Warm Up:

Give an example of a function and a non-function using points.

(3,2) (2,1)
(2,3) (2,2)
(1,3) (2,3)

Give an example of a function and a non-function using graphs.

Quote for this week:

"Even a mistake may turn out to be the one thing necessary to a worthwhile achievement."

-Henry Ford

Answers:

11. function; Each value in the domain is mapped to only one value in the range.

12. not a function; The value 3 is mapped onto two values, 1 and 0.

13. not a function; Possible answer: (1, 1) and (1, –1).

14. function

15. function

22. D: {–1, 0, 1, 2, 3}
R: {–1, 1, 3}
function; For every *x*-value there is only one *y*-value.

23. D: {a, b, c, d}
R: {1, 2, 4}
function; For each letter there is only one corresponding number

24. D: {7}
R: {1, 2, 3, 4, 6}
not a function; The domain value 7 is mapped onto 5 range values.

25. D: {1, 3, 5, 7, 9}
R: {3}
function; For every *x*-value there is only one *y*-value.

38. Statement A is incorrect; Possible answer: the input value 0 is paired with 2 output values, which violates the definition of a function.

1-7 Function Notation

Objectives

Write functions using function notation.

Evaluate and graph functions.

1-7 Function Notation

Vocabulary

function notation
dependent variable
independent variable

1-7 Function Notation

Some sets of ordered pairs can be described by using an equation. When the set of ordered pairs described by an equation satisfies the definition of a function, the equation can be written in **function notation.**

$f(x)$

1-7 Function Notation

$$\underbrace{f(x)}_{\text{Output value}} = 5\underbrace{x}_{\text{Input value}} + 3 \qquad \underbrace{f(1)}_{\text{Output value}} = 5(\underbrace{1}_{\text{Input value}}) + 3$$

f of *x* equals 5 times *x* plus 3. *f* of 1 equals 5 times 1 plus 3.

f(x) is the exact same thing as y. Don't let the different looks confuse you, they mean the same thing.

Look at f(x) = 3 + x and y = 3 + x
If we plug in 1, 2, or any other number for x we get the same thing...

$f(2)=3+2$ $y=3+2$

$f(2)=5$ $y=5$

1-7 Function Notation

Example 1A: Evaluating Functions

For each function, evaluate $f(0)$, $f\left(\frac{1}{2}\right)$, and $f(-2)$.

$f(x) = 8 + 4x$

$f(0) = 8 + 4 \cdot 0$

$f(0) = 8$

$f(\frac{1}{2}) = 8 + 4 \cdot \frac{1}{2}$

$f(\frac{1}{2}) = 10$

1-7 Function Notation

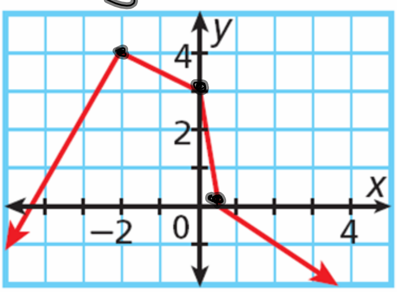
Example 1B: Evaluating Functions

For each function, evaluate $f(0)$, $f\left(\frac{1}{2}\right)$, and $f(-2)$.

$= 4$

$= \cancel{4}\ 3$

$= 0$



1-7 Function Notation

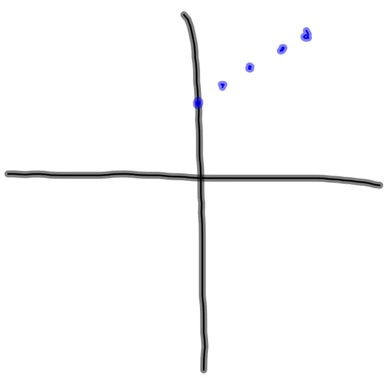
In the notation $f(x)$, f is the *name* of the function. The output $f(x)$ of a function is called the Y **dependent variable** because it *depends* on the input value of the function. The input x is called the X **independent variable**. When a function is graphed, the independent variable is graphed on the horizontal axis and the dependent variable is graphed on the vertical axis.

