Name _____ Date _____ Class _____

LESSON 4-2

Reteach

Relations and Functions

A **relation** is a set of ordered pairs. The relation can be in the form of a table, graph, or mapping diagram. The **domain** is all the *x*-values. The **range** is all the *y*-values.

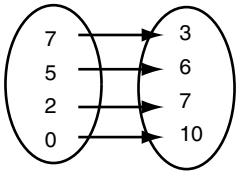
Find the domain and range.

x	3	4	5	6
y	1	2	2	3

D: {3, 4, 5, 6}; R: {1, 2, 3}

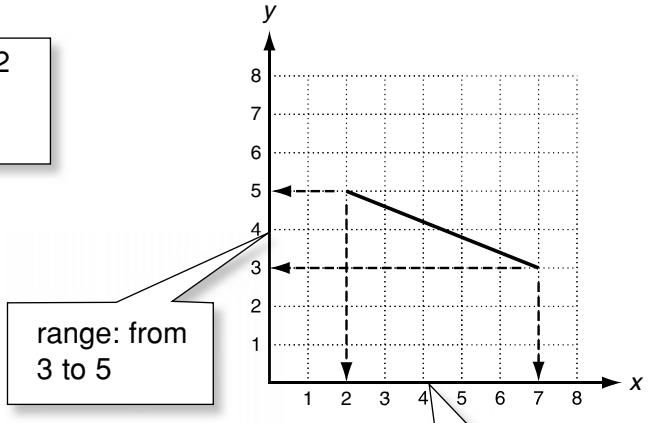
Do not list 2 twice in the range.

Find the domain and range.



D: {7, 5, 2, 0}; R: {3, 6, 7, 10}

Find the domain and range.



D: $2 \leq x \leq 7$
R: $3 \leq y \leq 5$

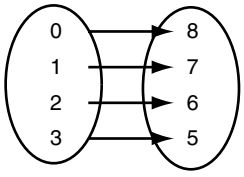
Find the domain and range of each relation.

1.

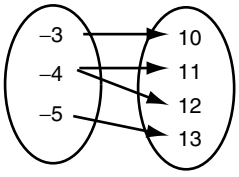
x	−2	−1	0	1
y	4	1	0	4

2. (4, 5) (−2, 6) (−5, 12)

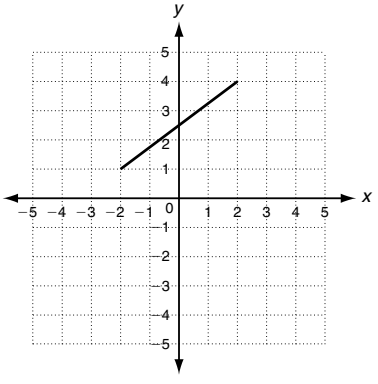
3.



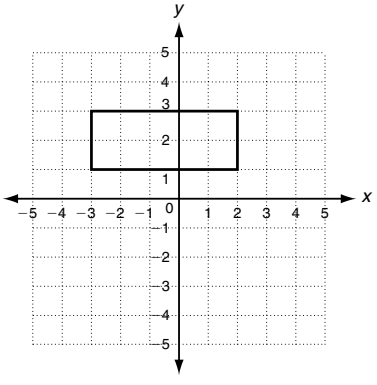
4.



5.



6.



Name _____ Date _____ Class _____

LESSON 4-2

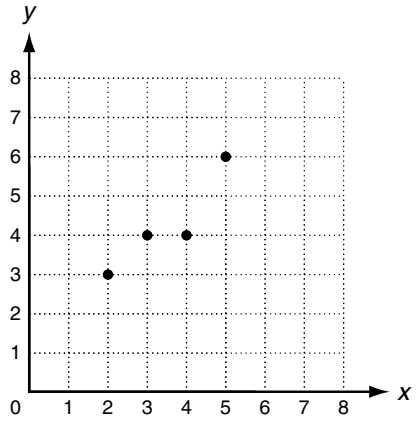
Reteach

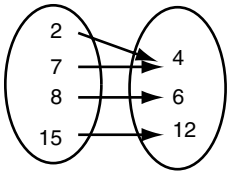
Relations and Functions (continued)

A **function** is a type of relation where each *x* value (domain) can be paired with only one *y* value (range).

