vertex of  $h(x)$ .

# Additional Practice | Answer Key

## Unit 7 | Lesson 15

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Additional Practice** 7.15

**Problems 1–3:** Here's the graph of  $y = -2x^2$ . Change one number to make the graph:

1. Wider:  
Answers vary.  $y = -x^2$

2. Narrower:  
Answers vary.  $y = -4x^2$

3. Open up:  
Answers vary.  $y = 2x^2$

4. Describe how the graph of  $f(x) = x^2$  compares to the graph of  $g(x) = 3(x + 1)^2 - 4$ .  
The graph of  $f(x)$  was vertically stretched by a factor of 3. Then, it was translated left 1 unit and down 4 units to make  $g(x) = 3(x + 1)^2 - 4$ .

5. Draw the graph of a parabola that has a vertex at  $(-1, 6)$  and is vertically stretched by a factor of  $-\frac{1}{2}$ .

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Problems 6–7:** Draw a graph for each situation.

6.  $c(x) = 0.5(x - 1)^2 + 3$

7.  $d(x) = -3(x + 2)^2 + 4$

8. The graph of  $h(x) = x^2$  is modified so that its new equation is  $j(x) = -2(x - 9)^2 + 6$ . Select all of the following statements that are true.

A. The graph of  $j(x)$  is concave up.  
 B. The graph of  $j(x)$  is concave down.  
 C. The graph of  $j(x)$  is narrower than  $h(x)$ .  
 D. The graph of  $j(x)$  is wider than  $h(x)$ .  
 E. The vertex of  $j(x)$  is translated 9 units to the right and 6 units down from the location of the vertex of  $h(x)$ .  
 F. The vertex of  $j(x)$  is translated 9 units to the left and 6 units down from the location of the vertex of  $h(x)$ .

Unit 7 Lesson 15 210 Additional Practice

Practice Problem Analysis		
Problem	DOK	Standard(s)
1	1	HSF.BF.A.1, HSF.BF.B.3
2	1	HSF.BF.A.1, HSF.BF.B.3
3	1	HSF.BF.A.1, HSF.BF.B.3
4	2	HSF.BF.B.3
5	2	HSF.IF.C.7a, HSF.BF.B.3
6	1	HSF.IF.C.7a, HSF.BF.B.3
7	1	HSF.IF.C.7a, HSF.BF.B.3
8	1	HSF.BF.B.3

Notes:

**Additional Practice**

7.16

- 1.** Which equation can be represented by a graph with a vertex at  $(5, 8)$ ?

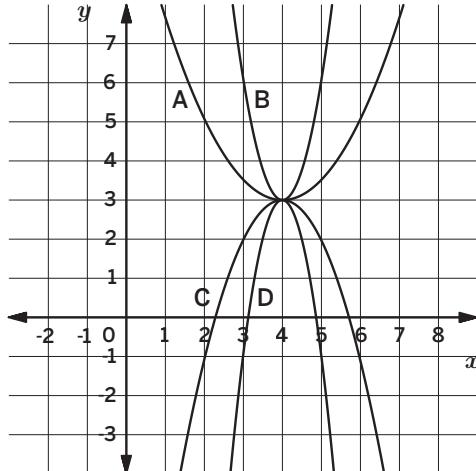
- A.  $y = (x + 5)^2 + 8$
- B.**  $y = (x - 5)^2 + 8$
- C.  $y = (x + 8)^2 + 5$
- D.  $y = (x - 8)^2 + 5$

- 2.** What is the value of each function at  $x = 0$ ?

- a**  $f(x) = (x + 3)^2$   
**9**
- b**  $h(x) = (x + 6)^2 - 1$   
**35**
- c**  $j(x) = (x - 2)^2 - 8$   
**-4**

- 3.** Match each graph with the equation that represents it.

- C** .....  $y = -(x - 4)^2 + 3$
- B** .....  $y = 3(x - 4)^2 + 3$
- A** .....  $y = \frac{1}{2}(x - 4)^2 + 3$
- D** .....  $y = -4(x - 4)^2 + 3$



- 4.** Select *all* the true statements about the function  $f(x) = -(x + 2)^2 - 9$ .

- A. The vertex of the graph is located at  $(2, -9)$ .
- B. The vertex of the graph is located at  $(-2, -9)$ .
- C. The  $y$ -intercept is located at  $(0, -13)$ .
- D. The  $y$ -intercept is located at  $(0, -9)$ .
- E. The graph opens downward.

5. Consider the function  $g(x) = (x + 3)^2 - 4$ .

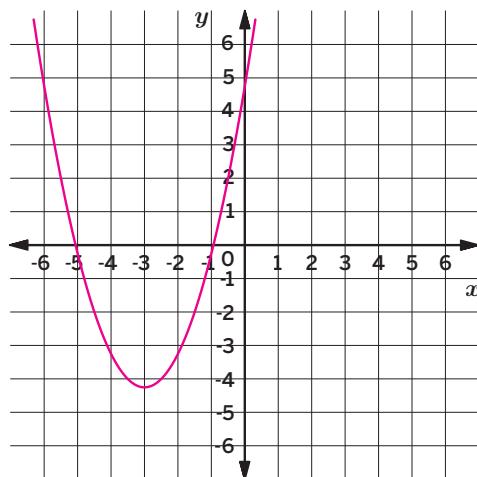
a What are the coordinates of the vertex of the graph of the function?

( $-3, -4$ )

b Is the vertex a maximum or a minimum? Explain your thinking.

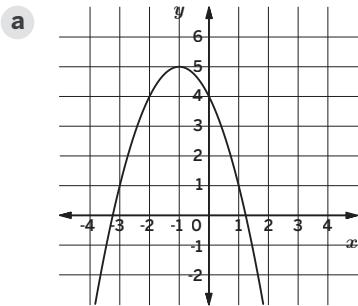
**Minimum; The value of  $a$  is positive, which means the parabola opens upward and the vertex is a minimum.**

c Sketch a graph of the function.

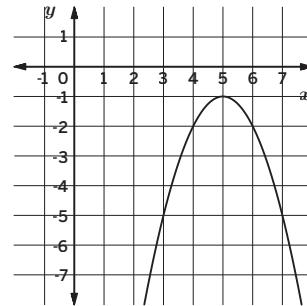


6. Match each graph with the equation that it represents.

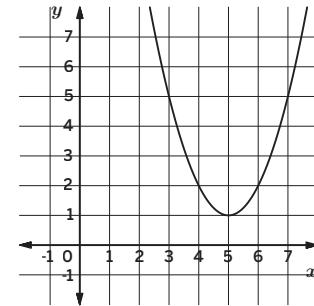
a  $y = -(x + 1)^2 + 5$



c  $y = (x - 5)^2 + 1$



b  $y = -(x - 5)^2 - 1$



7. Consider the quadratic function  $r(x) = (x + 2)^2 - 7$ .

a What are the coordinates of the vertex of the graph of the function?

( $-2, -7$ )

b What is the equation of the axis of symmetry?

$x = -2$

c The graph of  $r(x)$  passes through  $(0, -3)$ . What is the point on the graph that is on the other side of the axis of symmetry? Explain or show your thinking.

**( $-4, -3$ ); The point at  $(0, -3)$  is 2 units to the right and 4 units up from the vertex. Because the graph has an axis of symmetry that passes through the vertex, it also passes through a point that is 2 units to the left and 4 units up, which is  $(-4, -3)$ .**

# Additional Practice | Answer Key

## Unit 7 | Lesson 16

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

7.16

**1.** Which equation can be represented by a graph with a vertex at  $(5, 8)$ ?

- $y = (x + 5)^2 + 8$
- $\textcircled{B} \quad y = (x - 5)^2 + 8$
- $C \quad y = (x + 8)^2 + 5$
- $D \quad y = (x - 8)^2 + 5$

**2.** What is the value of each function at  $x = 0$ ?

- $f(x) = (x + 3)^2$   
9
- $\textcircled{b} \quad h(x) = (x + 6)^2 - 1$   
35
- $c \quad j(x) = (x - 2)^2 - 8$   
-4

**3.** Match each graph with the equation that represents it.

<input type="checkbox"/> C. $y = -(x - 4)^2 + 3$	
<input type="checkbox"/> B. $y = 3(x - 4)^2 + 3$	
<input type="checkbox"/> A. $y = \frac{1}{2}(x - 4)^2 + 3$	
<input type="checkbox"/> D. $y = -4(x - 4)^2 + 3$	

**4.** Select all the true statements about the function  $f(x) = -(x + 2)^2 - 9$ .

- A. The vertex of the graph is located at  $(2, -9)$ .
- B. The vertex of the graph is located at  $(-2, -9)$ .
- C. The  $y$ -intercept is located at  $(0, -13)$ .
- D. The  $y$ -intercept is located at  $(0, -9)$ .
- E. The graph opens downward.

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**5.** Consider the function  $g(x) = (x + 3)^2 - 4$ .

- What are the coordinates of the vertex of the graph?  $(-3, -4)$
- Is the vertex a maximum or a minimum? Explain your thinking.  
**Minimum:** The value of  $a$  is positive, which means the parabola opens upward and the vertex is a minimum.
- Sketch a graph of the function.

**6.** Match each graph with the equation that it represents.

<input type="checkbox"/> a. $y = -(x + 1)^2 + 5$	<input type="checkbox"/> c. $y = (x - 5)^2 + 1$	<input type="checkbox"/> b. $\textcircled{d}, y = -(x - 5)^2 - 1$

**7.** Consider the quadratic function  $r(x) = (x + 2)^2 - 7$ .

- What are the coordinates of the vertex of the graph of the function?  $(-2, -7)$
- What is the equation of the axis of symmetry?  $x = -2$
- The graph of  $r(x)$  passes through  $(0, -3)$ . What is the point on the graph that is on the other side of the axis of symmetry? Explain or show your thinking.  
**(-4, -3):** The point at  $(0, -3)$  is 2 units to the right and 4 units up from the vertex. Because the graph has an axis of symmetry that passes through the vertex, it also passes through a point that is 2 units to the left and 4 units up, which is  $(-4, -3)$ .

Unit 7 Lesson 16      212      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSF.IF.C.7.A
2	2	HSF.IF.C.7.A
3	2	HSF.IF.C.7.A
4	2	HSF.IF.C.7.A
5	2	HSF.IF.C.7.A
6	2	HSF.IF.C.7.A
7	3	HSF.IF.C.7.A

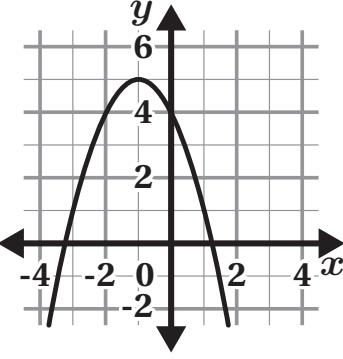
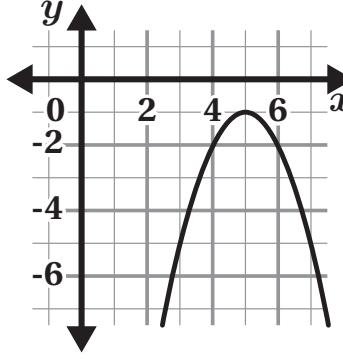
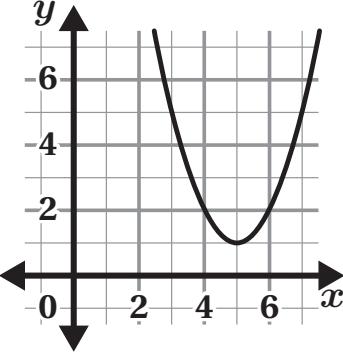
### Notes:

**Additional Practice**

7.17

- 1.** Which function has a vertex at  $(-3, 7)$ ?
- A.  $y = (x - 3)^2 + 7$   
 B.  $y = (x - 3)^2 - 7$   
**C.**  $y = (x + 3)^2 + 7$   
 D.  $y = (x + 3)^2 - 7$
- 2.** Select *all* the functions whose graphs have an  $x$ -intercept at  $(-2, 0)$ .
- A.  $a(x) = (x - 2)(x - 4)$   
 B.  $b(x) = (x + 2)(x + 4)$   
 C.  $c(x) = 2x(x + 6)$   
 D.  $d(x) = (2x + 4)(x + 3)$   
 E.  $e(x) = (3x - 6)(x + 5)$

- 3.** Match each equation to the graph it represents. One equation will have no match.

A. $y = -(x - 1)^2 + 5$	B. $y = -x^2 - 2x + 4$
C. $y = -(x - 5)^2 - 1$	D. $y = (x - 5)^2 + 1$
 $y = -x^2 - 2x + 4$	 $y = -(x - 5)^2 - 1$
 $y = (x - 5)^2 + 1$	

4. Write an equation of a parabola that opens downward and has  $x$ -intercepts at  $(-4, 0)$  and  $(6, 0)$ .

**Answers vary.**  $y = -(x + 4)(x - 6)$

**Problems 5–6:** Terrence and Raj write the equation to describe this graph. At least one equation is incorrect.

Terrence

$$y = (x + 2)^2 - 25$$

Raj

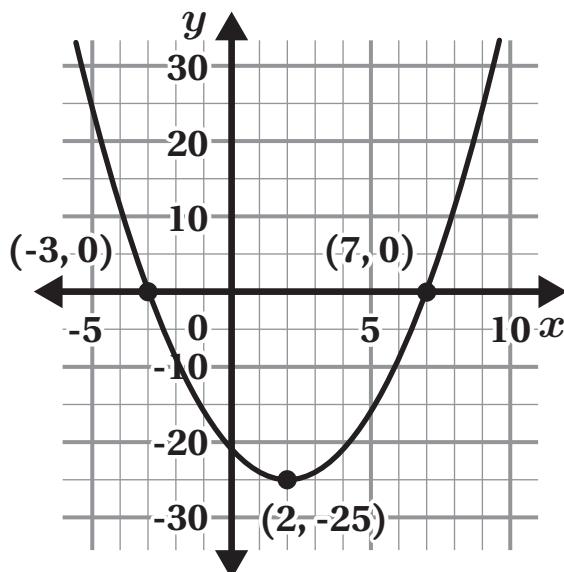
$$y = -(x + 3)(x - 7)$$

5. Whose equation is correct? Circle your choice.

Terrence

Raj

Neither



6. Explain what you would change about the incorrect equation(s) so that it creates this graph.

**Responses vary.** Terrence's equation is incorrect because the vertex is  $(2, -25)$ . Therefore, his equation should be  $y = (x - 2)^2 - 25$ . Raj's equation is incorrect because the graph is opening upward. So, his equation should be  $y = -(x + 3)(x - 7)$ .

