

Symbols study guide

Answer Section

SHORT ANSWER

1. ANS:

The expressions are not equivalent. Using the Distributive Property, students will find that the first equation is $2x + 8 + 4$ or $2x + 12 \neq 2x + 8$. Students may also make a graph or table to show that the values for each expression are not the same. If they use a graph, they will graph two parallel lines.

PTS: 1 DIF: L2 REF: Say It With Symbols | Check Up 1

OBJ: Investigation 1: Equivalent Expressions

NAT: CC 8.EE.7 | CC 8.EE.7.a | CC 8.EE.7.b | CC 8.G.9 | NAEP G2c

TOP: Problem 1.2 Determining Equivalence

KEY: simplifying expressions | equivalent expressions | distribute

2. ANS:

$$9x + 10 = 12x - 11$$

Subtract $9x$ from each side.

$$10 = 3x - 11$$

Add 11 to each side.

$$21 = 3x$$

Divide each side by 3.

$$7 = x$$

PTS: 1 DIF: L2 REF: Say It With Symbols | Check Up 2

OBJ: Investigation 3: Solving Equations

NAT: CC 8.EE.7 | CC 8.EE.7.b | CC 8.G.9 | NAEP G2e | NAEP G2f

TOP: Problem 3.1 Solving Linear Equations

KEY: solve | equation

3. ANS:

a. Solutions: $x = 0$ or $x = 10$

Students may find these by observing the points on the graph where the y -value is zero. Or they may make a table.

b. $y = x^2 - 10x = x(x - 10)$. If $y = 0$, then $0 = x(x - 10)$. For the product to equal 0, $x = 0$ or $x - 10 = 0$. Thus, $x = 0$ or $x = 10$.

PTS: 1 DIF: L2 REF: Say It With Symbols | Check Up 2

OBJ: Investigation 3: Solving Equations

NAT: CC 8.EE.7 | CC 8.EE.7.b | CC 8.G.9 | NAEP G2e | NAEP G2f

TOP: Problem 3.4 Solving Quadratic Equations

KEY: x-intercepts | solve | quadratic equation | graph

4. ANS:

a. Answers will vary. Some possibilities are

$$P = 120n - n^2 - 50n \text{ or}$$

$$P = 70n - n^2$$

b. If $70n - n^2 = 0$, then $n(70 - n) = 0$. This is equivalent to $n = 0$ or $n = 70$. Thus the travel agent's profit will equal zero if there are 0 or 70 passengers.

PTS: 1 DIF: L2 REF: Say It With Symbols | Check Up 2

OBJ: Investigation 3: Solving Equations

NAT: CC 8.EE.7 | CC 8.EE.7.b | CC 8.G.9 | NAEP G2e | NAEP G2f

TOP: Problem 3.1 Solving Linear Equations

KEY: equivalent expressions | equivalent equations | solve | quadratic equation

5. ANS:

Tua divided the trapezoid into two triangles with height h , one with base a , one with base b . The area of the trapezoid is equal to the sum of the areas of the triangles.

Sam added an identical trapezoid to make a parallelogram with base $a + b$ and height h ; the area of the parallelogram is $(a + b)h$, which is double the area of the trapezoid.

Carlos cut the trapezoid horizontally and rearranged the pieces to make a parallelogram with base $b + a$ and height $\frac{1}{2}h$.

PTS: 1 DIF: L2 REF: Say It With Symbols | Partner Quiz

OBJ: Investigation 2: Generating Expressions

NAT: CC 8.EE.7 | CC 8.EE.7.a | CC 8.EE.7.b | CC 8.G.9 | NAEP G2c

TOP: Problem 1.3 Interpreting Expressions | Problem 1.1 Writing Equivalent Expressions | Problem 1.2 Determining Equivalence

KEY: trapezoid | area

6. ANS:

Tua's method: $\frac{1}{2}bh + \frac{1}{2}ah$

Sam's method: $\frac{(b+a)h}{2}$

Carlos's method: $(b+a)\frac{1}{2}h$

PTS: 1 DIF: L2 REF: Say It With Symbols | Partner Quiz

OBJ: Investigation 2: Generating Expressions

NAT: CC 8.EE.7 | CC 8.EE.7.a | CC 8.EE.7.b | CC 8.G.9 | NAEP G2c

TOP: Problem 1.3 Interpreting Expressions | Problem 1.1 Writing Equivalent Expressions | Problem 1.2 Determining Equivalence

