$|x|$

ABSOLUTE VALUE

The absolute value ~~of~~ Modulus of a certain number x, denoted by $|x|$,is its distance from zero. So whatever is in the modulus comes out as a positive value.

$|x| = +ve$

$|4| = 4$

$|-5| = 5$

Remember that $\sqrt{9} = \pm 3$

$\sqrt{x^2} = |x|$

$|x| + |y| \geq |x + y|$

$x = 2 \quad y = -3$

$|2| + |-3| \geq |2-3|$

$2 + 3 \geq |-1|$

$5 \geq 1$

$|x| - |y| \leq |x - y|$

$x = -4 \quad y = 5$

$|-4| - |5| \leq |-4-5|$

$4 - 5 \leq 9 \rightarrow -1 \leq 9$ ✓

Example:

$$|x^2 - 9| = 1$$

So it is either A.

$$(x^2 - 9) = 1$$

$$x^2 = 10$$

$$x = \pm\sqrt{10}$$

or B.

$$-(x^2 - 9) = 1$$

$$-x^2 = -8$$

$$x = \pm\sqrt{8}$$

Always test the solutions. After testing the solutions we find out that $x = \{\sqrt{10}, -\sqrt{10}, \sqrt{8}, -\sqrt{8}\}$

$x = (\sqrt{8}, -\sqrt{8}, +\sqrt{10}, -\sqrt{10})$

Example:

Which of the following is equivalent to this inequality?

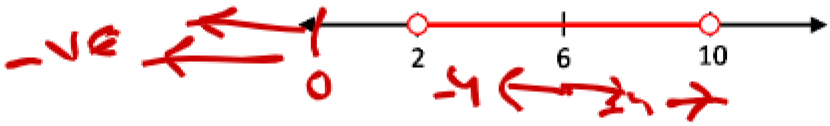
$$2 < x < 10$$

$$\frac{2+10}{2} = 6$$

$$\cancel{x < 6 \pm 4}$$

A. $|4 + x| < 5$ ✗
B. $|x - 6| < 4$
C. $|x + 6| < -4$
D. $|x - 2| < 10$ ✗
E. $|x + 1| < 9$ ✗

(Think of the original inequality as on a number line as follows



By looking the values we can quickly eliminate the irrelevant choices and get to the correct answer B)

$$x - 6 < 4$$
$$x < 10$$

$$-(x-6) < 4$$
$$-x + 6 < 4$$
$$-x < -2$$
$$x > 2$$