

Determine the
DOMAIN & RANGE of a
Relation Defined by a Graph

Learning Objective

We will determine the domain and range of a relation¹ defined by a graph.

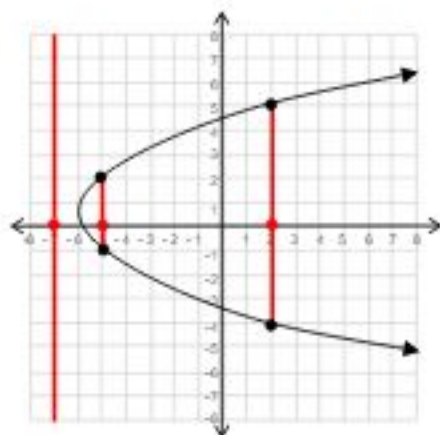
CFU

What are we going to learn?

Activate Prior Knowledge

Identify the missing y -values of the relation defined by the graph.

1.



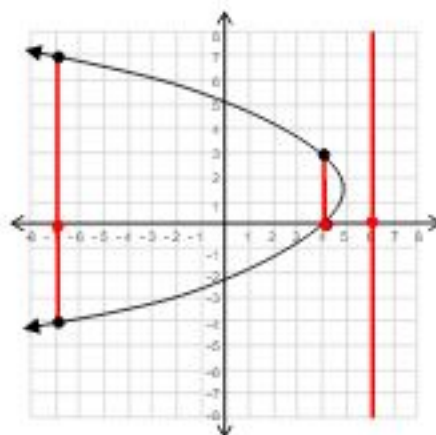
(2, 5)

(2, -4)

(-5, 2)

(-5, -1)

2.



(4, 0)

(4, 3)

(-7, 7)

(-7, -4)

Can a y value of the relation defined by the graph be identified at $(-7, \underline{\quad})$?
Why or why not?

No, because the relation does not contain any y -values to match the x value of -7 .

Can a y value of the relation defined by the graph be identified at $(6, \underline{\quad})$?
Why or why not?

No, because the relation does not contain any y -values to match the x value of 6 .

Make Connection

Students, you already know that ordered pairs consist of both x - and y -values and that they represent coordinates on a graph. Now, we will use ordered pairs of a relation defined by a graph to determine a relation's domain and range.

Vocabulary

¹ set of ordered pairs

The **domain** is all possible **inputs** for a given **relation**.

- In a graph, the **domain** is represented by all **x-values** defined by the graph.

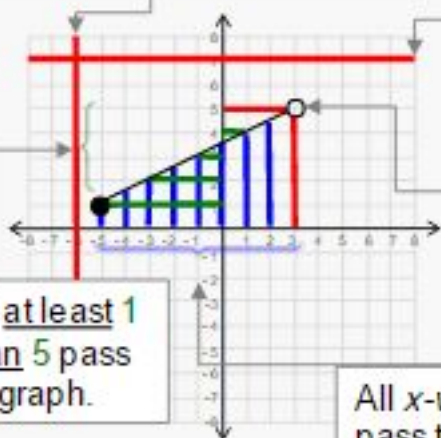
The **range** is all possible **outputs** for a given **relation**.

- In a graph, the **range** is represented by all **y-values** defined by the graph.

Domain and Range

The x value of -6 does not pass through the graph. -6 is not part of the domain.

The y value of 6 does not pass through the graph. 6 is not part of the range.



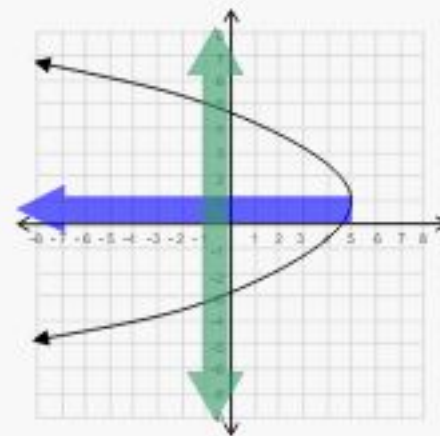
The x value of 3 and the y value of 5 are **excluded** from the graph. 3 is not part of the **domain** and 5 is not part of the **range**.

All **y-values** at least 1 and **less than** 5 pass through the graph.

All **x-values** at least -5 and **less than** 3 pass through the graph.

Range: $\{y, 1 \leq y < 5\}$

Domain: $\{x, -5 \leq x < 3\}$



Any value for x that is less than 5 will pass through the graph.

Domain: $\{x, x \geq 5\}$

Because the graph continues to infinity, any value for y will pass through the graph.

Range: $\{y\}$ ← All real y-values

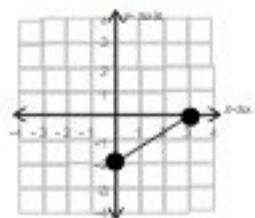
CFU

Which of the following shows a range of values at least 0 and no more than 3? How do you know?

