



# Concepts and Examples Interval and Set-Builder Notation

Based on power point presentations by Pearson Education, Inc.

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# Learning Objectives

1. Use Interval Notation to express a set of numbers.
2. Use Set-Builder Notation to express a set of numbers.

# 1. Interval Notation (1 of 5)

Previously we learned that sets of numbers can be expressed using inequality signs. For example, the set  $-2 \leq x \leq 1$  contains all numbers between  $-2$  and  $1$  with  $-2$  and  $1$  included.

We can also use **Interval Notation**. In mathematics, we often call sets of number “intervals”. So, when we say “interval notation”, we simply describe a set of numbers in a certain way. In in this notation, we use brackets  $[ ]$ , parentheses  $( )$ , the positive infinity symbol  $\infty$ , the negative infinity symbol  $-\infty$ , and sometimes the "union" symbol  $\cup$ .

# Interval Notation (2 of 5)

**Brackets [ ]:** A bracket next to a number indicates that the number is included in the set.

For example,  $[-2, 1]$  is *Interval Notation* for a set of numbers that contains all values between  $-2$  and  $1$ , including  $-2$  and  $1$ . **We call this a CLOSED INTERVAL OR CLOSED SET!**

$[-2, 1]$  is equivalent to  $-2 \leq x \leq 1$ .

# Interval Notation (3 of 5)

**Parentheses ( ):** A parenthesis next to a number indicates that the number is NOT included in the set.

For example,  $(-2, 1)$  is *Interval Notation* for a set of numbers that contains all values between  $-2$  and  $1$ , NOT including  $-2$  and  $1$ . **We call this an OPEN INTERVAL OR OPEN SET!**

$(-2, 1)$  is equivalent to  $-2 < x < 1$ .

WARNING: Since we use the notation  $(-2, 1)$  also for an ordered pair determining the location of a point in the coordinate system, always be aware in what context you are using  $(-2, 1)$ .

# Interval Notation (4 of 5)

**Negative and Positive Infinity Symbols:** Negative and positive infinity always start and/or end with a parenthesis.

For example,  $(-\infty, 1)$  is *Interval Notation* for a set of numbers that contains ALL values that are less than 1, NOT including 1.

$(-\infty, 1)$  is equivalent to  $x < 1$ .

On the other hand,  $[1, \infty)$  is *Interval Notation* for a set of numbers that contains ALL values that are greater than or equal to 1, including 1.

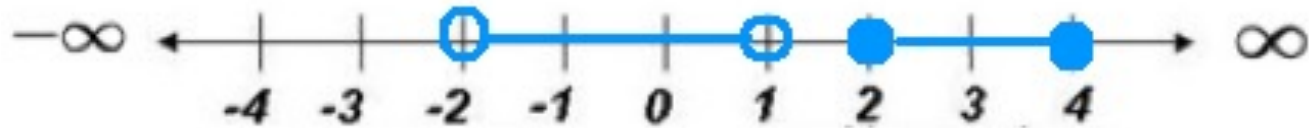
$[1, \infty)$  is equivalent to  $x \geq 1$ .

# Interval Notation (5 of 5)

**Union of Intervals:** The symbol  $\cup$  joins separate sets of items. The union symbol is usually read as “or”.

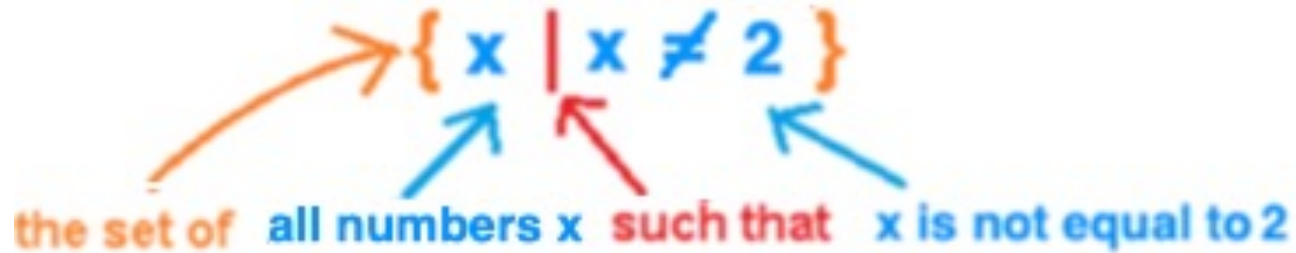
For example,  $(-2, 1) \cup [2, 4]$  is *Interval Notation* for a set of numbers that is a union of two separate intervals.

We can graph this set on a number line as follows:



## 2. Set-Builder Notation (1 of 2)

**Set-Builder Notation** can also be used to express a set of numbers. Here, we use braces  $\{ \}$  and the vertical separator  $|$ . We are going to use an example to illustrate *Set-Builder Notation*.

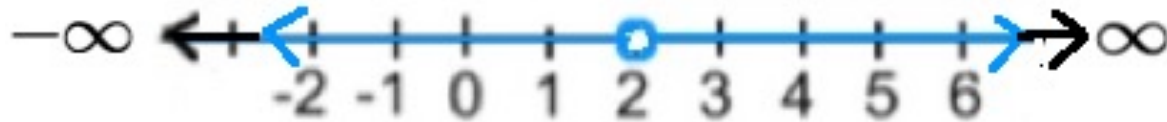


In the example above, the *Set-Builder Notation* means that we want to include ALL numbers in the set except the number 2.



## Set-Builder Notation (2 of 2)

We can graph the set  $\{x \mid x \neq 2\}$  on a number line as follows:



The blue line indicates the numbers included to the right and left of the circle. The arrows indicate that there are infinitely many numbers in the set. There is a CIRCLE at 2 which indicates that the number 2 is NOT included in the set!