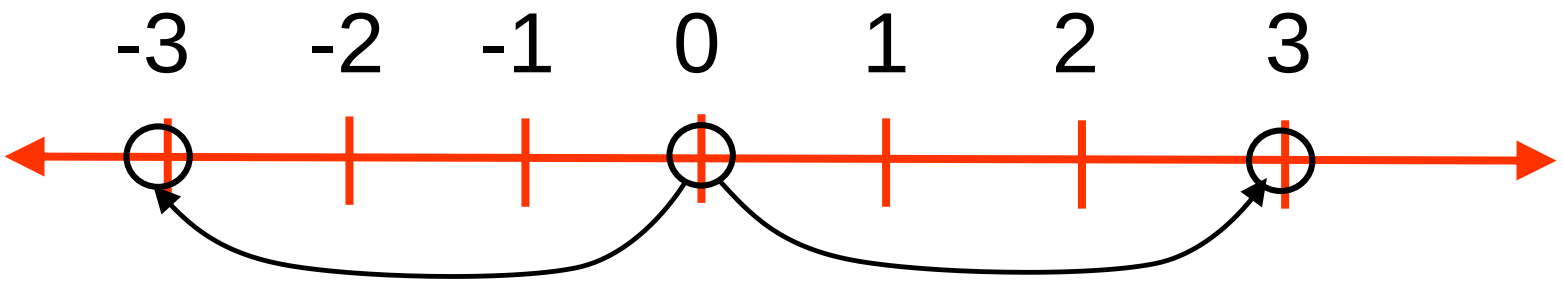
Math -2: Lesson 1-5 (Absolute Value)



3 And -3 are the same distance from zero.

-3 is the "opposite" of 3

Absolute Value of a number: $|x|$ The distance the number is from zero on the number line.

$$|3| = 3 \qquad |-3| = 3$$

Absolute Value of a number: $|x|$ The distance the number is from zero on the number line.

$|x| = 3 \rightarrow |3| = 3 \quad |-3| = 3 \rightarrow x = 3, -3$

Means: "what numbers are a distance of *three units* from zero on the number line?"

What is the solution to the equation?

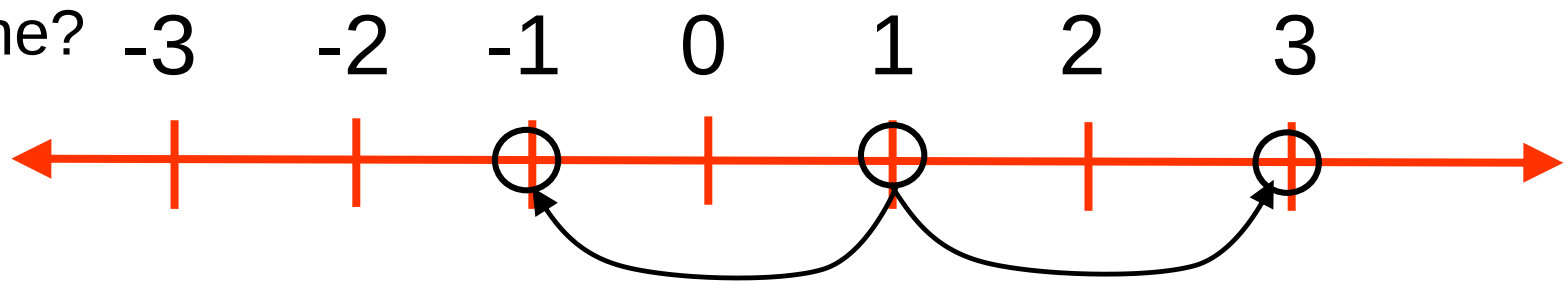
$|x| = -5$ Means: "what numbers are a distance of *negative five* units from zero on the number line?"

What is the solution?

Is distance ever negative?

$|x| = -5$ Has no solution.

