

1-6 : Set Notation

Example 1: Solve $a^2 = 25$ for a . State the solution set in words, set notation and graphically.

One can describe a solution set in any of the following ways:

IN WORDS: $a^2 = 25$ has solutions 5 and -5. (That is, $a^2 = 25$ is true when $a = 5$ or $a = -5$.)

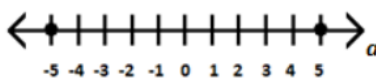
→ write it out as a sentence.

IN SET NOTATION: The solution set of $a^2 = 25$ is $\{-5, 5\}$.

↳ least to greatest

IN A GRAPHICAL REPRESENTATION ON A NUMBER LINE:

The solution set of $a^2 = 25$ is:



In this graphical representation, a solid dot is used to indicate a point on the number line that is to be included in the solution set.

How set notation works.

- The curly brackets $\{ \}$ indicate we are denoting a set. A set is essentially a collection of things, e.g., letters, numbers, cars, people. In this case, the things are numbers.
- From this example, the numbers -5 and 5 are called elements of the set. No other elements belong in this particular set because no other numbers make the equation $a^2 = 25$ true.
- When elements are listed, they are listed in increasing order. least → greatest
- Sometimes, a set is empty; it has no elements. In which case, the set looks like $\{ \}$. We often denote this with the symbol, \emptyset . We refer to this as the empty set or the null set.
- The symbol “|” means “such that”

$$\begin{array}{r} \cancel{7} + p = 12 \\ \underline{-\cancel{7}} \quad \downarrow \quad \underline{-\cancel{7}} \\ p = 5 \leftarrow \text{solution} \end{array}$$

Example 2:

Depict the solution set of $7 + p = 12$ in words, in set notation, and graphically.

WORDS: The solution is 5.

SET NOTATION: The solution set is $\{5\}$.



GRAPHICALLY:



● closed circle
(include this value)

Example 3:

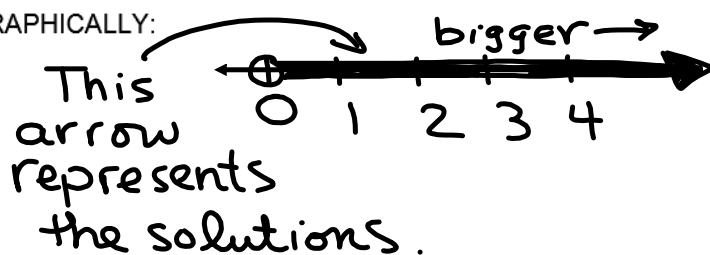
Solve $\frac{x}{x} = 1$ for x , over the set of positive real numbers. Depict the solution set in words, in set notation, and graphically.

WORDS: The solution is all positive real numbers.

SET NOTATION: The solution set is $\{\mathbb{R}^+\}$.

\mathbb{R} = the set of Real Numbers.

GRAPHICALLY:



○ open circle
(don't include this value).

More Set Notation:

- If it is not possible or not easy to list the elements in a set, then use the notation:
 $\{ \text{variable symbol} \ \text{number type} \ | \ \text{a description} \ }$
- For example:
 $\{x \text{ real} \ | \ x > 0\}$ reads as “the set of all real numbers that are greater than zero.”
 $\{p \text{ integer} \ | \ -3 \leq p < 100\}$ reads as “the set of all integers that are greater than or equal to -3 and smaller than 100 .”
 $\{y \text{ real} \ | \ y \neq 0\}$ reads as “the set of all real numbers that are not equal to zero.”
- The vertical bar “|” in this notation is often read as “that” or “such that.”
- It is awkward to express the set of all real numbers in set notation. We simply write the “blackboard script” \mathbb{R} for the set of all real numbers. (By hand, one usually just draws a double vertical bar in the capital letter: \mathcal{R} .)