1-7 Function Notation

Example 2A: Graphing Functions

Graph the function.

$\{(0, 4), (1, 5), (2, 6), (3, 7), (4, 8)\}$

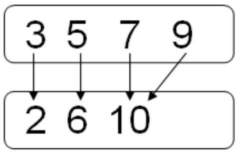


Holt Algebra 2
Copyright © by Holt, Rinehart and Winston. All Rights Reserved.

1-7 Function Notation

Check It Out! Example 2a

Graph the function.



1-7 Function Notation

The algebraic expression used to define a function is called the function rule. The function described by $f(x) = 5x + 3$ is defined by the function rule $5x + 3$. To write a function rule, first identify the independent and dependent variables.

Holt Algebra 2

Copyright © by Holt, Rinehart and Winston. All Rights Reserved.

1-7 Function Notation

Example 3A: Entertainment Application

A carnival charges a $5 entrance fee and $2 per ride.

Write a function to represent the total cost after taking a certain number of rides.

$f(x) = 5 + 2x$

1-7 Function Notation

Check It Out! Example 3b

A local photo shop will develop and print the photos from a disposable camera for $0.27 per print.

What is the value of the function for an input of 24, and what does it represent?

$f(x) = .27x$

$f(24) = .27 \cdot 24$

$f(24) = 6.48$

1-8 Exploring Transformations

Objectives

Apply transformations to points and sets of points.

Interpret transformations of real-world data.

1-8 Exploring Transformations

Vocabulary

transformation
translation
reflection
stretch
compression

1-8 Exploring Transformations

A **transformation** is a change in the position, size, or shape of a figure.

A **translation**, or slide, is a transformation that moves each point in a figure the same distance in the same direction.

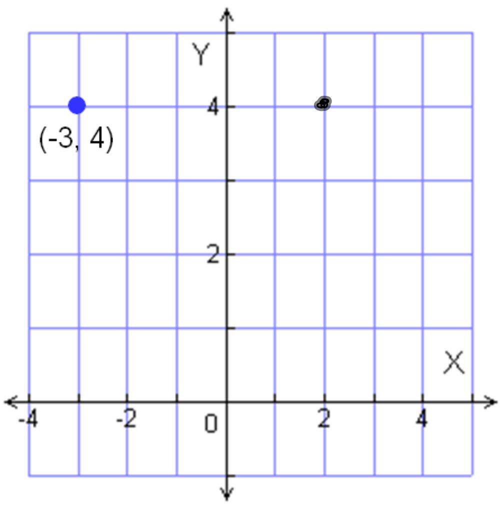
1-8 Exploring Transformations

Example 1A: Translating Points

Perform the given translation on the point (–3, 4). Give the coordinates of the translated point.

5 units right

(2,4)



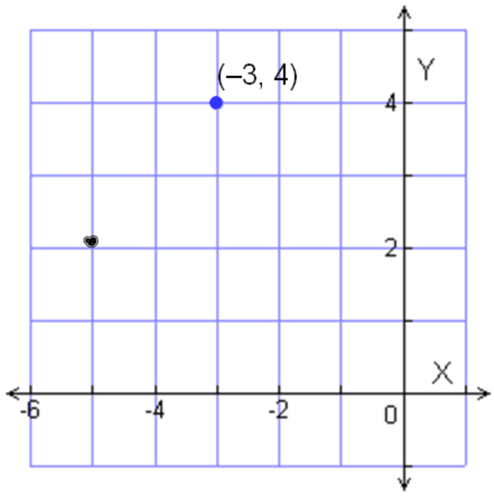
1-8 Exploring Transformations

Example 1B: Translating Points

Perform the given translation on the point (–3, 4). Give the coordinates of the translated point.

