

Objective 1 - Set Notation

Describe solutions as sets of numbers.

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

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.

Learning outcomes: Understand and solve linear inequalities.

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Set described in words	Inequality Notation	Interval Notation
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 $a \in [2, 3]$ ✓