

Symbols Used in Sets

MATH 1001

Quantitative Skills and Reasoning



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Definitions Regarding Sets

- A set is **well defined** if it is possible to determine whether any given item is an element of the set.
- For instance:
 - The set of vehicles currently in production by Ford is well defined.
 - The set of *awesome cars* is not a well-defined set, as it is not possible to determine whether any given car is an element of the set or is not, as there is no standard method for making such a judgement.

Definitions Regarding Sets

- The statement “3 is an element of the set of whole numbers” can be written using mathematical notation as $3 \in W$.
 - The symbol \in is read “is an element of.”
- To state that “-5 is not an element of the whole numbers,” we use the “is not an element of” symbol, \notin , and write $-5 \notin W$.

Definitions Regarding Sets

- Determine whether each statement is true or false:
 - $0 \in \{0, 1, 3, 5, 7\}$ TRUE
 - $-2 \in N$ FALSE
 - $\frac{1}{5} \notin Z$ TRUE
 - The set of good jobs is a well-defined set. FALSE

Definitions Regarding Sets

- The **empty set**, or **null set**, is the set that contains no elements. The symbol $\{ \}$ or \emptyset is used to represent the empty set.
 - As an example of an empty set, consider the set of 100-year-old cats.
- It is important to remember that we can use those symbols separately, but when we combine them, we get something that is no longer the null set:
 - $\{\emptyset\}$ is the set *containing* the empty set. So this set actually has an element (the empty set) and thus is not actually empty.

Definitions Regarding Sets

- We previously mentioned two methods for describing a set:
 - Verbal Descriptions, and
 - The Roster Method
- Another method of representing a set is **set-builder notation**. Set-builder notation is especially useful when describing infinite sets.
 - For instance, the set of whole numbers greater than 4 is written

$$\{x \mid x \in W \text{ and } x > 4\}$$

Definitions Regarding Sets

$$\{x \mid x \in W \text{ and } x > 4\}$$

such that

is read “the set of all elements x such that x is an element of the Whole numbers, and x is greater than 4.”

It would be impossible to list all the elements of this set, but set-builder notation defines the set by describing its elements.

- Use set-builder notation to write the following sets:

- The set of Integers greater than -4. $\{x \mid x \in Z \text{ and } x > -4\}$

- The set of Natural numbers less than 200. $\{x \mid x \in N \text{ and } x < 200\}$