KEY: trapezoid | area

7. ANS:

Students might show that each expression is equivalent to $\frac{1}{2}h(a + b)$:

$$\text{Tua's method: } \frac{1}{2}ah + \frac{1}{2}bh = \frac{1}{2}h(a + b)$$

$$\text{Sam's method: } \frac{(b + a)h}{2} = \frac{1}{2}(b + a)h = \frac{1}{2}h(b + a) = \frac{1}{2}h(a + b)$$

$$\text{Carlos's method: } (b + a)\left(\frac{h}{2}\right) = \frac{1}{2}h(b + a) = \frac{1}{2}h(a + b)$$

PTS: 1 DIF: L2 REF: Say It With Symbols | Partner Quiz

OBJ: Investigation 2: Generating Expressions

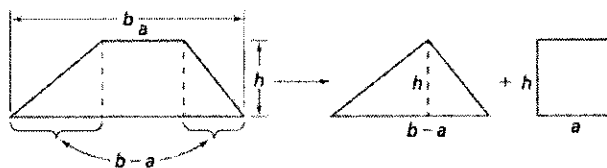
NAT: CC 8.EE.7 | CC 8.EE.7.a | CC 8.EE.7.b | CC 8.G.9 | NAEP G2c

TOP: Problem 1.3 Interpreting Expressions | Problem 1.1 Writing Equivalent Expressions | Problem 1.2 Determining Equivalence

KEY: trapezoid | area

8. ANS:

- a. Natasha's drawing may have shown the trapezoid is divided into three sections by two vertical lines. The area of the trapezoid is equal to the area of a triangle with base $b - a$ and height h , plus a rectangle with base a and height h . The area of the trapezoid is $\frac{1}{2}(b - a)h + ha$.



- b. Natasha's expression is equivalent to the three other expressions because it is equivalent to $\frac{1}{2}h(a + b)$:

$$\begin{aligned} \frac{1}{2}h(b - a) + ha &= \frac{1}{2}hb - \frac{1}{2}ha + ha \\ &= \frac{1}{2}hb + \frac{1}{2}ha \\ &= \frac{1}{2}h(b + a) \\ &= \frac{1}{2}h(a + b) \end{aligned}$$

PTS: 1 DIF: L2 REF: Say It With Symbols | Partner Quiz

OBJ: Investigation 2: Generating Expressions

NAT: CC 8.EE.7 | CC 8.EE.7.a | CC 8.EE.7.b | CC 8.G.9 | NAEP G2c

TOP: Problem 1.2 Determining Equivalence

KEY: area | trapezoid

9. ANS:

Students may use any of the above expressions. $\frac{1}{2}h(a + b)$:

$$\frac{1}{2}(10)(9 + 15) = 5(24) = 120 \text{ cm}^2$$

PTS: 1

DIF: L2

REF: Say It With Symbols | Partner Quiz

OBJ: Investigation 2: Generating Expressions

NAT: CC 8.EE.7 | CC 8.EE.7.a | CC 8.EE.7.b | CC 8.F.2

TOP: Problem 2.3 Using Equations

KEY: trapezoid | area

10. ANS:

- The total volume is equal to $50(5 + 4)$ or $(50 \times 5) + (50 \times 4)$.
- The expression $50(5 + 4)$ represents the area of the base multiplied by the total height of the cylinder. The expression $(50 \times 5) + (50 \times 4)$ reoresents the volume of the water in the cylinder, plus the volume of the rest of the cylinder.
- 450 cm^3

PTS: 1

DIF: L2

REF: Say It With Symbols | Unit Test

OBJ: Investigation 2: Generating Expressions

NAT: CC 8.EE.7 | CC 8.EE.7.a | CC 8.EE.7.b | CC 8.F.2

TOP: Problem 2.3

KEY: volume | cylinder

11. ANS:

- The equations $15x + 13(14 - x) = 198$ or $15x + 182 - 13x = 198$ could be used. In the equation $15x + 13(14 - x) = 198$, $15x$ represents the cost of each gift certificate, \$15, multiplied by the number of gift certificates, x , that Abe bought. The expression $13(14 - x)$ represents the cost of each stuffed animal, \$13, multiplied by the number of stuffed animals, $14 - x$, that Abe bought. The number of stuffed animals is written as $14 - x$ because 14 performers receive a prize and x is the number of gift certificates purchased. Using the Distributive Property, $15x + 13(14 - x) = 15x + 182 - 13x$.
- Abe bought 8 gift certificates.