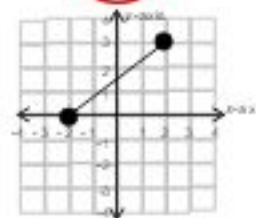
In your own words, what is the domain of a relation? "The domain of a relation is _____."

In your own words, what is the range of a relation? "The range of a relation is _____."

A



B



Skill Development/Guided Practice

The **domain** is all possible inputs for a given relation.

- In a graph, the **domain** is represented by all **x-values** defined by the graph.

The **range** is all possible outputs for a given relation.

- In a graph, the **range** is represented by all **y-values** defined by the graph.

Determine the domain and range of the relation defined by the graph.

1 Determine the domain by finding all x-values defined by the graph.

2 Determine the range by finding all y-values defined by the graph.

3 Interpret your answer.

"The domain of the relation is _____. The range of the relation is _____."

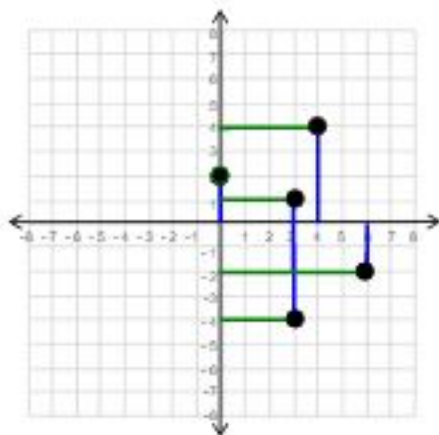
CFU

1 How did I/you determine the domain of the relation?

2 How did I/you determine the range of the relation?

3 How did I/you interpret the answer?

1.



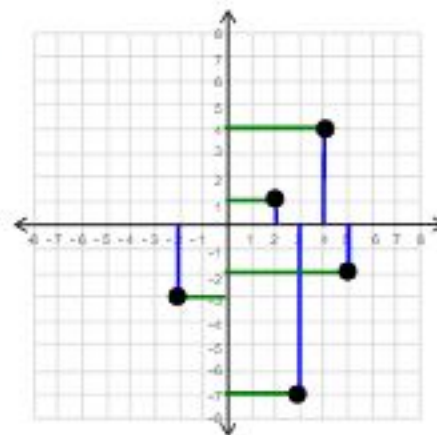
Domain: 0, 3, 4, 6

Range: -4, -2, 1, 2, 4

The domain of the relation is $\{0, 3, 4, 6\}$.

The range of the relation is $\{-4, -2, 1, 2, 4\}$.

2.



Domain: -2, 2, 3, 4, 5

Range: -7, -3, -2, 1, 4

The domain of the relation is $\{-2, 2, 3, 4, 5\}$.

The range of the relation is $\{-7, -3, -2, 1, 4\}$.

The **domain** is all possible inputs for a given relation.

- In a graph, the **domain** is represented by all **x-values** defined by the graph.

The **range** is all possible outputs for a given relation.

- In a graph, the **range** is represented by all **y-values** defined by the graph.

Determine the domain and range of the relation defined by the graph.

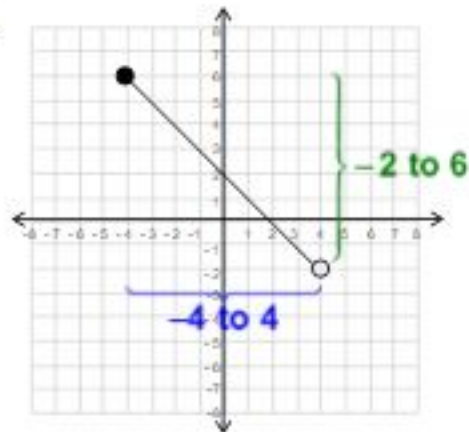
- Determine the domain by finding all x-values defined by the graph.
- Determine the range by finding all y-values defined by the graph.
- Interpret your answer.

"The domain of the relation is _____. The range of the relation is _____."

CFU

- How did I/you determine the domain of the relation?
- How did I/you determine the range of the relation?
- How did I/you interpret the answer?

3.



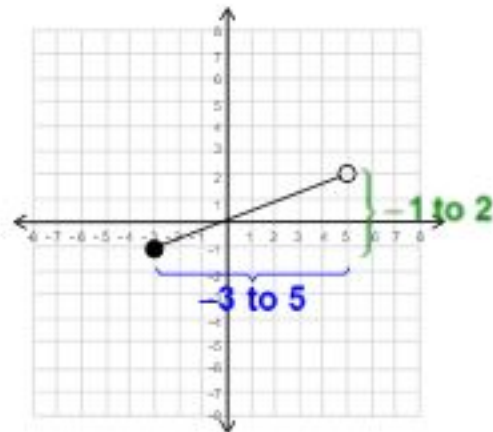
Domain: $x, -4 \leq x < 4$

Range: $y, -2 < y \leq 6$

The domain of the relation is $\{x, -4 \leq x < 4\}$.

The range of the relation is $\{y, -2 < y \leq 6\}$.

