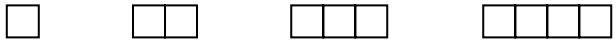
Name _____ Date _____ Class _____

Additional Practice

Investigation 1

Thinking With Mathematical Models

1. Toothpicks were used to make the pattern below.



a. How many toothpicks will be in the 5th figure? In the 6th figure?

b. Write an equation for the number of toothpicks t needed to make the nth figure.

c. Identify and describe the figure in this pattern that can be made with exactly 100 toothpicks.

d. Describe the pattern in words.

e. Make a graph of the data.

f. Is the pattern linear or not linear? Explain.

2. Toothpicks were used to make the pattern below.

a. How many toothpicks will be in the 5th figure? In the 6th figure?

b. Write an equation for the number of toothpicks t needed to make the nth figure.

Additional Practice *(continued)*

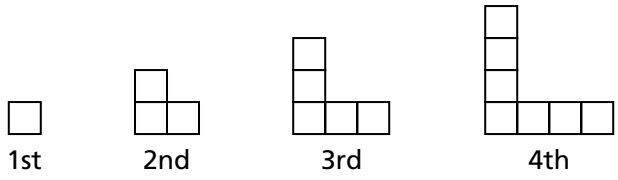
c. Identify and describe the figure in this pattern that can be made with exactly 61 toothpicks.

d. Describe the pattern in words.

e. Make a graph of the data.

f. Is the pattern linear or not linear? Explain.

3. Square tiles were used to make the pattern below.



a. How many tiles will be in the 5th figure? In the 6th figure?

b. Write an equation for the number of tiles t needed to make the nth figure.

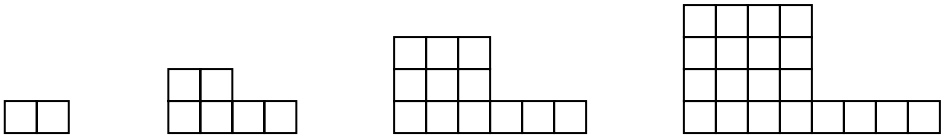
c. Identify and describe the figure in this pattern that can be made with exactly 25 tiles.

d. Describe the pattern in words.

e. Make a graph of the data.

f. Is the pattern linear or not linear? Explain.

4. Square tiles were used to make the pattern below.



a. How many tiles will be in the 5th figure? In the 6th figure?

b. Write an equation for the number of tiles t needed to make the nth figure.

c. Identify and describe the figure in this pattern that can be made with exactly 420 tiles.

d. Describe the pattern in words.

e. Make a graph of the data.

f. Is the pattern linear or not linear? Explain.

Additional Practice *(continued)*

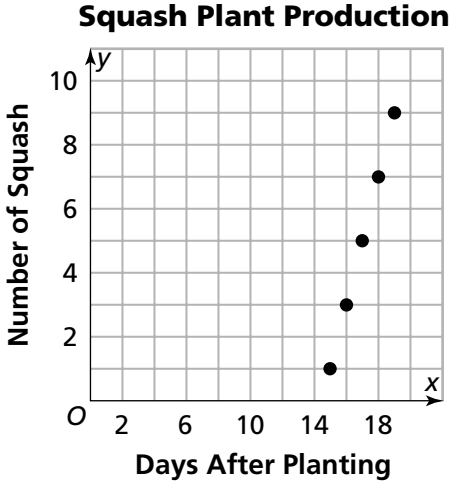
5. a. Make a graph of the data. Draw a line to show the trend and write an equation for the line. This group used construction paper for their bridges.

Bridge-Thickness Data

Thickness (layers)	1	2	3	4	5	6
Breaking Weight (pennies)	24	38	50	67	78	93

b. Predict the breaking weight of a bridge made from 14 layers of construction paper.

6. a. Complete the table using the graph:



Day	15	16	17	18	19
Total Number of Squash					

b. If the pattern continues, what is the total number of squash that would be produced by day 22? By day 26?

Additional Practice *(continued)*

c. Describe the pattern in words. What can you say about the number of squash produced each day?

d. Describe the pattern with an equation. What does the coefficient of x mean in this situation?

7. Betty went to the store to buy pepper. There were three different jars on the shelf:

1 ounce jar costs $0.65, 4 ounce jar costs $1.40, 8 ounce jar costs $2.40

a. Make a table and draw a graph for these data.

b. Predict the cost of 2 ounces, 3 ounces, and 6 ounces.

c. Describe the pattern in words. What can you say about the cost of a jar? What can you say about the cost of an ounce of pepper alone?

d. Describe the pattern with an equation. What information do the variables and numbers represent?

