

6.3a Domain and Range - Set Notation

Classify each of the following variables as discrete or continuous.

- a) time taken to complete a marathon **C**
- b) number of students who pass Math 10 **D**
- c) height of students **C**
- d) shoe size **D**

$$y = \sqrt{x}$$

$y \geq 0$ $x \geq 0$

$$P = 2c + S$$

use?

Domain and Range

When comparing two quantities, the words domain and range are used to describe the values that are appropriate.

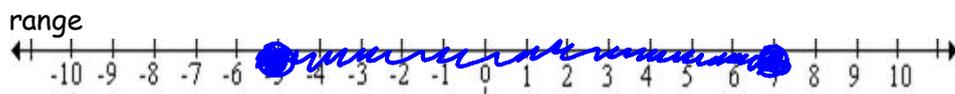
- The **domain** of a relation is the set of all possible values which can be used for the **input** of the independent variable (x).
- The **range** of a relation is the set of all possible values of the **output** of the dependent variable (y).

Domain and range can be shown in multiple ways.

- **Words:** The domain is the set of all real numbers less than 6. The range is the set of all real numbers between -5 and 7, inclusive.

\leftarrow includes boundary pts

- **Number lines:**



When do you use an open circle? - When the boundary point is not included

When do you use a closed circle? - When the boundary point is included

When do you need arrows? - To show infinity in one or two directions

- **List:** A list is useful for discrete data when there are not many numbers in the set.

For the relation $(-1, 2), (2, 4), (3, 1), (5, 1)$ the domain is $\{x = -1, 2, 3, 5\}$ and the range is $\{y = 1, 2, 4\}$.

\nearrow
List small to large

*no repeats

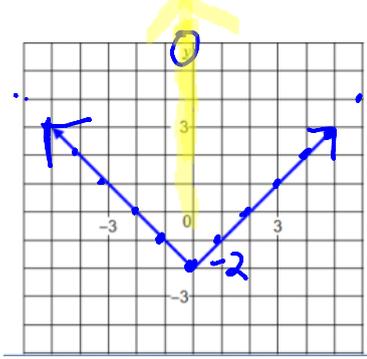
- **Set Notation:** This is a formal mathematical way to give the values of the domain and range.

Set Notation	What it Means
The domain: $\{x x < 6, x \in \mathbb{R}\}$	x such that, x is less than six, given x is in the set of all real numbers $x x < 6, x \in \mathbb{R}$
The range: $\{y y \geq -5, y \in \mathbb{R}\}$	y such that, y is greater than or equal to -5, given y is in the set of all real numbers
$\{x 0 < x < 7, x \in \mathbb{R}\}$	$0 < x < 7$
$\{y -5 \leq y < 1, y \in \mathbb{R}\}$	$-5 \leq y < 1$

Note: When the interval is between two values ...
 $\{ \text{lower boundary} < \underline{\text{variable}} < \text{upper boundary} \}$
 Arrows always point left!!!



Examples: Determine the domain and range of the relations graphed below. Use words and set notation.

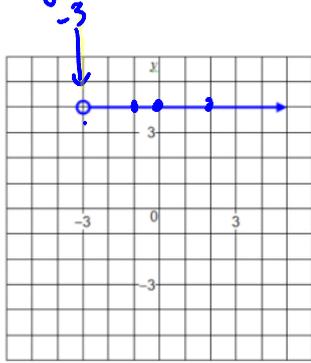


set notation:

no restriction → $\{x | x \in \mathbb{R}\}$ → $\{x | x \in \mathbb{R}\}$
 ↓ so

Domain: all real numbers $\{y | y \geq -2, y \in \mathbb{R}\}$

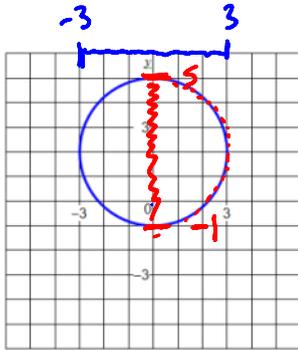
Range: all numbers greater than or equal to -2



set notation:

$$\{x \mid x > -3, x \in \mathcal{R}\}$$

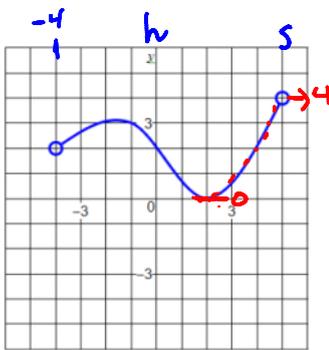
$$\{y \mid y = 4, y \in \mathcal{R}\}$$



set notation:

$$\{x \mid -3 \leq x \leq 3, x \in \mathcal{R}\}$$

$$\{y \mid -1 \leq y \leq 5, y \in \mathcal{R}\}$$



set notation:

$$\{x \mid -4 < x < 5, x \in \mathcal{R}\}$$

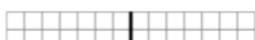
$$\{y \mid 0 \leq y < 4, y \in \mathcal{R}\}$$

Note: When data is discrete, simply list the domain and range

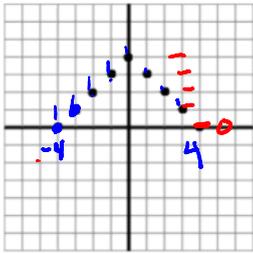
$(1, 2), (0, 5), (3, 8), (5, 9), (3, 2)$

Domain: $\{x \mid x = -3, 0, 1, 3, 5\}$

Range: $\{y \mid y = 2, 5, 8, 9\}$



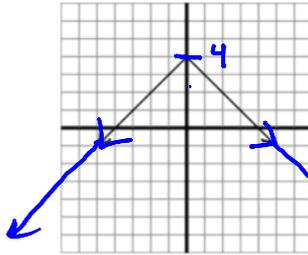
$0, \pm 1, \pm 2, \pm 3, \pm 4$



$$\{x \mid x = -4, -3, -2, -1, 0, 1, 2, 3, 4\}$$

$$\text{or } \{x \mid -4 \leq x \leq 4, x \in \mathbb{I}\}$$

$$\{y \mid y = 0, 1, 2, 3, 4\}$$

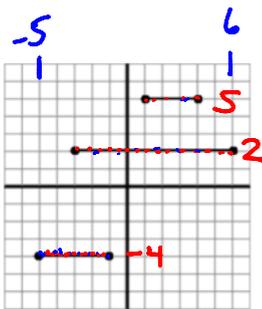


set notation:

$$\{x \mid \quad, x \in \mathbb{R}\}$$

$$\{x \mid x \in \mathbb{R}\}$$

$$\{y \mid y \leq 4, y \in \mathbb{R}\}$$



set notation:

$$\{x \mid -5 \leq x \leq 6, x \in \mathbb{R}\}$$

$$\{y \mid y = -4, 2, 5\}, y \in \mathbb{R}$$

Remember....

- Domain is left bound to right bound
- Range is lower bound to upper bound

Assignment p301 #1 ~~6~~ (words and set notation only)

$$1 \rightarrow 3, 5, 6b$$