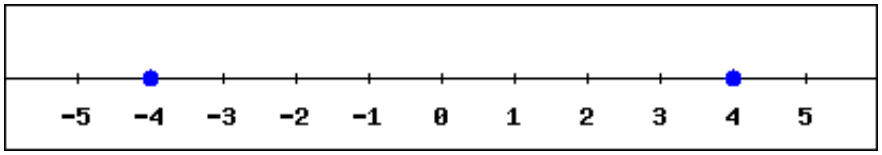
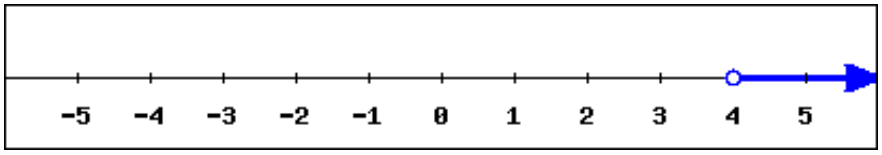

Problem 1. **(1 point)** CUNY/CityTech/Precalculus/setIntervalNotation/interval-intro.pg

It is straightforward to graph specific values for x; for instance, consider this graph of $x = 4$ or $x = -4$:



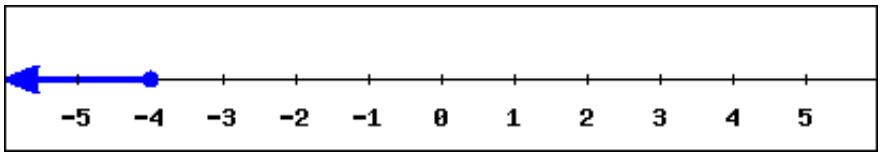
But sometimes we want to refer to a *interval* of values, such as **"all numbers greater than 4"**:



All the numbers greater than 4 have been shaded blue.
There is an open circle on the number 4 to indicate "4" is not included in the interval. (4 is not greater than itself!)

- Inequality notation: $x > 4$ (we could also write: $4 < x$)
- Interval notation: $(4, \infty)$ (∞ indicates that we want *all* values greater than 4, up to *infinity* as symbolized by the shaded arrow in the graph; note that the left parenthesis "(" next to the "4" indicates that the the left endpoint 4 is *not* included in the interval.)

If we want to include an endpoint in our interval, we must consider something like **"all numbers less than *or equal to* -4"**:



This interval *includes* -4 because of the additional "or equal to" in the description of our range of values.

- Inequality notation: $x \leq -4$ (alternatively: $-4 \geq x$)
- Interval notation: $(-\infty, -4]$ (here the square bracket "]" indicates that the endpoint -4 *is* included in the interval.)

Rewrite each of the following interval expressions in *interval notation*:

- You can use "inf" and "-inf" for ∞ and $-\infty$.

a. $x < 0$ ____

b. $-7 \leq x$ ____

c. $x < -6$ ____

d. $x \leq -3$ ____

e. $-16 < x$ ____

Hint: *(Instructor hint preview: show the student hint after the following number of attempts: 2)*

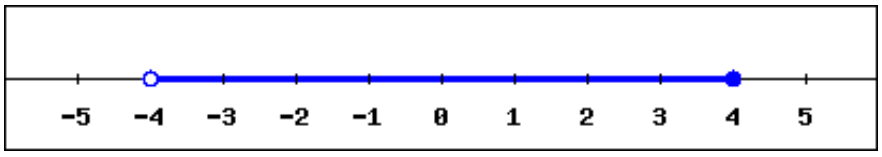
- Think about each inequality: is *x bigger* or *smaller* than the specified number?
- Is the number *included* in the interval ($\leq$ or $\geq$)? Or is it *excluded* ($<$ or $>$)?
- Use a parenthesis "(" or ")" when an endpoint is *excluded* from the interval; use square brackets "[" or "]" when an endpoint is *included* in the interval.
- Consider drawing a visual representation of the range given by each inequality - does that help you determine the interval notation?
- The order matters: $-\infty$ always goes on the left and ∞ always goes on the right.

Correct Answers:

- $(-\infty, 0)$
- $[-7, \infty)$
- $(-\infty, -6)$
- $(-\infty, -3]$
- $(-16, \infty)$

Problem 2. **(1 point)** CUNY/CityTech/Precalculus/setIntervalNotation/interval-compound.pg

Consider the set of values described by the phrase **"all numbers larger than -4 AND also less than or equal to 4"**:



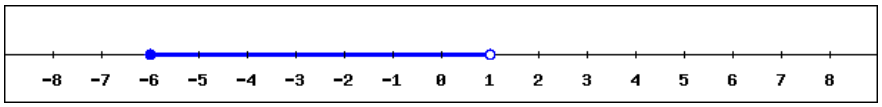
This interval includes one endpoint but not the other; do you see why?

