

6.3a Domain and Range - Set Notation

Classify each of the following variables as discrete or continuous.

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

Domain and Range

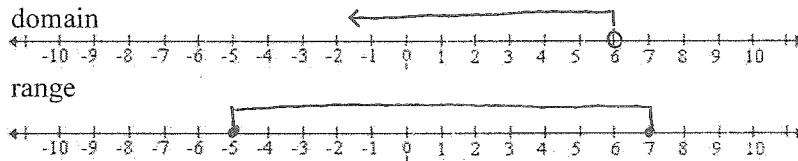
When comparing two quantities, the words domain and range are used to describe the values that are appropriate.

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

- **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 { -1, 2, 3, 5 } and the range is { 1, 2, 4 }

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

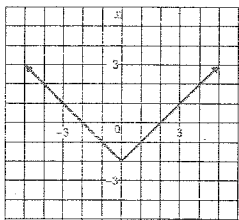
| Set Notation | What it Means |
|--|--|
| The domain: $\{x x < 6, x \in \mathcal{R}\}$ | x such that, x is less than six, given x is in the set of all real numbers |
| The range: $\{y y \geq -5, y \in \mathcal{R}\}$ | y such that, y is greater than or equal to -5, given y is in the set of all real numbers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

Note: When the interval is between two values ..

$\{ \text{lower boundary} < \text{variable} < \text{upper boundary} \}$

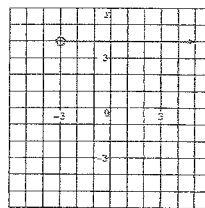
(Arrows always point left!!!)

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



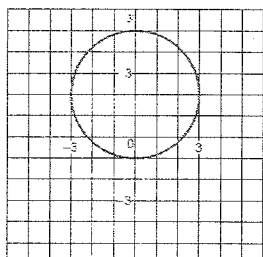
$$\{x \mid \text{---}, x \in \mathbb{R}\}$$

$$\{y \mid y \geq -2, y \in \mathbb{R}\}$$



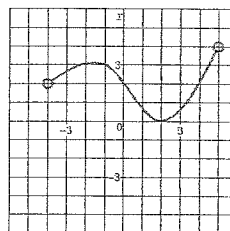
$$\{x \mid x > -3, x \in \mathbb{R}\}$$

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



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

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



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

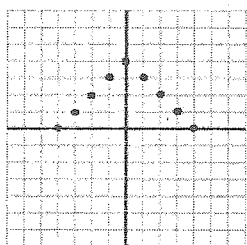
$$\{y \mid 0 < y < 4, y \in \mathbb{R}\}$$

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

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

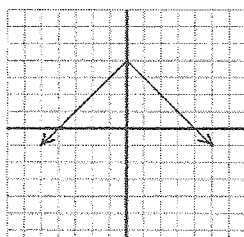
$$\text{Domain: } \{x \mid x = -3, 0, 1, 3, 5\}$$

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



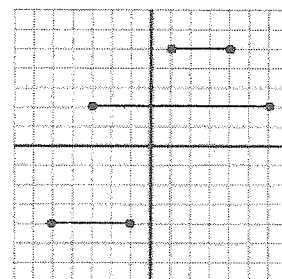
$$\{x \mid x = -4, -3, -2, -1, 0, 1, 2, 3, 4\}$$

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



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

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



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

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

Remember....

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

Assignment p301 #1,2,3,5,6bc (words and set notation only)