Functions

x	2	3	4	5
y	3	4	4	6

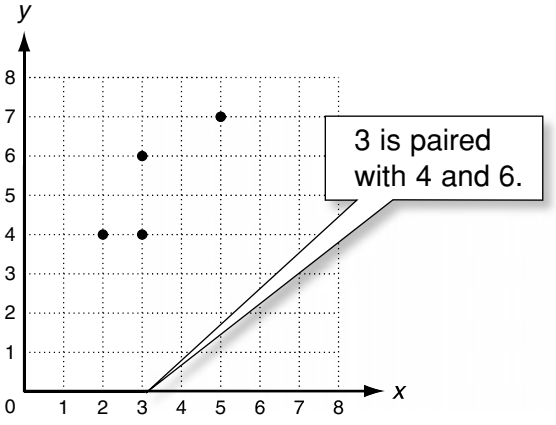




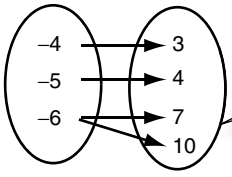
Not functions

6 is paired with 2 and 3.

x	5	6	6	7
y	1	2	3	4



3 is paired with 4 and 6.



−6 is paired with 7 and 10.

Tell whether the relation is a function. Explain.

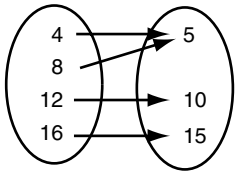
7.

x	−2	−3	−3	−4
y	1	2	3	4

_____

_____

8.



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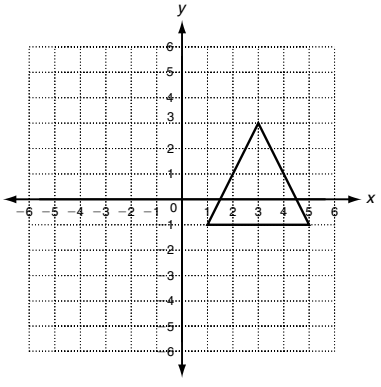
_____

9.



_____

_____

LESSON 4-2

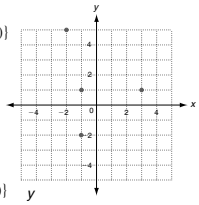
Practice A

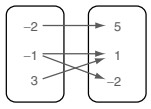
Relations and Functions

Express each relation as a table, as a graph, and as a mapping diagram.

1. {(−2, 5), (−1, 1), (3, 1), (−1, −2)}

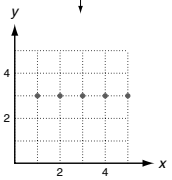
x	y
−2	5
−1	1
3	1
−1	−2

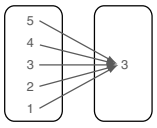




2. {(5, 3), (4, 3), (3, 3), (2, 3), (1, 3)}

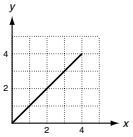
x	y
5	3
4	3
3	3
2	3
1	3





Give the domain and range of each relation. Tell whether the relation is a function. Explain.

3.



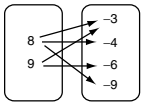
D: $\{0 \le x \le 4\}$

R: $\{0 \le y \le 4\}$

Function? yes

Explain: each domain value is paired with exactly one range value.

4.



D: {8, 9}

R: {−3, −4, −6, −9}

Function? no

Explain: both domain values are paired with more than one range value.

5.

x	y
1	4
2	5
0	6
1	7
2	8

D: {0, 1, 2}

R: {4, 5, 6, 7, 8}

Function? no

Explain: two domain values are paired with two range values.