4.



Domain: $x, -3 \leq x < 5$

Range: $y, -1 \leq y < 2$

The domain of the relation is $\{x, -3 \leq x < 5\}$.

The range of the relation is $\{y, -1 \leq y < 2\}$.

The **domain** is all possible inputs for a given relation.

- In a graph, the **domain** is represented by all **x-values** defined by the graph.

The **range** is all possible outputs for a given relation.

- In a graph, the **range** is represented by all **y-values** defined by the graph.

Determine the domain and range of the relation defined by the graph.

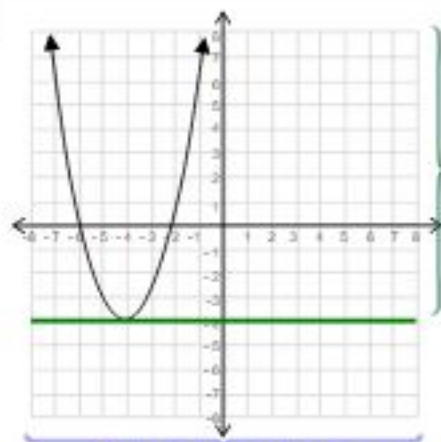
- Determine the domain by finding all x-values defined by the graph.
- Determine the range by finding all y-values defined by the graph.
- Interpret your answer.

"The domain of the relation is _____. The range of the relation is _____."

CFU

- How did I/you determine the domain of the relation?
- How did I/you determine the range of the relation?
- How did I/you interpret the answer?

5.



at least -4

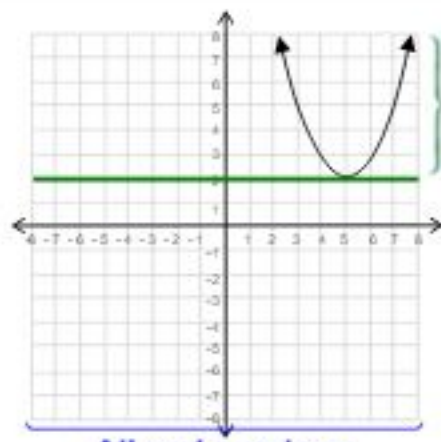
All real numbers

Domain: x Range: $y, y \geq -4$

The domain of the relation is $\{x\}$.

The range of the relation is $\{y, y \geq -4\}$.

6.



at least 2

All real numbers

Domain: x Range: $y, y \geq 2$

The domain of the relation is $\{x\}$.

The range of the relation is $\{y, y \geq 2\}$.

The **domain** is all possible **inputs** for a given relation.

- In a graph, the **domain** is represented by all **x-values** defined by the graph.

The **range** is all possible **outputs** for a given relation.

- In a graph, the **range** is represented by all **y-values** defined by the graph.

Determine the domain and range of the relation defined by the graph.

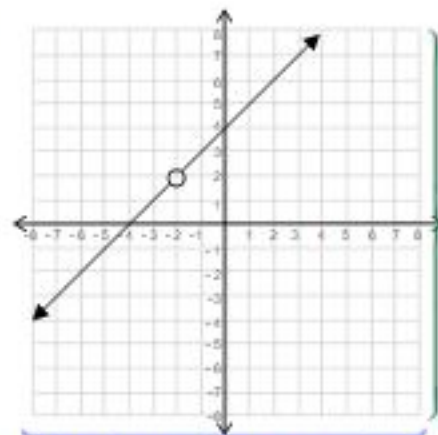
- Determine the domain by finding all x-values defined by the graph.
- Determine the range by finding all y-values defined by the graph.
- Interpret your answer.

"The domain of the relation is _____. The range of the relation is _____."

CFU

- How did I/you determine the domain of the relation?
- How did I/you determine the range of the relation?
- How did I/you interpret the answer?

7.



all real numbers except 2

all real numbers except -2

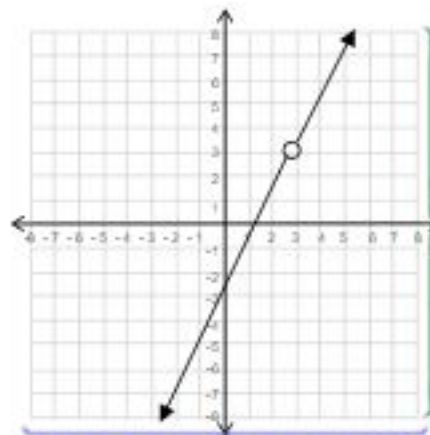
Domain: $x, x \neq -2$

Range: $y, y \neq 2$

The domain of the relation is $\{x, x \neq -2\}$.

The range of the relation is $\{y, y \neq 2\}$.

8.



all real numbers except 3

all real numbers except 3

Domain: $x, x \neq 3$

Range: $y, y \neq 3$

The domain of the relation is $\{x, x \neq 3\}$.

The range of the relation is $\{y, y \neq 3\}$.

The **domain** is all possible **inputs** for a given relation.