**Problems 7–8:** Here is a function:  $r(x) = -x(x + 4)$ .

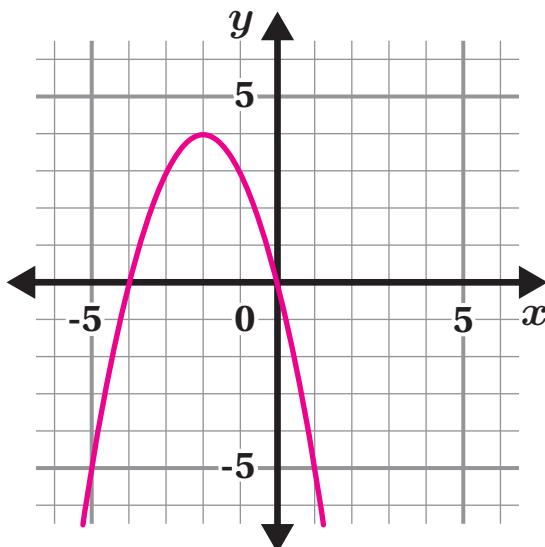
7. Determine the  $x$ -intercepts and vertex of  $r(x)$ .

$x$ -intercept: .....  **$(0, 0)$**

$x$ -intercept: .....  **$(-4, 0)$**

vertex: .....  **$(-2, 4)$**

8. Draw the graph of the function  $r(x)$ .



# Additional Practice | Answer Key

## Unit 7 | Lesson 17

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Additional Practice** 7.17

1. Which function has a vertex at  $(-3, 7)$ ?

- $y = (x - 3)^2 + 7$
- $y = (x - 3)^2 - 7$
- C.**  $y = (x + 3)^2 + 7$
- $y = (x + 3)^2 - 7$

2. Select all the functions whose graphs have an  $x$ -intercept at  $(-2, 0)$ .

- A.  $a(x) = (x + 2)(x - 4)$
- ✓ B.**  $b(x) = (x + 2)(x + 4)$
- C.  $c(x) = 2x(x + 6)$
- D.  $d(x) = (2x + 4)(x + 3)$
- E.  $e(x) = (3x - 6)(x + 5)$

3. Match each equation to the graph it represents. One equation will have no match.

A. $y = -(x - 1)^2 + 5$	B. $y = -x^2 - 2x + 4$
C. $y = -(x - 5)^2 - 1$	D. $y = (x - 5)^2 + 1$

$y = -(x - 1)^2 + 5$

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

$y = -(x - 5)^2 - 1$

$y = (x - 5)^2 + 1$

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

4. Write an equation of a parabola that opens downward and has  $x$ -intercepts at  $(-4, 0)$  and  $(6, 0)$ .  
**Answers vary.**  $y = -(x + 4)(x - 6)$

**Problems 5–6:** Terrence and Raj write the equation to describe this graph. At least one equation is incorrect.

Terrence	Raj
$y = (x + 2)^2 - 25$	$y = -(x + 3)(x - 7)$

5. Whose equation is correct? Circle your choice.

Terrence      Raj      **Neither**

6. Explain what you would change about the incorrect equation(s) so that it creates this graph.  
**Responses vary.** Terrence's equation is incorrect because the vertex is  $(2, -25)$ . Therefore, his equation should be  $y = (x - 2)^2 - 25$ . Raj's equation is incorrect because the graph is opening upward. So, his equation should be  $y = (x + 3)(x - 7)$ .

**Problems 7–8:** Here is a function:  $r(x) = -x(x + 4)$ .

7. Determine the  $x$ -intercepts and vertex of  $r(x)$ .

$x$ -intercept: **(0, 0)**  
 $x$ -intercept: **(-4, 0)**  
vertex: **(-2, 4)**

8. Draw the graph of the function  $r(x)$ .

Unit 7 Lesson 17 214 Additional Practice

## Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSF.BF.A.1, HSF.IF.B.4
2	1	HSF.BF.A.1, HSF.IF.B.4
3	1	HSF.IF.B.4, HSF.IF.C.7a
4	2	HSF.BF.A.1, HSF.IF.B.4
5	2	HSF.BF.A.1, HSF.IF.B.4, HSF.IF.C.7a
6	2	HSF.BF.A.1, HSF.IF.B.4, HSF.IF.C.7a
7	1	HSF.IF.B.4
8	1	HSF.IF.C.7a

Notes:

**Additional Practice****8.02**

- 1.** Match each expression to its equivalent expression in standard form.

a.  $(2x + 3)(x + 4)$  ..... c.  $x^2 + 10x + 16$

b.  $(x + 3)(x + 2)$  ..... a.  $2x^2 + 11x + 12$

c.  $(x + 8)(x + 2)$  ..... b.  $x^2 + 5x + 6$

d.  $(x + 3)(2x + 1)$  ..... d.  $2x^2 + 7x + 3$

- 2.** Complete the table by writing each expression in standard form.

Factored Form	Standard Form
$(x - 2)(x - 4)$	$x^2 - 6x + 8$
$(x + 5)(x + 2)$	$x^2 + 7x + 10$

- 3.** Chelsea wants to multiply  $(x + 1)(2x - 3)$  and rewrite it in standard form. What is the equivalent expression in standard form?

a.  $2x^2 - 2x - 6$

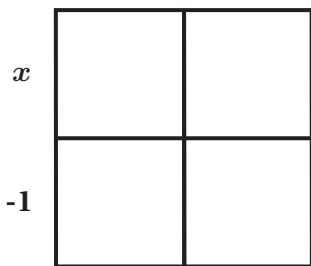
**b.**  $2x^2 - x - 3$

c.  $3x^2 - 2x - 6$

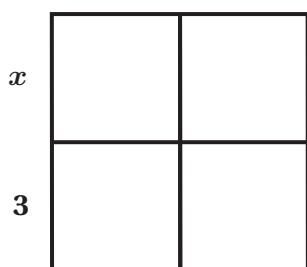
d.  $3x^2 - x - 3$

**Problems 4–6:** Write an expression in factored form and standard form that represents each area model.

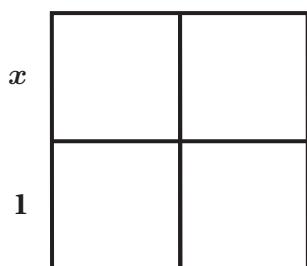
4.

 $x \quad 3$ Factored form: .....  $(x + 3)(x - 1)$ .....Standard form: .....  $x^2 + 2x - 3$ .....

5.

 $2x \quad 1$ Factored form: .....  $(2x + 1)(x + 3)$ .....Standard form: .....  $2x^2 + 7x + 3$ .....

6.

 $3x \quad -2$ Factored form: .....  $(3x - 2)(x + 1)$ .....Standard form: .....  $3x^2 + x - 2$ .....

# Additional Practice | Answer Key

## Unit 8 | Lesson 2

Name: ..... Date: ..... Period: .....

### Additional Practice

8.02

1. Match each expression to its equivalent expression in standard form.

- |                      |                      |
|----------------------|----------------------|
| a. $(2x + 3)(x + 4)$ | c. $x^2 + 10x + 16$  |
| b. $(x + 3)(x + 2)$  | a. $2x^2 + 11x + 12$ |
| c. $(x + 8)(x + 2)$  | b. $x^2 + 5x + 6$    |
| d. $(x + 3)(2x + 1)$ | d. $2x^2 + 7x + 3$   |

2. Complete the table by writing each expression in standard form.

Factored Form	Standard Form
$(x - 2)(x - 4)$	$x^2 - 6x + 8$
$(x + 5)(x + 2)$	$x^2 + 7x + 10$

3. Chelsea wants to multiply  $(x + 1)(2x - 3)$  and rewrite it in standard form. What is the equivalent expression in standard form?

- a.  $2x^2 - 2x - 6$
- b.**  $2x^2 - x - 3$
- c.  $3x^2 - 2x - 6$
- d.  $3x^2 - x - 3$

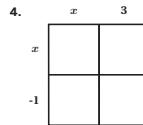
Unit 8 Lesson 2

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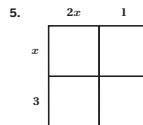
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Name: ..... Date: ..... Period: .....

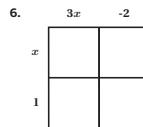
Problems 4–6: Write an expression in factored form and standard form that represents each area model.



Factored form: .....  $(x + 3)(x - 1)$   
Standard form: .....  $x^2 + 2x - 3$



Factored form: .....  $(2x + 1)(x + 3)$   
Standard form: .....  $2x^2 + 7x + 3$



Factored form: .....  $(3x - 2)(x + 1)$   
Standard form: .....  $3x^2 + x - 2$

Unit 8 Lesson 2

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Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.SSE.A.2
2	1	HSA.SSE.A.2
3	1	HSA.SSE.A.2
4	2	HSA.SSE.A.2
5	2	HSA.SSE.A.2
6	2	HSA.SSE.A.2

Notes:

**Additional Practice****8.03**

- 1.** Is the quadratic expression  $2x(x - 1)$  in standard form or in factored form?

**Factored form**

- 2.** Which quadratic expression is written in standard form?

- A.  $(x + 3)^2 - 2$       C.  $4x^2 + 7(x - 1)$   
 B.  $(x - 8)3x$       D.  $-2x^2 + 7x + 4$

- 3.** Consider the quadratic expression  $3x^2 - x$ .

- a** Is the expression in standard form? Explain your thinking.

**Yes; It is the sum of a squared variable term and a linear term.**

- b** Is the expression equivalent to  $x(3x - 1)$ ? Explain your thinking.

**Yes; Applying the Distributive Property gives  $3x^2 - x$ .**

- 4.** Which expression is equivalent to  $(4x - 2)(2x + 3)$ ?

- A.  $8x^2 - 4x + 6$       C.  $8x^2 + 8x - 6$   
 B.  $8x^2 + 12x + 6$       D.  $8x^2 + 10x - 6$

- 5.** Match each quadratic expression in factored form with an equivalent expanded expression in standard form.

**Factored form****Standard form**

- |                      |                                 |
|----------------------|---------------------------------|
| a. $(x + 3)(x + 8)$  | ..... d ..... $x^2 - 8x + 12$   |
| b. $(2x + 4)(x - 3)$ | ..... a ..... $x^2 + 11x + 24$  |
| c. $(2x + 6)(x + 4)$ | ..... b ..... $2x^2 - 2x - 12$  |
| d. $(x - 2)(x - 6)$  | ..... c ..... $2x^2 + 14x + 24$ |

6. Write each quadratic expression in standard form. Draw a diagram to explain your thinking.

a)  $(x - 2)(x + 7)$

$$x^2 + 5x - 14$$

$x$	$-2$
$x$	$x^2$
7	$-2x$
7	$7x$
	$-14$

b)  $(3x + 1)(x - 1)$

$$3x^2 - 2x - 1$$

$3x$	$1$
$x$	$3x^2$
-1	$x$
-1	$-3x$
	$-1$

c)  $(x - 6)^2$

$$x^2 - 12x + 36$$

$x$	$-6$
$x$	$x^2$
-6	$-6x$
-6	36

d)  $(2x + 4)(3x + 5)$

$$6x^2 + 22x + 20$$

$2x$	$4$
$3x$	$6x^2$
5	$12x$
5	$10x$
	20

7. Consider the two quadratic expressions:

$$(x + 3)^2 - 1$$

$$(x + 4)(x + 2)$$

Are the expressions equivalent? Explain your thinking.

**Yes; When in standard form, both expressions can be written as  $x^2 + 6x + 8$ .**

8. Consider the quadratic expression  $(2x - 6)(-x + 5)$ . Mai claims that when the expression is written in standard form, it has two negative terms. Han claims that when the expression is written in standard form, it has three negative terms. Who is correct? Explain or show your thinking.

**Mai is correct. Applying the Distributive Property gives the equivalent expression  $-2x^2 + 16x - 30$ , which can be written as  $-2x^2 + 16x + (-30)$ . Only the squared variable term and the constant term are negative.**

# Additional Practice | Answer Key

## Unit 8 | Lesson 3

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Additional Practice**
8.03

**1.** Is the quadratic expression  $2x(x - 1)$  in standard form or in factored form?  
**Factored form**

**2.** Which quadratic expression is written in standard form?  
A.  $(x + 3)^2 - 2$       C.  $4x^2 + 7(x - 1)$   
B.  $(x - 8)3x$       D.  $-2x^2 + 7x + 4$

**3.** Consider the quadratic expression  $3x^2 - x$ .  
**a** Is the expression in standard form? Explain your thinking.  
*Yes; It is the sum of a squared variable term and a linear term.*  
**b** Is the expression equivalent to  $x(3x - 1)$ ? Explain your thinking.  
*Yes; Applying the Distributive Property gives  $3x^2 - x$ .*

**4.** Which expression is equivalent to  $(4x - 2)(2x + 3)$ ?  
A.  $8x^2 - 4x + 6$       C.  $8x^2 + 8x - 6$   
B.  $8x^2 + 12x + 6$       D.  $8x^2 + 10x - 6$

**5.** Match each quadratic expression in factored form with an equivalent expanded expression in standard form.

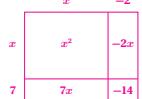
Factored form	Standard form
a. $(x + 3)(x + 8)$	.....d..... $x^2 - 8x + 12$
b. $(2x + 4)(x - 3)$	.....a..... $x^2 + 11x + 24$
c. $(2x + 6)(x + 4)$	.....b..... $2x^2 - 2x - 12$
d. $(x - 2)(x - 6)$	.....c..... $2x^2 + 14x + 24$

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**6.** Write each quadratic expression in standard form. Draw a diagram to explain your thinking.