We can express this range of values in inequality notation and in interval notation:

- Inequality notation: $-4 < x \leq 4$ (alternatively: $x > -4$ AND $x \leq 4$)
- Interval notation: $(-4, 4]$

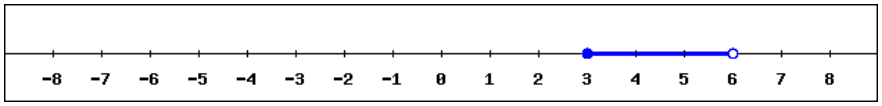
Rewrite each of the following inequalities in *interval notation*:

a.



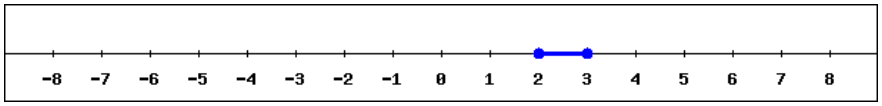
as an inequality: $-6 \leq x < 1$
in interval notation: _____

b.



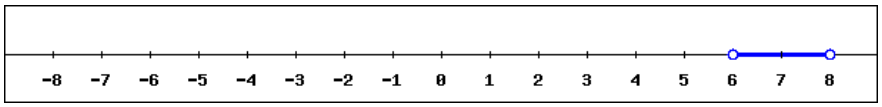
as an inequality: $3 \leq x < 6$
in interval notation: _____

c.



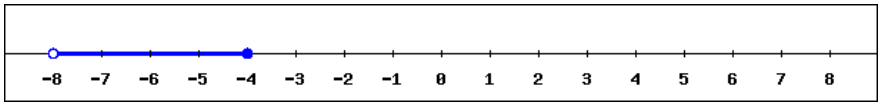
as an inequality: $2 \leq x \leq 3$
in interval notation: _____

d.



as an inequality: $6 < x < 8$
in interval notation: _____

e.



as an inequality: $-8 < x \leq -4$
in interval notation: _____

Hint: *(Instructor hint preview: show the student hint after the following number of attempts: 2)*

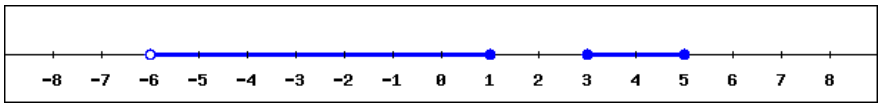
- For each endpoint, is it *included* in the range ($\leq$ or $\geq$)? Or is it *excluded* ($<$ or $>$)?
- Use a parenthesis "(" or ")" when an endpoint is *excluded* from the interval; use square brackets "[" or "]" when an endpoint is *included* in the interval.
- The order matters. When you write an interval such as $(a,b]$, the number on the left, a, has to be always smaller than the number on the right, b. Likewise, $-\infty$ always goes on the left, and ∞ always goes on the right.

Correct Answers:

- $[-6,1)$
- $[3,6)$
- $[2,3]$
- $(6,8)$
- $(-8,-4]$

Problem 3. **(1 point)** CUNY/CityTech/Precalculus/setIntervalNotation/interval-compound-union.pg

Consider the following set of numbers, which combines two intervals:



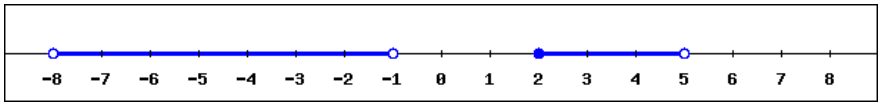
As an expression using inequalities, this is the set of all numbers x such that $-6 < x \leq 1$ **or** $3 \leq x \leq 5$.

This is called the *union* of the two intervals, and is represented by the symbol $\cup$. Thus, in interval notation, this set is $(-6,1] \cup [3,5]$.

Rewrite each of the following inequality expressions in *interval notation*:

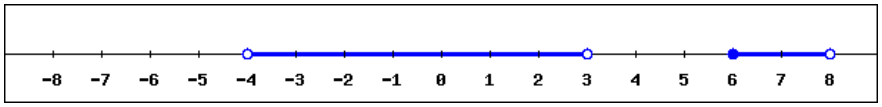
- Type the capital letter "U" to represent the union symbol $\cup$.

a.



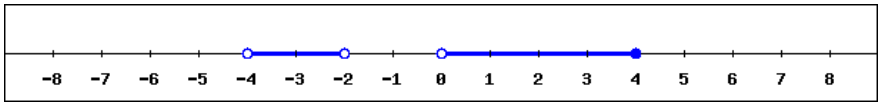
as an inequality: $-8 < x < -1$ or $2 \leq x < 5$
in interval notation: _____

b.



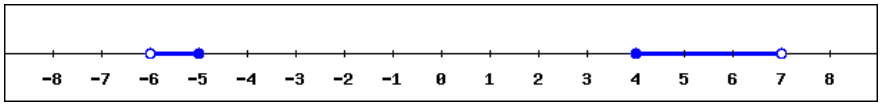
as an inequality: $-4 < x < 3$ or $6 \leq x < 8$
in interval notation: _____

c.