$$15x + 13(14 - x) = 198$$

$$15x + 182 - 13x = 198$$

$$2x = 16$$

$$x = 8$$

PTS: 1

DIF: L2

REF: Say It With Symbols | Unit Test

OBJ: Investigation 3: Solving Equations

NAT: CC 8.EE.C.7 | CC 8.EE.C.7b | CC 8.F.A.1

TOP: Problem 3.1 KEY: equation

12. ANS:

$$\text{a. } x = -\frac{31}{2} \text{ or } -15\frac{1}{2}$$

$$\text{b. } x = -1$$

$$\text{c. } x = -3 \text{ or } x = -4$$

$$\text{d. } x = -3 \text{ or } x = 4$$

PTS: 1

DIF: L2

REF: Say It With Symbols | Unit Test

OBJ: Investigation 3: Solving Equations

NAT: CC 8.EE.C.7 | CC 8.EE.C.7b | CC 8.F.A.1

TOP: Problem 3.2 | Problem 3.4

KEY: equation

13. ANS:

C and E

PTS: 1 DIF: L2 REF: Say It With Symbols | Question Bank

OBJ: Investigation 3: Solving Equations

NAT: CC 8.EE.7 | CC 8.EE.7.b | CC 8.G.9 | NAEP G2e | NAEP G2f

TOP: Problem 3.3 Factoring Quadratic Expressions

KEY: equivalent equations | distribute | x-intercepts | table of values

14. ANS:

A and F

PTS: 1 DIF: L2 REF: Say It With Symbols | Question Bank

OBJ: Investigation 3: Solving Equations

NAT: CC 8.EE.7 | CC 8.EE.7.b | CC 8.G.9 | NAEP G2e | NAEP G2f

TOP: Problem 3.3 Factoring Quadratic Expressions

KEY: equivalent equations | distribute | x-intercepts | table of values

15. ANS:

D and H

PTS: 1 DIF: L2 REF: Say It With Symbols | Question Bank

OBJ: Investigation 3: Solving Equations

NAT: CC 8.EE.7 | CC 8.EE.7.b | CC 8.G.9 | NAEP G2e | NAEP G2f

TOP: Problem 3.3 Factoring Quadratic Expressions

KEY: equivalent equations | distribute | x-intercepts | table of values

16. ANS:

B and G

PTS: 1 DIF: L2 REF: Say It With Symbols | Question Bank

OBJ: Investigation 3: Solving Equations

NAT: CC 8.EE.7 | CC 8.EE.7.b | CC 8.G.9 | NAEP G2e | NAEP G2f

TOP: Problem 3.3 Factoring Quadratic Expressions

KEY: equivalent equations | distribute | x-intercepts | table of values

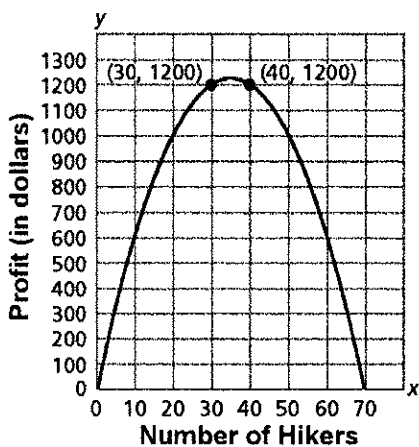
17. ANS:

- a. The question was some form of the following: "How many people must go on the hiking trip for my profit to be greater than \$1200?" The answer can be seen in the table below. (Note: Students may also interpret Rod's answer as including 30 and 40.)

n	P
30	1200
31	1209
32	1216
33	1221
34	1224
35	1225
36	1224
37	1221
38	1216
39	1209
40	1200

b. $n(120 - n) - 50n > 1200$

- c. Masako's profit will exceed \$1200 at the points on the graph above \$1200 on the profit axis, or for more than 30 people and fewer than 40 people.



