Inequalities

Inequality Sign and Meaning	Example
$<$ "less than"	$x < 5$ This means x is any number LESS THAN 5 $\ldots -1, 0, 1, 2, 3, 4, 5$
$>$ "greater than"	$x > 0$ This means x is any number GREATER THAN 0 $0, 1, 2, 3 \ldots$
$\leq$ "less than or equal to"	$x \leq 2$ This means x is any number LESS THAN OR EQUAL TO 2 $\ldots -1, 0, 1, 2$
$\geq$ "greater than or equal to"	$x \geq 1$ This means x is any number GREATER THAN OR EQUAL TO 1 $1, 2, 3, 4 \ldots$

- If the mouth is open to the value, that is the greater value of the inequality
- The line under the signs ($\leq$ *and* $\geq$) can remind you of an equals sign because an $=$ sign has straight lines

Determine the value of the inequalities below.

a) $x \geq -3$ b) $y < 10$ c) $a \leq 7$

If there is more than one inequality sign → work from left to right to determine its value.

Example 1) $-3 \leq x \leq 2$ → x is greater than or equal to -3 and is less than or equal to 2

→ x could be $-3, -2, -1, 0, 1, 2$

Determine the values x could be for the following.

d) $2 \leq x < 5$ e) $0 \leq x \leq 7$ f) $-6 < x < 4$

Set-Builder Notation Using Inequalities

Review: What could x be given {x | x is a positive multiple of 2} ?

So, given $\{x \mid x \geq -3\}$, x could be any number GREATER THAN OR EQUAL TO -3 $-3, -2, -1, 0, 1, 2 \ldots\ldots$

Determine what x could be given the following. (These are just like the examples one the other side!)

g) $\{x \mid x < 7\}$ h) $\{x \mid -1 \leq x \leq 5\}$ i) $\{x \mid 3 < x \leq 13\}$

Using Inequalities for Sets

**You may not always be able to use a venn diagram. For example, if A=$\{x \mid x \geq 3\}$, that means x could be any number greater than or equal to 3. It is impossible to put an infinite amount of numbers like that into one venn diagram.

Ex 2) If $A = \{x \mid x \leq 4\}$ $B = \{x \mid -2 < x < 6\}$ $C = \{x \mid -5 \leq x < 2\}$

Find:

j) $A \cup B =$

k) $(A \cup B) \cap (A \cup C)$

l) $A \cup C =$

m) $A \cup (B \cap C) =$

Interval Notation

For interval notation, we write only the first and last numbers included in the interval.

- We use square brackets when we want to include the end value [ ]
- We use round brackets when we don't want to include the end value

Example: Set-builder notation $\{x \mid -3 \leq x < 5\}$ → Interval Notation: $[-3, 5)$

3 is included 5 is not included 3 is included 5 is not included

If $A = \{x \mid x \leq 4\}$ $B = \{x \mid -2 < x < 6\}$ $C = \{x \mid -5 \leq x < 2\}$

Express each in interval notation:

n) $A \cap B =$

o) $A \cap C =$

p) $(A \cap B) \cup (A \cap C) =$

q) $A \cap (B \cup C) =$