Part A: Introduction to Quadratic Functions

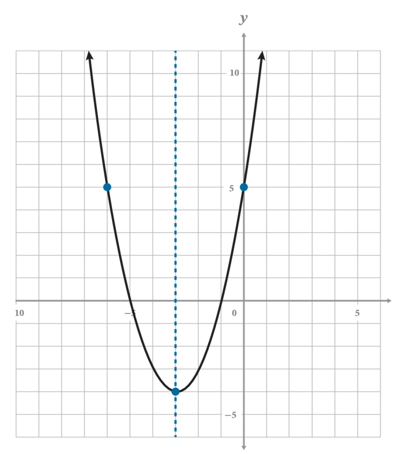
Practice 1

1.
$a = 3$; therefore, the graph opens upward and has a minimum vertex.

2.
$a = -\frac{4}{3}$; therefore, the graph opens downward and has a maximum vertex.

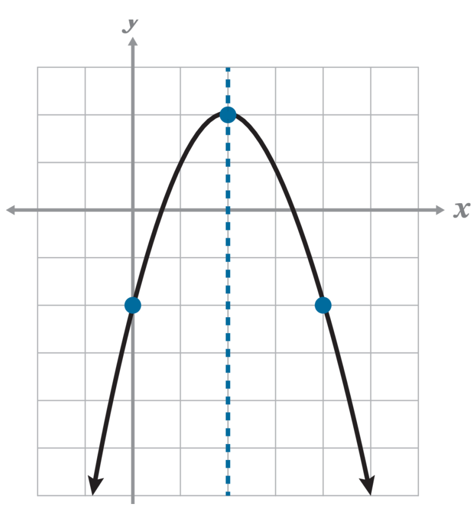
3.
$a = -1$; therefore, the graph opens downward and has a maximum vertex.

4.



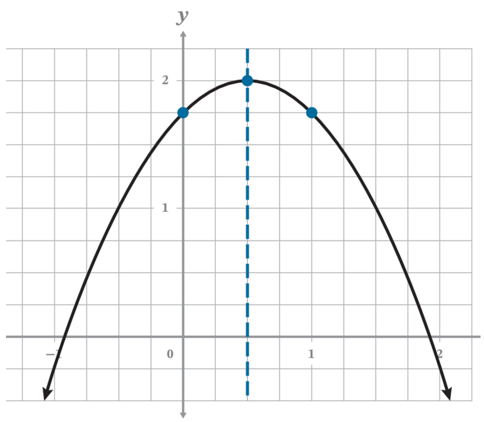
AoS:	$x = -3$
vertex:	(−3, −4)
y-intercept:	(0, 5)
symmetric to y-intercept:	(−6, 5)
solutions(s):	(−5, 0) and (−1, 0)

5.



AoS:	$x = 2$
vertex:	(2, 2)
y-intercept:	(0, −2)
symmetric to y-intercept:	(4, −2)
solution(s):	(0.518, 0) and (3.414, 0)

6.



AoS:	$x = \frac{1}{2}$
vertex:	$\left(\frac{1}{2}, 2\right)$
y-intercept:	$\left(0,\ 1\frac{3}{4}\right)$ or $\left(0,\ \frac{7}{4}\right)$
symmetric to y-intercept:	$\left(1,\ 1\frac{3}{4}\right)$ or $\left(1,\ \frac{7}{4}\right)$

7.

direction:	down
vertex:	max
AoS:	$-\left(\frac{14}{2(-1)}\right) = \frac{-14}{-2} = 7$
vertex (Aos, y):	$y = -(7)^2 + 8(7) - 11$ $y = -49 + 56 - 11$ $y = -4$ $(7, -4)$
(0, y-int)	$(0, -11)$

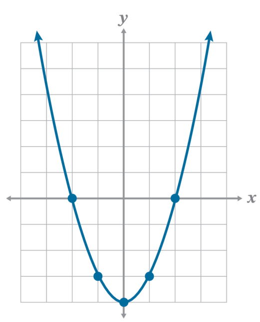
8.

direction:	up
vertex:	min
AoS:	$-\left(\frac{8}{2\cdot 4}\right) = -1$
vertex (Aos, y):	$y = 4(-1)^2 + 8(-1) + 15$ $y = 4 - 8 + 15$ $y = 11$ $(-1, 11)$
(0, y-int)	$(0, 15)$