<b>a</b> $(x - 2)(x + 7)$ $x^2 + 5x - 14$	<b>b</b> $(3x + 1)(x - 1)$ $3x^2 - 2x - 1$
--	---

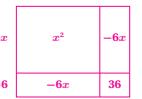


$x$        $x^2$        $-2x$   
7       $7x$        $-14$

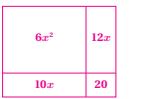


$3x$        $3x^2$        $x$   
-1       $-3x$       -1

<b>c</b> $(x - 6)^2$ $x^2 - 12x + 36$	<b>d</b> $(2x + 4)(3x + 5)$ $6x^2 + 22x + 20$
--	--



$x$        $x^2$        $-6x$   
-6       $-6x$       36



$2x$        $6x^2$        $12x$   
5       $10x$       20

**7.** Consider the two quadratic expressions:  
 $(x + 3)^2 - 1$        $(x + 4)(x + 2)$   
Are the expressions equivalent? Explain your thinking.  
*Yes; When in standard form, both expressions can be written as  $x^2 + 6x + 8$ .*

**8.** Consider the quadratic expression  $(2x - 6)(x + 5)$ . Mai claims that when the expression is written in standard form, it has two negative terms. Han claims that when the expression is written in standard form, it has three negative terms. Who is correct? Explain or show your thinking.  
*Mai is correct. Applying the Distributive Property gives the equivalent expression  $-2x^2 + 16x - 30$ , which can be written as  $-2x^2 + 16x + (-30)$ . Only the squared variable term and the constant term are negative.*

Unit 8 Lesson 3      222      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.SSE.B.3
2	2	HSA.SSE.B.3
3	2	HSA.SSE.B.3
4	2	HSA.SSE.B.3
5	2	HSA.SSE.B.3
6	2	HSA.SSE.B.3
7	3	HSA.SSE.B.3
8	3	HSA.SSE.B.3

**Notes:**

**Additional Practice****8.04**

- 1.** Determine values that make the equation true.

$$4x^2 + 4x - \underline{\quad 3 \quad} = (\underline{\quad 2 \quad}x - 1)(2x + \underline{\quad 3 \quad})$$

- 2.** Rewrite each expression in factored or standard form.

**Factored form**

$$(3x + 1)(3x - 1)$$

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

$$(2x + 3)(x - 6)$$

$$(x + 3)(x + 3)$$

**Standard form**

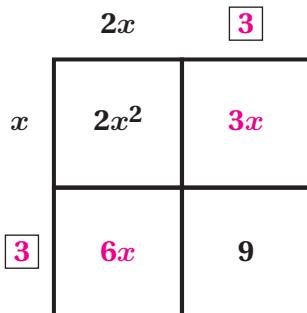
$$\mathbf{9x^2 - 1}$$

$$4x^2 - 7x - 2$$

$$\mathbf{2x^2 - 9x - 18}$$

$$x^2 + 6x + 9$$

- 3.** Write two possible constants that could complete the outside of the diagram.



**Problems 4–5:** Complete the diagram puzzles and expressions.

4.  $3x$       2

	$3x^2$	2x
x		
-4	-12x	-8

Factored form: .....  $(3x + 2)(x - 4)$  .....

Standard form: .....  $3x^2 - 10x - 8$  .....

5.  $4x$       -3

	$4x^2$	-3x
x		
2	8x	-6

Factored form: .....  $(4x - 3)(x + 2)$  .....

Standard form: .....  $4x^2 + 5x - 6$  .....

6. This quadratic expression in standard form has an unknown  $c$ -value. If we know the expression can be factored, fill in the  $c$ -value.

$$3x^2 - 7x - \underline{\hspace{2cm}} \textcolor{red}{6}$$

Name: ..... Date: ..... Period: .....

**Additional Practice**      **8.04**

**1.** Determine values that make the equation true.

$$4x^2 + 4x - \underline{\quad 3 \quad} = (\underline{\quad 2 \quad}x - 1)(2x + \underline{\quad 3 \quad})$$

**2.** Rewrite each expression in factored or standard form.

Factored form	Standard form
$(3x + 1)(3x - 1)$	$\underline{9x^2 - 1}$
$(4x + 1)(x - 2)$	$4x^2 - 7x - 2$
$(2x + 3)(x - 6)$	$\underline{2x^2 - 9x - 18}$
$(x + 3)(x + 3)$	$x^2 + 6x + 9$

**3.** Write two possible constants that could complete the outside of the diagram.

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Name: ..... Date: ..... Period: .....

**Problems 4–5:** Complete the diagram puzzles and expressions.

**4.**

	$3x$	$2$
$x$	$3x^2$	$2x$
-4	$\underline{-12x}$	-8

Factored form: .....  $\underline{(3x + 2)(x - 4)}$  .....  
 Standard form: .....  $\underline{3x^2 - 10x - 8}$  .....

**5.**

	$4x$	-3
$x$	$4x^2$	$-3x$
[?]	$8x$	-6

Factored form: .....  $\underline{(4x - 3)(x + 2)}$  .....  
 Standard form: .....  $\underline{4x^2 + 5x - 6}$  .....

**6.** This quadratic expression in standard form has an unknown  $c$ -value. If we know the expression can be factored, fill in the  $c$ -value.  
 $3x^2 - 7x - \underline{\quad 6 \quad}$

Unit 8 Lesson 4      **224**      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.SSE.A.2
2	1	HSA.SSE.A.2
3	2	HSA.SSE.A.2
4	1	HSA.SSE.A.2
5	1	HSA.SSE.A.2
6	2	HSA.SSE.A.2

Notes:

**Additional Practice****8.05**

- 1.** Select all expressions that are equivalent to the expression  $x + (-7)$ .

A.  $7 + x$

E.  $7 + (-x)$

B.  $x - 7$

F.  $-7 - (-x)$

C.  $7 - x$

G.  $-x - (-7)$

D.  $-7 + x$

- 2.** Determine the missing values for each pair of equivalent expressions.

a  $x^2 \dots + 9 \dots x \dots + 8 \dots$  and  $(x + 8)(x + 1)$

b  $x^2 + 5x + 6$  and  $(x + 2)(x \dots + 3 \dots)$

c  $x^2 - 16x + 63$  and  $(x \dots - 9 \dots)(x - 7)$

d  $x^2 - 9x + 20$  and  $(x - 5)(x \dots - 4 \dots)$

- 3.** Complete the diagrams to show that each pair of expressions are equivalent.

a  $(x - 2)(x - 5)$  and  $x^2 - 7x + 10$

b  $(x + 9)(x + 4)$  and  $x^2 + 13x + 36$

$x$	$-2$
$x$	$x^2$
$-5$	$-5x$
	10

$x$	$9$
$x$	$x^2$
4	$4x$
	36

- 4.** Rewrite each quadratic expression in standard form.

a  $(x + 6)(x + 8)$

$x^2 + 14x + 48$  (or equivalent)

b  $(x - 1)(x - 3)$

$x^2 - 4x + 3$  (or equivalent)

- 5.** Rewrite each quadratic expression in factored form. Use a diagram, if helpful.

a  $x^2 - 12x + 20$

$(x - 2)(x - 10)$  (or equivalent)

b  $x^2 + 14x + 49$

$(x + 7)(x + 7)$  (or equivalent)

c  $x^2 - 17x + 72$

$(x - 8)(x - 9)$  (or equivalent)

d  $x^2 + 9x + 20$

$(x + 4)(x + 5)$  (or equivalent)

- 6.** Each row in the table contains a pair of equivalent expressions. Complete the table by writing the missing equivalent expression. Consider drawing a diagram, if helpful.

Factored form	Standard form
$x(x + 4)$	$x^2 + 4x$ (or equivalent)
$x(x - 7)$ (or equivalent)	$x^2 - 7x$
$(x + 11)(x + 2)$ (or equivalent)	$x^2 + 13x + 22$
$(x - 5)(x - 5)$	$x^2 - 10x + 25$ (or equivalent)
$(x - 9)(x - 3)$ (or equivalent)	$x^2 - 12x + 27$

- 7.** Consider the expressions  $(x + c)(x + c)$  and  $x^2 + cx + c^2$ . Tyler claims the expressions are equivalent. Shawn claims the expressions are not equivalent. Who is correct? Explain your thinking.

Shawn; Using the Distributive Property, the expression  $(x + c)(x + c)$  is equivalent to  $x^2 + cx + cx + c^2$  or  $x^2 + 2cx + c^2$ .

# Additional Practice | Answer Key

## Unit 8 | Lesson 5

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Additional Practice** **8.05**

1. Select all expressions that are equivalent to the expression  $x + (-7)$ .

A.  $7 + x$   
 B.  $x - 7$   
 C.  $7 - x$   
 D.  $-7 + x$   
 E.  $7 + (-x)$   
 F.  $-7 - (-x)$   
 G.  $-x - (-7)$

2. Determine the missing values for each pair of equivalent expressions.

a)  $x^2 + \underline{\text{9}}_x + \underline{\text{8}}_x$  and  $(x + 8)(x + 1)$   
b)  $x^2 + 5x + 6$  and  $(x + 2)(x + \underline{\text{3}})$   
c)  $x^2 - 16x + 63$  and  $(x - \underline{\text{9}})(x - 7)$   
d)  $x^2 - 9x + 20$  and  $(x - 5)(x - \underline{\text{4}})$

3. Complete the diagrams to show that each pair of expressions are equivalent.

a)  $(x - 2)(x - 5)$  and  $x^2 - 7x + 10$   
  
b)  $(x + 9)(x + 4)$  and  $x^2 + 13x + 36$   
  

4. Rewrite each quadratic expression in standard form.

a)  $(x + 6)(x + 8)$   
 $x^2 + 14x + 48$  (or equivalent)  
b)  $(x - 1)(x - 3)$   
 $x^2 - 4x + 3$  (or equivalent)

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

5. Rewrite each quadratic expression in factored form. Use a diagram, if helpful.

a)  $x^2 - 12x + 20$   
 $(x - 2)(x - 10)$  (or equivalent)

b)  $x^2 + 14x + 49$   
 $(x + 7)(x + 7)$  (or equivalent)

c)  $x^2 - 17x + 72$   
 $(x - 8)(x - 9)$  (or equivalent)

d)  $x^2 + 9x + 20$   
 $(x + 4)(x + 5)$  (or equivalent)

6. Each row in the table contains a pair of equivalent expressions. Complete the table by writing the missing equivalent expression. Consider drawing a diagram, if helpful.

Factored form	Standard form
$x(x + 4)$	$x^2 + 4x$ (or equivalent)
$x(x - 7)$ (or equivalent)	$x^2 - 7x$
$(x + 11)(x + 2)$ (or equivalent)	$x^2 + 13x + 22$
$(x - 5)(x - 5)$	$x^2 - 10x + 25$ (or equivalent)
$(x - 9)(x - 3)$ (or equivalent)	$x^2 - 12x + 27$

7. Consider the expressions  $(x + c)(x + c)$  and  $x^2 + cx + c^2$ . Tyler claims the expressions are equivalent. Shawn claims the expressions are not equivalent. Who is correct? Explain your thinking.  
Shawn: Using the Distributive Property, the expression  $(x + c)(x + c)$  is equivalent to  $x^2 + cx + cx + c^2$  or  $x^2 + 2cx + c^2$ .

Unit 8 Lesson 5 **226** Additional Practice

**Practice Problem Analysis**

Problem	DOK	Standard(s)
1	1	HSA.SSE.A.2
2	1	HSA.SSE.A.2
3	2	HSA.SSE.A.2
4	2	HSA.SSE.A.2
5	2	HSA.SSE.A.2
6	2	HSA.SSE.A.2
7	3	HSA.SSE.A.2

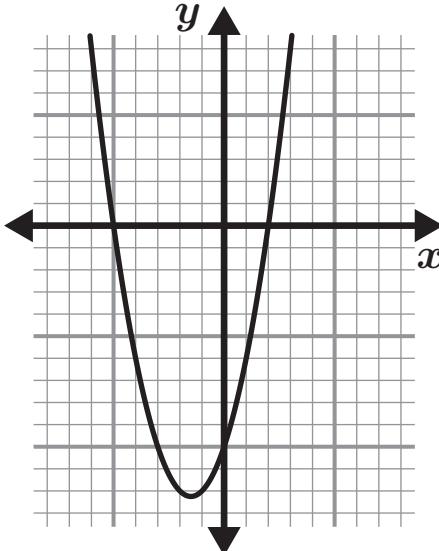
**Notes:**

**Additional Practice****8.06**

- 1.** Select all the functions that have 3 and  $-2$  as their  $x$ -intercepts.

- A.  $f(x) = (x + 3)(x - 2)$
- B.  $g(x) = (x - 3)(x + 2)$
- C.  $h(x) = x^2 - x - 6$
- D.  $j(x) = 2x^2 - x - 6$
- E.  $k(x) = (2x + 3)(2x - 2)$

- 2.** What are the  $x$ -intercepts of the function  $f(x) = (x + 5)(x - 2)$ ?



- A.  $(-5, 0)$  and  $(2, 0)$

- B.  $(5, 0)$  and  $(-2, 0)$

- C.  $(0, 5)$  and  $(0, 2)$

- D.  $(2, 5)$  and  $(0, 0)$

- 3.** How many zeros does the function  $g(x) = x^2 + 6x + 9$  have?

- A. 0

- B. 1

- C. 2

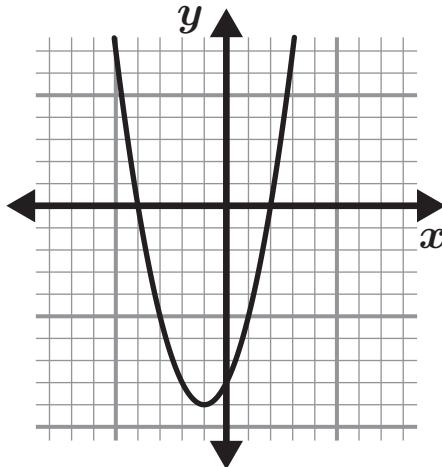
- D. More information is needed.

Explain your thinking.

The factored form of  $g(x) = x^2 + 6x + 9$  is  $g(x) = (x + 3)(x + 3)$ . When  $x = -3$ , the factor  $x + 3 = 0$ , so  $f(-3) = 0$ . So, there is one zero at  $x = -3$ .

**Problems 4–5:** What are the  $x$ -intercepts of the function?

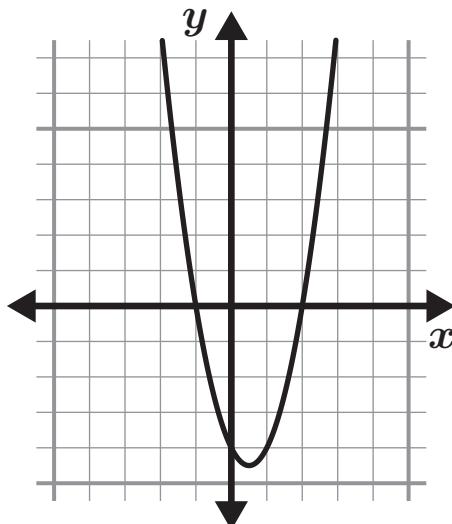
4.  $f(x) = x^2 + 2x - 8$



$x$ -intercept 1: ..... (**(-4, 0)**)

$x$ -intercept 2: ..... (**(2, 0)**)

5.  $g(x) = 2x^2 - 2x - 4$



$x$ -intercept 1: ..... (**(-1, 0)**)

$x$ -intercept 2: ..... (**(2, 0)**)

Name: ..... Date: ..... Period: .....