PTS: 1

DIF: L2

REF: Say It With Symbols | Question Bank

OBJ: Investigation 2: Generating Expressions

NAT: CC 8.EE.7 | CC 8.EE.7.a | CC 8.EE.7.b | CC 8.F.2

TOP: Problem 2.3 Using Equations

KEY: writing equations | writing inequalities | graph | substitute | solve | linear equation

18. ANS:

a.

x	$y = 100 + 2x$	$y = 12x - 10$
8	116	86
9	118	98
10	120	110
⑪	122	122
12	124	134
13	126	146
14	128	158

b. Possible solution:

$$100 + 2x = 12x - 10$$

$$100 = 10x - 10$$

$$110 = 10x$$

$$11 = x$$

Check:

$$100 + 2(11) = 12(11) - 10$$

$$100 + 22 = 132 - 10$$

$$122 = 122$$

PTS: 1 DIF: L2 REF: Say It With Symbols | Question Bank

OBJ: Investigation 3: Solving Equations

NAT: CC 8.EE.7 | CC 8.EE.7.b | CC 8.G.9 | NAEP G2e | NAEP G2f

TOP: Problem 3.4 Solving Quadratic Equations

KEY: table | solve | linear equation

19. ANS:

a, b.

x	$y = x^2 - 5x$
-2	14
-1	6
0	0
1	-4
2	-6
3	-6
4	-4
5	0
6	6
7	14
8	24

c. $x^2 - 5x = 0$

$x(x - 5) = 0$

$x = 0$ or $x = 5$

d. The solution(s) to a quadratic equation can be determined from a graph by finding the x -value(s) of the points where the graph crosses the x -axis.

PTS: 1 DIF: L2 REF: Say It With Symbols | Question Bank

OBJ: Investigation 3: Solving Equations

NAT: CC 8.EE.7 | CC 8.EE.7.b | CC 8.G.9 | NAEP G2e | NAEP G2f

TOP: Problem 3.4 Solving Quadratic Equations

KEY: table | quadratic equation | solve

20. ANS:

Many solution paths are possible for each equation. One sample is shown for each.

a. $9.5x = 38$ (subtract 12.5 from each side)

$$x = 4 \text{ (divide each side by 9.5)}$$

b. $3x(x + 4) = 0$ (use the Distributive Property to factor the expression)

$$x = 0 \text{ and } x = -4 \text{ (use the Zero Product Property)}$$

c. $x + 4 = 0$ when $x = -4$, and $3x - 6 = 0$ when $x = 2$, so the original equation has roots -4 and 2 .

d. $18x + 30 = 8 + 2x$ (use the Distributive Property)

$$16x = -22 \text{ (subtract } 2x \text{ and } 30 \text{ from both sides)}$$

$$x = \frac{-22}{16} = -1\frac{3}{8} \text{ or } x = -1.375$$

PTS: 1 DIF: L2 REF: Say It With Symbols | Question Bank

OBJ: Investigation 3: Solving Equations

NAT: CC 8.EE.7 | CC 8.EE.7.b | CC 8.G.9 | NAEP G2e | NAEP G2f

TOP: Problem 3.4 Solving Quadratic Equations

KEY: linear equation | quadratic equation | solve

21. ANS:

Equivalent expressions give the same value for any given values of the variables involved.

PTS: 1 DIF: L2 REF: Say It With Symbols | Question Bank

OBJ: Investigation 1: Equivalent Expressions

NAT: CC 8.EE.7 | CC 8.EE.7.a | CC 8.EE.7.b | CC 8.G.9 | NAEP G2c

TOP: Problem 1.2 Determining Equivalence

KEY: equivalent expressions

22. ANS:

$$P = 2L + 2W \text{ and } P = 2(L + W)$$

PTS: 1 DIF: L2 REF: Say It With Symbols | Additional Practice Investigation 1

OBJ: Investigation 1: Equivalent Expressions

NAT: CC 8.EE.7 | CC 8.EE.7.a | CC 8.EE.7.b | CC 8.G.9 | NAEP G2c

TOP: Problem 1.1 Writing Equivalent Expressions

KEY: perimeter

23. ANS:

a. $L = 2W = 2(1.5) = 3$

b. $P = 2L + 2W = 2(4) + 2(2) = 12$

c. $P = 2(2W) + 2W$ and $P = 6W$

PTS: 1 DIF: L2 REF: Say It With Symbols | Additional Practice Investigation 1
 OBJ: Investigation 1: Equivalent Expressions
 NAT: CC 8.EE.7 | CC 8.EE.7.a | CC 8.EE.7.b | CC 8.G.9 | NAEP G2c
 TOP: Problem 1.2 Determining Equivalence KEY: perimeter