9.

direction:	up
vertex:	min
AoS:	$-\left(\frac{1}{2\left(\frac{1}{2}\right)}\right) = \frac{-1}{1} = -1$
vertex (Aos, y):	$y = \frac{1}{2}(-1) + (-1)^2$ $y = -\frac{1}{2} - 1$ $y = -1\frac{1}{2} = -\frac{3}{2}$ $\left(-1, -\frac{3}{2}\right)$
(0, y-int)	(0, 0)

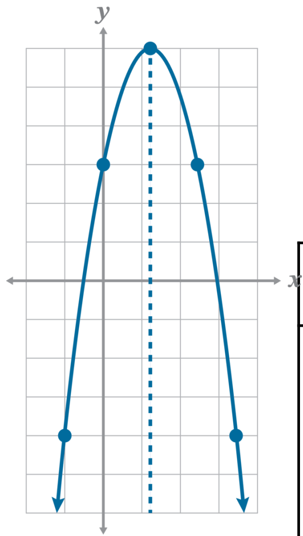
10.



vertex: (0, −4)
y-int: (0, −4)
solutions: (−2, 0) and (2, 0)

AoS	$-\left(\frac{0}{2\cdot 1}\right) = 0$
vertex (Aos, y):	$y = (0)^2 - 4 = -4$ (0, 4)
(0, y-int)	(0, −4)
solutions	$x^2 - 4 = 0$ $(x+2)(x-2) = 0$ $x = -2, 2$ Solutions: (−2, 0) and (2, 0)

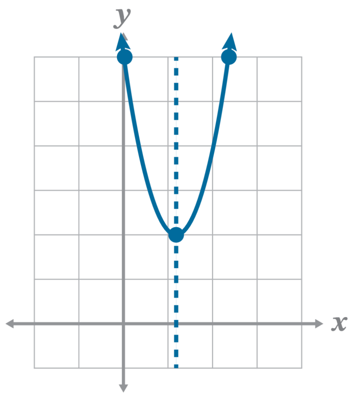
11.



vertex: $\left(\frac{5}{4}, \frac{49}{8}\right)$ or $(1.25, 6.125)$
y-int: (0, 3)
symmetric to y-int: (2.5, 3)
solutions: (−0.5, 0) and (3, 0)

AoS	$-\left(\frac{5}{2\cdot(-2)}\right) = \frac{5}{4}$
vertex (Aos, y):	$y = -2\left(\frac{5}{4}\right)^2 + 5\left(\frac{5}{4}\right) + 3$ $y = -2\left(\frac{25}{16}\right) + \frac{25}{4} + 3$ $\left(\frac{5}{4}, \frac{49}{8}\right)$
(0, y-int)	(0, 3)
solutions	$-2x^2 + 5x + 3 = 0$ $-\left(2x^2 - 5x - 3\right) = 0$ $-(2x + 1)(x - 3) = 0$ $x = -\frac{1}{2}, 3$ Solutions: $(-\frac{1}{2}, 0)$ and (3, 0)

12.



vertex: $\left(\frac{7}{6}, \frac{23}{12}\right)$
y-int: $(0,\ 6)$
symmetric to y-int: $\left(\frac{7}{3},\ 6\right)$
solutions: no real solutions

AoS	$-\left(\frac{-7}{2\cdot 3}\right) = \frac{7}{6}$
vertex (Aos, y):	$y = 3\left(\frac{7}{6}\right)^2 - 7\left(\frac{7}{6}\right) + 6$ $y = 3\left(\frac{49}{36}\right) - \frac{49}{6} + 6$ $y = \frac{23}{12}$ $\left(\frac{7}{6}, \frac{23}{12}\right)$
(0, y-int)	$(0,\ 6)$
solutions	no real solutions (does not cross the x-axis)

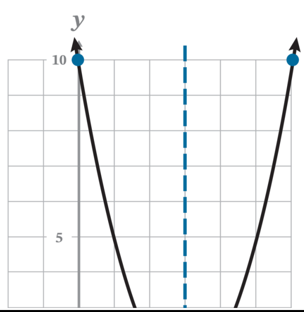
Practice 2

1.
$a = \frac{1}{8}$; therefore, the graph opens upward and has a minimum vertex.

2.
$a = 2$; therefore, the graph opens upward and has a minimum vertex.