### Additional Practice

8.06

**1.** Select all the functions that have 3 and -2 as their  $x$ -intercepts.

A.  $f(x) = (x + 3)(x - 2)$   
 B.  $g(x) = (x - 3)(x + 2)$   
 C.  $h(x) = x^2 - x - 6$   
 D.  $j(x) = 2x^2 - x - 6$   
 E.  $k(x) = (2x + 3)(2x - 2)$

**2.** What are the  $x$ -intercepts of the function  $f(x) = (x + 5)(x - 2)$ ?

(A)  $(-5, 0)$  and  $(2, 0)$   
(B)  $(5, 0)$  and  $(-2, 0)$   
(C)  $(0, 5)$  and  $(0, 2)$   
(D)  $(2, 5)$  and  $(0, 0)$

**3.** How many zeros does the function  $g(x) = x^2 + 6x + 9$  have?

A. 0  
 B. 1  
C. 2  
D. More information is needed.

Explain your thinking.  
The factored form of  $g(x) = x^2 + 6x + 9$  is  $g(x) = (x + 3)(x + 3)$ . When  $x = -3$ , the factor  $x + 3 = 0$ , so  $f(-3) = 0$ . So, there is one zero at  $x = -3$ .

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Name: ..... Date: ..... Period: .....

**Problems 4–5:** What are the  $x$ -intercepts of the function?

**4.**  $f(x) = x^2 + 2x - 8$

$x$ -intercept 1: (-4, 0)  
 $x$ -intercept 2: (2, 0)

**5.**  $g(x) = 2x^2 - 2x - 4$

$x$ -intercept 1: (2, 0)  
 $x$ -intercept 2: (-1, 0)

Unit 8 Lesson 6      228      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	2	8.G.B
2	1	8.G.B
3	1	8.G.B
4	2	8.G.B
5	1	8.G.B

Notes:

**Additional Practice****8.07**

- 1.** Bard is solving the equation  $x^2 - 8x = 20$ . What should be Bard's first step?

- A. Factor  $x^2 - 8x$ .
- B. Divide each side by  $x$ .
- C. Add 20 to both sides of the equation.
- D.** Subtract 20 from both sides of the equation.

- 2.** Determine the number of solutions to each equation.

**a**  $(3x - 2)(x + 4) = 0$

**2 solutions**

**b**  $(10 + t)(10 + t) = 0$

**1 solution**

- 3.** Find *all* the solutions to each equation.

**a**  $n(n + 9) = 0$

**$n = 0$  and  $n = -9$**

**b**  $(6 + y)(6 - y) = 0$

**$y = -6$  and  $y = 6$**

**c**  $(3x - 1)(x + 11) = 0$

**$x = \frac{1}{3}$  (or equivalent) and  $x = -11$**

**d**  $(4p + 8)(4p + 8) = 0$

**$p = -2$**

**e**  $(b + 7)(10 - b) = 0$

**$b = -7$  and  $b = 10$**

- 4.** Rewrite each equation in factored form, if possible, and solve the equation using the Zero Product Property.

**a**  $x^2 - 11x + 10 = 0$

**$(x - 1)(x - 10) = 0$  (or equivalent);  
 $x = 1$  and  $x = 10$**

**b**  $t^2 + 24t + 144 = 0$

**$(t + 12)(t + 12) = 0$  (or equivalent);  
 $t = -12$**

**c**  $c^2 - c - 72 = 0$

**$(c + 8)(c - 9) = 0$  (or equivalent);  
 $c = -8$  and  $c = 9$**

**d**  $h^2 - 0.4h + 0.04 = 0$

**$(h - 0.2)(h - 0.2) = 0$  (or equivalent);  
 $h = 0.2$**

- 5.**  $x = 3$  is one of the solutions to the equation  $x^2 - x - 6 = 0$ . What is the other solution?

**$x = -2$**

- 6.** *Graphing technology required.* Consider the function  $f(x) = x^2 + 8x + 16$ .

- a Use graphing technology to graph  $f(x)$ . How many  $x$ -intercepts does the graph have? If there are  $x$ -intercept(s), what are the coordinates?

**One;  $(-4, 0)$**

- b Solve the equation  $x^2 + 8x + 16 = 0$  by writing it in factored form and using the Zero Product Property. Explain or show your thinking.

**$x = -4$ ; Sample response: The equation in factored form is  $(x + 4)(x + 4) = 0$ . The solutions are  $-4$  and  $-4$ . Because the two values are the same, this equation has only one solution.**

- c Which of the following functions has a graph with only one  $x$ -intercept?

A.  $f(x) = x^2 - 1$

C.  $f(x) = x^2 + 10x + 25$

B.  $f(x) = x^2 - 3x$

D.  $f(x) = x^2 + 3x - 4$

- 7.** A square pool has a walkway surrounding it. The total area of the pool and walkway is given by the equation  $y = (x + 4)(x + 6)$ , where  $y$  represents the area in square feet and  $x$  represents the side length of the pool in feet. The total area is  $360 \text{ ft}^2$ .

- a Write an equation to represent the total area of the pool and walkway.

**$(x + 4)(x + 6) = 360$  (or equivalent)**

- b What is the side length of the pool? Explain or show your thinking.

**14 ft; Sample response:**

$$(x + 4)(x + 6) = 360$$

$$x^2 + 10x + 24 = 360$$

$$x^2 + 10x - 336 = 0$$

$$(x - 14)(x + 24) = 0$$

$$x = 14 \text{ or } x = -24$$

**Because a side length cannot be negative, the length of the pool must be the positive solution, 14 ft.**

- 8.** Lin is solving the quadratic equation  $x^2 + 8x - 48 = 0$ . Her work is shown.

Do you agree or disagree with her work? If you disagree, explain the error and correct it. Otherwise, check Lin's solutions by substituting them into the original equation and showing that the equation is true.

**Lin's work:**

$$x^2 + 8x - 48 = 0$$

$$(x - 12)(x + 4) = 0$$

$$x - 12 = 0 \text{ or } x + 4 = 0$$

$$x = 12 \text{ or } x = -4$$

**Disagree; Sample response: Lin incorrectly rewrote the expression in factored form. It should be  $(x + 12)(x - 4) = 0$  so that the linear terms have a sum of  $8x$ . This means  $x = -12$  and  $x = 4$  are the correct solutions.**

# Additional Practice | Answer Key

## Unit 8 | Lesson 7

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

8.07

**1.** Bard is solving the equation  $x^2 - 8x = 20$ . What should be Bard's first step?

- Factor  $x^2 - 8x$ .
- Divide each side by  $x$ .
- Add 20 to both sides of the equation.
- Subtract 20 from both sides of the equation.

**2.** Determine the number of solutions to each equation.

a.  $(3x - 2)(x + 4) = 0$   
2 solutions

b.  $(10 + t)(10 + t) = 0$   
1 solution

**3.** Find all the solutions to each equation.

a.  $n(n + 9) = 0$   
 $n = 0$  and  $n = -9$

b.  $(6 + y)(6 - y) = 0$   
 $y = -6$  and  $y = 6$

c.  $(3x - 1)(x + 11) = 0$   
 $x = \frac{1}{3}$  (or equivalent) and  $x = -11$

d.  $(4p + 8)(4p + 8) = 0$   
 $p = -2$

e.  $(b + 7)(10 - b) = 0$   
 $b = -7$  and  $b = 10$

**4.** Rewrite each equation in factored form, if possible, and solve the equation using the Zero Product Property.

a.  $x^2 - 11x + 10 = 0$   
 $(x - 1)(x - 10) = 0$  (or equivalent);  
 $x = 1$  and  $x = 10$

b.  $t^2 + 24t + 144 = 0$   
 $(t + 12)(t + 12) = 0$  (or equivalent);  
 $t = -12$

c.  $c^2 - c - 72 = 0$   
 $(c + 8)(c - 9) = 0$  (or equivalent);  
 $c = -8$  and  $c = 9$

d.  $h^2 - 0.4h + 0.04 = 0$   
 $(h - 0.2)(h - 0.2) = 0$  (or equivalent);  
 $h = 0.2$

**5.**  $x = 3$  is one of the solutions to the equation  $x^2 - x - 6 = 0$ . What is the other solution?

$x = -2$

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**6.** Graphing technology required. Consider the function  $f(x) = x^2 + 8x + 16$ .

- Use graphing technology to graph  $f(x)$ . How many  $x$ -intercepts does the graph have? If there are  $x$ -intercept(s), what are the coordinates?  
One;  $(-4, 0)$
- Solve the equation  $x^2 + 8x + 16 = 0$  by writing it in factored form and using the Zero Product Property. Explain or show your thinking.  
 $x = -4$ ; Sample response: The equation in factored form is  $(x + 4)(x + 4) = 0$ . The solutions are  $-4$  and  $-4$ . Because the two values are the same, this equation has only one solution.
- Which of the following functions has a graph with only one  $x$ -intercept?
 

<b>A.</b> $f(x) = x^2 - 1$	<b>C.</b> $f(x) = x^2 + 10x + 25$
<b>B.</b> $f(x) = x^2 - 3x$	<b>D.</b> $f(x) = x^2 + 3x - 4$
- A square pool has a walkway surrounding it. The total area of the pool and walkway is given by the equation  $y = (x + 4)(x + 6)$ , where  $y$  represents the area in square feet and  $x$  represents the side length of the pool in feet. The total area is  $360 \text{ ft}^2$ .
  - Write an equation to represent the total area of the pool and walkway.  
 $(x + 4)(x + 6) = 360$  (or equivalent)
  - What is the side length of the pool? Explain or show your thinking.  
**14 ft;** Sample response:  
 $(x + 4)(x + 6) = 360$   
 $x^2 + 10x + 24 = 360$   
 $x^2 + 10x - 336 = 0$   
 $(x - 14)(x + 24) = 0$   
 $x = 14$  or  $x = -24$   
Because a side length cannot be negative, the length of the pool must be the positive solution, 14 ft.
- Lin is solving the quadratic equation  $x^2 + 8x - 48 = 0$ . Her work is shown. Do you agree or disagree with her work? If you disagree, explain the error and correct it. Otherwise, check Lin's solutions by substituting them into the original equation and showing that the equation is true.
 

<b>Lin's work:</b> $x^2 + 8x - 48 = 0$ $(x - 12)(x + 4) = 0$ $x - 12 = 0$ or $x + 4 = 0$ $x = 12$ or $x = -4$	<b>Disagree:</b> Sample response: Lin incorrectly rewrote the expression in factored form. It should be $(x + 12)(x - 4) = 0$ so that the linear terms have a sum of $8x$ . This means $x = -12$ and $x = 4$ are the correct solutions.
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**Unit 8 Lesson 7      230      Additional Practice**

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.SSE.A.2
2	1	HSA.SSE.A.2
3	2	HSA.SSE.A.2
4	2	HSA.SSE.A.2
5	2	HSA.SSE.A.2
6	2	HSA.SSE.A.2
7	3	HSA.SSE.A.2
8	3	HSA.SSE.A.2

### Notes:

**Additional Practice****8.08**

- 1.** How many solutions does the quadratic equation have?

$$(x + 10)^2 = -25$$

- A.** No Solutions
- B.** One Solution
- C.** Two Solutions
- D.** More information is needed.

- 2.** For each equation, determine the number of solutions.

Equation	Number of Solutions
$x^2 + 2 = 2$	<b>One Solution</b>
$(x - 3)^2 = 1$	<b>Two Solutions</b>
$(x + 8)^2 = -16$	<b>No Solutions</b>
$(x + 3)^2 = 0$	<b>One Solution</b>
$x^2 - 8 = -4$	<b>Two Solutions</b>

- 3.** What is the solution for the equation?

$$(x - 2)^2 + 27 = 27$$

- A.**  $x = -2$
- B.**  $x = 0$
- C.**  $x = 2$
- D.**  $x = -27$

**Problems 4–5:** Determine the solution for each equation.

**4.**  $(x + 2)^2 = 0$

**$x = -2$**

**5.**  $(x + 3)(x + 3) = 0$

**The solution is  $x = -3$ .**

6. Which value for  $x$  is a solution to the equation  $x^2 + 7x = x - 9$ ?

- A.  $x = -9$
- B.**  $x = -3$
- C.  $x = 0$
- D.  $x = 3$

Explain your thinking.

First, I brought all the terms to the left side of the equal sign. When I brought the terms to the left side of the equal sign, I got  $x^2 + 6x + 9 = 0$ . I factored the left side of the equation:  $(x + 3)(x + 3) = 0$ . This means  $x = -3$ .

**Problems 7–8:** Determine the two solutions for each equation. **Show your thinking.**

7.  $x^2 - 20 = -4$

The solutions are  $x = -4$  and  $x = 4$ .

8.  $100 + (x - 3)^2 = 136$

The solutions are  $x = -3$  and  $x = 9$ .

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

8.08

**1.** How many solutions does the quadratic equation have?  
 $(x + 10)^2 = -25$

A. No Solutions  
 B. One Solution  
 C. Two Solutions  
 D. More information is needed.

**2.** For each equation, determine the number of solutions.

Equation	Number of Solutions
$x^2 + 2 = 2$	One Solution
$(x - 3)^2 = 1$	Two Solutions
$(x + 8)^2 = -16$	No Solutions
$(x + 3)^2 = 0$	One Solution
$x^2 - 8 = -4$	Two Solutions

**3.** What is the solution for the equation?  
 $(x - 2)^2 + 27 = 27$

A.  $x = -2$   
 B.  $x = 0$   
 C.  $x = 2$   
 D.  $x = -27$

**Problems 4–5:** Determine the solution for each equation.

**4.**  $(x + 2)^2 = 0$   
 x = **-2**

**5.**  $(x + 3)(x + 3) = 0$   
 The solution is  $x = -3$ .

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**6.** Which value for  $x$  is a solution to the equation  $x^2 + 7x = x - 9$ ?

A.  $x = -9$   
 B.  $x = -3$   
 C.  $x = 0$   
 D.  $x = 3$

Explain your thinking.  
 First, I brought all the terms to the left side of the equal sign. When I brought the terms to the left side of the equal sign, I got  $x^2 + 6x + 9 = 0$ . I factored the left side of the equation:  $(x + 3)(x + 3) = 0$ . This means  $x = -3$ .