24. ANS:

$$14(6.5) - 38 = 53 \text{ m}^2$$

PTS: 1 DIF: L2 REF: Say It With Symbols | Additional Practice Investigation 1
 OBJ: Investigation 1: Equivalent Expressions
 NAT: CC 8.EE.7 | CC 8.EE.7.a | CC 8.EE.7.b | CC 8.G.9 | NAEP G2c
 TOP: Problem 1.2 Determining Equivalence KEY: area

25. ANS:

$$A = WL - Q$$

PTS: 1 DIF: L2 REF: Say It With Symbols | Additional Practice Investigation 1
 OBJ: Investigation 1: Equivalent Expressions
 NAT: CC 8.EE.7 | CC 8.EE.7.a | CC 8.EE.7.b | CC 8.G.9 | NAEP G2c
 TOP: Problem 1.3 Interpreting Expressions KEY: area

26. ANS:

a. $P = 120 + x^2 - (200 + 11x)$, which is equivalent to $P = -80 + x^2 - 11x$

b. To break even the profit would be zero dollars. By guessing and checking or using a graphing calculator to make a table, we have that $x = 16$ gives a profit of zero.

c. 20 videos must be sold to make a profit of \$100.

d. For part (b), a table can be used by looking for the corresponding x -value when $P = 0$. In the graphing calculator, the P is represented by y , the dependent variable. A graph can be used by tracing the line and finding the corresponding x -value for the point that crosses the x -axis (the point with a y -value of 0). For part (c), using a table, you look for the x -value that corresponds to a y -value of 100. Using a graph, you trace the line until you reach the point with a y -value of 100 and look at what the value for x is at this point.

PTS: 1 DIF: L2 REF: Say It With Symbols | Additional Practice Investigation 2
 OBJ: Investigation 2: Generating Expressions
 NAT: CC 8.EE.7 | CC 8.EE.7.a | CC 8.EE.7.b | CC 8.F.2 TOP: Problem 2.3 Using Equations
 KEY: writing equations | substitute

27. ANS:

- a. The minimum point is $(-2, -4)$.
- b. $(-6, 0)$ and $(2, 0)$
- c. $(0, -3)$
- d. No; the parabola opens upward, not downward.
- e. No; this is a linear equation.
- f. No; the line $y = -6$ is below the minimum point.

PTS: 1 DIF: L2 REF: Say It With Symbols | Additional Practice Investigation 3

OBJ: Investigation 3: Solving Equations

NAT: CC 8.EE.7 | CC 8.EE.7.b | CC 8.G.9 | NAEP G2e | NAEP G2f

TOP: Problem 3.3 Factoring Quadratic Expressions

KEY: x-intercepts | y-intercepts | coordinate | parabola | quadratic equation

28. ANS:

- a. 36 m^2
- b. When $l = 8$, $w = 20 - 8 = 12$, so $A = 8(12) = 96 \text{ m}^2$.
- c. width = 5 m, length = 15 m
- d. width = 8 m, length = 12 m
- e. width = 7.5 m, length = 12.5 m

PTS: 1 DIF: L2 REF: Say It With Symbols | Additional Practice Investigation 3

OBJ: Investigation 3: Solving Equations

NAT: CC 8.EE.7 | CC 8.EE.7.b | CC 8.G.9 | NAEP G2e | NAEP G2f

TOP: Problem 3.4 Solving Quadratic Equations

KEY: area | substitute | evaluate expressions

29. ANS:

- a. $4(5^2) = 100 \text{ ft}$
- b. $4(10^2) = 400 \text{ ft}$
- c. The car is 0 ft from the light because it has not yet begun to move.

PTS: 1 DIF: L2 REF: Say It With Symbols | Additional Practice Investigation 4

OBJ: Investigation 4: Looking Back at Functions

NAT: CC 8.EE.7.b | CC 8.F.3 | CC 8.F.4 | CC 8.F.5 | CC 8.G.9 TOP: Problem 4.2 Linear Exponential

KEY: evaluate expressions | substitute

30. ANS:

a. $\frac{80}{20} = \$4$

b. $\frac{94}{20} = \$4.70$

c. There are 20 nickels in 1 dollar, so the number of nickels divided by 20 gives the number of dollars.