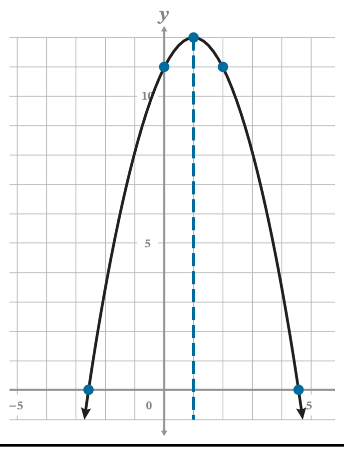
3.
$a = -0.65$; therefore, the graph opens downward and has a maximum vertex.

4.



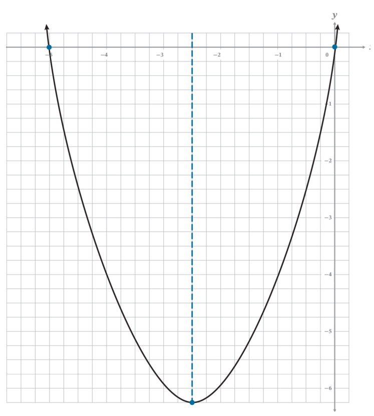
AoS:	$x = 3$
vertex:	(3, 1)
y-intercept:	(0, 10)
symmetric to y-intercept:	(6, 10)
solution(s):	none

5.



AoS:	$x = 1$
vertex:	(1, 12)
y-intercept:	(0, 11)
symmetric to y-intercept:	(2, 11)
solution(s)	(−2.464, 0) and (4.464, 0)

6.



AoS:	$x = -2\frac{1}{2}$
vertex:	$\left(-2\frac{1}{2},\ -6\frac{1}{4}\right)$ or $\left(-\frac{5}{2}, -\frac{25}{4}\right)$
y-intercept:	(0, 0)
symmetric to y-intercept:	(−5, 0)
solution(s):	(0, 0) and (−5, 0)

7.

direction:	up
vertex:	min
AoS:	$-\left(\frac{3}{2\cdot6}\right) = -\frac{3}{12} = -\frac{1}{4}$
vertex (Aos, y):	$y = 6\left(-\frac{1}{4}\right)^2 + 3\left(\frac{1}{4}\right) + 13$ $y = \frac{6}{16} - \frac{3}{4} + 13$ $y = \frac{3}{8} - \frac{6}{8} + 13$ $y = \frac{101}{8}$ $\left(-\frac{1}{4}, \frac{101}{8}\right)$
(0, y-int)	(0, 13)

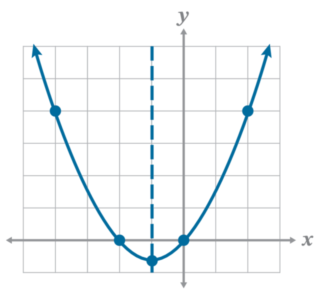
8.

direction:	down
vertex:	max
AoS:	$-\left(\frac{-6}{2(-1)}\right) = \ -3$
vertex (Aos, y):	$y = \ -(-3)^2 - 6(-3) - 1$ $y = \ -(9) + 18 - 1$ $y = 8$ $(-3, 8)$
(0, y-int)	(0, −1)

9.

direction:	up
vertex:	min
AoS:	$-\left(\frac{0}{2\left(\frac{2}{3}\right)}\right) = 0$
vertex (Aos, y):	$y = \frac{2}{3}(0)^2 + 5$ $y = 0 + 5$ $y = 5$ (0, 5)
(0, y-int)	(0, 5)

10.

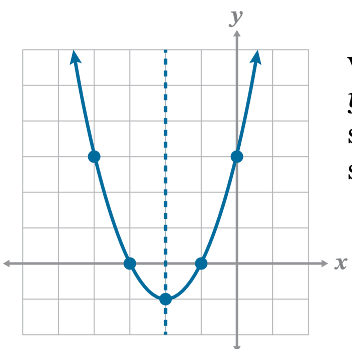


vertex: $\left(-1, -\frac{1}{2}\right)$
y-int: (0, 0)
symmetric to y-int: (−2, 0)
solutions: (0, 0), and (−2, 0)