2 units left and 2 units down

(-5,2)

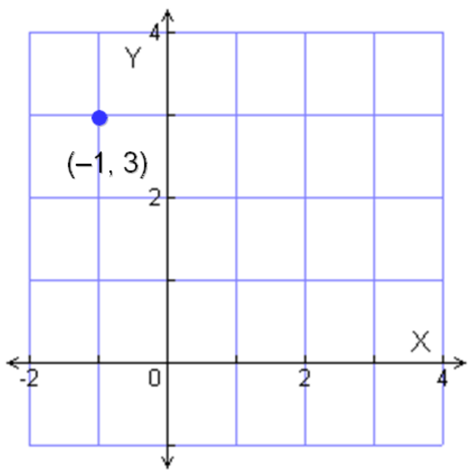


1-8 Exploring Transformations

Check It Out! Example 1a

Perform the given translation on the point (–1, 3). Give the coordinates of the translated point.

4 units right



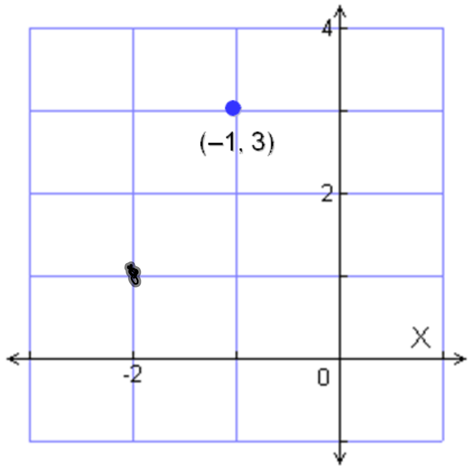
1-8 Exploring Transformations

Check It Out! Example 1b

Perform the given translation on the point (–1, 3). Give the coordinates of the translated point.

1 unit left and 2 units down

(-2, 1)

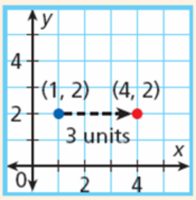
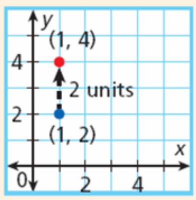


X: Left or right Y: Up or Down

1-8 Exploring Transformations

Notice that when you translate **left or right**, the ***x*-coordinate** changes, and when you translate **up or down**, the ***y*-coordinate** changes.

Translations

Horizontal Translation	Vertical Translation
Each point shifts *right* or *left* by a number of units.	Each point shifts *up* or *down* by a number of units.
	
The *x*-coordinate changes.	The *y*-coordinate changes.
$(1, 2) \rightarrow (1 + 3, 2)$	$(1, 2) \rightarrow (1, 2 + 2)$
$(x, y) \rightarrow (x + h, y)$	$(x, y) \rightarrow (x, y + k)$
left if $h < 0$ right if $h > 0$	down if $k < 0$ up if $k > 0$

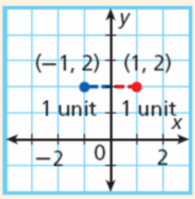
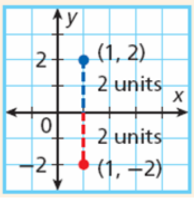
1-8 Exploring Transformations

A **reflection** is a transformation that flips a figure across a line called the line of reflection. Each reflected point is the same distance from the line of reflection, but on the opposite side of the line.

X: Y Axis Y: X-Axis

1-8 Exploring Transformations

Reflections

Reflection Across y-axis	Reflection Across x-axis
Each point flips across the y-axis.  The x-coordinate changes. $(1, 2) \rightarrow (-1, 2)$ $(x, y) \rightarrow (-x, y)$	Each point flips across the x-axis.  The y-coordinate changes. $(1, 2) \rightarrow (1, -2)$ $(x, y) \rightarrow (x, -y)$

1-8 Exploring Transformations

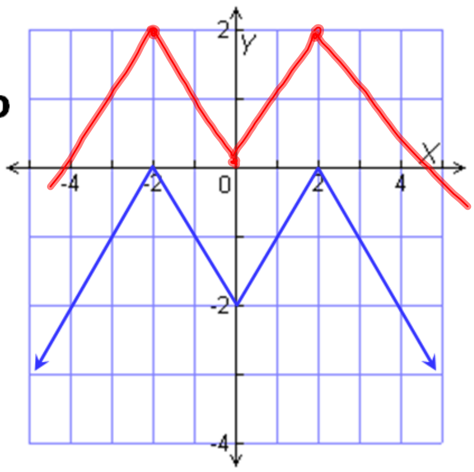
You can transform a function by transforming its ordered pairs. When a function is translated or reflected, the original graph and the graph of the transformation are *congruent* because the size and shape of the graphs are the same.