LESSON 4-2

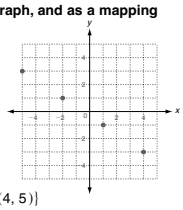
Practice B

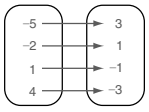
Relations and Functions

Express each relation as a table, as a graph, and as a mapping diagram.

1. {(−5, 3), (−2, 1), (1, −1), (4, −3)}

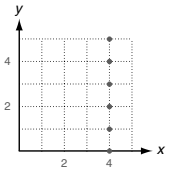
x	y
−5	3
−2	1
1	−1
4	−3

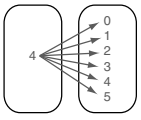




2. {(4, 0), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5)}

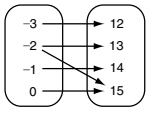
x	y
4	0
4	1
4	2
4	3
4	4
4	5





Give the domain and range of each relation. Tell whether the relation is a function. Explain.

3.



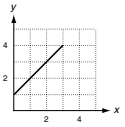
D: $\{-3, -2, -1, 0\}$

R: {12, 13, 14, 15}

Function? no

Explain: −2 is paired with both 13 and 15.

4.



D: $\{0 \le x \le 3\}$

R: $\{1 \le y \le 4\}$

Function? yes

Explain: each domain value is paired with exactly one range value.

5.

x	y
8	8
6	6
4	4
2	6
0	8

D: {0, 2, 4, 6, 8}

R: {4, 6, 8}

Function? yes

Explain: each domain value is paired with exactly one range value.

LESSON 4-2

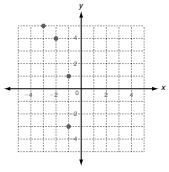
Practice C

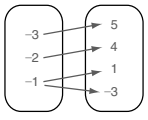
Relations and Functions

Express each relation as a table, as a graph, and as a mapping diagram.

1. {(−3, 5), (−2, 4), (−1, 1), (−1, −3)}

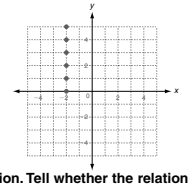
x	y
−3	5
−2	4
−1	1
−1	−3

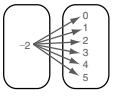




2. {(−2, 0), (−2, 1), (−2, 2), (−2, 3), (−2, 4), (−2, 5)}

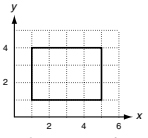
x	y
−2	0
−2	1
−2	2
−2	3
−2	4
−2	5





Give the domain and range of each relation. Tell whether the relation is a function. Explain.

3.



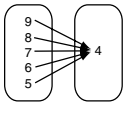
D: $\{1 \le x \le 5\}$

R: $\{1 \le y \le 4\}$

Function? no

Explain: all domain values are paired with more than one range value.

4.



D: {5, 6, 7, 8, 9}

R: {4}

Function? yes

Explain: each domain value is paired with exactly one range value.

5.

x	y
1	1
2	2
3	3
4	4
5	5

D: {1, 2, 3, 4, 5}

R: {1, 2, 3, 4, 5}

Function? yes

Explain: each domain value is paired with exactly one range value.

LESSON 4-2

Reteach

Relations and Functions

A **relation** is a set of ordered pairs. The relation can be in the form of a table, graph, or mapping diagram. The **domain** is all the *x*-values. The **range** is all the *y*-values.

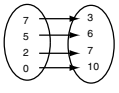
Find the domain and range.

x	3	4	5	6
y	1	2	2	3

D: {3, 4, 5, 6}; R: {1, 2, 3}

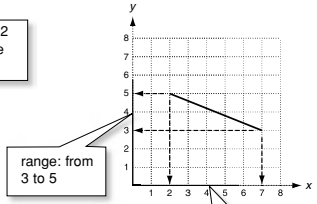
Do not list 2 twice in the range.

Find the domain and range.