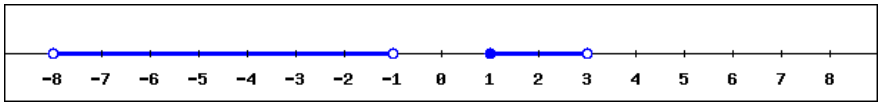
as an inequality: $-4 < x < -2$ or $0 < x \leq 4$
in interval notation: _____

d.



as an inequality: $-6 < x \leq -5$ or $4 \leq x < 7$
in interval notation: _____

e.



as an inequality: $-8 < x < -1$ or $1 \leq x < 3$
in interval notation: _____

Hint: *(Instructor hint preview: show the student hint after the following number of attempts: 2)*

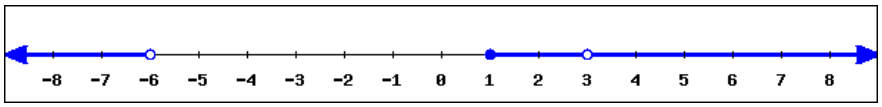
- For each endpoint, is it *included* in the interval ($\leq$ or $\geq$)? Or is it *excluded* ($<$ or $>$)?
- Use a parenthesis "(" or ")" when an endpoint is *excluded* from the interval; use square brackets "[" or "]" when an endpoint is *included* in the interval.
- "Join" the intervals using the union symbol $\cup$ (type the *capital* letter U).
- The order matters. When you write an interval such as $(a,b]$, the number on the left, a, has to be always smaller than the number on the right, b. Likewise, $-\infty$ always goes on the left, and ∞ always goes on the right.

Correct Answers:

- $[2,5) \cup (-8,-1)$
- $[6,8) \cup (-4,3)$
- $(0,4] \cup (-4,-2)$
- $[4,7) \cup (-6,-5]$
- $[1,3) \cup (-8,-1)$

Problem 4. **(1 point)** CUNY/CityTech/Precalculus/setIntervalNotation/interval-mixed-union.pg

Consider the following set, which consists of the union of two intervals, but with the single point $x = 3$ excluded:



As an interval expression, this is the set of all numbers x such that $x < -6$ or $x \geq 1$ ***and*** $x \neq 3$.

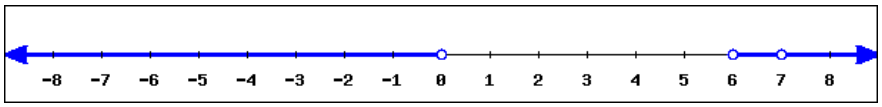
In order to express this set in interval notation, we express it as the union of 3 separate intervals: $(-\infty, -6) \cup [1, 3) \cup (3, \infty)$

Do you understand why this excludes the number 3 from the set?

Rewrite each of the following interval expressions in *interval notation*:

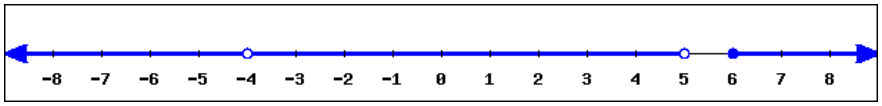
- Type "inf" and "-inf" for ∞ and $-\infty$, respectively.
- Type the capital letter "U" to represent the union symbol $\cup$.

a.



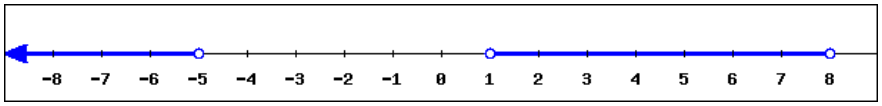
as an inequality: $x < 0$ or $6 < x$ and $x \neq 7$
in interval notation: _____

b.



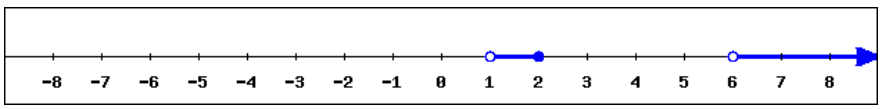
as an inequality: $x < 5$ and $x \neq -4$ or $6 \leq x$
in interval notation: _____

c.



as an inequality: $x < -5$ or $1 < x < 8$
in interval notation: _____

d.



as an inequality: $1 < x \leq 2$ or $6 < x$
in interval notation: _____

Hint: *(Instructor hint preview: show the student hint after the following number of attempts: 2)*

- Think about each inequality: is *x larger* or *smaller* than the specified number?
- Is the number *included* in the range ($\leq$ or $\geq$)? Or is it *excluded* ($<$ or $>$)?
- The order matters. When you write an interval such as $(a,b]$, the number on the left, a, has to be always smaller than the number on the right, b. Likewise, $-\infty$ always goes on the left, and ∞ always goes on the right.

Correct Answers:

- $(-\infty,0)\cup(6,7)\cup(7,\infty)$
- $(-\infty,-4)\cup(-4,5)\cup[6,\infty)$
- $(-\infty,-5)\cup(1,8)$
- $(1,2]\cup(6,\infty)$