**Problems 7–8:** Determine the two solutions for each equation. Show your thinking.

**7.**  $x^2 - 20 = -4$   
 The solutions are  $x = -4$  and  $x = 4$ .

**8.**  $100 + (x - 3)^2 = 136$   
 The solutions are  $x = -3$  and  $x = 9$ .

Unit 8 Lesson 8      232      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.REI.B.4.B
2	1	HSA.REI.B.4.B
3	1	HSA.REI.B.4
4	1	HSA.REI.B.4
5	2	HSA.REI.B.4
6	2	HSA.REI.B.4
7	2	HSA.REI.B.4
7	2	HSA.REI.B.4

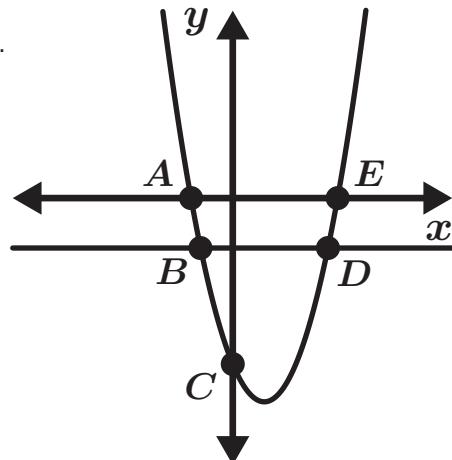
**Notes:**

## Additional Practice

8.09

1. Here is a graph of  $y = x^2 - 3x - 10$  and  $y = -4$ .  
Select all points that are solutions to  $x^2 - 3x - 10 = -4$ .

- A. Point A
- B. Point B
- C. Point C
- D. Point D
- E. Point E



**Problems 2–5:** Circle how many solutions each equation has. Record any solutions.

2.  $3x^2 + 6 = 18$       No Solution      One Solution      Two Solutions  $x = \dots$

$x = \dots$  **2**

3.  $x(x - 5) = -6$       No Solution      One Solution      Two Solutions  $x = \dots$

$x = \dots$  **3**

4.  $0 = -(x - 3)(x + 2) - 10$       No Solution      One Solution      Two Solutions  $x = \dots$

$x = \dots$  **N/A**

5.  $x(x + 4) = -16$       No Solution      One Solution      Two Solutions  $x = \dots$

$x = \dots$  **N/A**

**Problems 6–7:** Fill in the blank so the equation has:

6. One solution

$x(x - 2) = \dots$  **-1**

7. No solutions

$(x + 3)(x - \dots) = -7$

**Answers vary.**

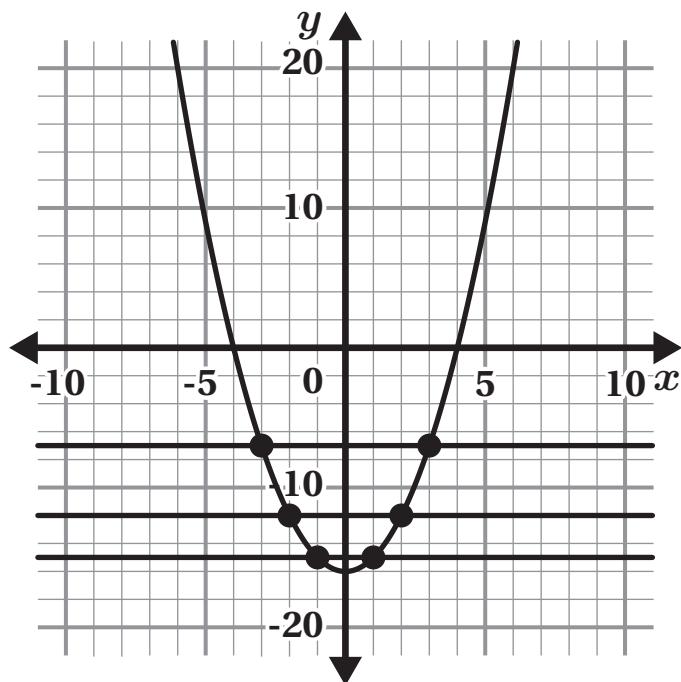
**Problems 8–9:** The graphs of  $y = -16x^2$ ,  $y = -15$ ,  $y = -12$ , and  $y = -7$  all intersect at integer values.

8. Write the equations of three more lines that follow this property.

$$y = \dots \textcolor{red}{0}$$

$$y = \dots \textcolor{red}{9}$$

$$y = \dots \textcolor{red}{20}$$



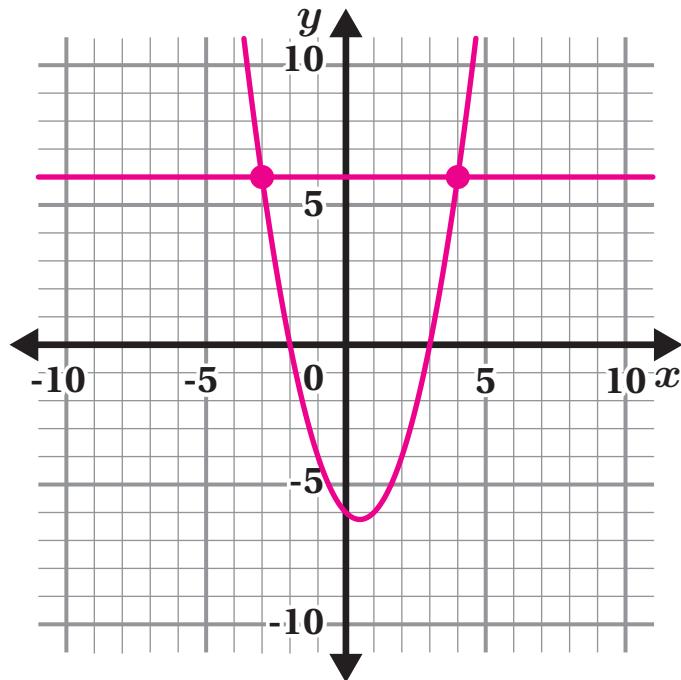
9. What pattern do you notice?

Responses vary. The y-values of these points are growing in a quadratic pattern with the same second differences.

10. Solve  $(x - 3)(x + 2) = 6$ . Show and explain your thinking.

$$x = 4 \text{ and } x = -3.$$

Responses vary. I wrote the equation as two different functions  $y = (x - 3)$  ( $x + 2$ ) and ( $y = 6$ ) and graphed them. The  $x$ -values of the intersection points are  $-3$  and  $4$ .



# Additional Practice | Answer Key

## Unit 8 | Lesson 9

Name: ..... Date: ..... Period: .....

### Additional Practice

**8.09**

1. Here is a graph of  $y = x^2 - 3x - 10$  and  $y = -4$ . Select all points that are solutions to  $x^2 - 3x - 10 = -4$ .

A. Point A  
 B. Point B  
 C. Point C  
 D. Point D  
 E. Point E

**Problems 2–5:** Circle how many solutions each equation has. Record any solutions.

2.  $3x^2 + 6 = 18$  No Solution One Solution **Two Solutions**  $x = \underline{-2}$   
 $x = \underline{2}$

3.  $x(x - 5) = -6$  No Solution One Solution **Two Solutions**  $x = \underline{2}$   
 $x = \underline{3}$

4.  $0 = -(x - 3)(x + 2) - 10$  **No Solution** One Solution Two Solutions  $x = \underline{\text{N/A}}$   
 $x = \underline{\text{N/A}}$

5.  $x(x + 4) = -16$  **No Solution** One Solution Two Solutions  $x = \underline{\text{N/A}}$   
 $x = \underline{\text{N/A}}$

**Problems 6–7:** Fill in the blank so the equation has:

6. One solution  $x(x - 2) = \underline{-1}$   
7. No solutions  $(x + 3)(x - \underline{1}) = -7$   
**Answers vary.**

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**Problems 8–9:** The graphs of  $y = -16x^2$ ,  $y = -15$ ,  $y = -12$ , and  $y = -7$  all intersect at integer values.

8. Write the equations of three more lines that follow this property.

$y = \underline{0}$   
 $y = \underline{9}$   
 $y = \underline{20}$

9. What pattern do you notice?  
**Responses vary.** The y-values of these points are growing in a quadratic pattern with the same second differences.

10. Solve  $(x - 3)(x + 2) = 6$ . Show and explain your thinking.  
 $x = 4$  and  $x = -3$   
**Responses vary.** I wrote the equation as two different functions  $y = (x - 3)$ ,  $(x + 2)$  and  $(y = 6)$  and graphed them. The x-values of the intersection points are -3 and 4.

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### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.REI.D.10
2	1	HSA.REI.D.10
3	1	HSA.REI.D.10
4	1	HSA.REI.D.10
5	1	HSA.REI.D.10
6	2	HSA.REI.D.10
7	2	HSA.REI.D.10
8	2	HSA.REI.D.10
9	2	HSA.REI.D.10
10	2	HSA.REI.D.10

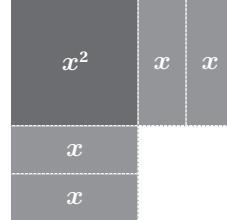
**Notes:**

## Additional Practice

8.11

1. The algebra tiles in the figure represent the expression  $x^2 + 4x$ . How many 1-tiles are needed to make the figure a square?

- A. 1 tile      C. 4 tiles  
B. 2 tiles      D. 8 tiles



$$1\text{-tile} = \boxed{1}$$

2. Which expression is a perfect square expression?

- A.  $x(x - 4)$       C.  $x - 5^2$   
B.  $(x + 6)^2$       D.  $x^2 + 1$

3. Consider the incomplete quadratic expression  $x^2 - 14x + \dots$ .

- a. What value can be added to make the expression a perfect square expression?

**49**

- b. Write the perfect square expression in factored form.

 $(x - 7)^2$  or  $(x - 7)(x - 7)$ 

4. For each expression, determine the value that, when added to the expression, makes it a perfect square expression. Write the perfect square expression in both standard form and factored form.

Expression	Perfect square expression in standard form	Perfect square expression in factored form
$x^2 + 12x$	$x^2 + 12x + 36$	$(x + 6)^2$
$x^2 - 18x$	$x^2 - 18x + 81$	$(x - 9)^2$
$x^2 + 22x$	$x^2 + 22x + 121$	$(x + 11)^2$
$x^2 - 5x$	$x^2 - 5x + \frac{25}{4}$ (or equivalent)	$\left(x - \frac{5}{2}\right)^2$ (or equivalent)

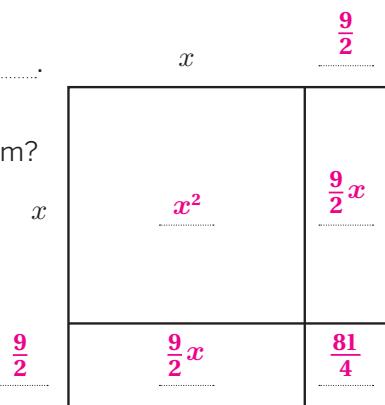
5. Consider the incomplete quadratic expression  $x^2 + 9x + \underline{\hspace{2cm}}$ .

- a Complete the area diagram to turn the expression into a perfect square expression. What is the value of the missing term?

$$\left(\frac{9}{2}\right)^2 \text{ or } \frac{81}{4} \text{ (or equivalent)}$$

- b Write the perfect square expression in factored form.

$$\left(x + \frac{9}{2}\right)^2 \text{ or } \left(x + \frac{9}{2}\right)\left(x + \frac{9}{2}\right) \text{ (or equivalent)}$$



6. Each of the following expressions written in standard form is a perfect square expression that is missing either a coefficient or a constant term. Determine the missing value. Then match each expression in standard form with an equivalent perfect square expression in factored form.

**Standard Form**

a  $x^2 + 14x + \underline{\hspace{2cm}}$

b  $x^2 + \underline{\hspace{2cm}}x + 4$

c  $x^2 - 6x + \underline{\hspace{2cm}}$

d  $x^2 - \underline{\hspace{2cm}}x + 16$

**Factored Form**

c  $(x - 3)^2$

a  $(x + 7)^2$

b  $(x + 2)^2$

d  $(x - 4)^2$

7. Lin is changing the expression  $x^2 + 16x$  so that it will be a perfect square expression. Her work is shown. Andre studies Lin's work, but does not understand exactly what Lin did to change the expression. Complete Lin's missing step to help Andre see how Lin changed the expression.

$$x^2 + 16x + \underline{\hspace{2cm}}$$

**Lin's work:**

$$x^2 + 16x = \underline{\hspace{2cm}}$$

$$= (x + 8)^2$$

8. Consider the quadratic expression  $x^2 - 30x$ . Elena claims that 900 can be added to the expression to make it a perfect square expression. Shawn argues that the number 225 must be added to the expression to make it a perfect square expression. Who is correct? Explain your thinking.

**Shawn; Sample response:** To make the expression a perfect square expression, the number  $\left(-\frac{30}{2}\right)^2 = (-15)^2$  or 225 must be added. The perfect square expression can be written as  $x^2 - 30x + 225$  or  $(x - 15)^2$ .

# Additional Practice | Answer Key

## Unit 8 | Lesson 11

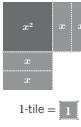
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### Additional Practice

8.11

**1.** The algebra tiles in the figure represent the expression  $x^2 + 4x$ . How many 1-tiles are needed to make the figure a square?

A. 1 tile      C. 4 tiles  
 B. 2 tiles      D. 8 tiles



1-tile = **1**

**2.** Which expression is a perfect square expression?

A.  $x(x - 4)$       C.  $x - 5^2$   
 B.  $(x + 6)^2$       D.  $x^2 + 1$

**3.** Consider the incomplete quadratic expression  $x^2 - 14x + \dots$

a. What value can be added to make the expression a perfect square expression?  
**49**

b. Write the perfect square expression in factored form.  
 $(x - 7)^2$  or  $(x - 7)(x - 7)$

**4.** For each expression, determine the value that, when added to the expression, makes it a perfect square expression. Write the perfect square expression in both standard form and factored form.

Expression	Perfect square expression in standard form	Perfect square expression in factored form
$x^2 + 12x$	$x^2 + 12x + 36$	$(x + 6)^2$
$x^2 - 18x$	$x^2 - 18x + 81$	$(x - 9)^2$
$x^2 + 22x$	$x^2 + 22x + 121$	$(x + 11)^2$
$x^2 - 5x$	$x^2 - 5x + \frac{25}{4}$ (or equivalent)	$(x - \frac{5}{2})^2$ (or equivalent)

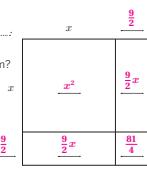
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**5.** Consider the incomplete quadratic expression  $x^2 + 9x + \dots$

a. Complete the area diagram to turn the expression into a perfect square expression. What is the value of the missing term?  
 $\frac{81}{4}$  or  $\frac{81}{2}$  (or equivalent)

b. Write the perfect square expression in factored form.  
 $(x + \frac{9}{2})^2$  or  $(x + \frac{9}{2})(x + \frac{9}{2})$  (or equivalent)



**6.** Each of the following expressions written in standard form is a perfect square expression that is missing either a coefficient or a constant term. Determine the missing value. Then match each expression in standard form with an equivalent perfect square expression in factored form.