AoS	$-\left(\frac{1}{2 \cdot \frac{1}{2}}\right) = -1$
vertex (Aos, y):	$y = \frac{1}{2}(-1)^2 + (-1)$ $y = \frac{1}{2} - 1$ $y = \ -\frac{1}{2}$ $\left(-1, -\frac{1}{2}\right)$
(0, y-int)	$(0, 0)$

solutions	$\frac{1}{2}x^2 + x = 0$ $x\left(\frac{1}{2}x + 1\right) = 0$ $x = 0, -2$ (0, 0), and (−2, 0)

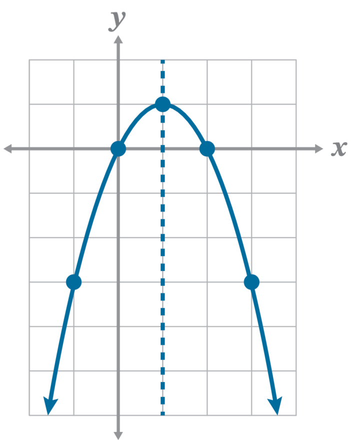
11.



vertex: (−2, −1)
y-int: (0, 3)
symmetric to *y*-int: (−4, 3)
solutions: (−3, 0) and (−1, 0)

AoS	$-\left(\frac{4}{2\cdot1}\right) = -2$
vertex (Aos, *y*):	$y = (-2)^2 + 4(-2) + 3$ $y = 4 - 8 + 3$ $y = -1$ $(-2, -1)$
(0, *y*-int)	$(0, 3)$
solutions	$x^2 + 4x + 3 = 0$ $(x + 3)(x + 1) = 0$ $x = -3, -1$ (-3, 0), and (−1, 0)

12.



vertex: (1, 1)
y-int: (0, 0)
symmetric to *y*-int: (2, 0)
solutions: (0, 0) and (2, 0)

AoS	$-\left(\frac{2}{2\cdot(-1)}\right)=1$
vertex (Aos, y):	$y=-(1)^2+2(1)$ $y=-1+2$ $y=1$ $(1,\ 1)$
(0, y-int)	$(0,\ 0)$
solutions	$-x^2+2x=0$ $-x(x-2)=0$ $x=0,\ 2$ (0, 0), and (2, 0)

Part B: Graphical Solutions to Quadratic Functions

Practice 1

1. $x=-1.14, 6.14$

2. $x=-14.446, -0.554$

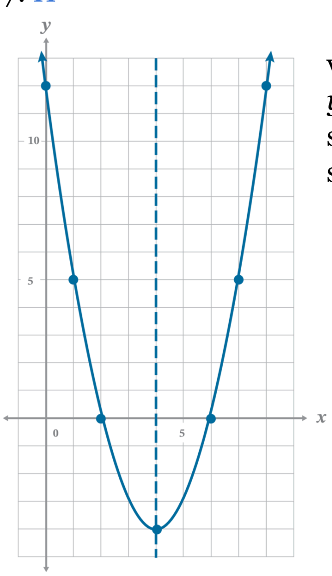
3. $x=-1.205, 6.761$

4. $x=0$

5. $x=-0.529, 17.029$

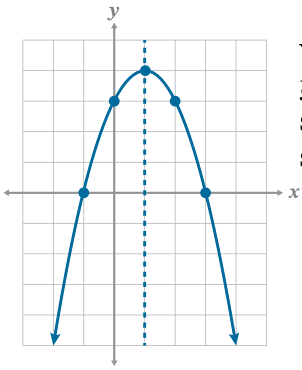
6. no real solution

7. H



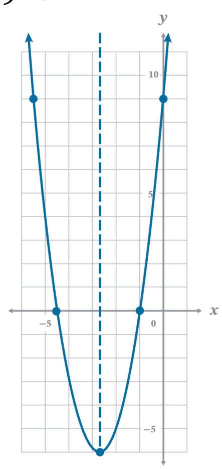
vertex: (4, −4)
y-int: (0, 12)
symmetric to y-int: (8, 12)
solutions: (2, 0) and (6, 0)

8. G



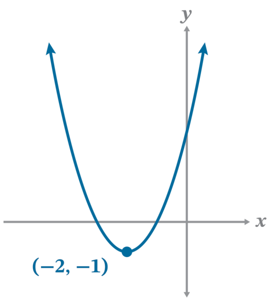
vertex: (1, 4)
y-int: (0, 3)
symmetric to y-iny: (2, 3)
solutions: (−1, 0) and (3, 0)

