Math 1010 Interval Notation

Intermediate Algebra

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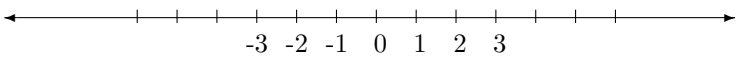
When we discuss an interval, we are talking about a piece of the real number line. Recall that the real number line is just a way to visualize the order of the real numbers.



When we wish to take an interval of the real numbers that means that we want to talk about all the numbers in between two **endpoints**, but this set is too large to write in a list. Thus we need a better way to write it.

Let's talk about the set of numbers between the two endpoints 1 and 3. The first question is do we want to include the endpoints 1 and 3 in the set or do we want to just talk about the numbers in between the points but not including them.

If we wish to include the endpoints we write:

$$[1,3] \text{ or } 1 \leq x \leq 3$$

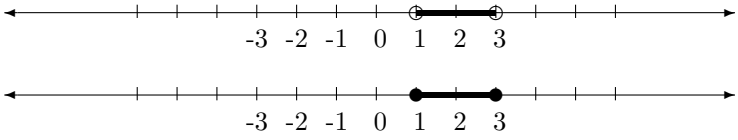
If we do not wish to include the endpoints we write:

$$(1,3) \text{ or } 1 < x < 3$$

We may also include only one of the endpoints. The first example includes the endpoint 1 and the second includes only the endpoint 3.

$$[1,3) \text{ or } 1 \leq x < 3$$
$$(1,3] \text{ or } 1 < x \leq 3$$

When we talk about these intervals we highlight the area between the endpoints on the real number line. At the endpoints we put an open circle if we do not want to include them and a closed circle if we do. Here are examples of each.



We can also use interval notation to express that we have one value and want to talk about all the values that are larger (or smaller) than it. Consider all the numbers bigger than one, this is quite a large set. Since we do not really have a second endpoint (the set continues on forever) we use the idea of infinity (∞). Below we have the set of all values larger than one.

$$(1,\infty) \text{ or } x > 1$$

If we want to say all numbers greater than or equal to one we write

$$[1,\infty) \text{ or } x \geq 1$$

We do something similar with all values less then one. The first example is the set of values strictly less than one, the second is the set of numbers less than or equal to one.

$$(-\infty,1) \text{ or } x < 1$$
$$(-\infty,1] \text{ or } x \leq 1$$

Notice that we will always use an open bracket for infinity.