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: $\{1, 2, 3, 4, \ldots\}$.

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	$a < x < b$	$\{x \mid x \in \boxed{(a,b)}\}$
All Real numbers greater than a, but not including a	$x > a$	$\{x \mid x \in \boxed{(a,\infty)}\}$
All Real numbers less than b, but not including b	$x < b$	$\{x \mid x \in \boxed{(-\infty,b)}\}$
All Real numbers greater than a, including a	$x \geq a$	$\{x \mid x \in \boxed{[a,\infty)}\}$
All Real numbers less than b, including b	$x \leq b$	$\{x \mid x \in \boxed{(-\infty,b]}\}$
All Real numbers between a and b, including a	$a \leq x < b$	$\{x \mid x \in \boxed{[a,b)}\}$
All Real numbers between a and b, including b	$a < x \leq b$	$\{x \mid x \in \boxed{(a,b]}\}$
All Real numbers between a and b, including a and b	$a \leq x \leq b$	$\{x \mid x \in \boxed{[a,b]}\}$
All Real numbers less than a or greater than b	$x < a$ *or* $x > b$	$\{x \mid x \in \boxed{(-\infty,a)} \cup \boxed{(b,\infty)}\}$
All Real numbers	$x \geq a$ *or* $x < a$	$\{x \mid x \in \boxed{(-\infty,\infty)}\}$

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* $a \in [2,3]$ ✓