PTS: 1 DIF: L2 REF: Say It With Symbols | Additional Practice Investigation 4
 OBJ: Investigation 4: Looking Back at Functions
 NAT: CC 8.EE.7.b | CC 8.F.3 | CC 8.F.4 | CC 8.F.5 | CC 8.G.9 TOP: Problem 4.2 Linear Exponential
 KEY: evaluate expressions | substitute

MULTIPLE CHOICE

1. ANS: B PTS: 1 DIF: L2
 REF: Say It With Symbols | Multiple-Choice Items OBJ: Investigation 3: Solving Equations
 NAT: CC 8.EE.7 | CC 8.EE.7.b | CC 8.G.9 | NAEP G2e | NAEP G2f
 TOP: Problem 3.4 Solving Quadratic Equations
 KEY: x-intercepts | linear equation | quadratic equation
2. ANS: B PTS: 1 DIF: L2
 REF: Say It With Symbols | Multiple-Choice Items
 OBJ: Investigation 1: Equivalent Expressions
 NAT: CC 8.EE.7 | CC 8.EE.7.a | CC 8.EE.7.b | CC 8.G.9 | NAEP G2c
 TOP: Problem 1.2 Determining Equivalence KEY: equivalent expressions
3. ANS: A PTS: 1 DIF: L2
 REF: Say It With Symbols | Multiple-Choice Items
 OBJ: Investigation 5: Reasoning with Symbols
 NAT: CC 8.EE.C.7a | NAEP A2b | NAEP A4b
 TOP: Problem 5.2 Odd and Even Revisited KEY: odd numbers | writing expressions
4. ANS: A PTS: 1 DIF: L2
 REF: Say It With Symbols | Multiple-Choice Items OBJ: Investigation 3: Solving Equations
 NAT: CC 8.EE.7 | CC 8.EE.7.b | CC 8.G.9 | NAEP G2e | NAEP G2f
 TOP: Problem 3.4 Solving Quadratic Equations
 KEY: solve | linear equation | quadratic equation
5. ANS: C PTS: 1 DIF: L2
 REF: Say It With Symbols | Skills Practice Investigation 2
 OBJ: Investigation 2: Generating Expressions
 NAT: CC 8.EE.7 | CC 8.EE.7.a | CC 8.EE.7.b | CC 8.F.2
 TOP: Problem 2.2 Substituting Equivalent Expressions
 KEY: Addition and Subtraction Properties of Equality | Multiplication and Division Properties of Equality | equations with variables on both sides | equivalent equations | inverse operations | multi-step equation | multi-part question

6. ANS: A PTS: 1 DIF: L2
REF: Say It With Symbols | Skills Practice Investigation 3 OBJ: Investigation 3: Solving Equations
NAT: CC 8.EE.7 | CC 8.EE.7.b | CC 8.G.9 | NAEP G2e | NAEP G2f
TOP: Problem 3.3 Factoring Quadratic Expressions
KEY: polynomial | greatest common factor in a polynomial | factoring out a monomial
7. ANS: C PTS: 1 DIF: L1
REF: Say It With Symbols | Skills Practice Investigation 3 OBJ: Investigation 3: Solving Equations
NAT: CC 8.EE.7 | CC 8.EE.7.b | CC 8.G.9 | NAEP G2e | NAEP G2f
TOP: Problem 3.4 Solving Quadratic Equations
KEY: factoring | solving quadratic equations
8. ANS: A PTS: 1 DIF: L1
REF: Say It With Symbols | Skills Practice Investigation 3 OBJ: Investigation 3: Solving Equations
NAT: CC 8.EE.7 | CC 8.EE.7.b | CC 8.G.9 | NAEP G2e | NAEP G2f
TOP: Problem 3.4 Solving Quadratic Equations
KEY: factoring | solving quadratic equations
9. ANS: C PTS: 1 DIF: L1
REF: Say It With Symbols | Skills Practice Investigation 3 OBJ: Investigation 3: Solving Equations
NAT: CC 8.EE.7 | CC 8.EE.7.b | CC 8.G.9 | NAEP G2e | NAEP G2f
TOP: Problem 3.4 Solving Quadratic Equations
KEY: factoring | solving quadratic equations
10. ANS: A PTS: 1 DIF: L3
REF: Say It With Symbols | Skills Practice Investigation 4
OBJ: Investigation 4: Looking Back at Functions
NAT: CC 8.EE.7.b | CC 8.F.3 | CC 8.F.4 | CC 8.F.5 | CC 8.G.9 TOP: Problem 4.2 Linear Exponential
KEY: graphing a nonlinear function