9. J



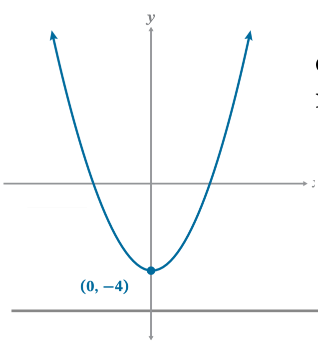
vertex: $\left(-\frac{11}{4}, \ -\frac{49}{8}\right)$ or (−2.75, −6.125)
y-int: (0, 9)
symmetric to y-int: (−5.5, 9)
solutions: (−4.5, 0) and (−1, 0)

10. D



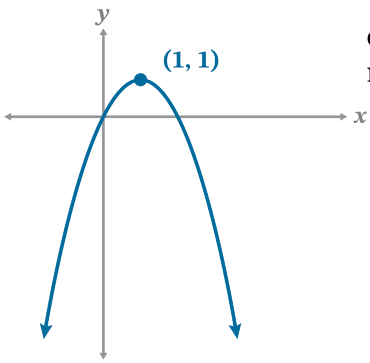
domain: $(-\infty, \infty)$
range: $[-1, \infty)$

11. E



domain: $(-\infty, \infty)$
range: $[-4, \infty)$

12. F



domain: $(-\infty, \infty)$
range: $(-\infty, 1]$

Practice 2

1. $x = -3.193, 2.193$

2. $x = -1.5, 2$

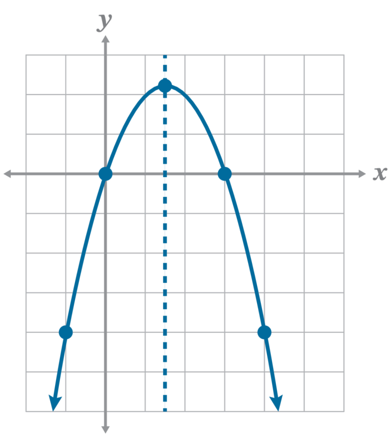
3. $x = 0.125, 39.875$

4. $x = 0.453, 1.261$

5. no real solutions

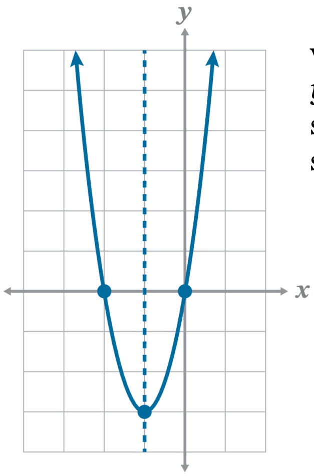
6. $x = -4.886, -0.614$

7. M



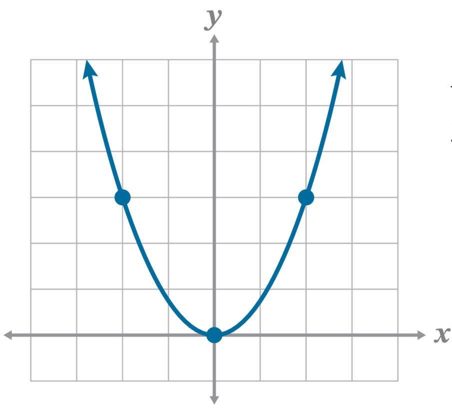
vertex: $\left(\frac{3}{2}, \frac{9}{4}\right)$ or (1.5, 2.25)
y-int (0, 0)
symmetric to y-int: (3, 0)
solutions: (0, 0) and (3, 0)

8. K



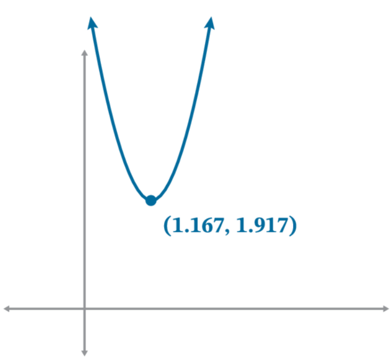
vertex: (−1, −3)
y-int: (0, 0)
symmetric to y-int: (−2, 0)
solutions: (−2, 0) and (0, 0)