Standard Form	Factored Form
a. $x^2 + 14x + 49$	c. $(x - 3)^2$
b. $x^2 + 4x + 4$	a. $(x + 7)^2$
c. $x^2 - 6x + 9$	b. $(x + 2)^2$
d. $x^2 - 8x + 16$	d. $(x - 4)^2$

**7.** Lin is changing the expression  $x^2 + 16x$  so that it will be a perfect square expression. Her work is shown. Andre studies Lin's work, but does not understand exactly what Lin did to change the expression. Complete Lin's missing step to help Andre see how Lin changed the expression.

**Lin's work:**  
 $x^2 + 16x = \dots$   
 $= (x + 8)^2$

**8.** Consider the quadratic expression  $x^2 - 30x$ . Elena claims that 900 can be added to the expression to make it a perfect square expression. Shawn argues that the number 225 must be added to the expression to make it a perfect square expression. Who is correct? Explain your thinking.

**Shawn:** Sample response: To make the expression a perfect square expression, the number  $(-\frac{30}{2})^2 = (-15)^2$  or 225 must be added. The perfect square expression can be written as  $x^2 - 30x + 225$  or  $(x - 15)^2$ .

Unit 8 Lesson 11      238      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.SSE.A.2
2	1	HSA.SSE.A.2
3	2	HSA.SSE.A.2
4	2	HSA.SSE.A.2
5	2	HSA.SSE.A.2
6	2	HSA.SSE.A.2
7	2	HSA.SSE.A.2
8	3	HSA.SSE.A.2

### Notes:

**Additional Practice****8.12**

- 1.** What number can you add to each expression to make it a perfect square expression?

**a**  $x^2 + 10x + 14$

**11**

**b**  $x^2 - 8x - 3$

**19**

- 2.** Which value(s) of  $x$  make the equation  $(x + 1)^2 = 4$  true? Select *all* that apply.

 A. -3 D. 1 B. -1 E. 2 C. 0 F. 3

- 3.** Jada wants to solve the quadratic equation

$$x^2 - 10x + 21 = 0 \text{ by completing the square.}$$

Her work is shown. She says that there is one solution,  $x = 5$ . Do you agree with Jada? Explain your thinking.

No; Sample response: Jada made a mistake in solving the equation. She did not add 4 to both sides of the equation. The equation she wrote,  $x^2 - 10x + 25 = 0$ , is not equivalent to the original equation. The correct solutions are  $x = 3$  and  $x = 7$ .

- 4.** Solve each equation by completing the square.

**a**  $x^2 - 4x - 3 = 2$

 **$x = -1$  or  $x = 5$** 

**b**  $x^2 + 8x + 3 = -9$

 **$x = -6$  or  $x = -2$** 

**c**  $x^2 - 14x + 54 = 5$

 **$x = 7$** 

**d**  $7 = x^2 + 6x - 20$

 **$x = -9$  or  $x = 3$** **Jada's work:**

$$x^2 - 10x + 21 = 0$$

$$x^2 - 10x + 21 + 4 = 0$$

$$x^2 - 10x + 25 = 0$$

$$(x - 5)^2 = 0$$

5. Which of the following could be the first step in solving the quadratic equation  $x^2 + 8x - 20 = 0$  by completing the square?

- A.  $x^2 + 8x - 16 = 20$   
B.  $x^2 + 8x - 20 + 36 = 36$   
 C.  $x^2 + 8x - 20 = -20$   
 D.  $x^2 + 8x - 20 + 16 = 0$

6. Solve each equation by completing the square.

a  $x^2 - 1.4x = 0.51$

$x = -0.3 \text{ or } x = 1.7$

b  $x^2 + 3x = \frac{7}{4}$

$x = -\frac{11}{2} \text{ (or equivalent) or } x = \frac{5}{2} \text{ (or equivalent)}$

c  $(5 - x)(1 - x) + 3 = 0$

$x = 2 \text{ or } x = 4$

7. Priya wants to solve the quadratic equation  $x^2 + 12x + 11 = 0$  by completing the square. Her work is shown. She says that the solutions are  $x = 19$  or  $x = -31$ . Which of the following statements is true?

- A. Priya's work and solutions are correct.  
 B. Priya made an error in the second line by adding 25 to each side of the equation.  
 C. Priya made an error in the third line by incorrectly writing the expression in factored form.  
D. Priya made an error in the fourth line by not taking the square root of 25.

8. Consider the quadratic equation  $x^2 + 16x + 38 = 23$ . Bard claims that when solving the equation by completing the square, the equation has one solution,  $x = -1$ . Do you agree? Explain your thinking.

No; Sample response: Bard is missing the second solution. When solving the equation  $x^2 + 16x + 38 = 23$  by completing the square, the equation  $(x + 8)^2 = 49$  results. Because  $x + 8 = 7$  and  $x + 8 = -7$ , the equation has two solutions,  $x = -1$  and  $x = -15$ .

**Priya's work:**

$$x^2 + 12x + 11 = 0$$

$$x^2 + 12x + 36 = 25$$

$$(x + 6)^2 = 25$$

$$x + 6 = 25 \text{ or } x + 6 = -25$$

$$x = 19 \text{ or } x = -31$$

Name: ..... Date: ..... Period: .....

### Additional Practice

8.12

**1.** What number can you add to each expression to make it a perfect square expression?

A.  $x^2 + 10x + 14$   
 B.  $x^2 - 8x - 3$   
**11**  
 C.  $x^2 - 1$   
**19**

**2.** Which value(s) of  $x$  make the equation  $(x + 1)^2 = 4$  true? Select all that apply.

A.  $-3$        D.  $1$   
 B.  $-1$        E.  $2$   
 C.  $0$        F.  $3$

**3.** Jada wants to solve the quadratic equation  $x^2 - 10x + 21 = 0$  by completing the square. Her work is shown. She says that there is one solution.  $x = 5$ . Do you agree with Jada? Explain your thinking.

No; Sample response: Jada made a mistake in solving the equation. She did not add 4 to both sides of the equation. The equation she wrote,  $x^2 - 10x + 25 = 0$ , is not equivalent to the original equation. The correct solutions are  $x = 3$  and  $x = 7$ .

**4.** Solve each equation by completing the square.

A.  $x^2 - 4x - 3 = 0$   
 $x = -1$  or  $x = 5$   
 B.  $x^2 + 8x + 3 = -9$   
 $x = -6$  or  $x = -2$   
 C.  $x^2 - 14x + 54 = 5$   
 $x = 7$   
 D.  $7 = x^2 + 6x - 20$   
 $x = -9$  or  $x = 3$

**Jada's work:**  
 $x^2 - 10x + 21 = 0$   
 $x^2 - 10x + 21 + 4 = 0$   
 $x^2 - 10x + 25 = 0$   
 $(x - 5)^2 = 0$

**5.** Which of the following could be the first step in solving the quadratic equation  $x^2 + 8x - 20 = 0$  by completing the square?

A.  $x^2 + 8x - 16 = 20$   
 B.  $x^2 + 8x - 20 + 36 = 36$   
 C.  $x^2 + 8x - 20 = -20$   
 D.  $x^2 + 8x - 20 + 16 = 0$

**6.** Solve each equation by completing the square.

A.  $x^2 - 14x = 51$   
 $x = -0.3$  or  $x = 1.7$   
 B.  $x^2 + 3x = \frac{7}{4}$   
 $x = -\frac{11}{2}$  (or equivalent) or  $x = \frac{5}{2}$  (or equivalent)  
 C.  $(5 - x)(1 - x) + 3 = 0$   
 $x = 2$  or  $x = 4$

**7.** Priya wants to solve the quadratic equation  $x^2 + 12x + 11 = 0$  by completing the square. Her work is shown. She says that the solutions are  $x = 19$  or  $x = -31$ . Which of the following statements is true?

A. Priya's work and solutions are correct.  
B. Priya made an error in the second line by adding 25 to each side of the equation.  
C. Priya made an error in the third line by incorrectly writing the expression in factored form.  
D. Priya made an error in the fourth line by not taking the square root of 25.

**Priya's work:**  
 $x^2 + 12x + 11 = 0$   
 $x^2 + 12x + 36 = 25$   
 $(x + 6)^2 = 25$   
 $x + 6 = 25$  or  $x + 6 = -25$   
 $x = 19$  or  $x = -31$

**8.** Consider the quadratic equation  $x^2 + 16x + 38 = 23$ . Bard claims that when solving the equation by completing the square, the equation has one solution,  $x = -1$ . Do you agree? Explain your thinking.

No; Sample response: Bard is missing the second solution. When solving the equation  $x^2 + 16x + 38 = 23$  by completing the square, the equation  $(x + 8)^2 = 49$  results. Because  $x + 8 = 7$  and  $x + 8 = -7$ , the equation has two solutions,  $x = -1$  and  $x = -15$ .

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Name: ..... Date: ..... Period: .....

**5.** Which of the following could be the first step in solving the quadratic equation  $x^2 + 8x - 20 = 0$  by completing the square?

A.  $x^2 + 8x - 16 = 20$   
 B.  $x^2 + 8x - 20 + 36 = 36$   
 C.  $x^2 + 8x - 20 = -20$   
 D.  $x^2 + 8x - 20 + 16 = 0$

**6.** Solve each equation by completing the square.

A.  $x^2 - 14x = 51$   
 $x = -0.3$  or  $x = 1.7$   
 B.  $x^2 + 3x = \frac{7}{4}$   
 $x = -\frac{11}{2}$  (or equivalent) or  $x = \frac{5}{2}$  (or equivalent)  
 C.  $(5 - x)(1 - x) + 3 = 0$   
 $x = 2$  or  $x = 4$

**7.** Priya wants to solve the quadratic equation  $x^2 + 12x + 11 = 0$  by completing the square. Her work is shown. She says that the solutions are  $x = 19$  or  $x = -31$ . Which of the following statements is true?

A. Priya's work and solutions are correct.  
B. Priya made an error in the second line by adding 25 to each side of the equation.  
C. Priya made an error in the third line by incorrectly writing the expression in factored form.  
D. Priya made an error in the fourth line by not taking the square root of 25.

**Priya's work:**  
 $x^2 + 12x + 11 = 0$   
 $x^2 + 12x + 36 = 25$   
 $(x + 6)^2 = 25$   
 $x + 6 = 25$  or  $x + 6 = -25$   
 $x = 19$  or  $x = -31$

**8.** Consider the quadratic equation  $x^2 + 16x + 38 = 23$ . Bard claims that when solving the equation by completing the square, the equation has one solution,  $x = -1$ . Do you agree? Explain your thinking.

No; Sample response: Bard is missing the second solution. When solving the equation  $x^2 + 16x + 38 = 23$  by completing the square, the equation  $(x + 8)^2 = 49$  results. Because  $x + 8 = 7$  and  $x + 8 = -7$ , the equation has two solutions,  $x = -1$  and  $x = -15$ .

Unit 8 Lesson 12      240      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.REI.B.4.B
2	1	HSA.REI.B.4.B
3	2	HSA.REI.B.4.A, HSA.REI.B.4.B
4	2	HSA.REI.B.4.A, HSA.REI.B.4.B
5	2	HSA.REI.B.4.A, HSA.REI.B.4.B
6	2	HSA.REI.B.4.A, HSA.REI.B.4.B
7	2	HSA.REI.B.4.B
8	3	HSA.REI.B.4.B

### Notes:

**Additional Practice****8.14**

- 1.** Which of the following is the correct form of the quadratic formula?

A.  $x = \frac{b \pm \sqrt{b - 4ac}}{2a}$       B.  $x = \frac{-b \pm \sqrt{b^2 - ac}}{2a}$       C.  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{a}$

D.  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$       E.  $y = \frac{b \pm \sqrt{b^2 - 4ac}}{2a}$

**Problems 2–5:** Identify the values for  $a$ ,  $b$ , and  $c$  in each of the quadratic equations below.

Equation	<i>a-term</i>	<i>b-term</i>	<i>c-term</i>
2. $-2x^2 - 7x + 5 = 0$	<b>-2</b>	<b>-7</b>	<b>5</b>
3. $8x^2 = 2x + 4$	<b>8</b>	<b>-2</b>	<b>-4</b>
4. $4x^2 = 12$	<b>4</b>	<b>0</b>	<b>-12</b>
5. $2x(x - 5) = 0$	<b>2</b>	<b>-10</b>	<b>0</b>

- 6.** Janie used the quadratic formula to solve the equation  $x^2 + 6x + 10 = 0$ . Her work is shown below. How many solutions are there for  $x$ ? Explain or show how you know.

$$x^2 + 6x + 10 = 0$$

**There are no solutions for  $x$  because the  $\sqrt{-4}$  is not a real number.**

$$a = 1 \quad b = 6 \quad c = 10$$

$$x = \frac{-6 \pm \sqrt{6^2 - 4(1)(10)}}{2(1)}$$

$$x = \frac{-6 \pm \sqrt{36 - 40}}{2}$$

$$x = \frac{-6 \pm \sqrt{-4}}{2}$$

**Problems 7–10:** Here is the equation  $x^2 - 8x = -7$ .

- 7.** Write the equation in standard form.

$$x^2 - 8x + 7 = 0$$

- 8.** Identify the values for  $a$ ,  $b$ , and  $c$ .

$$a = 1 \quad b = -8 \quad c = 7$$

- 9.** Substitute the values for  $a$ ,  $b$ , and  $c$  into the quadratic formula. (You don't need to perform any operations.)

$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(1)(7)}}{2(1)}$$

- 10.** Show or explain how the expression you wrote is related to solving  $x^2 - 8x = -7$  by completing the square.