D: {7, 5, 2, 0}; R: {3, 6, 7, 10}

Find the domain and range.



range: from 3 to 5

domain: from 2 to 7

D: $2 \le x \le 7$
R: $3 \le y \le 5$

Find the domain and range of each relation.

1.

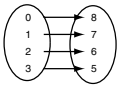
x	−2	−1	0	1
y	4	1	0	4

D: {−2, −1, 0, 1}; R: {4, 1, 0}

2. (4, 5) (−2, 6) (−5, 12)

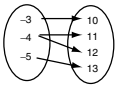
D: {4, −2, −5}; R: {5, 6, 12}

3.



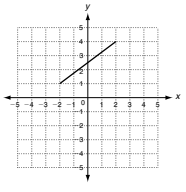
D: {0, 1, 2, 3}; R: {5, 6, 7, 8}

4.



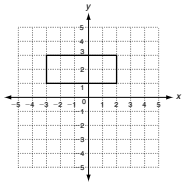
D: {−3, −4, −5}; R: {10, 11, 12, 13}

5.



D: $-2 \le x \le 2$; R: $1 \le y \le 4$

6.



D: $-3 \le x \le 2$; R: $1 \le y \le 3$

LESSON 4-2

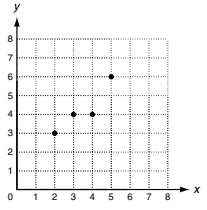
Reteach

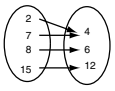
Relations and Functions (continued)

A **function** is a type of relation where each x value (domain) can be paired with only one y value (range).

Functions

x	2	3	4	5
y	3	4	4	6

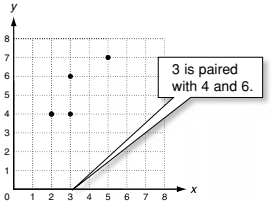


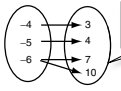


6 is paired with 2 and 3.

Not functions

x	5	6	6	7
y	1	2	3	4





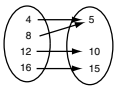
Tell whether the relation is a function. Explain.

7.

x	−2	−3	−3	−4
y	1	2	3	4

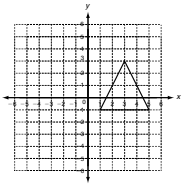
No; −3 is paired with both 2 and 3.

8.



Yes; each domain value is paired with exactly one range value.

9.



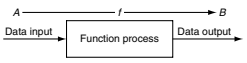
No; several domain values are paired with more than one range value.

LESSON 4-2

Challenge

Relations and Functions

A function is a correspondence, f, between two sets, A and B, such that each member of A is assigned exactly one member of B. The diagram shows a function as a dynamic process.



In Exercises 1–3, suppose that the input set, A, is the set of integers. Describe the range of each function.

1. f: Multiply each integer, n, by 5.

multiples of 5: . . . , −15, −10, −5, 0, 5, 10, 15, . . .

2. g: Multiply each integer, n, by a fixed integer, k.

multiples of k: kn

3. h: Divide the input integer, n, by 10 and write the remainder, r.

0, 1, 2, 3, 4, 5, 6, 7, 8, 9

In Exercises 4–6, write a function rule that represents the function described.

4. j: the coordinate of the point halfway between each distinct pair of points on a number line

If P has coordinate a, Q has coordinate b, assign $\frac{a+b}{2}$.

5. k: the distance of each point from 0

If P has coordinate a, assign $|a|$.

6. m: the length of the line segment determined by each distinct pair of points on the number line

If P has coordinate a and Q has coordinate b, assign $|a-b|$.

In Exercises 7 and 8, the domain of each function is the set of all squares.

7. a. Write a function, P, that gives the perimeter of any square.

If the length of a side of square X is s, then $P(\text{square } X) = 4s$.

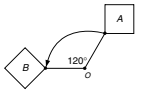
b. Write a function, A, that gives the area of any square.