1-8 Exploring Transformations

Example 2A: Translating and Reflecting Functions

Use a table to perform each transformation of $y=f(x)$. Use the same coordinate plane as the original function.

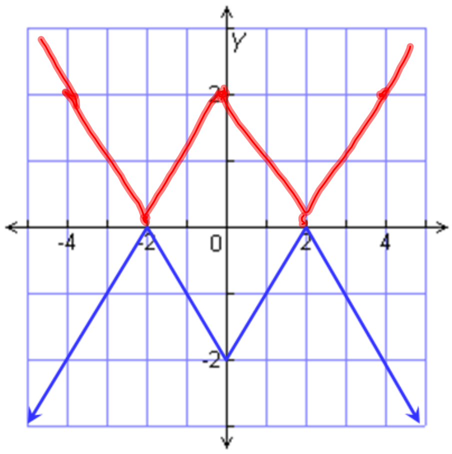
translation 2 units up



1-8 Exploring Transformations

Example 2B: Translating and Reflecting Functions

reflection across *x*-axis

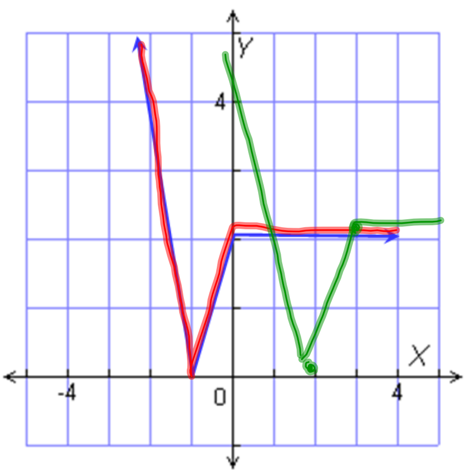


1-8 Exploring Transformations

Check It Out! Example 2a

Use a table to perform the transformation of $y = f(x)$. Use the same coordinate plane as the original function.

translation 3 units right



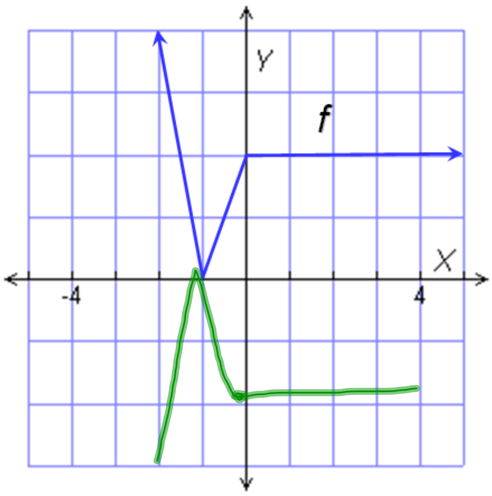
The entire graph shifts 3 units right.

1-8 Exploring Transformations

Check It Out! Example 2b

Use a table to perform the transformation of *y* = *f*(*x*). Use the same coordinate plane as the original function.

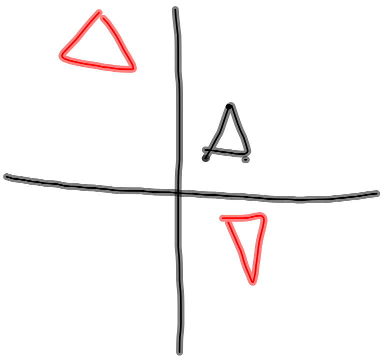
reflection across *x*-axis



Multiply each y-coordinate by –1.

Plot at least 3 points. Now with those points translate them: 2 units to the right, 3 units up and then reflect them over the y-axis.

Have your partner check your work.



Homework
p. 54 #12-17, 45-48
p. 63 # 5-7, 44

Present: 48, p. 65 #44