

## Objective 1 - Set Notation

*Describe solutions as sets of numbers.*

[Link to section in online textbook.](#)

**Note: As this section reviews definitions, there is no associated video.**

We start with a terminology review.

A **set** is a collection of mathematical objects. We'll commonly look at sets of numbers like the Natural numbers:  $\{1, 2, 3, 4, \dots\}$ .

An **interval** is a collection of Real numbers. For example,  $(1, 2)$  is the set of Real numbers between 1 and 2 (but not including 1 or 2). If we want to include the endpoints of an interval, we use brackets, such as  $[1, 2]$ .

We can describe solutions that exist in an interval by using the notation  $x \in (a, b)$ . We read this as “ $x$  is an element of  $(a, b)$ ” and means that  $x$  is some number between  $a$  and  $b$ . For example,  $x \in [1, 2]$  means that  $x$  is some number between 1 and 2 (and could be one of the two numbers).

We can also describe intervals using **inequalities**. For example, to describe the set of  $x \in (1, 2)$  using inequalities, we would use  $1 < x < 2$ . This is usually a more natural way for students to read “ $x$  is a Real number between 1 and 2.” If we want to include the endpoints of an inequality, we use the symbols  $\leq$  or  $\geq$ .

**Question 1** Write each set described in Interval notation.

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Learning outcomes: Understand and solve linear inequalities.  
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Objective 1 - Set Notation

| <b>Set described in words</b>                                       | <b>Inequality Notation</b> | <b>Interval Notation</b>                         |
|---|----------------------------|--|
| All Real numbers between $a$ and $b$ , but not including $a$ or $b$ | $a < x < b$                | $\{x \mid x \in (a, b)\}$                        |
| All Real numbers greater than $a$ , but not including $a$           | $x > a$                    | $\{x \mid x \in (a, \infty)\}$                   |
| All Real numbers less than $b$ , but not including $b$              | $x < b$                    | $\{x \mid x \in (-\infty, b)\}$                  |
| All Real numbers greater than $a$ , including $a$                   | $x \geq a$                 | $\{x \mid x \in [a, \infty)\}$                   |
| All Real numbers less than $b$ , including $b$                      | $x \leq b$                 | $\{x \mid x \in (-\infty, b]\}$                  |
| All Real numbers between $a$ and $b$ , including $a$                | $a \leq x < b$             | $\{x \mid x \in [a, b)\}$                        |
| All Real numbers between $a$ and $b$ , including $b$                | $a < x \leq b$             | $\{x \mid x \in (a, b]\}$                        |
| All Real numbers between $a$ and $b$ , including $a$ and $b$        | $a \leq x \leq b$          | $\{x \mid x \in [a, b]\}$                        |
| All Real numbers less than $a$ or greater than $b$                  | $x < a$ or $x > b$         | $\{x \mid x \in (-\infty, a) \cup (b, \infty)\}$ |
| All Real numbers  | $x \geq a$ or $x < a$      | $\{x \mid x \in (-\infty, \infty)\}$             |

**Question 2** On exams, you will answer questions primarily using interval notation. Solve the linear equation below and choose the interval that contains the solution.

$$x + 3 = 5.5$$

**Multiple Choice:**

- (a)  $x = a$ , where  $a \in [-2, -1]$
- (b)  $x = a$ , where  $a \in [-1, 0]$
- (c)  $x = a$ , where  $a \in [0, 1]$
- (d)  $x = a$ , where  $a \in [1, 2]$
- (e)  $x = a$ , where  $a \in [2, 3]$  ✓