If the length of a side of square X is s, then $A(\text{square } X) = s^2$.

8. a. Using the diagram below, describe the function that moves the square from A to B.

The function rotates square A 120° counterclockwise about point O.

b. What is the range of the function in part **a**?



The set of all squares that are the same size as and in the same plane as the original square.

9. Suppose that you roll two number cubes. The sum of the numbers that are showing can be represented by a function.

a. In the space at the right, make a table showing the members of the domain.

b. What is the range of the function? {2, 3, 4, 5, 6, 7, 8, 9, 10, 12}

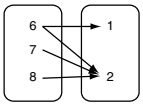
LESSON 4-2

Problem Solving

Relations and Functions

Give the domain and range of each relation and tell whether it is a function.

1. The mapping diagram shows the ages x and grade level y of four children.



D: {6, 7, 8}
R: {1, 2}
no

2.

Age x	Shoe Size y
6	8
9	10
12	10
15	10.5
18	11

D: {6, 9, 12, 15, 18}
R: {8, 10, 10.5, 11}
yes

3. The list represents the number of cars sold and the bonus received by the salespeople of a car dealership.
{(1, 50), (2, 50), (3, 100), (4, 150)}

D: {1, 2, 3, 4}
R: {50, 100, 150}
yes

4. A 2-inch-tall plant grows at a rate of 2.5 inches every week for 5 weeks. Let x represent the number of weeks and y represent the height of the plant.

D: {0, 1, 2, 3, 4, 5}
R: {2, 4.5, 7, 9.5, 12, 14.5}
yes

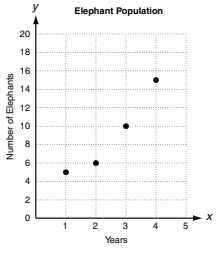
Use the graph below to answer questions 5–6. A conservation group has been working to increase the population of a herd of Asian elephants. The graph shows the results of their efforts. Select the correct answer.

5. Which relation represents the information in the graph?

A {(1, 4.5), (2, 6), (3, 10), (4, 14.5)}
B {(1, 5), (2, 6), (3, 10), (4, 15)}
C {(4.5, 1), (6, 2), (10, 3), (14.5, 4)}
D {(5, 1), (6, 2), (10, 3), (15, 4)}

6. What is the range of the relation shown in the graph?

F {0, 1, 2, 3, 4, 5}
G {1, 2, 3, 4}
H {4.5, 6, 10, 14.5}
J {5, 6, 10, 15}



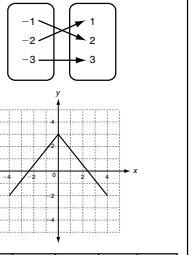
LESSON 4-2

Reading Strategies

Use Examples and Non-Examples

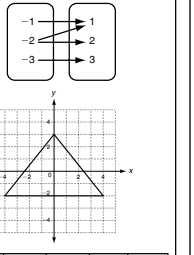
A **function** is defined as a relation that pairs each domain value with exactly one range value. No x-value can be repeated with a different y-value.

Examples
{(1, 3), (2, 4), (3, 5), (6, 8)}



x	−2	−1	0	1	2
y	6	6	6	6	6

Non-Examples
{(1, 3), (1, 4), (3, 5), (3, 8)}



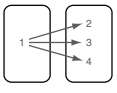
x	6	6	6	6	6
y	−2	−1	0	1	2

Answer the following.

1. Give your own example of a function in table form.

x	1	2	3	4
y	1	2	3	4

2. Give an example of a mapping diagram that is NOT a function.

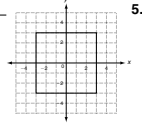


3. Explain why the relation in problem 2 is not a function.

because the domain value 1 is paired with more than one range value.

Tell whether each of the following is a function by writing *yes* or *no*.

4. no



5. no

x	y
−3	8
−2	5
−1	1
−1	4
−1	6

6. yes