- In a graph, the **domain** is represented by all **x-values** defined by the graph.

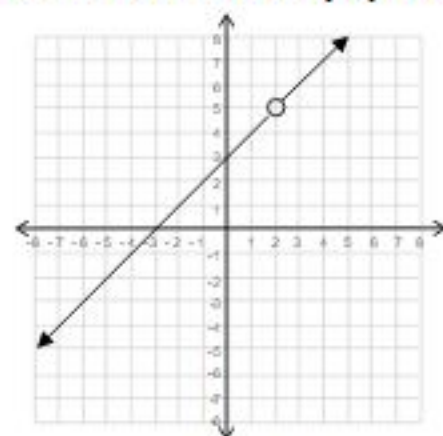
The **range** is all possible **outputs** for a given relation.

- In a graph, the **range** is represented by all **y-values** defined by the graph.

1 *Determining the domain and range of a relation will help you understand what values to expect from a function.*

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

The domain of the function is all real numbers except for 2. It can be concluded that there is no output for the x value of 2.



2 *Determining the domain and range of a relation will help you do well on tests.*

Sample Test Question:

32. For which equation graphed below are *all* the y-values negative?

A

B

C

D

CFU

Does anyone else have another reason why it is relevant to determine the domain and range of a relation? (Pair-Share) Why is it relevant to determine the domain and range of a relation? You may give one of my reasons or one of your own. Which reason is more relevant to you? Why?

The **domain** is all possible **inputs** for a given relation.

- In a graph, the **domain** is represented by all **x-values** defined by the graph.

The **range** is all possible **outputs** for a given relation.

- In a graph, the **range** is represented by all **y-values** defined by the graph.

Skill Closure

Determine the domain and range of the relation defined by the graph.

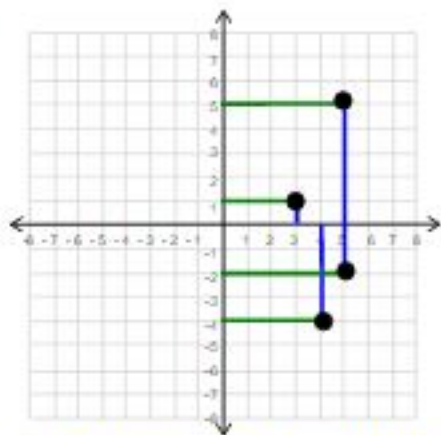
- 1 Determine the domain by finding all x-values defined by the graph.
- 2 Determine the range by finding all y-values defined by the graph.
- 3 Interpret your answer.

"The domain of the relation is _____. The range of the relation is _____."

Word Bank

domain
range
relation
graph
x-values
y-values

1.



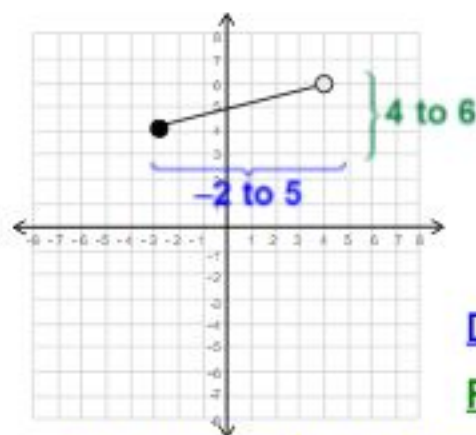
Domain: 3, 4, 5

Range: -4, -2, 1, 5

The domain of the relation is $\{3, 4, 5\}$.

The range of the relation is $\{-4, -2, 1, 5\}$.

2.



Domain: $x, -2 \leq x < 5$

Range: $y, 4 \leq y < 6$

The domain of the relation is $\{x, -2 \leq x < 5\}$.

The range of the relation is $\{y, 4 \leq y < 6\}$.

Summary Closure

What did you learn today about determining the domain and range of the relation defined by a graph? (Pair-Share) Use words from the word bank.

The **domain** is all possible inputs for a given relation.

- In a graph, the **domain** is represented by all **x-values** defined by the graph.

The **range** is all possible outputs for a given relation.

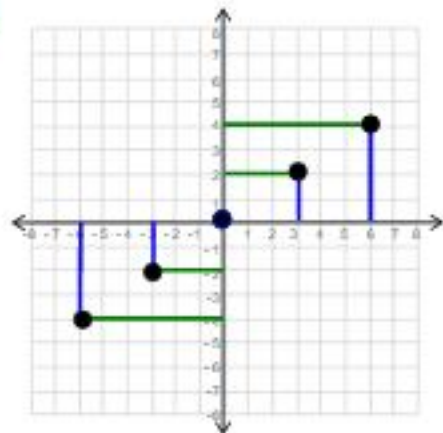
- In a graph, the **range** is represented by all **y-values** defined by the graph.

Determine the domain and range of the relation defined by the graph.

- Determine the domain by finding all x-values defined by the graph.
- Determine the range by finding all y-values defined by the graph.
- Interpret your answer.

"The domain of the relation is _____. The range of the relation is _____."

1.



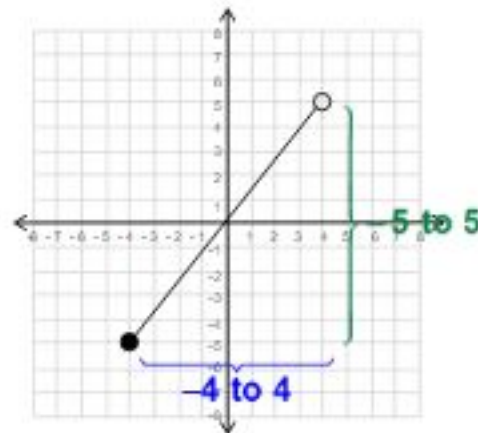
Domain: $-6, -3, 0, 3, 6$

Range: $-4, -2, 0, 2, 4$

The domain of the relation is $\{-6, -3, 0, 3, 6\}$.

The range of the relation is $\{-4, -2, 0, 2, 4\}$.

2.



Domain: $x, -4 \leq x < 4$

Range: $y, -5 \leq y < 5$

The domain of the relation is $\{x, -4 \leq x < 4\}$.

The range of the relation is $\{y, -5 \leq y < 5\}$.

Independent Practice (continued)

The **domain** is all possible inputs for a given relation.

- In a graph, the **domain** is represented by all **x-values** defined by the graph.

The **range** is all possible outputs for a given relation.

- In a graph, the **range** is represented by all **y-values** defined by the graph.

Determine the domain and range of the relation defined by the graph.

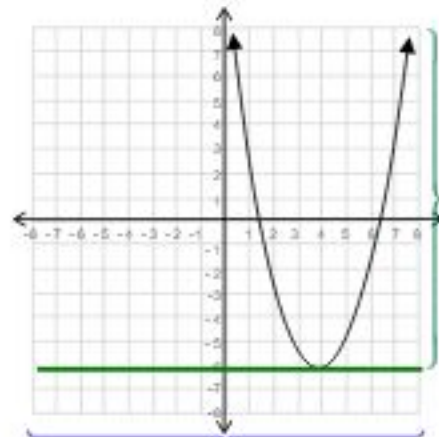
1 Determine the domain by finding all x-values defined by the graph.

2 Determine the range by finding all y-values defined by the graph.

3 Interpret your answer.

"The domain of the relation is _____. The range of the relation is _____."

3.



at least -6

All real numbers

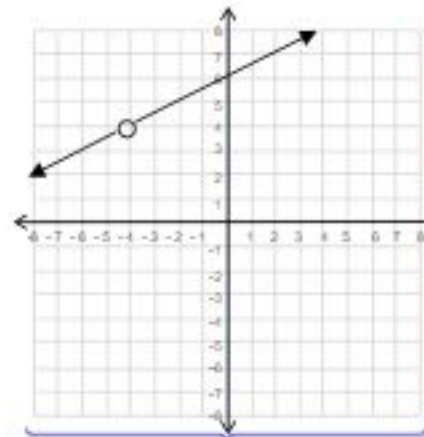
Domain: x

Range: $y, y \geq -6$

The domain of the relation is $\{x\}$.

The range of the relation is $\{y, y \geq -6\}$.

4.



all real numbers except 4

all real numbers except -4

Domain: $x, x \neq -4$

Range: $y, y \neq 4$

The domain of the relation is $\{x, x \neq -4\}$.

The range of the relation is $\{y, y \neq 4\}$.

The **domain** is all possible **inputs** for a given relation.

- In a graph, the **domain** is represented by all **x-values** defined by the graph.

The **range** is all possible **outputs** for a given relation.

- In a graph, the **range** is represented by all **y-values** defined by the graph.

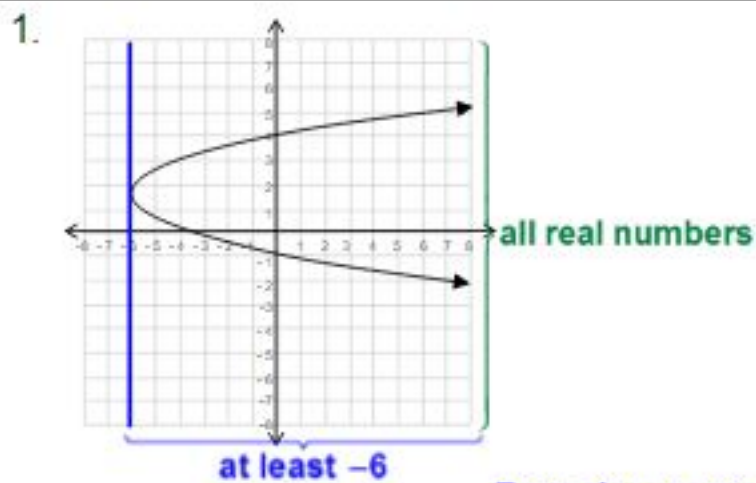
Determine the domain and range of the relation defined by the graph.

1 Determine the domain by finding all x-values defined by the graph.

2 Determine the range by finding all y-values defined by the graph.

3 Interpret your answer.

"The domain of the relation is _____. The range of the relation is _____."

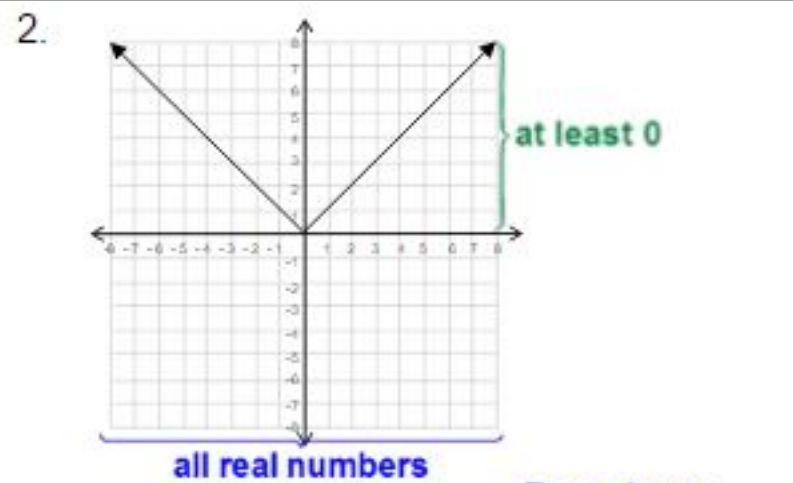


Domain: $x, x \geq -6$

Range: y

The domain of the relation is $\{x, x \geq -6\}$.

The range of the relation is $\{y\}$.



Domain: x

Domain: x

Range: $y, y \geq 0$

The domain of the relation is $\{x\}$.

The range of the relation is $\{y, y \geq 0\}$.

The **domain** is all possible inputs for a given relation.

- In a graph, the **domain** is represented by all **x-values** defined by the graph.

The **range** is all possible outputs for a given relation.

- In a graph, the **range** is represented by all **y-values** defined by the graph.

Determine the domain and range of the relation defined by the graph.

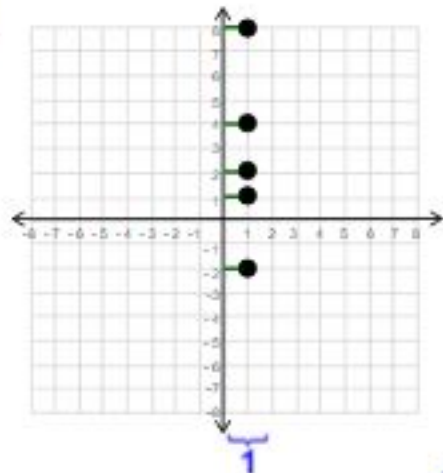
1 Determine the domain by finding all x-values defined by the graph.

2 Determine the range by finding all y-values defined by the graph.

3 Interpret your answer.

"The domain of the relation is _____. The range of the relation is _____."

3.



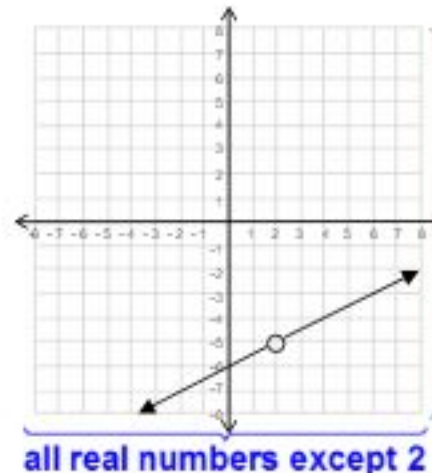
Domain: 1

Range: -2, 1, 2, 4, 8

The domain of the relation is $\{1\}$.

The range of the relation is $\{-2, 1, 2, 4, 8\}$.

4.



all real numbers except 2

all real numbers except -5

Domain: $x, x \neq 2$

Range: $y, y \neq -5$

The domain of the relation is $\{x, x \neq 2\}$.

The range of the relation is $\{y, y \neq -5\}$.

The **domain** is all possible **inputs** for a given relation.

- In a graph, the **domain** is represented by all **x-values** defined by the graph.

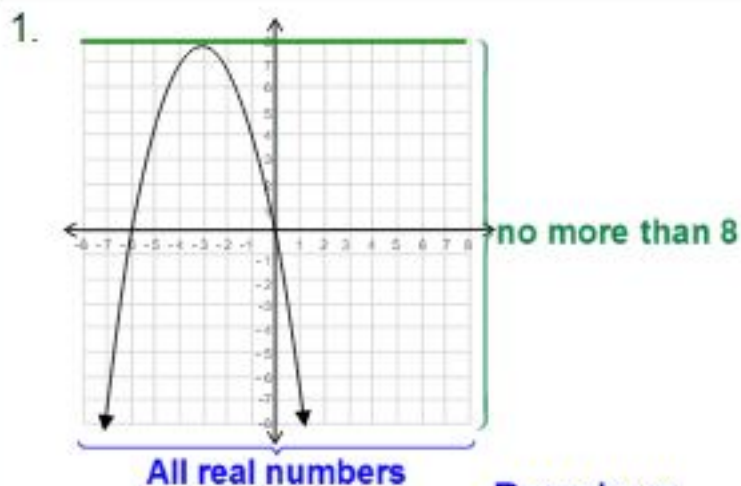
The **range** is all possible **outputs** for a given relation.

- In a graph, the **range** is represented by all **y-values** defined by the graph.

Determine the domain and range of the relation defined by the graph.

- 1 Determine the domain by finding all x-values defined by the graph.
- 2 Determine the range by finding all y-values defined by the graph.
- 3 Interpret your answer.

"The domain of the relation is _____. The range of the relation is _____."

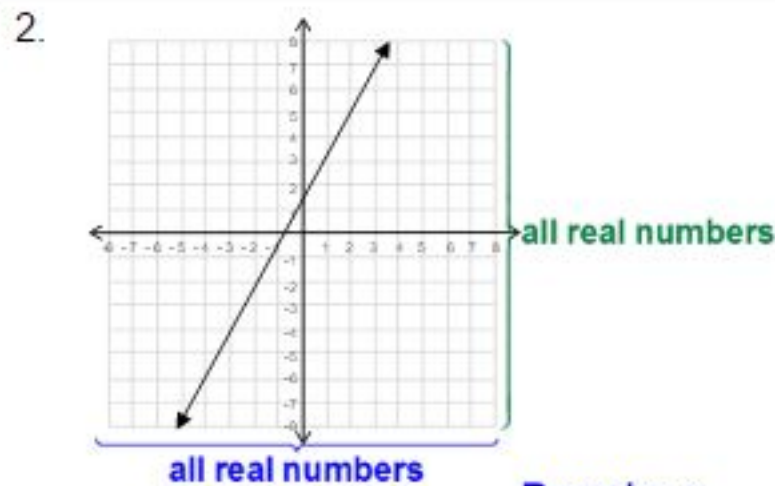


Domain: x

Range: $y, y \leq 8$

The domain of the relation is $\{x\}$.

The range of the relation is $\{y, y \leq 8\}$.



Domain: x

Range: y

The domain of the relation is $\{x\}$.

The range of the relation is $\{y\}$.

The **domain** is all possible **inputs** for a given relation.

- In a graph, the **domain** is represented by all **x-values** defined by the graph.

The **range** is all possible **outputs** for a given relation.

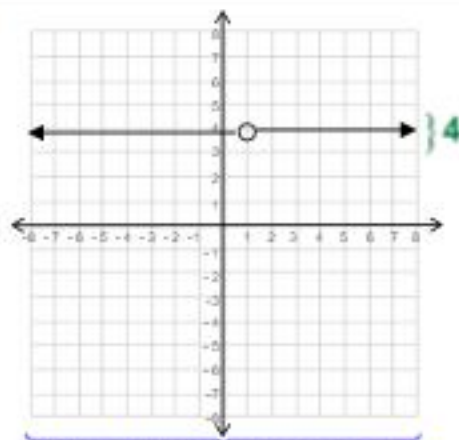
- In a graph, the **range** is represented by all **y-values** defined by the graph.

Determine the domain and range of the relation defined by the graph.

- Determine the domain by finding all x-values defined by the graph.
- Determine the range by finding all y-values defined by the graph.
- Interpret your answer.

"The domain of the relation is _____. The range of the relation is _____."

3.



All real numbers except 1

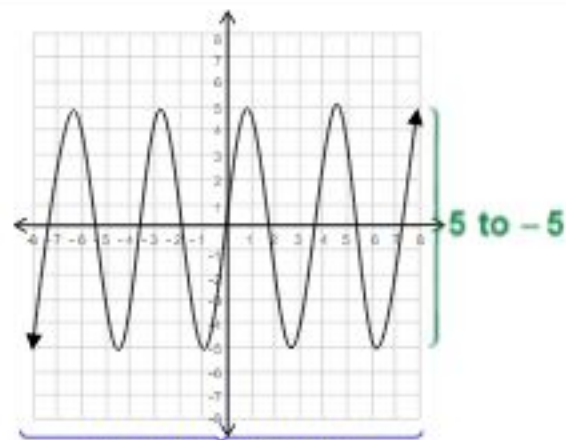
Domain: $x, x \neq 1$

Range: 4

The domain of the relation is $\{x, x \neq 1\}$.

The range of the relation is $\{4\}$.

4.



all real numbers

Domain: x

Range: $y, -5 \leq y \leq 5$

The domain of the relation is $\{x\}$.

The range of the relation is $\{y, -5 \leq y \leq 5\}$.

Periodic Review 3

The **domain** is all possible **inputs** for a given relation.

- In a graph, the **domain** is represented by all **x-values** defined by the graph.

The **range** is all possible **outputs** for a given relation.

- In a graph, the **range** is represented by all **y-values** defined by the graph.

Determine the domain and range of the relation defined by the graph.

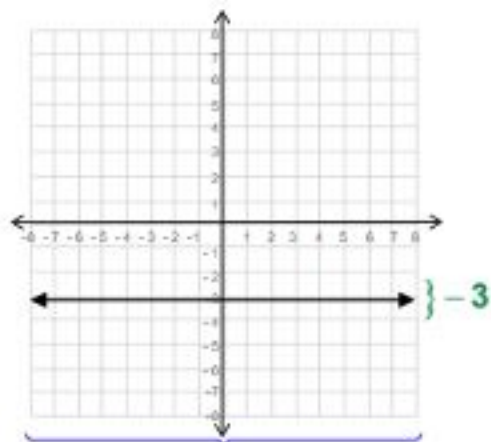
1 Determine the domain by finding all x-values defined by the graph.

2 Determine the range by finding all y-values defined by the graph.

3 Interpret your answer.

"The domain of the relation is _____. The range of the relation is _____."

1.



all real numbers

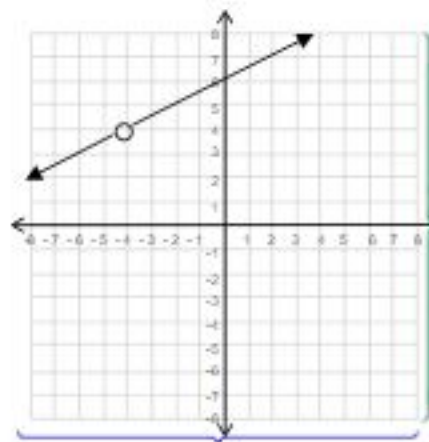
Domain: x

Range: -3

The domain of the relation is $\{x\}$.

The range of the relation is $\{-3\}$.

2.



all real numbers except -4

all real numbers except 4

Domain: $x, x \neq -4$

Range: $y, y \neq 4$

The domain of the relation is $\{x, x \neq -4\}$.

The range of the relation is $\{y, y \neq 4\}$.

The **domain** is all possible inputs for a given relation.

- In a graph, the **domain** is represented by all **x-values** defined by the graph.

The **range** is all possible outputs for a given relation.

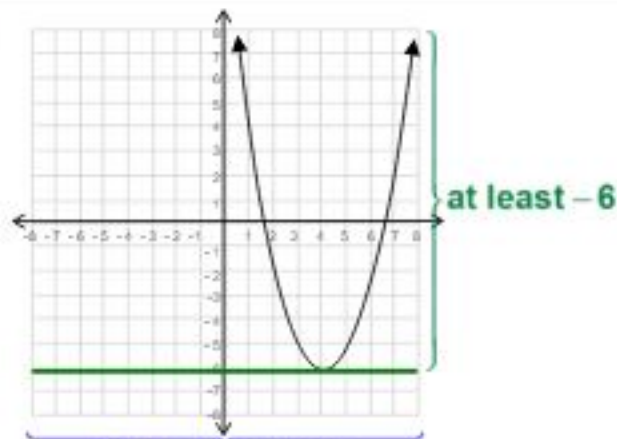
- In a graph, the **range** is represented by all **y-values** defined by the graph.

Determine the domain and range of the relation defined by the graph.

- 1 Determine the domain by finding all x-values defined by the graph.
- 2 Determine the range by finding all y-values defined by the graph.
- 3 Interpret your answer.

"The domain of the relation is _____. The range of the relation is _____."

3.



All real numbers

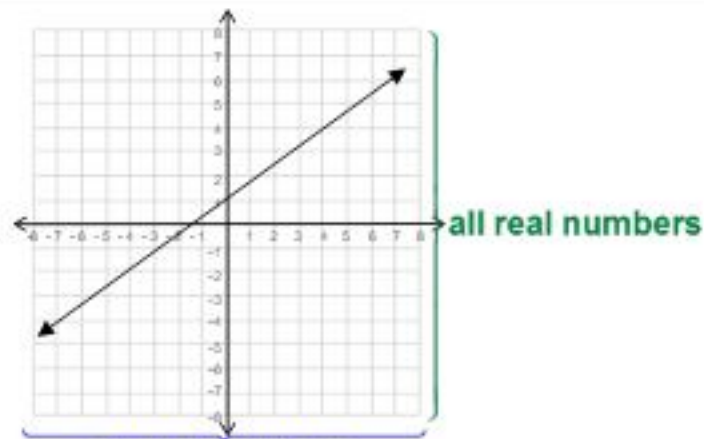
Domain: x

Range: $y, y \geq -6$

The domain of the relation is x .

The range of the relation is $y, y \geq -6$.

4.



all real numbers

Domain: x

Range: y

The domain of the relation is $\{x\}$.

The range of the relation is $\{y\}$.