Responses vary.

$$x^2 - 8x + 7 = 0$$

$$x^2 - 8x + 16 - 16 + 7 = 0$$

$$(x - 4)^2 - 9 = 0$$

$$(x - 4)^2 = 9$$

$$\sqrt{(x-4)^2} = \sqrt{9}$$

$$x - 4 = \pm\sqrt{9}$$

$x = 4 \pm \sqrt{9}$  ← This is a simpler form of the values in the quadratic formula.

$$x = 4 \pm 3$$

$$x = 7 \text{ and } x = 1$$

<p>Name: ..... Date: ..... Period: .....</p> <p><b>Additional Practice</b> <span style="float: right;">8.14</span></p> <p>1. Which of the following is the correct form of the quadratic formula?      A. <math>x = \frac{b \pm \sqrt{b^2 - 4ac}}{2a}</math>      B. <math>x = \frac{-b \pm \sqrt{b^2 - ac}}{2a}</math>      C. <math>x = \frac{-b \pm \sqrt{b^2 - 4ac}}{a}</math>      D. <math>x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}</math>      E. <math>y = \frac{b \pm \sqrt{b^2 - 4ac}}{2a}</math></p> <p><b>Problems 2–5:</b> Identify the values for <math>a</math>, <math>b</math>, and <math>c</math> in each of the quadratic equations below.</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Equation</th> <th style="text-align: center;"><math>a</math>-term</th> <th style="text-align: center;"><math>b</math>-term</th> <th style="text-align: center;"><math>c</math>-term</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><math>-2x^2 - 7x + 5 = 0</math></td> <td style="text-align: center;"><b>-2</b></td> <td style="text-align: center;"><b>-7</b></td> <td style="text-align: center;"><b>5</b></td> </tr> <tr> <td style="text-align: center;"><math>8x^2 + 2x + 4</math></td> <td style="text-align: center;"><b>8</b></td> <td style="text-align: center;"><b>-2</b></td> <td style="text-align: center;"><b>-4</b></td> </tr> <tr> <td style="text-align: center;"><math>4x^2 = 12</math></td> <td style="text-align: center;"><b>4</b></td> <td style="text-align: center;"><b>0</b></td> <td style="text-align: center;"><b>-12</b></td> </tr> <tr> <td style="text-align: center;"><math>2x(x - 5) = 0</math></td> <td style="text-align: center;"><b>2</b></td> <td style="text-align: center;"><b>-10</b></td> <td style="text-align: center;"><b>0</b></td> </tr> </tbody> </table> <p>6. Janie used the quadratic formula to solve the equation <math>x^2 + 6x + 10 = 0</math>. Her work is shown below. How many solutions are there for <math>x</math>? Explain or show how you know.  <math>x^2 + 6x + 10 = 0</math>  <math>a = 1 \quad b = 6 \quad c = 10</math>  <math>x = \frac{-6 \pm \sqrt{6^2 - 4(1)(10)}}{2(1)}</math>  <math>x = \frac{-6 \pm \sqrt{36 - 40}}{2}</math>  <math>x = \frac{-6 \pm \sqrt{-4}}{2}</math></p> <p><b>Problems 7–10:</b> Here is the equation <math>x^2 - 8x = -7</math>.</p> <p>7. Write the equation in standard form.  <math>x^2 - 8x + 7 = 0</math></p> <p>8. Identify the values for <math>a</math>, <math>b</math>, and <math>c</math>.  <math>a = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}} \quad c = \underline{\hspace{2cm}}</math></p> <p>9. Substitute the values for <math>a</math>, <math>b</math>, and <math>c</math> into the quadratic formula. (You don't need to perform any operations.)  <math>x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(1)(7)}}{2(1)}</math></p>	Equation	$a$ -term	$b$ -term	$c$ -term	$-2x^2 - 7x + 5 = 0$	<b>-2</b>	<b>-7</b>	<b>5</b>	$8x^2 + 2x + 4$	<b>8</b>	<b>-2</b>	<b>-4</b>	$4x^2 = 12$	<b>4</b>	<b>0</b>	<b>-12</b>	$2x(x - 5) = 0$	<b>2</b>	<b>-10</b>	<b>0</b>	<p>Name: ..... Date: ..... Period: .....</p> <p>10. Show or explain how the expression you wrote is related to solving <math>x^2 - 8x = -7</math> by completing the square.</p> <p><b>Responses vary.</b></p> <p><math>x^2 - 8x + 7 = 0</math>  <math>x^2 - 8x + 16 - 16 + 7 = 0</math>  <math>(x - 4)^2 - 9 = 0</math>  <math>(x - 4)^2 = 9</math>  <math>\sqrt{(x - 4)^2} = \sqrt{9}</math>  <math>x - 4 = \pm \sqrt{9}</math>  <math>x = 4 \pm \sqrt{9} \quad \leftarrow \text{This is a simpler form of the values in the quadratic formula.}</math>  <math>x = 4 \pm 3</math>  <math>x = 7 \text{ and } x = 1</math></p>
Equation	$a$ -term	$b$ -term	$c$ -term																		
$-2x^2 - 7x + 5 = 0$	<b>-2</b>	<b>-7</b>	<b>5</b>																		
$8x^2 + 2x + 4$	<b>8</b>	<b>-2</b>	<b>-4</b>																		
$4x^2 = 12$	<b>4</b>	<b>0</b>	<b>-12</b>																		
$2x(x - 5) = 0$	<b>2</b>	<b>-10</b>	<b>0</b>																		

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Unit 8 Lesson 14      244      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.REI.B.4.A
2	1	HSA.REI.B.4.A
3	1	HSA.REI.B.4.A
4	1	HSA.REI.B.4.A
5	1	HSA.REI.B.4.A
6	2	HSA.REI.B.4.A
7	1	HSA.REI.B.4.A
8	1	HSA.REI.B.4.A
9	1	HSA.REI.B.4.A
10	2	HSA.REI.B.4.A

**Notes:**

**Additional Practice****8.15**

- 1.** For each equation, identify the values of  $a$ ,  $b$ , and  $c$ .

**a**  $2x^2 + 5x + 1 = 0$

**a = 2, b = 5, c = 1**

**b**  $-4x^2 + 3x + 6 = 0$

**a = -4, b = 3, c = 6**

**c**  $x^2 - 7x + 4 = 0$

**a = 1, b = -7, c = 4**

**d**  $-x^2 + 10x - 8 = 0$

**a = -1, b = 10, c = -8**

- 2.** What are the values of  $x$  if  $x = \frac{7 \pm \sqrt{49 - (-72)}}{4}$ ?

A. 0 and  $-\frac{9}{2}$

B. 0 and 1

C.  $-1$  and  $\frac{9}{2}$

D.  $-\frac{9}{2}$  and 1

- 3.** Determine whether the solutions for each quadratic equation are correct. Use the quadratic formula to verify that the solutions are correct or to show that they are not correct.

**a** Equation:  $x^2 - x - 56 = 0$

Solutions:  $x = -7$  or  $x = 8$

**Yes**

**b** Equation:  $x^2 + 4x - 45 = 0$

Solutions:  $x = -9$  or  $x = 5$

**No**

**c** Equation:  $2x^2 - 8x + 3 = 0$

Solutions:  $x = \frac{4 + \sqrt{10}}{2}$  or  $x = \frac{4 - \sqrt{10}}{2}$

**Yes**

- 4.** For each equation, identify the values of  $a$ ,  $b$ , and  $c$ .

**a**  $24 + 2x - x^2 = 0$

**a = -1, b = 2, c = 24**

**b**  $\frac{3}{4}x^2 - 8x = \frac{1}{4}$

**a =  $\frac{3}{4}$  (or equivalent), b = -8, c =  $-\frac{1}{4}$  (or equivalent)**

**c**  $x^2 = 100$

**a = 1, b = 0, c = -100**

**d**  $5x - 2x^2 = -19$

**a = -2, b = 5, c = 19**

- 5.** Solve each quadratic equation using the quadratic formula. Show your thinking.

a)  $x^2 + 5x - 36 = 0$

$x = -9$  or  $x = 4$

b)  $2x^2 + 9x - 35 = 0$

$x = \frac{5}{2}$  (or equivalent) or  $x = -7$

c)  $2x^2 - 16x + 30 = 0$

$x = 3$  or  $x = 5$

d)  $x^2 + 8x + 4 = 0$

$x = -4 - \frac{\sqrt{48}}{2}$  (or equivalent) or  $x = -4 + \frac{\sqrt{48}}{2}$  (or equivalent)

- 6.** Solve each quadratic equation using any strategy.

a)  $x^2 - 2x - 63 = 0$

$x = -7$  or  $x = 9$

b)  $2x^2 + 18x + 40 = 0$

$x = -4$  or  $x = -5$

c)  $4x^2 - 45x + 11 = 0$

$x = \frac{1}{4}$  (or equivalent) or  $x = 11$

d)  $3x^2 + 15x - 2 = 0$

$x = \frac{-15 - \sqrt{246}}{6}$  (or equivalent) or  $x = \frac{-15 + \sqrt{246}}{6}$  (or equivalent)

- 7.** Diego is solving  $5x^2 - x - 8 = 0$  using the quadratic formula. His work is shown. Are his solutions correct? Explain your thinking.

No; Sample response: In the second line, Diego wrote  $-1$  for  $(-1)^2$  rather than  $1$ . The correct solutions are

$x = 1 + \frac{\sqrt{161}}{10}$  or  $x = 1 - \frac{\sqrt{161}}{10}$ .

Diego's work:

$$x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(5)(-8)}}{2(5)}$$

$$x = \frac{1 \pm \sqrt{-1 + 160}}{10}$$

$$x = \frac{1 + \sqrt{159}}{10} \text{ or } x = \frac{1 - \sqrt{159}}{10}$$

# Additional Practice | Answer Key

## Unit 8 | Lesson 15

Name: ..... Date: ..... Period: .....

### Additional Practice

8.15

**1.** For each equation, identify the values of  $a$ ,  $b$ , and  $c$ .

- $2x^2 + 5x + 1 = 0$   
 $a = 2, b = 5, c = 1$
- $-4x^2 + 3x + 6 = 0$   
 $a = -4, b = 3, c = 6$
- $x^2 - 7x + 4 = 0$   
 $a = 1, b = -7, c = 4$
- $-x^2 + 10x - 8 = 0$   
 $a = -1, b = 10, c = -8$

**2.** What are the values of  $x$  if  $x = \frac{7 \pm \sqrt{49 - (-72)}}{4}$ ?

- 0 and  $-\frac{9}{2}$
- 0 and 1
- 1 and  $\frac{9}{2}$
- $-\frac{9}{2}$  and 1

**3.** Determine whether the solutions for each quadratic equation are correct. Use the quadratic formula to verify that the solutions are correct or to show that they are not correct.

- Equation:  $x^2 - x - 56 = 0$  Solutions:  $x = -7$  or  $x = 8$   
Yes
- Equation:  $x^2 + 4x - 45 = 0$  Solutions:  $x = -9$  or  $x = 5$   
No
- Equation:  $2x^2 - 8x + 3 = 0$  Solutions:  $x = \frac{4 + \sqrt{10}}{2}$  or  $x = \frac{4 - \sqrt{10}}{2}$   
Yes

**4.** For each equation, identify the values of  $a$ ,  $b$ , and  $c$ .

- $24 + 2x - x^2 = 0$   
 $a = -1, b = 2, c = 24$
- $\frac{3}{4}x^2 - 8x = \frac{1}{4}$   
 $a = \frac{3}{4}$  (or equivalent),  $b = -8$ ,  $c = -\frac{1}{4}$  (or equivalent)
- $x^2 = 100$   
 $a = 1, b = 0, c = -100$
- $5x - 2x^2 = -19$   
 $a = -2, b = 5, c = 19$

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Name: ..... Date: ..... Period: .....

**5.** Solve each quadratic equation using the quadratic formula. Show your thinking.

- $x^2 + 5x - 36 = 0$   
 $x = -9$  or  $x = 4$
- $2x^2 + 9x - 35 = 0$   
 $x = \frac{5}{2}$  (or equivalent) or  $x = -7$
- $2x^2 - 16x + 30 = 0$   
 $x = 3$  or  $x = 5$
- $x^2 + 8x + 4 = 0$   
 $x = -4 - \frac{\sqrt{48}}{2}$  (or equivalent) or  $x = -4 + \frac{\sqrt{48}}{2}$  (or equivalent)

**6.** Solve each quadratic equation using any strategy.

- $x^2 - 2x - 63 = 0$   
 $x = -7$  or  $x = 9$
- $2x^2 + 18x + 40 = 0$   
 $x = -4$  or  $x = -5$
- $4x^2 - 45x + 11 = 0$   
 $x = \frac{1}{4}$  (or equivalent) or  $x = 11$
- $3x^2 + 15x - 2 = 0$   
 $x = -15 - \frac{\sqrt{246}}{6}$  (or equivalent) or  $x = \frac{-15 + \sqrt{246}}{6}$  (or equivalent)

**7.** Diego is solving  $5x^2 - x - 8 = 0$  using the quadratic formula. His work is shown. Are his solutions correct? Explain your thinking.

**No. Sample response:** In the second line, Diego wrote  $-1$  for  $(-1)^2$  rather than  $1$ . The correct solutions are  $x = 1 + \frac{\sqrt{161}}{10}$  or  $x = 1 - \frac{\sqrt{161}}{10}$ .

**Diego's work:**  

$$x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(5)(-8)}}{2(5)}$$

$$x = \frac{1 \pm \sqrt{-1 + 160}}{10}$$

$$x = \frac{1 + \sqrt{159}}{10} \text{ or } x = \frac{1 - \sqrt{159}}{10}$$

**Unit 8 Lesson 15**      **246**      Additional Practice

### Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.REI.B.4.B
2	1	HSA.REI.B.4.B
3	2	HSA.REI.B.4.B
4	2	HSA.REI.B.4.B
5	2	HSA.REI.B.4.B
6	2	HSA.REI.B.4.B
7	3	HSA.REI.B.4.B

### Notes:

**Additional Practice****8.16**

- 1.** Select *all* the equations that have two solutions.

- |   |  |
|---|--|
| <input type="checkbox"/> A. $(x + 2)^2 = -4$                | <input type="checkbox"/> D. $(x + 5)^2 = 0$                  |
| <input checked="" type="checkbox"/> B. $(x - 7)^2 = 9$      | <input checked="" type="checkbox"/> E. $(x - 3)^2 = 1$       |
| <input checked="" type="checkbox"/> C. $(x - 8)^2 - 16 = 0$ | <input checked="" type="checkbox"/> F. $10 = (x + 6)(x + 6)$ |

- 2.** Evaluate the expression  $2x^2 - 3x + c$  when  $c = 4$  and  $x = 2$ .

- A. 0
- B. 2
- C. 4
- D.** 6

- 3.** An apple is launched into the air from a toy cannon. The function  $g(t) = -4.9t^2 + 40t + 6$  models the height, in meters, of the apple  $t$  seconds after it has been launched.

- a** Write an equation to determine when the apple will hit the ground.

**-4.9t<sup>2</sup> + 40t + 6 = 0 (or equivalent)**

- b** Use the quadratic formula to determine when the apple hits the ground. Round to the nearest thousandths.