9. N



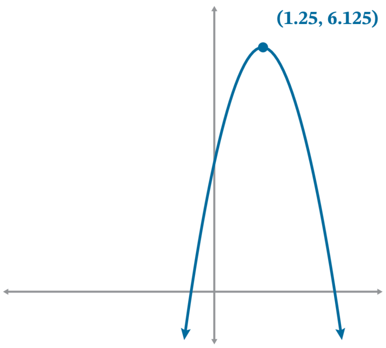
vertex: (0, 0)
y-int (0, 0)
solution: (0, 0)

10. C



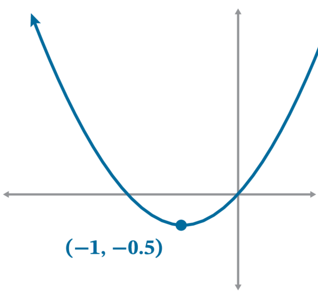
domain: $(-\infty, \infty)$
range: $[\frac{23}{12}, \infty)$

11. A



domain: $(-\infty, \infty)$
range: $(-\infty, 6.125]$

12. B



domain: $(-\infty, \infty)$
range: $[-0.5, \infty)$

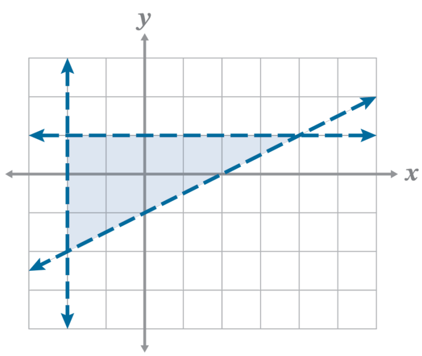
Targeted Review

Problem	1	2	3	4	5	6	7	8	9	10	11	12
Lesson Origin	24	24	15	15	19	8	8, 12	19	25	25	PA, 1	1

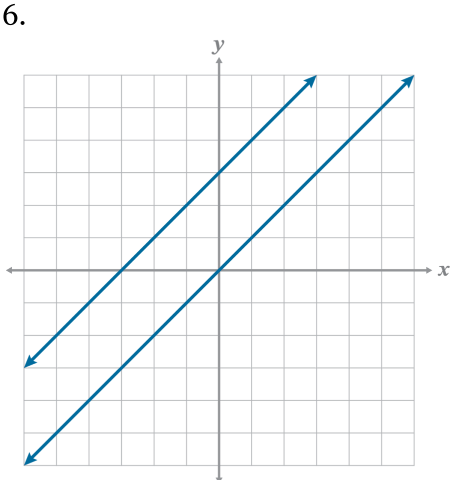
1.
$5(x^2 + 7x - 1)$

2.
$\frac{1}{2}(x^2 + 7x + 10)$
$\frac{1}{2}(x + 5)(x + 2)$

3.
$y > 2x - 3$

4.


5.
$3^{2+5}y^{6+3}$
3^7y^9

6.


7.
The new function's equation is $y = x + 3$, or $g(x) = x + 3$. The two functions are parallel lines.

8.
$A = lw;\ l = 3xy^5;\ w = 11y$
$A = (3xy^5)(11y)$
$A = 33xy^6$ square units

9.
$x(x + 2) = 80$
The variable x represents the first even whole number, $(x + 2)$ represents the next even whole number, and 80 is the product of the factors.

10.
$$x(x + 2) = 80$$
$$x^2 + 2x = 80$$
$$x^2 + 2x - 80 = 0$$
$$(x + 10)(x - 8) = 0$$
$$x + 10 = 0,\ x - 8 = 0$$
$$x = -10, 8$$

The solution −10 is extraneous because it is not a whole number. When $x = 8$, $x + 2 = 10$.
The numbers for the equation are 8 and 10 because whole numbers must be positive.

11.
☑ $x^2 + 3x$
☐ -3
☐ $6x - 3y$
☑ $4x + 3y + 2z$
Distractor Rationale:
The value −3 is a constant. It has no variable, so it cannot be a coefficient.
The coefficients in $6x - 3y$ are 6 and −3.

12.
☑ $2x - 5 + 3x$
☑ $(x^2 + 11x) - (x^2 + 2)$
☑ $14x + 63y$
☐ x^3y^8
Distractor Rationale:
The final expression is one term because the variables are multiplied together. Terms are separated by addition and subtraction symbols.