Name _____ Date _____ Class _____

Skill: Patterns and Predictions

Investigation 1

Thinking With Mathematical Models

Complete each table.

1.

Time (h)	1	2	3	4	7
Distance cycled (mi)	8	16	24	32	

2.

Time (min)	1	2	3	4	7
Distance from surface of water (yd)	−3	−2	−1	0	

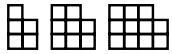
For Exercises 3–4, find the values of the missing entries in each table.

3.

m	4	6		10
n	24	26	28	

4.

p		6	10	14
q	1	13	25	

5. A pattern of squares is shown. 

a. Sketch the 4th and 5th figure in this pattern.

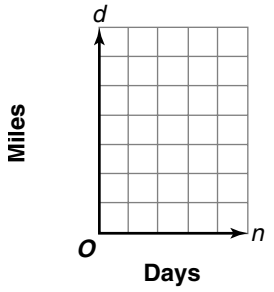
b. Make a table comparing the figure number to the number of squares. Write an expression for the number of squares in the *n*th figure.

Skill: Patterns and Predictions *(continued)*

Make a table for each function. Then graph the function. Show only the portion that makes sense for each situation.

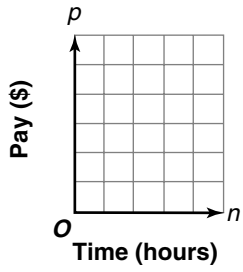
6. On a trip Alex averages 300 mi/day. The distance d he covers is a function of the number of days n.

n				
d				



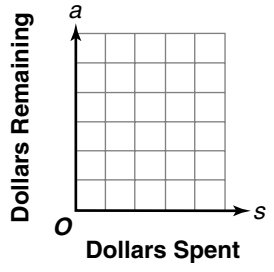
7. Suppose you earn \$7 per hour. The number of hours you work n determines your pay p.

n				
p				



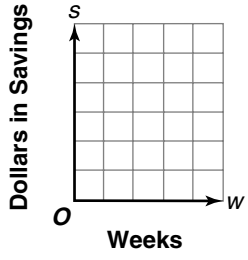
8. Suppose you have \$50. The amount of money you spend s decreases the amount you have left a.

s				
a				



9. You have \$10.00. Each week you save \$2.50. The number of weeks you save w increases your savings s.

w				
s				



Name _____ Date _____ Class _____

Skill: Solving Equations

Investigation 1

Solve each equation.

1. $4r + 6 = 14$

2. $9y - 11 = 7$

3. $\frac{m}{4} + 6 = 3$

4. $-5b - 6 = -11$

5. $\frac{v}{-7} + 8 = 19$

6. $15w - 21 = -111$

7. $7 - 2n = n - 14$

8. $3d + 8 = 2d - 7$

9. $7x - 8 = 3x + 12$

10. $6k - 25 = 7 - 2k$

Skill: Solving Equations *(continued)*

For Exercises 11–14, solve each equation. Check your answer.

11. $3h - 5h + 11 = 17$

12. $7g + 14 - 5g = -8$

13. $4 = 0.4(3d - 5)$

14. $\frac{2}{3}g + \frac{1}{2}g = 14$

15. The perimeter of a pool table is 30 feet. The table is twice as long as it is wide. What is the length ℓ of the pool table? Write an equation to model the situation. Then solve the equation for ℓ.

Name _____ Date _____ Class _____

Additional Practice

Investigation 2

Thinking With Mathematical Models

For Exercises 1–4, write an equation and sketch a graph for the line that meets the given conditions.

1. A line with slope 3.5 and y-intercept $(0, 4)$

2. A line with slope $\frac{3}{2}$ that passes through the point $(-2, 0)$

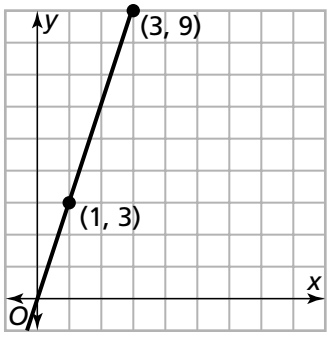
3. A line that passes through the points $(2, 7)$ and $(6, 15)$

4. A line that passes through the points $(2, 1)$ and $(6, 9)$

Additional Practice *(continued)*

For Exercises 5–8, write an equation for the line shown. Identify the slope and *y*-intercept.

5.



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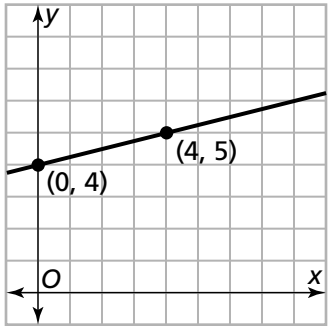
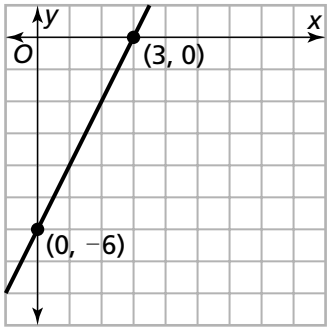
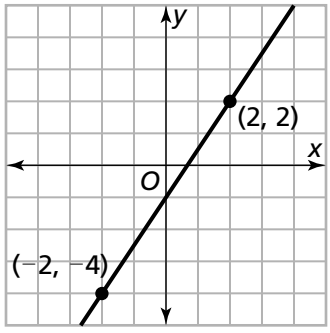


7.



8.



9. For parts (a)–(c), write an equation and sketch a graph for the line that meets the given conditions. Use one set of axes for all three graphs.

a. A line with slope $\frac{2}{3}$ and *y*-intercept $(0, 0)$

b. A line with slope $\frac{2}{3}$ that passes through the point $(6, 6)$

c. A line with slope $\frac{2}{3}$ that passes through the point $(6, 2)$

d. What do you notice about the equations and graphs of the three lines?

Additional Practice *(continued)*

10. For parts (a)–(c), write an equation and sketch a graph for a line that meets the given conditions. Use one set of axes for all three graphs.

a. A line with slope 3 and y-intercept $(0, 5)$

b. A line parallel to the line drawn in part (a) with a y-intercept greater than 5

c. A line parallel to the line drawn in parts (a) and (b) with a y-intercept less than 5

d. What do you notice about the equations and graphs of the three lines?

For Exercises 11–12, write an equation and sketch a graph for the line that meets the given conditions.

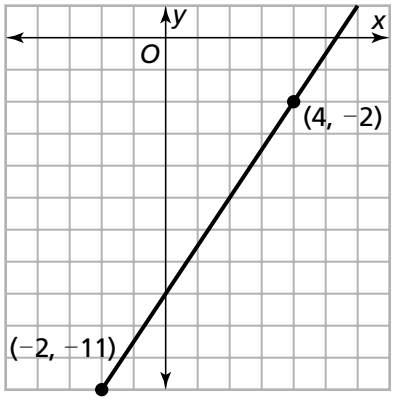
11. A line with slope $-\frac{15}{5}$ that passes through the point $(-2.5, 4.5)$

12. A line that passes through the points $(2, -9)$ and $(-2, 3)$

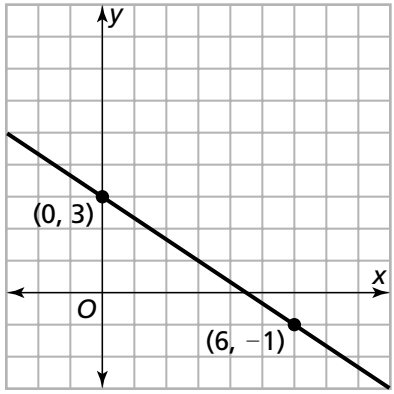
Additional Practice *(continued)*

For Exercises 13–14, write an equation for the line shown. Identify the slope and *y*-intercept.

13.



14.



15. For parts (a)–(c), write an equation and sketch a graph for the line that meets the given conditions. Use one set of axes for all three graphs.

a. A line with slope -2 and y-intercept $(0, 0)$

b. A line with slope -2 that passes through the point $(3, -3)$

c. A line with slope -2 that passes through the point $(3, -9)$

d. What do you notice about the equations and graphs of the three lines?

Additional Practice *(continued)*

16. For parts (a)–(c), write an equation and sketch a graph for a line that meets the given conditions. Use one set of axes for all three graphs.

a. A line with slope $-\frac{1}{2}$ and y-intercept $(0, 3)$

b. A line parallel to the line drawn in part (a) with a y-intercept greater than 3

c. A line parallel to the line drawn in parts (a) and (b) with a y-intercept less than 3

d. What do you notice about the equations and graphs of the three lines?

17. a. Predict how high a stack of 10 cups would be.

Stack of Styrofoam Cups

Number of Cups	1	2	3	4
Height of the Stack of Cups (cm)	7	8	9	10

b. Describe the pattern in words.

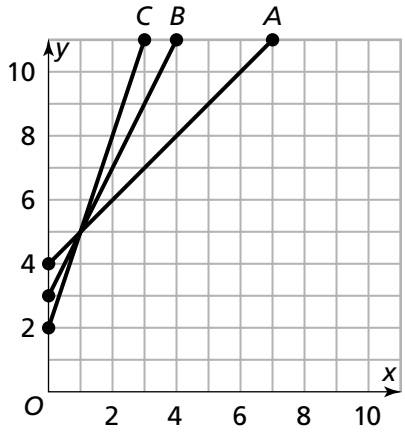
c. Describe the pattern with an equation. Let x represent the number of cups and h the height.

d. What does the coefficient of x mean in this context? Does it have a unit of measure? Explain.

e. What does the constant term mean in this context? Does it have a unit of measure? Explain.

Additional Practice *(continued)*

18. To the right are the graphs of three lines.



a. Match each line with its rule.

$y = x + 4$ $y = 2x + 3$ $y = 3x + 2$

b. For each equation, what are the y-values when $x = 3$? When $x = 4$?

c. Why are the y-values "farther apart" when $x = 4$ than when $x = 3$?

19. Find exact solutions for each of these equations.

a. $9 - x = 3x - 7$ **b.** $3.6x + 2.4 = 2.1x - 0.6$

20. Find at least three values of x for which the inequality is true.

a. $5x - 3 \leq 12$ **b.** $8x - 1 \leq 4x + 7$

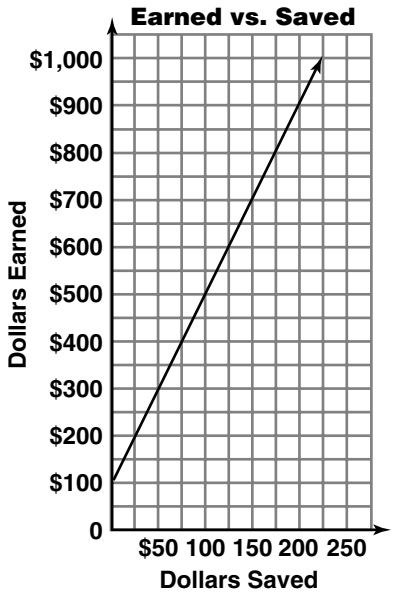
Name _____ Date _____ Class _____

Skill: Using Linear Models

Investigation 2

Thinking With Mathematical Models

For Exercises 1–5, use the graph at the right.



1. What earnings will produce $225 in savings?

2. How much is saved from earnings of $400?

3. What is the slope of the line in the graph?

4. For each increase of $200 in earnings, what is the increase in savings?

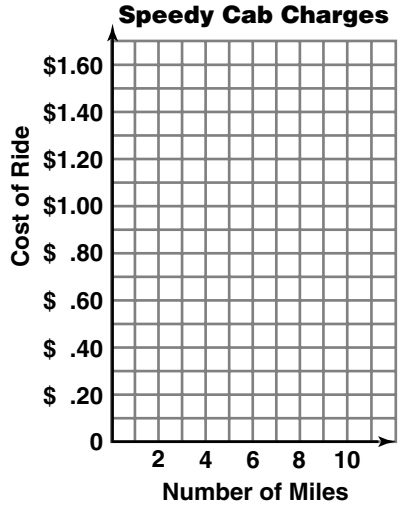
5. Write an equation for the line.

6. A ride in a cab costs $0.40 plus $0.15 per mile.

a. Write and graph an equation for traveling x miles in the cab.

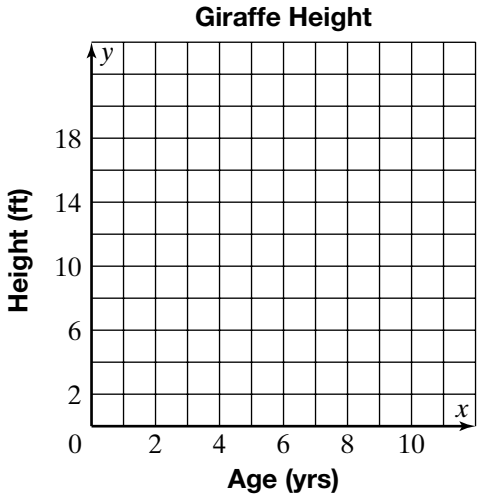
b. The cab charges $0.70 for a ride of how many miles?

c. How much does the cab charge for a trip of 8 miles?



Skill: Using Linear Models *(continued)*

A giraffe was 1 foot tall at birth, 7 feet tall at the age of 4, and $11\frac{1}{2}$ feet tall at the age of 7.



7. Plot the data.

8. Draw a line that models the pattern in the data.

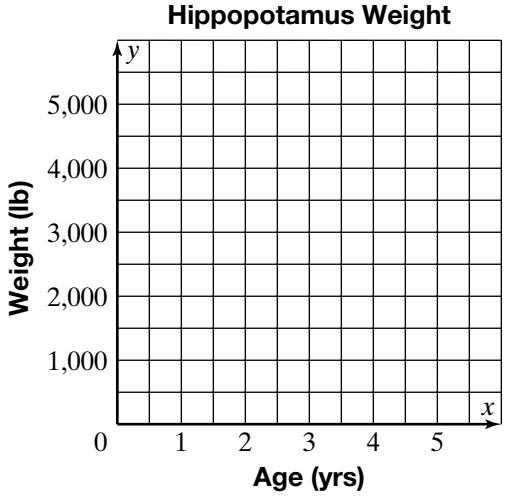
9. Write an equation for your line.

10. Use your equation to find the following information.

a. the giraffe's height at the age of 5

b. the age at which the giraffe was 16 ft tall

A hippopotamus weighed 700 pounds at the age of 1, 1,900 pounds at the age of 3, and 2,500 pounds at the age of 4.



11. Plot the data.

12. Draw a line that models the pattern in the data.

13. Write an equation for your line.

14. Use the equation to predict the following information.

a. the hippo's weight at the age of 8

b. the age at which the hippo weighed 7,900 pounds

Name _____ Date _____ Class _____

Skill: Writing Equations of Lines

Investigation 2

Thinking With Mathematical Models

Write an equation for the line through the given points or through the given point with the given slope.

1. $(5, 7), (6, 8)$

2. $(-2, 3)$; slope $= -1$

3. $(1, 2), (3, 8)$

4. $(-2, 3)$; slope $= 4$

5. $(4, 7)$; slope $= \frac{3}{2}$

6. $(6, -2)$; slope $= -\frac{4}{3}$

7. $(0, 5), (-3, 2)$

8. $(8, 11), (6, 16)$

Skill: Writing Equations of Lines *(continued)*

Is the relationship shown by the data linear? If it is, model the data with an equation.

9.

x	*y*
2	3
3	7
4	11
5	15

10.

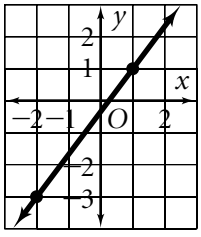
x	*y*
−3	4
−1	6
1	7
3	10

11.

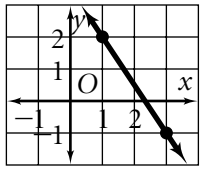
x	*y*
−2	5
3	−5
7	−13
11	−21

Write an equation of each line.

12.



13.



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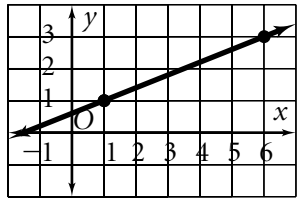

Name _____ Date _____ Class _____

Skill: Solving Inequalities

Investigation 2

Thinking With Mathematical Models

Determine whether each number is a solution of the given inequality.

1. $x \leq -8$	**a.** -10	**b.** 6	**c.** -8
2. $-1 > x$	**a.** 0	**b.** -3	**c.** -6
3. $w < \frac{18}{7}$	**a.** 5	**b.** -2	**c.** $3\frac{1}{2}$
4. $0.65 \geq y$	**a.** 0.43	**b.** -0.65	**c.** 0.56
5. $2y + 1 > -5$	**a.** -4	**b.** -2	**c.** 4
6. $7x - 14 \leq 6x - 16$	**a.** 0	**b.** -4	**c.** 2
7. $n(n - 6) \geq -4$	**a.** 3	**b.** -2	**c.** 5

Write an inequality for each situation.

8. Everyone in the class is under 13 years old. Let x be the age of a person in the class.

9. The speed limit is 60 miles per hour. Let s be the speed of a car driving within the limit.

10. You have \$4.50 to spend on lunch. Let c be the cost of your lunch.

Additional Practice

1. Suppose you are designing a rectangular garden with an area of 350 square feet.

a. What perimeters can you make the garden using whole numbers? For each perimeter, give the length and the width.

b. Suppose you know the length L of a rectangle with an area of 350 square feet. Write an equation that would help you to determine the width W.

c. Suppose you know the width W of a rectangle with an area of 350 square feet. Write an equation that would help you to determine the length L.

d. Make a graph using the equation you wrote in part (b). Explain what your graph is showing.

2. Use only the first quadrant of the coordinate grid for this problem. If you are using a graphing calculator, set your window to show x and y values from 0 to 10 with a scale of 1. Show each graph on the same set of axes.

a. Graph the equation $y = \frac{10}{x}$ for x values from 1 to 10.
For which value of x (from 1 to 10) is y the greatest?
For which value of x is y the least?

b. Graph the equation $y = 10x$ for x values from 1 to 10.
For which value of x (from 1 to 10) is y the greatest?
For which value of x is y the least?

c. Compare the greatest and least values for y that you found in parts (a) and (b).

d. At what point do the two graphs intersect?

Additional Practice *(continued)*

3. Carl wants to save $1,000 for a trip.

a. Suppose he saves $10 per week. How many weeks will it take? How many weeks at $20 per week? How many weeks at $30 per week?

b. Complete this table and then draw a graph to show the data.

Carl's Savings

Amount Saved per Week	10	20	30	40	50	60	70
Number of Weeks							

c. Write an equation showing the relationship between the amount a saved per week and the number of weeks n.

d. What are the changes in the number of weeks needed to reach $1,000 when the amount saved per week changes from:

i. $10 to $20

ii. $20 to $30

iii. $30 to $40

e. How do the answers to part (d) show that the relationship between *amount saved per week* and *number of weeks* is not linear?

4. Tamika is organizing a walkathon for her class. The goal is for students to walk a total of 500 miles. Each student who participates will walk 1 mile per day.

a. How many days will it take to reach the goal if Tamika is the only student who participates?

Additional Practice *(continued)*

b. How many days will it take to reach the goal if 5 students participate? How many days if 10 students participate? How many days if 25 students participate?

c. Make a table of data.

500-Mile Walkathon

Number of Students	1	2	3	4	5	6	7	8	9	10	11	12	13
Number of Days													

Number of Students	14	15	16	17	18	19	20	21	22	23	24	25
Number of Days												

d. Make a graph of the data.

e. Should the points be connected? Explain your reasoning.

f. What pattern do you notice for the number of days when there are 1, 2, 4, 8, and 16 students participating?

g. How do the data in the table show that the relationship between *number of students participating* and *number of day* is not linear?

h. Write an equation showing the relationship between the number of students s participating and the number of days n required to reach the goal.

Additional Practice *(continued)*

5. How are the length and width of rectangles related if the area is fixed at 60 cm^2?

a. Make a table of lengths and widths. Draw a graph of these data.

b. Should the points be connected? Explain your reasoning.

c. Write an equation showing the relationship between length ℓ and width w.

d. Is the relationship between *length* and *width* linear when the area is constant? How does the graph show this?

6. How are the length and width of rectangles related if the perimeter is fixed at 60 cm?

a. Make a table of lengths and widths. Draw a graph of these data.

b. Should the points be connected? Why?

c. Write an equation showing the relationship between length ℓ and width w.

d. Is the relationship between *length* and *width* linear when the perimeter is constant? How does the graph show this?

Name _____ Date _____ Class _____

Skill: Identifying Inverse Variation

Tell whether the relationship between *x* and *y* is an *inverse variation*. If it is, write an equation for the relationship.

1.

x	1	7	14
y	70	10	5

2.

x	2	3	4
y	24	16	12

3.

x	5	6	7
y	55	66	77

4.

x	2	4	8
y	9	18	36

5.

x	2	3	4
y	18	12	9

6.

x	1	2	3
y	6	3	2