**8.311 seconds**

- 4.** Two objects are launched into the air. The function  $h(t) = 45 + 130t - 16t^2$  models the height, in feet, of Object A  $t$  seconds after it has been launched. The function  $f(t) = 18 + 70t - 16t^2$  models the height, in feet, of Object B  $t$  seconds after it has been launched.

- a** After 5 seconds have passed, which object is still in the air?

**Object A**

- b** Write equations for each object to determine when each object will hit the ground.

**Object A: 45 + 130t - 16t<sup>2</sup> = 0 (or equivalent); Object B: 18 + 70t - 16t<sup>2</sup> = 0 (or equivalent)**

- c** Use the quadratic formula to determine when each object hits the ground. Round to the nearest thousandths.

**Object A: 8.458 seconds; Object B: 4.619 seconds**

- 5.** A picture is 10 in. wide, 15 in. long, and has a frame  $x$  in. thick surrounding it. The equation  $(10 + 2x)(15 + 2x) = 336$  represents the total area, in square inches, of a picture and its frame.

- a** Rewrite the equation  $(10 + 2x)(15 + 2x) = 336$  in standard form.

$$4x^2 + 50x - 186 = 0 \text{ (or equivalent)}$$

- b** Use the quadratic formula to solve your equation and determine the thickness of the frame.

**3 in.**

- 6.** A picture is 8 in. wide and 10 in. long. It has a frame around it that is of equal thickness all the way around. The equation  $(8 + 2x)(10 + 2x) = 195$  represents the total area, in square inches, of the picture and the frame.

- a** Rewrite the equation  $(8 + 2x)(10 + 2x) = 195$  in standard form.

$$4x^2 + 36x - 115 = 0 \text{ (or equivalent)}$$

- b** Solve your equation using the quadratic formula. What do the solutions represent?

**$x = -11.5$  and  $x = 2.5$  Sample response: Only the positive solution makes sense in this context. So, the thickness of the frame is 2.5 in.**

- 7.** A ball is thrown up into the air. Its height in inches is modeled by the function  $h(t) = -16t^2 + 28t + 3$ , where  $t$  is the time after the ball is thrown, measured in seconds. Solve the equation  $-16t^2 + 28t + 3 = 0$ . What do the solutions tell you about the ball?

**$t \approx -0.101$  and  $t \approx 1.851$ ; Sample response: The ball landed on the ground about 1.851 seconds after it was thrown up in the air. The negative solution does not make sense in this context.**

- 8.** A projectile is launched into the air and its height above the ground, in feet, is modeled by the function  $f(t) = 6 + 32t - 16t^2$ , where  $t$  is the number of seconds since the projectile was launched.

- a** What are the solutions to the equation  $0 = 6 + 32t - 16t^2$ ?

$$t \approx -0.173 \text{ and } t \approx 2.173$$

- b** Do both of the solutions have meaning in this context? Explain your thinking.

**No; Sample response: The negative value for time does not make sense in this context. The positive value means the projectile hits the ground about 2.173 seconds after it was launched.**

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

8.16

**1.** Select all the equations that have two solutions.

A.  $(x + 2)^2 = -4$   
 B.  $(x - 7)^2 = 9$   
 C.  $(x - 8)^2 - 16 = 0$   
 D.  $(x + 5)^2 = 0$   
 E.  $(x - 3)^2 = 1$   
 F.  $10 = (x + 6)(x + 6)$

**2.** Evaluate the expression  $2x^2 - 3x + c$  when  $c = 4$  and  $x = 2$ .

A. 0  
B. 2  
C. 4  
 D. 6

**3.** An apple is launched into the air from a toy cannon. The function  $g(t) = -4.9t^2 + 40t + 6$  models the height, in meters, of the apple  $t$  seconds after it has been launched.

a. Write an equation to determine when the apple will hit the ground.  
 $-4.9t^2 + 40t + 6 = 0$  (or equivalent)

b. Use the quadratic formula to determine when the apple hits the ground. Round to the nearest thousandths.  
**8.311 seconds**

**4.** Two objects are launched into the air. The function  $h(t) = 45 + 130t - 16t^2$  models the height, in feet, of Object A  $t$  seconds after it has been launched. The function  $f(t) = 18 + 70t - 16t^2$  models the height, in feet, of Object B  $t$  seconds after it has been launched.

a. After 5 seconds have passed, which object is still in the air?  
**Object A**

b. Write equations for each object to determine when each object will hit the ground.  
**Object A:  $45 + 130t - 16t^2 = 0$  (or equivalent); Object B:  $18 + 70t - 16t^2 = 0$  (or equivalent)**

c. Use the quadratic formula to determine when each object hits the ground. Round to the nearest thousandths.  
**Object A: 8.458 seconds; Object B: 4.619 seconds**

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**5.** A picture is 10 in. wide, 15 in. long, and has a frame  $x$  in. thick surrounding it. The equation  $(10 + 2x)(15 + 2x) = 336$  represents the total area, in square inches, of a picture and its frame.

a. Rewrite the equation  $(10 + 2x)(15 + 2x) = 336$  in standard form.  
 $4x^2 + 50x - 186 = 0$  (or equivalent)

b. Use the quadratic formula to solve your equation and determine the thickness of the frame.  
**3 in.**

**6.** A picture is 8 in. wide and 10 in. long. It has a frame around it that is of equal thickness all the way around. The equation  $(8 + 2x)(10 + 2x) = 195$  represents the total area, in square inches, of the picture and the frame.

a. Rewrite the equation  $(8 + 2x)(10 + 2x) = 195$  in standard form.  
 $4x^2 + 36x - 115 = 0$  (or equivalent)

b. Solve your equation using the quadratic formula. What do the solutions represent?  
 $x = -11.5$  and  $x = 2.5$  **Sample response:** Only the positive solution makes sense in this context. So, the thickness of the frame is 2.5 in.

**7.** A ball is thrown up into the air. Its height in inches is modeled by the function  $h(t) = -16t^2 + 28t + 3$ , where  $t$  is the time after the ball is thrown, measured in seconds. Solve the equation  $-16t^2 + 28t + 3 = 0$ . What do the solutions tell you about the ball?  
 **$t \approx -0.101$  and  $t \approx 1.851$ ; Sample response: The ball landed on the ground about 1.851 seconds after it was thrown up in the air. The negative solution does not make sense in this context.**

**8.** A projectile is launched into the air and its height above the ground, in feet, is modeled by the function  $f(t) = 6 + 32t - 16t^2$ , where  $t$  is the number of seconds since the projectile was launched.

a. What are the solutions to the equation  $0 = 6 + 32t - 16t^2$ ?  
 **$t \approx -0.173$  and  $t \approx 2.173$**

b. Do both of the solutions have meaning in this context? Explain your thinking.  
**No: Sample response: The negative value for time does not make sense in this context. The positive value means the projectile hits the ground about 2.173 seconds after it was launched.**

Unit 8 Lesson 16      248      Additional Practice

## Practice Problem Analysis

Problem	DOK	Standard(s)
1	1	HSA.REI.B.4.B
2	1	HSA.REI.B.4.B
3	2	HSA.REI.B.4.B
4	2	HSA.REI.B.4.B
5	2	HSA.REI.B.4.B
6	2	HSA.REI.B.4.B
7	3	HSA.REI.B.4.B
8	3	HSA.REI.B.4.B

## Notes:

**Additional Practice****8.17**

- 1.** Here are sums and products of rational and irrational numbers. Select *all* solutions that are rational numbers.

- A.  $\frac{1}{4} \cdot \sqrt{9}$   
 B.  $\sqrt{5} + \sqrt{9}$   
 C.  $2.6 + 5.3$

- D.  $-\sqrt{7} + \sqrt{7}$   
 E.  $\sqrt{16} \cdot \sqrt{4}$   
 F.  $6 + \sqrt{6}$

- 2.** Determine which of the following statements are *always true*, *true for some numbers*, or *never true*. Explain your thinking.

- a An irrational number multiplied by a rational number is always rational.

**True for some numbers. This is only true if the rational number is 0.**

- b Two rational numbers added together will always be rational.

**This is true for all numbers. There is no way to get an irrational number from adding two rational numbers.**

- c Multiplying an irrational number by another non-zero irrational number will result in an irrational number.

**This is true for some numbers. When an irrational number is multiplied by itself, it results in a rational number. For example,  $\sqrt{7} \cdot \sqrt{7} = \sqrt{49} = 7$**

- d The sum or a rational number and an irrational number is sometimes rational.

**This is not true for all numbers. There is no way to get an irrational number from adding two rational numbers.**

- 3.** Which of the following numbers will result in a rational number when multiplied by  $\sqrt{2}$ . Select *all* that apply.

- A. 2  
 B. 8  
 C.  $\frac{1}{2}$

- D.  $\sqrt{2}$   
 E.  $\sqrt{4}$   
 F.  $\sqrt{8}$

4. Which of the following examples show that the statement “The product of a rational number and an irrational number is irrational” is false?

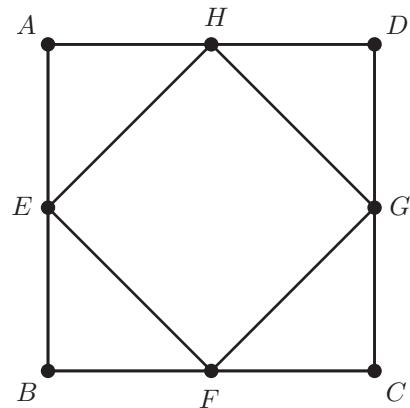
- A.  $\sqrt{7} \cdot \sqrt{7} = 7$
- B.  $2 \cdot \sqrt{2} = 2\sqrt{2}$
- C.  $\sqrt{4} \cdot \sqrt{16} = 8$
- D.  $\sqrt{7} \cdot 0 = 0$

5. Consider the sum  $\sqrt{2 + a}$  and the product  $b\sqrt{2}$ . Determine a value of  $a$  and  $b$  so both will result in a rational number.

**Sample response:** If  $a = -\sqrt{2}$ , then the sum will result in a rational number. If  $b = \sqrt{2}$ , then the product will result in a rational number.

6. Here are two squares  $ABCD$  and  $EFGH$ . If the length of side  $AB$  is 4 units, will the length of the diagonals of  $ABCD$  and  $EFGH$  be rational or irrational numbers? Explain your thinking.

**Sample response:** The length of the diagonal of  $ABCD$  will be an irrational number. Using the pythagorean theorem to calculate the diagonal  $AC$  results in a length of 4 $\sqrt{2}$  units, an irrational number. The length of the diagonal of  $EFGH$  will be 4 units, a rational number. I know it is 4 units because the diagonal is the same length as the side of a square.



7. Here are two quadratic equations,  $f(x) = x^2 + 6x + 8$  and  $g(x) = x^2 + 4x + 3$ . Which of the following represents the sum of the zeros of  $f(x)$  and  $g(x)$ ?

- A.  $-6$
- B.  $-10$
- C.  $-6 + \sqrt{2}$
- D.  $-10 + \sqrt{2}$

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

### Additional Practice

8.17

**1.** Here are sums and products of rational and irrational numbers. Select *all* solutions that are rational numbers.

A.  $\frac{1}{4} \cdot \sqrt{9}$        D.  $-\sqrt{7} + \sqrt{7}$   
 B.  $\sqrt{5} + \sqrt{9}$        E.  $\sqrt{16} \cdot \sqrt{4}$   
 C.  $2.6 + 5.3$        F.  $6 + \sqrt{6}$

**2.** Determine which of the following statements are *always true*, *true for some numbers*, or *never true*. Explain your thinking.

(a) An irrational number multiplied by a rational number is always rational.  
**True for some numbers. This is only true if the rational number is 0.**

(b) Two rational numbers added together will always be rational.  
**This is true for all numbers. There is no way to get an irrational number from adding two rational numbers.**

(c) Multiplying an irrational number by another non-zero irrational number will result in an irrational number.  
**This is true for some numbers. When an irrational number is multiplied by itself, it results in a rational number. For example,  $\sqrt{7} \cdot \sqrt{7} = \sqrt{49} = 7$**

(d) The sum of a rational number and an irrational number is sometimes rational.  
**This is not true for all numbers. There is no way to get an irrational number from adding two rational numbers.**

**3.** Which of the following numbers will result in a rational number when multiplied by  $\sqrt{2}$ . Select *all* that apply.

A. 2       D.  $\sqrt{2}$   
 B. 8       E.  $\sqrt{4}$   
 C.  $\frac{1}{2}$        F.  $\sqrt{8}$

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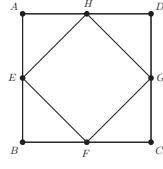
Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**4.** Which of the following examples show that the statement "The product of a rational number and an irrational number is irrational" is false?

A.  $\sqrt{7} \cdot \sqrt{7} = 7$   
B.  $2 \cdot \sqrt{2} = 2\sqrt{2}$   
C.  $\sqrt{4} \cdot \sqrt{16} = 8$   
 D.  $\sqrt{7} \cdot 0 = 0$

**5.** Consider the sum  $\sqrt{2+a}$  and the product  $b\sqrt{2}$ . Determine a value of  $a$  and  $b$  so both will result in a rational number.  
**Sample response: If  $a = -\sqrt{2}$ , then the sum will result in a rational number. If  $b = \sqrt{2}$ , then the product will result in a rational number.**

**6.** Here are two squares  $ABCD$  and  $EFGH$ . If the length of side  $AB$  is 4 units, will the length of the diagonals of  $ABCD$  and  $EFGH$  be rational or irrational numbers? Explain your thinking.  
**Sample response: The length of the diagonal of  $ABCD$  will be an irrational number. Using the pythagorean theorem to calculate the diagonal  $AC$  results in a length of units, an irrational number. The length of the diagonal of  $EFGH$  will be 4 units, a rational number. I know it is 4 units because the diagonal is the same length as the side of a square.**



**7.** Here are two quadratic equations,  $f(x) = x^2 + 6x + 8$  and  $g(x) = x^2 + 4x + 3$ . Which of the following represents the sum of the zeros of  $f(x)$  and  $g(x)$ ?

A. -6  
 B. -10  
C.  $-6 + \sqrt{2}$   
D.  $-10 + \sqrt{2}$

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### Practice Problem Analysis

Problem	DOK	Standard(s)
1	2	HSN.RN.B.3
2	2	HSN.RN.B.3
3	1	HSN.RN.B.3
4	2	HSN.RN.B.3
5	2	HSN.RN.B.3
6	3	HSN.RN.B.3
7	3	HSN.RN.B.3, A.REI.B.4

### Notes: