Directions:

1. Place all cards face up on the desk.
2. Arrange the yellow family name cards horizontally
3. Under each family name, place the corresponding pink parent function card
4. Under each parent function, place the corresponding white graph card
5. Under each graph, place the corresponding blue graph shape name card
6. Once you have all the cards placed, ask your teacher to check your work.

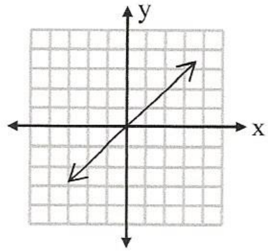
copy onto yellow

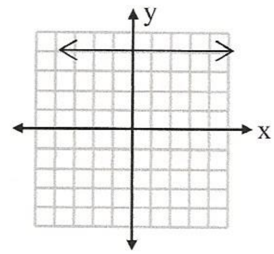
Linear	Constant
Exponential	Absolute Value
Quadratic	Square Root
Cubic	Cube Root

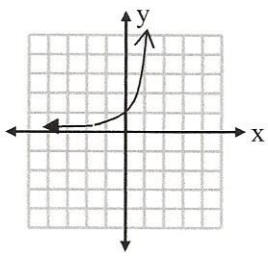
copy onto pink

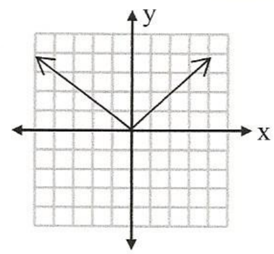
$y = x$	$y = c$
$y = ab^x$	$y = \lvert x \rvert$
$y = x^2$	$y = \sqrt{x}$
$y = x^3$	$y = \sqrt[3]{x}$

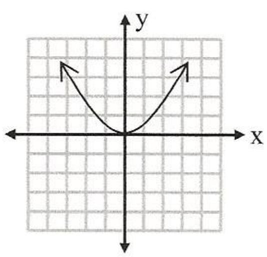
copy onto white

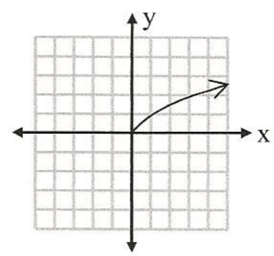


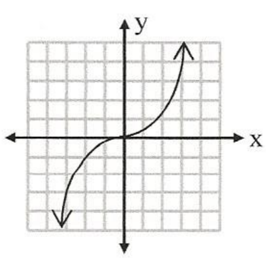


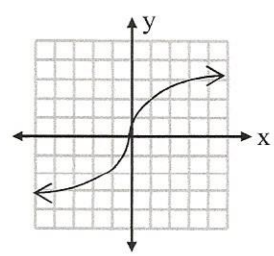












copy onto blue

Oblique Line	Horizontal Line
Slide	V-shaped
Parabola	Root Ramp
Cubic Curve	S-shaped

Lesson 18

Identifying and Determining Domains and Ranges

CA Standard Alg 1 17.0

Recall that the **domain** of a function is the set of all input values, or values of the *independent* variable, and the **range** is the set of all output values, or values of the *dependent* variable.

New Vocabulary
- domain
- range

Identifying Domain

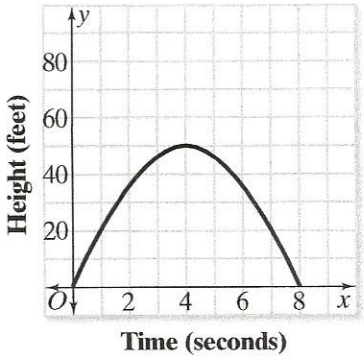
Domain is partly determined by *reasonableness*; if a function describes a real-world situation, some values cannot be possible inputs given that situation.

EXAMPLE 1

The graph shows the height of a cannonball in terms of the time after it was fired.

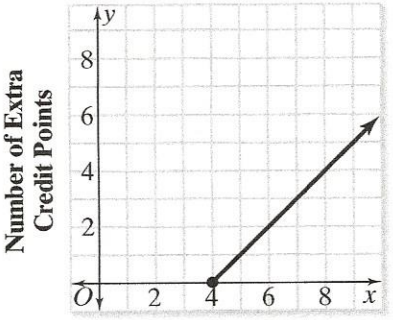
Describe the domain of the function shown in the graph.

The domain is the set of input values, or x-values. The graph lies between $x = 0$ and $x = 8$. Since the graph actually touches $x = 0$ and $x = 8$, it includes those values. Thus, the domain is $0 \leq x \leq 8$. (*Check:* Since the x-values in this function stand for time, it is reasonable that the domain should begin at 0 and not include negative x-values.)

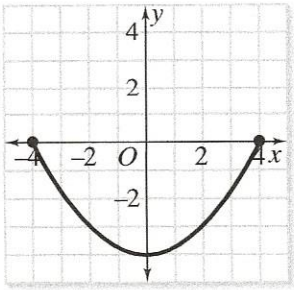


CA Standards Check 1

1a. Alana does 4 word problems for math homework. She can work more problems for 1 extra credit point per problem. The function is graphed below. Give the domain.



1b. Identify the domain of the function graphed below.



Identifying Range

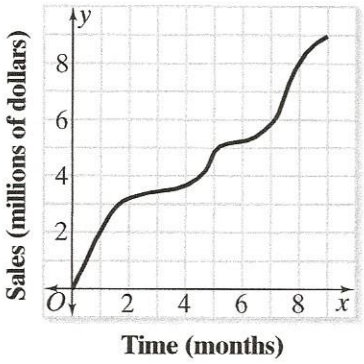
Like domain, range is partly determined by *reasonableness*; if a function describes a real-world situation, some values cannot be possible outputs given that situation. Since output values depend on input values, range is also limited by domain.

MATH TIP

Some output values are impossible, and this affects the range of a function. For example, in the function $y = \frac{2}{x}$, the range includes all y-values EXCEPT 0, because there is no value of x for which $\frac{2}{x} = 0$. Thus, the range is $y \neq 0$.

EXAMPLE 2

The graph below shows the sales of a limited-edition print for the 9-month period for which it was available.



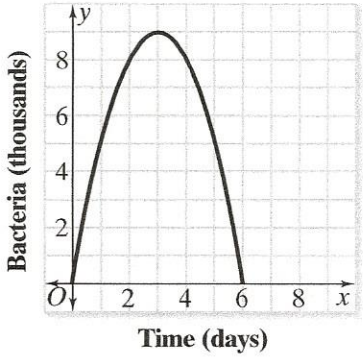
Find the range of the function the graph represents.

The graph starts at the point (0, 0). It makes sense that the y-value, which represents sales (in millions of dollars), could be 0, but it cannot be negative. So, $y \geq 0$. The sale of the print only takes place over a period of 9 months. At the end of this time, the total sales have reached their greatest value. On the graph, this value is \$9 million. So, $y \leq 9$.

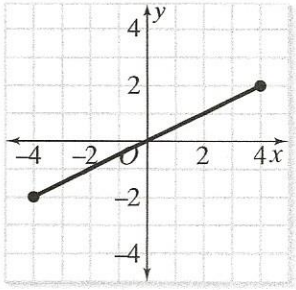
The range is $0 \leq y \leq 9$.

CA Standards Check 2

2a. The graph below represents the population of bacteria on a slide over time during a laboratory experiment. What is the range of the function described by the graph?



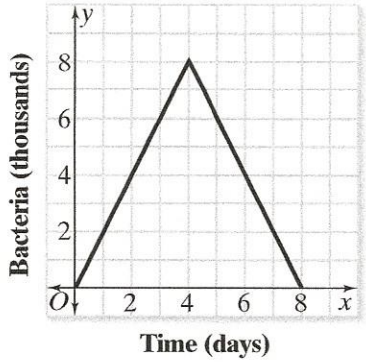
2b. Identify the range of the function graphed below.



California PRACTICE

Name_____ Class_____ Date_____

1 Find the domain and range of the function graphed below.



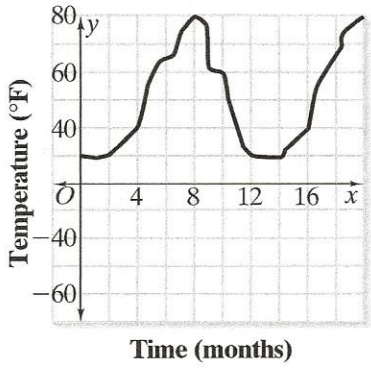
A Domain: $0 \le x \le 4$; Range: $0 \le y \le 4$

B Domain: $0 \le x \le 8$; Range: $0 \le y \le 4$

C Domain: $0 \le x \le 4$; Range: $0 \le y \le 8$

D Domain: $0 \le x \le 8$; Range: $0 \le y \le 8$

2 The graph below shows the temperature recorded at a weather station during a period of several months. Which inequality best approximates the range of the function?



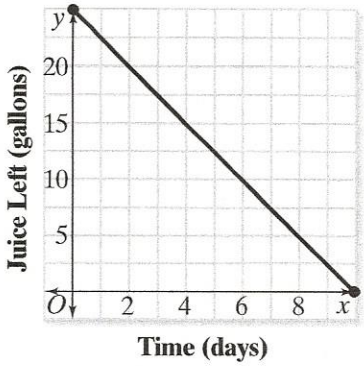
A $0 \le x \le 20$

B $0 \le y \le 20$

C $20 \le x \le 80$

D $20 \le y \le 80$

3 Ms. Drazi bought 25 gallons of cranberry juice for the juice machine at her office. The graph below shows how much juice was left over time.



What is the domain of this function?

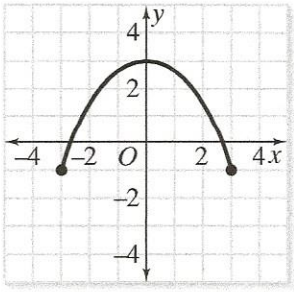
A $0 < x < 10$

B $0 < y < 10$

C $0 \le x \le 10$

D $0 \le y \le 10$

4 Determine the domain and range of the function graphed below.



A Domain: $-3 \le x \le 3$; Range: $-1 \le y \le 3$

B Domain: $-3 \le x \le 3$; Range: $0 \le y \le 3$

C Domain: $0 \le x \le 3$; Range: $-1 \le y \le 3$

D Domain: $-1 \le x \le 3$; Range: $-3 \le y \le 3$

Name: _____ Period: _____ Date: _____

WORKSHEET – DOMAINS AND RANGES FROM WORD PROBLEMS

Read each word problem below and answer the questions that follow. Remember to answer all questions in context using proper notation and symbols. When asked to describe the domain or range, be sure to think about appropriate limitations on the domain and range in context of the problem.

Use the following information to answer questions 1 – 3.
Joe had a summer job that pays $7.00 an hour and he worked between 15 and 35 hours every week. His weekly salary can be modeled by the equation: $S = 7h$, where S is his weekly salary and h is the number of hours he worked in a week.

1. Describe the independent variable for this problem.

2. Describe the domain and range for this problem using appropriate notation.

   Domain:

   Range:

3. What does each value in the ordered pair (20, 140) mean in context of this problem?

Use the following information to answer questions 4 and 5.
Hector's service club is raising money by wrapping presents in the mall. The function $f(x) = 3x$ describes the amount of money, in dollars, the club will earn for wrapping x presents. They only have enough wrapping paper to wrap 1000 presents.

4. Describe the dependent variable for this problem.

5. Describe the domain and range for this problem using appropriate notation.

   Domain:

   Range:

Use the following information to answer questions 6 – 8.

The surface area of a cube can be found using the following formula: $A = 6s^2$, where A represents the surface area of the cube and s represents the length of one edge. Your geometry teacher wants you to draw a cube that has a length of at least 5 inches.

6. Describe the independent variable for this problem.

7. Describe the domain and range for this problem using appropriate notation.

Domain:

Range:

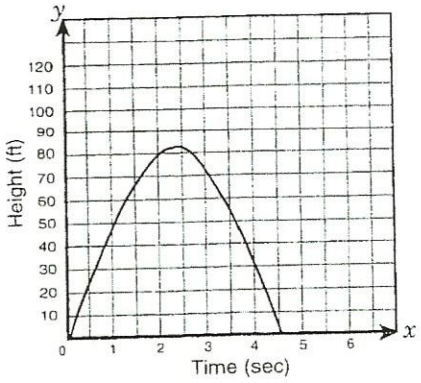
8. Find one ordered pair that represents a reasonable input and output value for this function and describe in context of the problem what each number in the ordered pair means.

Ordered pair:

Description:

Use the following information to answer questions 9 – 10.

A ball was thrown into the air with an initial velocity of 72 feet per second. The height of the ball after t seconds is represented by the equation $\mathbf{h = 72t - 16t^2}$. The graph of the function is shown to the right.



9. Describe the dependent variable for this problem.

10. Describe the domain and range for this problem using appropriate notation.

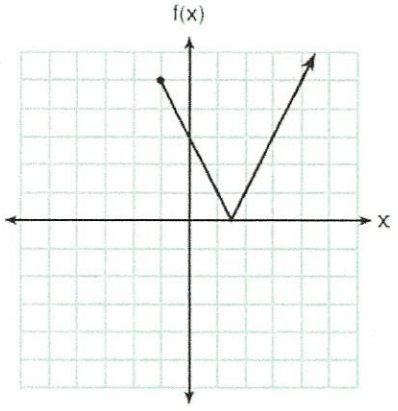
Domain:

Range:

Name: _____

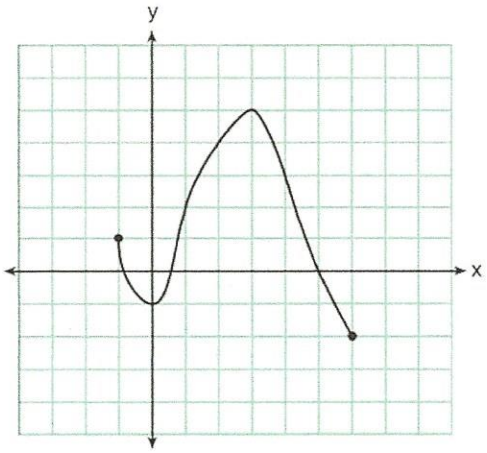
F.IF.A.2: Domain and Range 1a

1 The function $f(x)$ is graphed below.



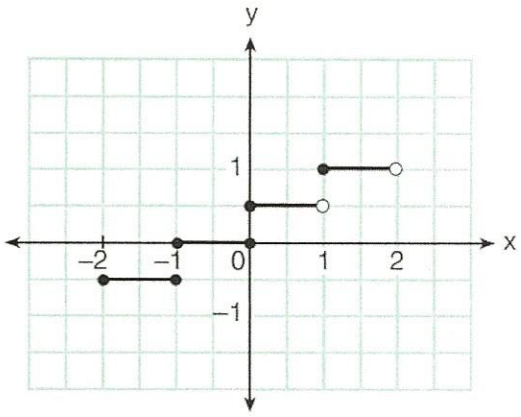
The domain of this function is
1) all positive real numbers
2) all positive integers
3) $x \geq 0$
4) $x \geq -1$

2 What is the domain of the function shown below?



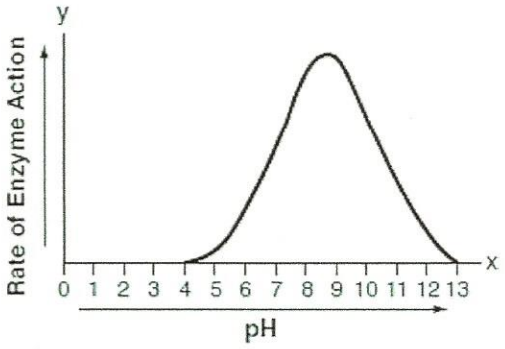
1) $-1 \leq x \leq 6$
2) $-1 \leq y \leq 6$
3) $-2 \leq x \leq 5$
4) $-2 \leq y \leq 5$

3 The graph of a relation is shown below.



What is the domain of this relation?
1) $\{-2,-1,0,1\}$
2) $\left\{-\frac{1}{2},0,\frac{1}{2},1\right\}$
3) $\{x \mid -2 \leq x < 2\}$
4) $\{x \mid -2 \leq x \leq 2\}$

4 The effect of pH on the action of a certain enzyme is shown on the accompanying graph.

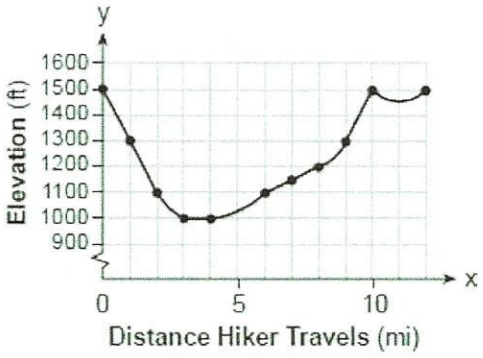


What is the domain of this function?
1) $4 \leq x \leq 13$
2) $4 \leq y \leq 13$
3) $x \geq 0$
4) $y \geq 0$

Regents Exam Questions F.IF.A.2: Domain and Range 1a
www.jmap.org

Name: _____

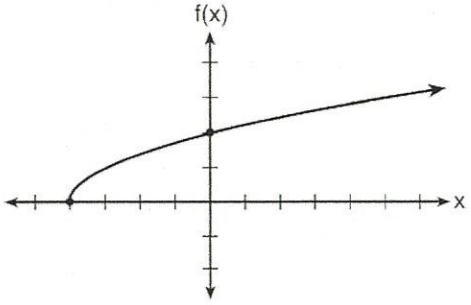
5 The accompanying graph shows the elevation of a certain region in New York State as a hiker travels along a trail.



What is the domain of this function?

1) $1,000 \le x \le 1,500$
2) $1,000 \le y \le 1,500$
3) $0 \le x \le 12$
4) $0 \le y \le 12$

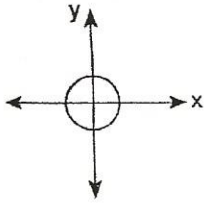
6 The graph of the function $f(x) = \sqrt{x+4}$ is shown below.

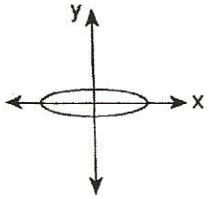


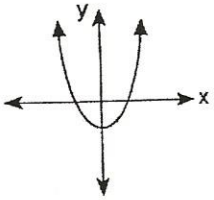
The domain of the function is

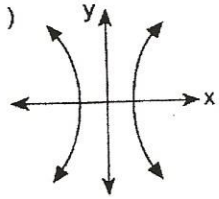
1) $\{x \mid x > 0\}$
2) $\{x \mid x \ge 0\}$
3) $\{x \mid x > -4\}$
4) $\{x \mid x \ge -4\}$

7 Which graph illustrates a quadratic relation whose domain is all real numbers?

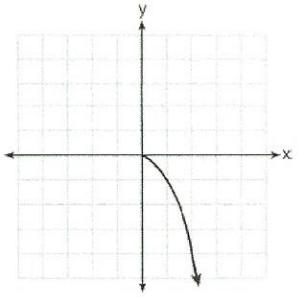
1)


2)


3)


4)


8 What is the range of the function shown below?

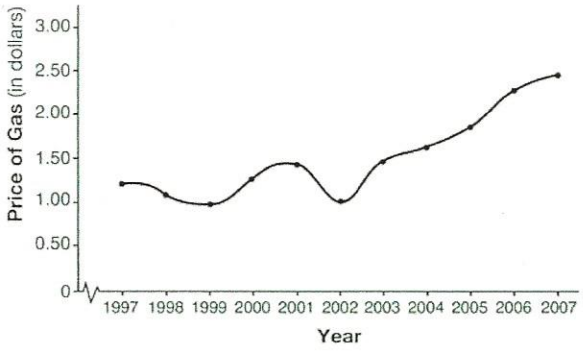


1) $x \le 0$
2) $x \ge 0$
3) $y \le 0$
4) $y \ge 0$

Regents Exam Questions F.IF.A.2: Domain and Range 1a
www.jmap.org

Name: _____

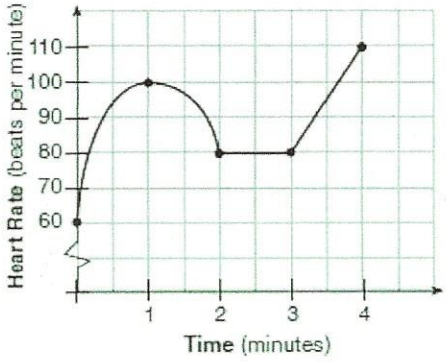
9 The graph below shows the average price of gasoline, in dollars, for the years 1997 to 2007.



What is the approximate range of this graph?

1) $1997 \leq x \leq 2007$
2) $1999 \leq x \leq 2007$
3) $0.97 \leq y \leq 2.38$
4) $1.27 \leq y \leq 2.38$

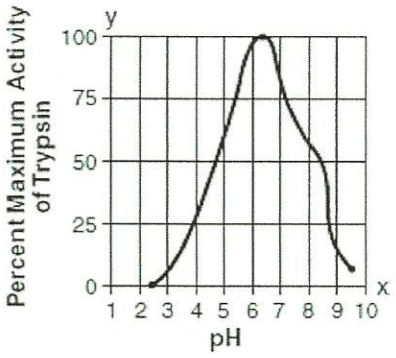
10 The accompanying graph shows the heart rate, in beats per minute, of a jogger during a 4-minute interval.



What is the range of the jogger's heart rate during this interval?

1) 0 – 4
2) 1 – 4
3) 0 – 110
4) 60 – 110

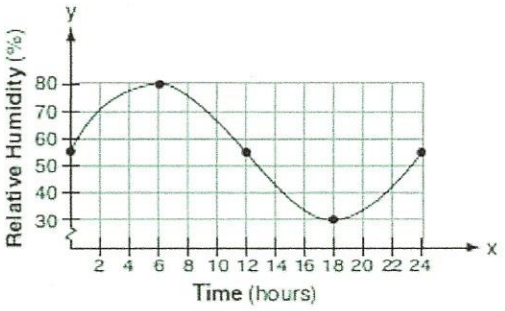
11 Data collected during an experiment are shown in the accompanying graph.



What is the range of this set of data?

1) $2.5 \leq y \leq 9.5$
2) $2.5 \leq x \leq 9.5$
3) $0 \leq y \leq 100$
4) $1 \leq x \leq 10$

12 A meteorologist drew the accompanying graph to show the changes in relative humidity during a 24-hour period in New York City.



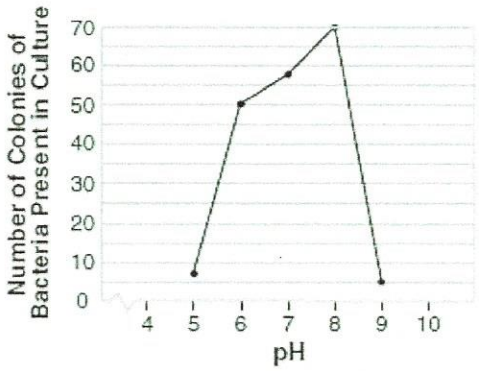
What is the range of this set of data?

1) $0 \leq y \leq 24$
2) $0 \leq x \leq 24$
3) $30 \leq y \leq 80$
4) $30 \leq x \leq 80$

Regents Exam Questions F.IF.A.2: Domain and Range 1a
www.jmap.org

Name: _____

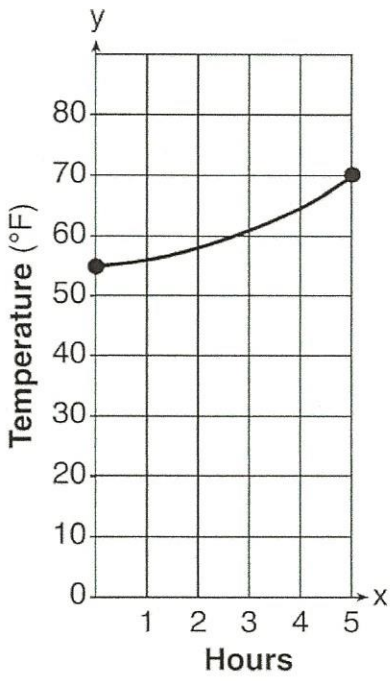
13 The accompanying graph illustrates the presence of a certain strain of bacteria at various pH levels.



What is the range of this set of data?

1) $5 \leq x \leq 9$
2) $5 \leq x \leq 70$
3) $0 \leq y \leq 70$
4) $5 \leq y \leq 70$

14 The air temperature in Dallas, Texas, over a 5-hour period is shown in the accompanying graph.

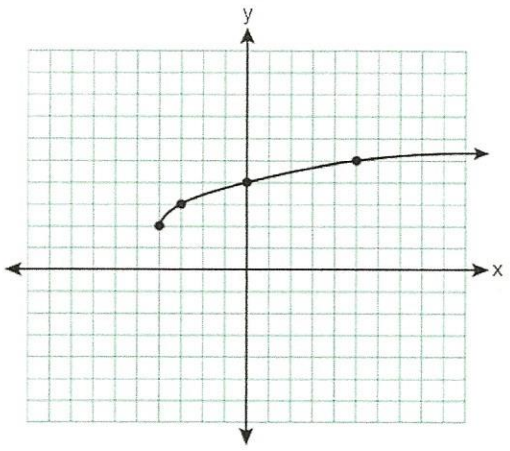


What is the range of this set of data?

1) $0 \leq x \leq 5$
2) $56 \leq x \leq 70$
3) $0 \leq y \leq 80$
4) $56 \leq y \leq 70$

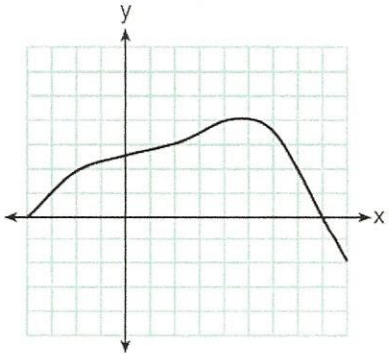
Name: _____

15 What are the domain and the range of the function shown in the graph below?



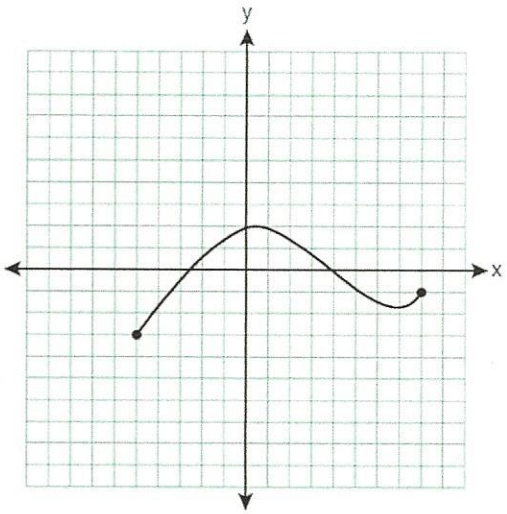
1) $\{x \mid x > -4\}$; $\{y \mid y > 2\}$
2) $\{x \mid x \geq -4\}$; $\{y \mid y \geq 2\}$
3) $\{x \mid x > 2\}$; $\{y \mid y > -4\}$
4) $\{x \mid x \geq 2\}$; $\{y \mid y \geq -4\}$

16 Which value is in the domain of the function graphed below, but is *not* in its range?



1) 0
2) 2
3) 3
4) 7

17 The graph below represents the function $y = f(x)$.



State the domain and range of this function.

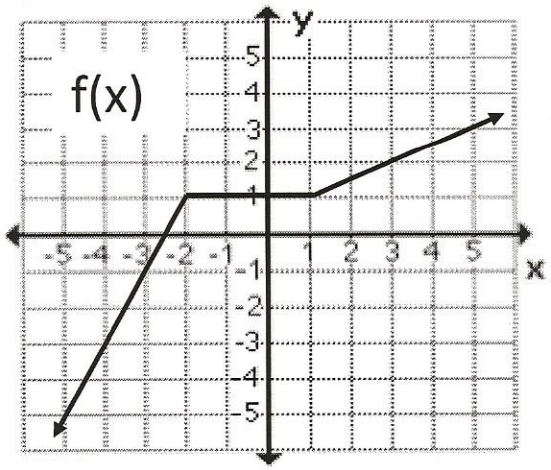
Algebra 1 Name_____

Function Notation

Find each of the following:

1) If $f(x) = 6x$, find $f(2)$. $f(2) =$ _____	2) If $g(x) = x - 2$, find $g(7)$. $g(7) =$ _____	3) $h(x) = 3x - 4$. Find $h(8)$. $h(8) =$ _____
4) $m(x) = -2x$. Find $m(3)$. $m(3) =$ _____	5) Given $k(x) = x^2$, find $k(6)$. $k(6) =$ _____	6) Given $d(x) = x$, find $d(5)$. $d(5) =$ _____
7) Given $F(x) = 2x + 3$, find $F(-1)$. $F(-1) =$ _____	8) If $H(x) = 3x^2$, find $H(5)$. $H(5) =$ _____	9) $P(x) = 2x^2 + 3$. Find $P(1)$. $P(1) =$ _____
10) $h(x) = -5x - 4$. Find $h(-2)$. $h(-2) =$ _____	11) Given $k(x) = x^2 + 5$, find $k(-4)$. $k(-4) =$ _____	12) $F(x) = 2x^2 - 1$. Find $F(-3)$. $F(-3) =$ _____

Use the graph of f(x) to find each of the following:



13) $f(1) =$ _____

14) $f(-2) =$ _____

15) $f(-4) =$ _____

16) $f(0) =$ _____

17) $f(3) =$ _____

18) $f(-1) =$ _____

19) $f(-3) =$ _____

20) $f(1) =$ _____

21) Is f(x) a function? Why or why not.

Algebra 1
Evaluating Functions in Function Notation

Name_____

$f(x) = 3x$	$g(x) = x^2 + 1$	$h(x) = 4 - 2x$	$k(x) = \frac{x-6}{2}$	$j(x) = -3x^2$

Use the functions given above to find each of the following:

1) $h(5) =$ _____ 2) $f(-4) =$ _____ 3) $k(-2) =$ _____ 4) $g(-2) =$ _____

5) $j(-2) =$ _____ 6) $h(-3) =$ _____ 7) $f(5) - k(8) =$ _____ 8) $h(-5) + k(4) =$ _____

9) $g(-2) + j(-2) =$ _____ 10) $6f(4) =$ _____ 11) $k(6) - 2g(3) =$ _____

$F(x) = x^2 + 6x + 2$	$G(x) = 3x^2 - 5x + 2$	$H(x) = -2x^2 - 6x - 7$	$J(x) = -x^2 + x - 4$

Use the functions given above to find each of the following:

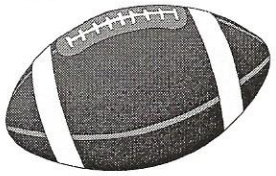
12) $F(1) =$ _____ 13) $G(2) =$ _____ 14) $H(-1) =$ _____ 15) $J(2) =$ _____

16) $F(3) + G(1) =$ _____ 17) $H(1) - J(1) =$ _____ 18) $7H(-2) =$ _____

19) $G(-3) + J(-2) =$ _____ 20) $F(1) + G(1) + H(1) + K(1) =$ _____

Why is Cinderella bad at playing football?

Name _____



Solve and show your work. Place the letter of the problem in the blank above the numerical answer at the bottom of the page.

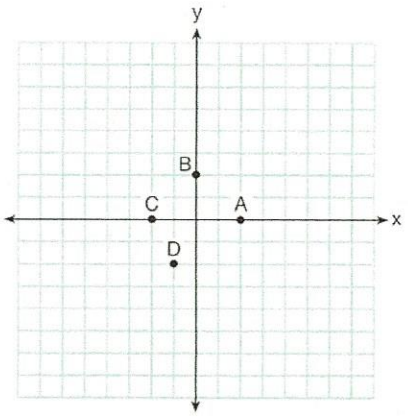
I) $f(x) = x + 3x^2; x = -4$	R) $g(x) = x^3 - x; x = -2$	S) $h(x) = x - x^2; x = 5$
A) $p(x) = 2x^4 + x^2; x = -1$	E) $g(x) = -3x^2; x = -2$	M) $j(x) = -x^2 + 8x; x = 2$
N) $h(x) = 4x - x^2; x = -3$	H) $f(x) = 2x^2 + x - 3; x = 4$	U) $r(x) = 1 - 6x - x^2; x = -5$
O) $k(x) = -x^3 - x^2; x = 4$	K) $f(x) = 2x^2 - x + 2; x = -3$	P) $j(x) = 5x - x^2 - 7; x = -1$
C) $f(x) = -x^2 - 3x - 9; x = -5$		

33	-12	-6	-19	-80	3	-19	33	44	-20	3	-13	6	12	-13	23	44	-21

Name: _____

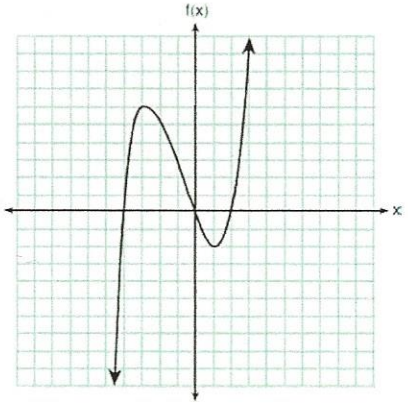
F.IF.A.2: Functional Notation 1a

1 The graph of $y = f(x)$ is shown below.



Which point could be used to find $f(2)$?
1) A
2) B
3) C
4) D

2 The graph of $f(x)$ is shown below.



What is the value of $f(-3)$?
1) 6
2) 2
3) –2
4) –4

3 The function $g(x)$ is defined as $g(x) = -2x^2 + 3x$. The value of $g(-3)$ is
1) –27
2) –9
3) 27
4) 45

4 If $k(x) = 2x^2 - 3\sqrt{x}$, then $k(9)$ is
1) 315
2) 307
3) 159
4) 153

5 If $f(x) = \frac{1}{2}x^2 - \left(\frac{1}{4}x + 3\right)$, what is the value of $f(8)$?
1) 11
2) 17
3) 27
4) 33

6 If $f(x) = |x^3 - 3|$, then $f(-1)$ is equivalent to
1) 0
2) 2
3) –2
4) 4

Basic Practice:

Evaluate each function.

1) $w(x) = 3x + 1$; Find $w(-4 - x)$

2) $g(x) = -3x - 1$; Find $g(-3x)$

3) $h(x) = -3x + 4$; Find $h(x - 3)$

4) $k(a) = 2a - 5$; Find $k(4a)$

5) $g(x) = x + 4$; Find $g(2x)$

6) $g(x) = -x + 4$; Find $g(x - 2)$

7) $p(n) = n + 3$; Find $p(-n)$

8) $w(n) = n - 5$; Find $w(n - 4)$

9) $p(x) = 4x + 2$; Find $p(2 + x)$

10) $f(x) = 3x$; Find $f(3x)$

Worksheet Level 4:

Goals:

Evaluate a composite function

Concept # _____

Practice #1

Evaluate each function.

1) $p(a) = -4a - 2$; Find $p(2a)$

2) $f(x) = 2x - 4$; Find $f(x + 3)$

3) $h(n) = 2n - 4$; Find $h(1 + n)$

4) $f(x) = 4x - 5$; Find $f(2 + x)$

5) $g(x) = 3x - 2$; Find $g(2x)$

6) $h(n) = n + 1$; Find $h(n + 2)$

7) $f(x) = 4x + 4$; Find $f(3x)$

8) $f(x) = -x - 1$; Find $f(x^2)$

9) $w(n) = 4n - 3$; Find $w(n^2)$

10) $f(t) = 2t - 3$; Find $f(t^2)$

Function Notation

$w(n) = n - 5$ Find n when $w(n) = -1$	$p(x) = 4x - 2$ Find x when $p(x) = 6$	$h(n) = 3n + 5$ Find n when $h(n) = 17$
$k(x) = x + 5$ Find x when $k(x) = 10$	$f(x) = 4x + 2$ Find x when $f(x) = 34$	$h(x) = 4x - 2$ Find x when $h(x) = -38$
$f(x) = 4x + 1$ Find x when $f(x) = 13$	$g(x) = 3x - 5$ Find x when $g(x) = -11$	$f(x) = 3x - 5$ Find x when $f(x) = 1$
$w(a) = a - 1$ Find a when $w(a) = -1$	$w(n) = n - 1$ Find n when $w(n) = -5$	$w(n) = -2n - 1$ Find n when $w(n) = -7$
$h(n) = 3n - 4$ Find n when $h(n) = -22$	$f(x) = 2x + 1$ Find x when $f(x) = 7$	$g(x) = -x$ Find x when $g(x) = -3$

Function Notation

1. Evaluate the following expressions given the functions below:

$g(x) = -3x + 1$ $f(x) = x^2 + 7$ $h(x) = \frac{12}{x}$ $j(x) = 2x + 9$

a. $g(10) =$

b. $f(3) =$

c. $h(-2) =$

d. $j(7) =$

e. $h(a)$

f. $g(b+c)$

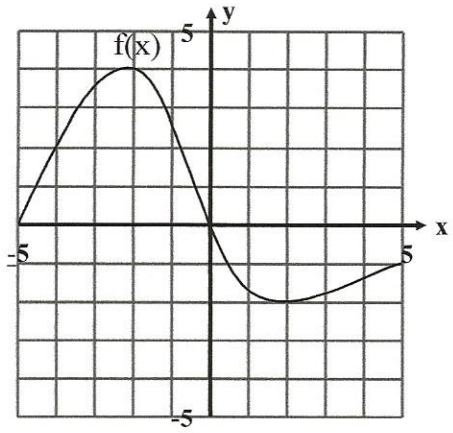
g. $j(2a - 3)$

h. Find x if $g(x) = 16$

i. Find x if $h(x) = -2$

j. Find x if $j(x) = 23$

2. Given this graph of the function f(x):



Find:

a. f(–4) = **b.** f(0) = **c.** f(3) **d.** f(-5)

e. x when f(x) = 2 **f.** x when f(x) = 0

APPLICATION

3. Swine flu is attacking Porkopolis. The function below determines how many people have swine where t = time in days and S = the number of people in thousands.

$$S(t) = 9t - 4$$

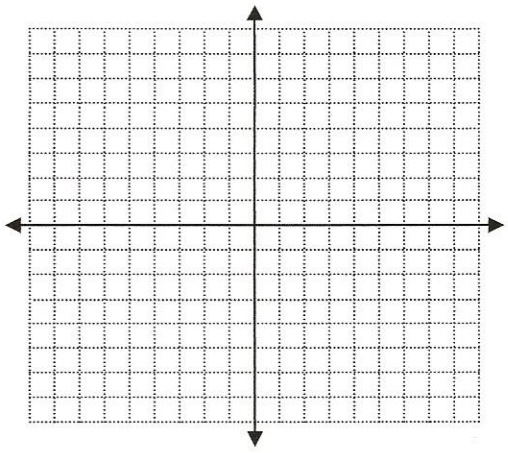
a. Find $S(4)$.

b. What does $S(4)$ mean?

c. Find t when $S(t) = 23$.

d. What does $S(t) = 23$ mean?

e. Graph the function



Name _____ Date _____

Family of Functions Worksheet

 # 1- 6 Give the family name of the function.

1. $g(x) = x^2 - 1$
2. $f(x) = 2(3)^x$
3. $h(x) = \sqrt{x-2}$
4. $g(x) = x^3 + 3$
5. $g(x) = 5$
6. $f(x) = |x + 5| - 2$

 # 7- 12 Draw the basic graph for the parent function.

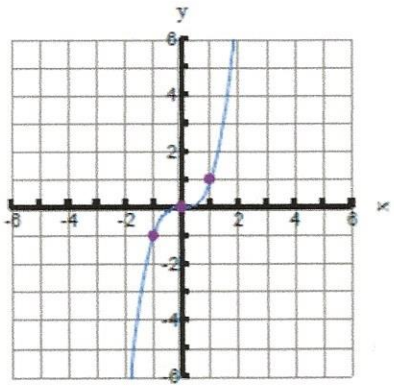
7. $h(x) = 2 - 6x$
8. $g(x) = 3\sqrt{x}$
9. $h(x) = -x^2 + 1$
10. $h(x) = -|x - 2|$
11. $f(x) = (x + 2)(x - 5)(x + 3)$
12. $h(x) = \sqrt[3]{(-x - 1)}$

#13 - 20 Write the parent function for each family name.

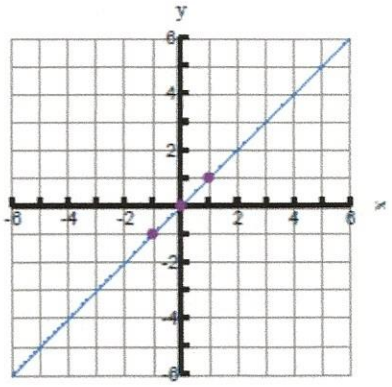
13. Absolute value _____
14. Square root _____
15. Cubic _____
16. Constant _____
17. Quadratic _____
18. Linear _____
19. Cube Root _____
20. Exponential _____

#20 – 26 **Write the family name for each of the following graphs.**

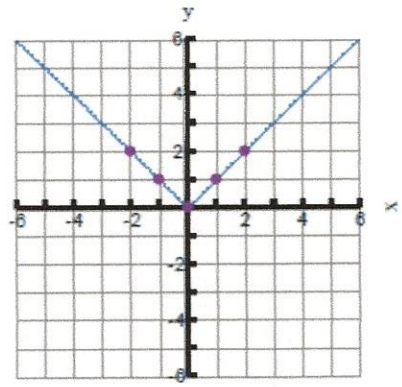
21. _____



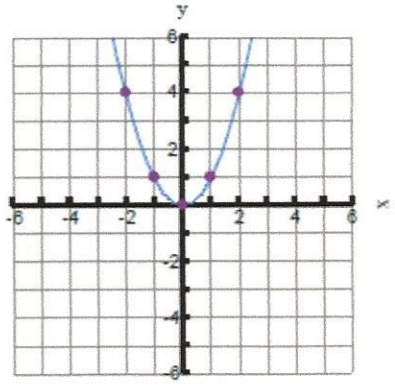
22. _____



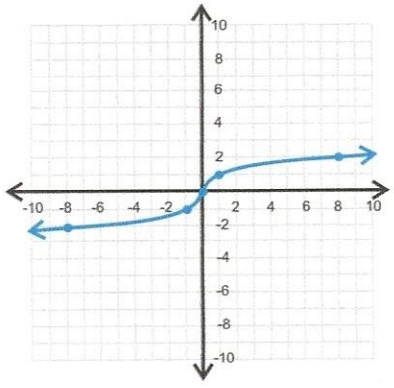
23. _____



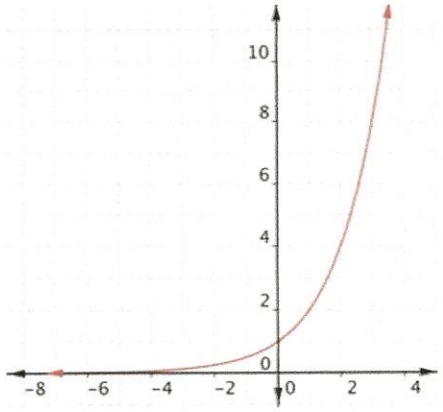
24. _____



25. _____



26. _____



Solving One-Step Equations

Name: _____ Date: _____

Solve each equation.

(1) $23 = s + 19$

(2) $b(4) = 20$

(3) $6q = 48$

(4) $-\frac{1}{4}g = 10$

(5) $9 = j - 5$

(6) $31 = a + 15$

(7) $31 = t + 13$

(8) $-\frac{y}{5} = 8$

(9) $21 = w(3)$

(10) $b(10) = 90$

(11) $9 = \frac{1}{6}f$

(12) $100 = r(10)$

(13) $\frac{b}{7} = 7$

(14) $s - 7 = 4$

(15) $-70 = q(-7)$

(16) $\frac{1}{9}a = 10$

(17) $26 = m + 11$

(18) $-\frac{r}{7} = 7$

(19) $18 = x + 5$

(20) $z + 5 = 15$

(21) $b + 4 = 9$

(22) $r(4) = -36$

(23) $6g = -18$

(24) $18 = s + 5$

Solving Two-Step Equations

Multiplication & Division - Negative Coefficients

Name: _____ **Date:** _____

Solve the equations.

(1) $-259 = 11x - 50$

(2) $-1 + \frac{x}{-3} = -7$

(3) $-7 = -2x + 27$

(4) $-85 = 125 - 15x$

(5) $76 = 6x - 50$

(6) $-6 = \frac{x}{16} - 1$

(7) $1 = \frac{x}{6} - 2$

(8) $68 = -7x + 12$

(9) $200 = 10x + 70$

(10) $2 = \frac{x}{3} - 4$

(11) $-22 = 77 - 11x$

(12) $60 = 6x - 18$

(13) $-2 + \frac{x}{-8} = -5$

(14) $-5 = \frac{x}{10} - 2$

(15) $-154 = 10x - 44$

Solving Multi-Step Equations

Like Terms - Negative Coefficients

Name: _____ **Date:** _____

Solve the equations.

(1) $2x + 5x - 42 = 14$

(2) $x - 39 - 6x = 21$

(3) $2x + 3x - 45 = 15$

(4) $3x + 6x - 38 = 25$

(5) $2x + 4x - 61 = 17$

(6) $-6x + 4x - 8 = 4$

(7) $-3x - 5x - 27 = 29$

(8) $-17 - 3x - 2x = 33$

(9) $3x - 29 + 5x = 35$

(10) $-43 - 5x - 3x = 77$

(11) $6x - 37 + 3x = 80$

(12) $-x + 2x - 9 = 4$

Solving Multi-Step Equations

Variables on Both Sides - Negative Coefficients

Name: _____ **Date:** _____

Solve the equations.

(1) $5x - 50 = 76 - 4x$

(2) $-6 - 5x = 8 - 3x$

(3) $-x - 21 = -5x + 31$

(4) $3x - 44 = -5x + 28$

(5) $-22 + 2x = -3x + 33$

(6) $-18 - x = 17 + 4x$

(7) $-16 - 6x = 14 - 3x$

(8) $-x - 11 = -5x + 13$

(9) $-25 + 4x = -6x + 45$

(10) $5x - 47 = -6x + 19$

(11) $x - 18 = 18 - 5x$

(12) $2x - 19 = 6x + 13$

Solving Multi-Step Equations

Distributive With Parentheses - Negative Coefficients

Name: _____ **Date:** _____

Solve the equations.

(1) $96 = -4x + 4(-x + 4)$

(2) $-10 = -5x + 3(2x - 7)$

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

(4) $41 = -5x + 4(3x - 2)$

(5) $72 = -4x + 4(2x + 7)$

(6) $2x - 2(-6x - 9) = -80$

(7) $-7x - 3(-4x - 8) = 54$

(8) $92 = 6x + 4(2x + 2)$

(9) $-56 = 5x - 2(6x + 7)$

(10) $26 = 5x - 2(x + 2)$

What happens when the variable disappears??

WE:

$10x + 12 = 2(5x + 6)$

$9m - 4 = -3m + 5 + 12m$

YOU:

$3(4b - 2) = -6 + 12b$

$2x + 7 = -1(3 - 2x)$

c. Multi-step equations

1) $-20 = -4x - 6x$

2) $6 = 1 - 2n + 5$

3) $8x - 2 = -9 + 7x$

4) $a + 5 = -5a + 5$

5) $4m - 4 = 4m$

6) $p - 1 = 5p + 3p - 8$

7) $5p - 14 = 8p + 4$

8) $p - 4 = -9 + p$

9) $-8 = -(x + 4)$

10) $12 = -4(-6x - 3)$

11) $14 = -(p - 8)$

12) $-(7 - 4x) = 9$

13) $-18 - 6k = 6(1 + 3k)$

14) $5n + 34 = -2(1 - 7n)$

15) $2(4x - 3) - 8 = 4 + 2x$

16) $3n - 5 = -8(6 + 5n)$

NAME_____ DATE_____ PERIOD_____

A P.I. R^2 Mini-Mystery

Who Killed Ms. X?

Directions: Solve each equation below, then use your solutions to eliminate the suspects and solve the mystery.

1. $7 + 5(x - 2) = 12$
2. $4(x - 12) + 19 = -89$
3. $7x + 3(4x - 8) = 109$
4. $-4x - 2(2x + 10) = -116$
5. $-4x - 7(-3x - 6) = 195$
6. $2(x + 9) - 4 = 68$
7. $8(x + 5) + 4 = 60$
8. $6 + 5(x - 7) = 71$
9. $-6x + 5(-2x - 11) = 137$
10. $-3x - 5(-3x - 9) = -51$
11. $7(x - 5) - 2 = -100$
12. $7(x - 3) - 14 = 70$
13. $4 - 2(x + 19) = 50$
14. $2x + 6(5x - 5) = 130$
15. $-5x + 3(-4x - 11) = 137$
16. $2(x + 9) - 15 = -3$
17. $5 - 3(x - 7) = 32$
18. $3 - 3(x - 5) = 60$
19. $2x - 2(-3x + 3) = 58$
20. $5x - 3(-6x + 5) = -130$

WHO?	
□ Mr. Jones	$x = 14$
□ Mr. Brown	$x = -5$
□ Mr. Patrick	$x = 20$
□ Ms. Manns	$x = 8$
□ Mrs. Wright	$x = 7$
□ Ms. Davis	$x = 12$
WHAT?	
□ Crowbar	$x = -3$
□ Pistol	$x = 27$
□ Poison	$x = -2$
□ Knife	$x = 10$
□ Rope	$x = 15$
□ Vase	$x = 9$
WHERE?	
□ Dining Room	$x = 3$
□ Game Room	$x = 2$
□ Office	$x = -14$
□ Kitchen	$x = -27$
□ Bedroom	$x = -15$
□ Garage	$x = -9$
□ Cellar	$x = -12$
□ Library	$x = -42$
□ Hall	$x = -8$
□ Balcony	$x = -10$
□ Garden	$x = 5$

IT WAS (WHO)	WITH A (WHAT)	IN THE (WHERE)

B

Multi-Step Equations–Worksheet #2 EXTRA

Find the ONE mistake that was made in each problem and circle it. Then, describe what kind of mistake it was. Then, fix the mistake and finish the problem to the right.

Joe Schmoe **You**

1) $8x - 27 - 10 - 6x = 15$ (equation)

$2x - 27 - 10 = 15$ (equation)

$2x - 17 = 15$ (equation)
$+17 \quad +17$

$\frac{2x}{2} = \frac{32}{2}$ (equation)

$x = 16$ (equation)

Kind of mistake: _____

2) $-3(2x - 3) = 33$ (equation)

$-6x + 6 = 33$ (equation)
$-6 \quad -6$

$\frac{-6x}{-6} = \frac{27}{-6}$ (equation)

$x = -4.5$ (equation)

Kind of mistake: _____

Multi-Step Equations–Worksheet #2 EXTRA

Silly Sally **You**

3) $4(x + 7) = -12$ (equation)

$4x + 28 = -12$ (equation)
$-28 \quad -28$

$\frac{4x}{4} = \frac{-16}{4}$ (equation)

$x = -4$ (equation)

Kind of mistake: _____

4) $-19 + 3x - 11 + 2x = 2$ (equation)

$5x - 19 - 11 = 2$ (equation)

$5x - 30 = 2$ (equation)
$-30 \quad -30$

$\frac{5x}{5} = \frac{-28}{5}$ (equation)

$x = -5.6$ (equation)

Kind of mistake: _____

NAME _____ DATE _____ PERIOD _____

Test 2 Review: Solving 1, 2 & Multi-Step Equations

Vocabulary: Define the following words.

1. Expression _____
2. Equation _____
3. Solution of an Equation _____
4. All Real Numbers _____
5. No Solution _____

SOLVE. Show all work. Circle or box in your answer.

6. $\frac{2}{5}x - 9 = -7$

7. $87 - 3x = -13x$

8. $4h + 9 = 14$

9. $\frac{y}{8} - 5 = -3$

10. $1.2h + 6 = 9.6$

11. $4(b - 7) = 4b + 5$

12. $-6(x - 8) = 78$

13. $10x + 4 = 2(5x+2)$

14. $3x-5 = 2x-9$

15. $-6x - 7 = -2(3x + 5)$

16. $8x - (6x - 2) = -2$

17. $-4(2x-3) = -6x +12 -2x$

Word Problems

18. Which of the equations below represents the next step of the solution process?

Original: $3(5x + 2) + 4 = -35$

A. $15x + 2 + 1 = -35$

B. $15x + 6 + 12 = -35$

C. $15x + 6 + 4 = -35$

D. $3(5x + 6) = -35$

Name_____

Assignment

Date_____ Period____

Solve each equation.

1) $\left|\frac{b}{5}\right| = 2$

2) $|r + 3| = 2$

3) $|x + 5| = 10$

4) $|n + 1| = 1$

5) $|-3x| = 3$

6) $|v + 5| = 1$

7) $|b - 1| = 2$

8) $|5x| = 10$

9) $|4 + n| = 4$

10) $|-3 + x| = 1$

11) $\left|\frac{k}{5}\right| = 1$

12) $\left|\frac{p}{5}\right| = 1$

13) $|r - 1| = 3$

14) $|m + 6| = 11$

15) $|x - 3| = 3$

16) $|-3n| = 12$

17) $|6b| = 6$

18) $\left|\frac{x}{2}\right| = 1$

19) $\left|\frac{v}{6}\right| = 3$

20) $\left|\frac{n}{3}\right| = 2$

21) $|a - 3| = 6$

22) $|k - 1| = 1$

23) $|x + 4| = 9$

24) $|x - 6| = 6$

Name_____

Date_____ Period____

Assignment

Solve each equation.

1) $|-5-4x|+9=-40$

2) $-3|-n-4|=45$

3) $\frac{|2-5b|}{6}=3$

4) $-9+|3r-5|=-2$

5) $|2-3x|+4=24$

6) $3-|7-6n|=-26$

7) $\frac{|8x+7|}{4}=2$

8) $6|4+7v|=0$

9) $6|5a+7|=102$

10) $9+|3+6x|=9$

11) $|3a+6|-7=20$

12) $-4|k-1|=-8$

13) $\frac{|5x+5|}{5}=3$

14) $|-8n+5|-8=3$

15) $-2+|9m-3|=58$

16) $10|8+6p|=100$

17) $5|n-4|=-35$

18) $-8|-5-4x|=-72$

19) $|-9r-4|+5=-26$

20) $|5v-5|+2=12$

21) $\frac{|8-4b|}{4}=2$

22) $|-3n-5|-5=3$

23) $|x-5|-7=-6$

24) $-10|a+8|=-60$

Solving Literal Equations

Literal Equations – Equations with multiple variables where you are asked to solve for just one of the variables. (Usually represent formulas used in the sciences and/or geometry)

To solve literal equations: Use the same process you use to isolate the variable in an algebraic equation with one variable. It's just that you are going to be adding, subtracting, multiplying, and dividing (and sometimes factoring) variables as well as numbers.

CAUTION: BE CAREFUL NOT TO COMBINE UNLIKE TERMS!

Example 1: Solve $E = IR \ for \ R.$

Goal: Isolate *R* to get *R* = an expression in *E* and *I*

$$E = IR$$

To isolate *R*, divide both sides of the equation by *I*:

$$\frac{E}{I} = \frac{IR}{I}$$

Simplify:

$$\frac{E}{I} = R$$

Solution: $R = \frac{E}{I}$

Example 2: Solve $\frac{d}{t} = r \ for \ t.$

Goal: Isolate *t* to get *t* = an expression in *d* and *r*

$$\frac{d}{t} = r$$

First multiply both sides of the equation by *t* to clear the fractions:

$$\frac{d}{t}(t) = r(t)$$

Simplify:

$$d = rt$$

To isolate *t*, divide both sides of the equation by *r*:

$$\frac{d}{r} = \frac{rt}{r}$$

Simplify:

$$\frac{d}{r} = t$$

Solution: $t = \frac{d}{r}$

Example 3: Solve $A = \frac{1}{2}h(b_1 + b_2) \ for \ b_1$

Goal: Isolate b_1 to get b_1 = an expression in *A*, *h*, & b_2 (Note: b_1 and b_2 are two *different* variables.)

First multiply both sides of the equation by 2 to clear the fractions:

$$(2)A = (2)\frac{1}{2}h(b_1 + b_2)$$

(continued on next page)

Simplify:

$$2A = h(b_1 + b_2)$$

Distribute *h*:

$$2A = hb_1 + hb_2$$

Next subtract hb_2 from both sides of the equation to get hb_1 alone:

$$\begin{array}{rcl} 2A = & hb_1 + & \cancel{-hb_2} \\ \underline{-hb_2} & & \underline{\cancel{-hb_2}} \end{array}$$

$$2A - hb_2 = hb_1$$

To isolate b_1, divide both sides of the equation by *h*:

$$\frac{2A-hb_2}{h} = \frac{\cancel{h}b_1}{\cancel{h}}$$

Simplify:

$$\frac{2A - hb_2}{h} = b_1$$

Solution: $b_1 = \frac{2A-hb_2}{h}$

Example 4: Solve $I = \frac{PN}{RN+A}$ for N

Goal: Isolate *N* to get *N* = an expression in *I*, *P*, *R*, & *A*:

First multiply both sides of the equation by (*RN*+*A*) to clear the fractions:

$$(RN + A)I = \frac{PN}{\cancel{RN+A}}\cancel{(RN + A)}$$

Simplify:

$$(RN + A)I = PN$$

Distribute *I*:

$$IRN + IA = PN$$

Subtract *IRN* from both sides to get all *N*'s on the same side:

$$\begin{array}{rcl} \cancel{IRN} + & IA = & PN \\ \underline{\cancel{-IRN}} & & \underline{-IRN} \end{array}$$

Note: *PN* & *IRN* are <u>not</u> like terms we cannot combine them!

$$IA = PN - IRN$$

But we <u>can</u> factor out the *N* from each term!

$$IA = N(P - IR)$$

Finally, we can divide both sides by (*P* – *IR*) to isolate *N*:

$$\frac{IA}{P-IR} = \frac{N\cancel{(P-IR)}}{\cancel{P-IR}}$$

Simplify:

$$\frac{IA}{P - IR} = N$$

Solution: $N = \frac{IA}{P-IR}$

Practice Problems

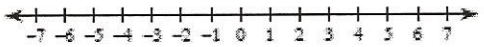
1. Solve $d = rt \ for \ r$
2. Solve $P = \frac{144p}{y} \ for \ p$
3. Solve $R = \frac{CS}{d} \ for \ C$
4. Solve $P = a + b + c \ for \ b$
5. Solve $T = m - n \ for \ n$
6. Solve $A = \frac{a+b}{2} \ for \ b$
7. Solve $V = lwh \ for \ w$
8. Solve $m = \frac{y_2 - y_1}{x_2 - x_1} \ for \ y_2$
9. Solve $ax + by = c \ for \ y$
10. Solve $A = \frac{a+b+c+d}{4} \ for \ c$
11. Solve $S = 2(lw + lh + wh) \ for \ w$
12. Solve $P = 2(l + w) \ for \ l$
13. Solve $d = \frac{C}{\pi} \ for \ \pi$
14. Solve $\frac{1}{f} = \frac{1}{a} + \frac{1}{b} \ for \ f$
15. Solve $A = p(1 + rt) \ for \ t$
16. Solve $I = prt \ for \ r$
17. Solve $ax + b = c \ for \ a$
18. Solve $S = 2\pi rh \ for \ h$
19. Solve $A = 2\pi r^2 + 2\pi rh \ for \ h$
20. Solve $y - y_1 = m(x - x_1) \ for \ x$
21. Solve $R = \frac{l+3w}{2} \ for \ w$
22. Solve $ax + by + c = 0 \ for \ y$
23. Solve $C = \frac{5}{9}(F - 32) \ for \ F$
24. Solve $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} \ for \ R$
25. Solve $H = \frac{62.4NS}{33{,}000} \ for \ N$
26. Solve $B = \frac{703w}{h^2} \ for \ w$
27. Solve $K = \frac{1}{2}mv^2 \ for \ m$
28. Solve $5t - 2r = 25 \ for \ t$
29. Solve $S = R - rR \ for \ R$
30. Solve $V = \frac{1}{3}\pi h^2(3r - h) \ for \ r$
31. Solve $A = \frac{1}{2}nal \ for \ n$
32. Solve $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \ for \ T_1$
33. Solve $F = \frac{gm_1m_2}{d^2} \ for \ g$
34. Solve $\frac{12ds}{w} = CD \ for \ w$
35. Solve $A = \frac{1}{2}bh \ for \ b$
36. Solve $s = r\theta \ for \ \theta$
37. Solve $h = vt - 16t^2 \ for \ v$
38. Solve $C = \frac{100B}{L} \ for \ L$
39. Solve $A = S(1 - DN) \ for \ N$
40. Solve $D = \frac{11}{5}(P - 15) \ for \ P$
41. Solve $E = IR \ for \ I$
42. Solve $E = mc^2 \ for \ c^2$
43. Solve $F = \frac{lt}{d} \ for \ l$
44. Solve $A = 2\pi r^2 + 2\pi rh \ for \ \pi$

2. Inequalities

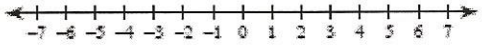
a. Graphing one-variable inequalities

Draw a graph for each inequality.

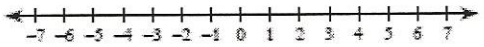
1) $n \leq -5$



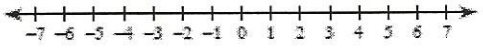
2) $n \leq 5$



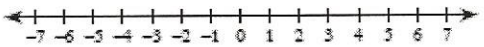
3) $x < 1$



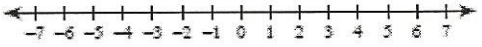
4) $r > 2$



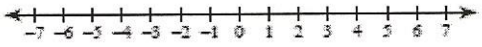
5) $n > 5$



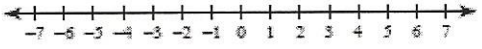
6) $r \leq -2$



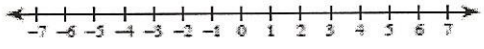
7) $k \leq -2$



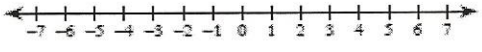
8) $m < -5$



9) $x \geq 2$



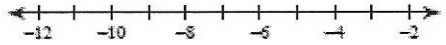
10) $-5 \geq v$



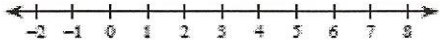
b. One-step inequalities

Solve each inequality and graph its solution.

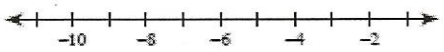
1) $-12 > x - 7$



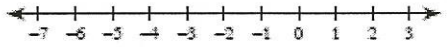
2) $-1 + r \geq 4$



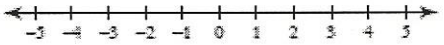
3) $n - 6 \leq -14$



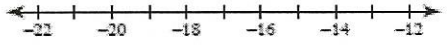
4) $b - 7 < -12$



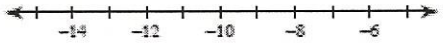
5) $a - 17 > -16$



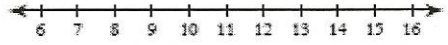
6) $15 + x \leq 0$



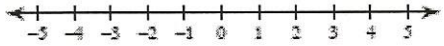
7) $3 + v \leq -9$



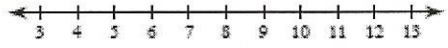
8) $8 \geq n - 6$



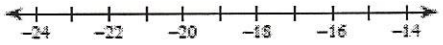
9) $-3x > 3$



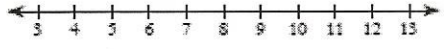
10) $\frac{n}{3} > 3$



11) $\frac{k}{4} < -4$



12) $-9x \geq -90$

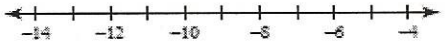


c. Two-step inequalities

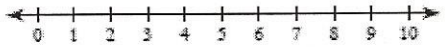
Solve each inequality and graph its solution.

1) $2x + 4 \geq 24$

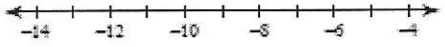
2) $\frac{m}{3} - 3 \leq -6$



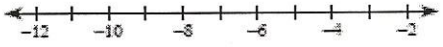
3) $-3(p + 1) \leq -18$



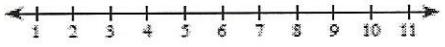
4) $-4(-4 + x) > 56$



5) $-b - 2 > 8$



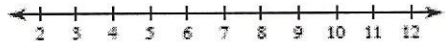
6) $-4(3 + n) > -32$



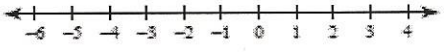
7) $4 + \frac{n}{3} < 6$

8) $-3(r - 4) \geq 0$

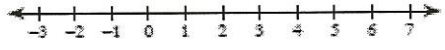
9) $-7x + 7 \leq -56$



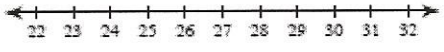
10) $-3(p - 7) \geq 21$



11) $-11x - 4 > -15$



12) $\frac{-9 + a}{15} > 1$



Kuta Software - Infinite Pre-Algebra

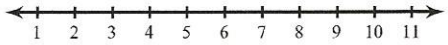
Name_____

Solving Multi-Step Inequalities

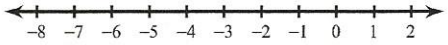
Date_____ Period____

Solve each inequality and graph its solution.

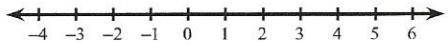
1) $-11 \geq 6 - 2n - 5$



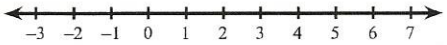
2) $0 > -5x - 6x$



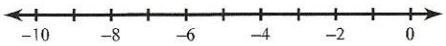
3) $x + 1 + 4 \leq 9$



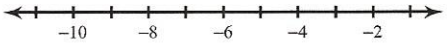
4) $-9 > -5n - 4n$



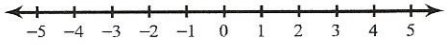
5) $5k - 2k > -9$



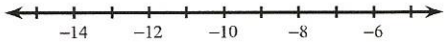
6) $-2 \geq 4p + 6 + 4$



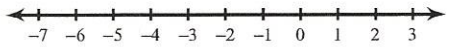
7) $30 - 6a < -3(5 + 7a)$



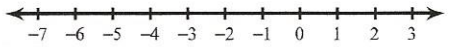
8) $33 + 4x \leq -(x + 7)$



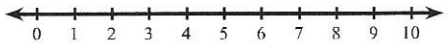
9) $2(6+4n) \geq 12-8n$



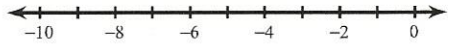
10) $-5(2b+7)+b<-b-11$



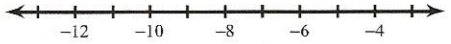
11) $-33-n \leq -3(2n+1)$



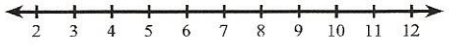
12) $-3(-7p-6)-7<p-29$



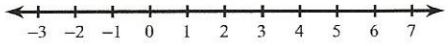
13) $-x+23<2-2(x-8)$



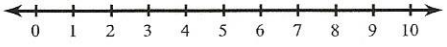
14) $32-5n \geq 7-5(n-5)$



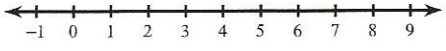
15) $12(10b-9)>-12(9+8b)$



16) $-2(k-12)-5(k+2)<-9k+4k$



17) $8(1+8x)+8(x-11)<-10x+2x$



18) $-2(9r+3)-7r \geq -10r-(12r+9)$