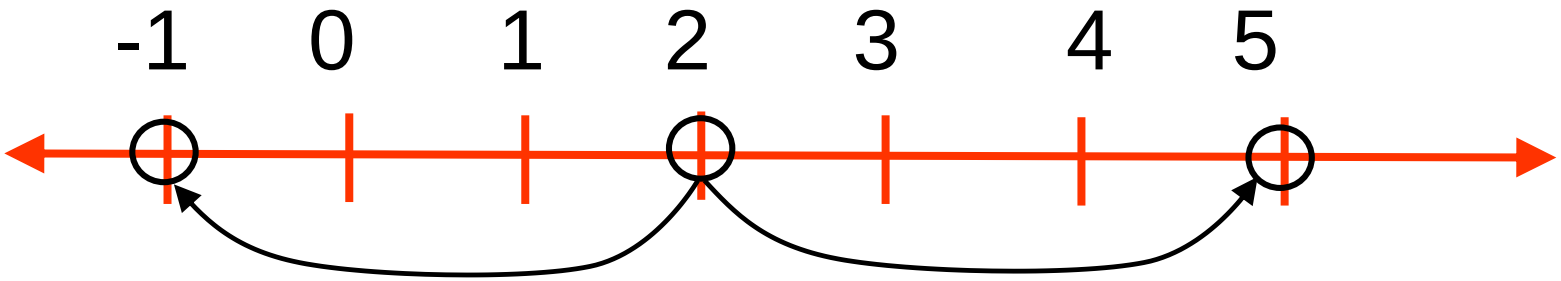
What two numbers are 2 units away from the number 1 on the number line?



-1 And 3 are 2 units away from 1 (the same distance).

-1 and 3 are on opposite sides of 1

What two numbers are 3 units away from the number 2 on the number line?



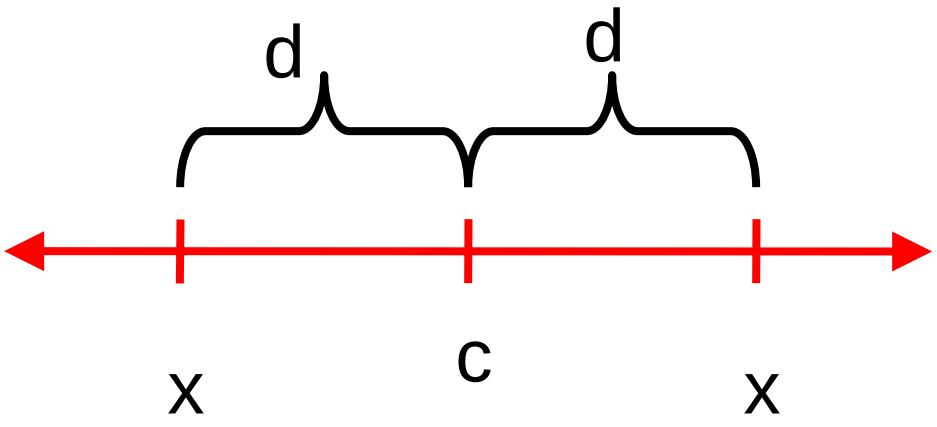
-1 And 5 are 3 units away from 2 (the same distance).

-1 and 5 are on opposite sides of 2

Absolute Value: $|x-c|=d$ The number "d" is the distance between "x' and "c" on the number line.

$$|x-(c)|=d$$

"c" is the "center number" and
"d" is the distance from the center number.



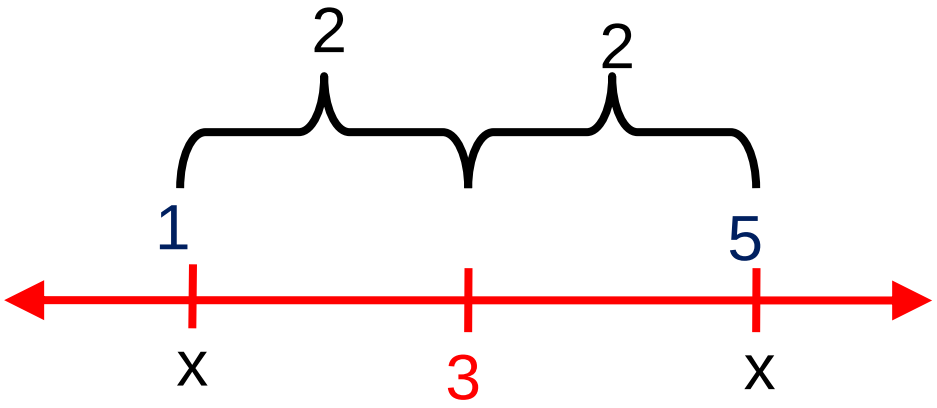
$|x - 3| = 2$

(English): What numbers are exactly 2 units from the center number “3”?

$x = 3 \pm 2$

$x = 1, 5$

$|x - (+3)| = 2$



x = 3 - 2

x = 1

x = 3 + 2

x = 5

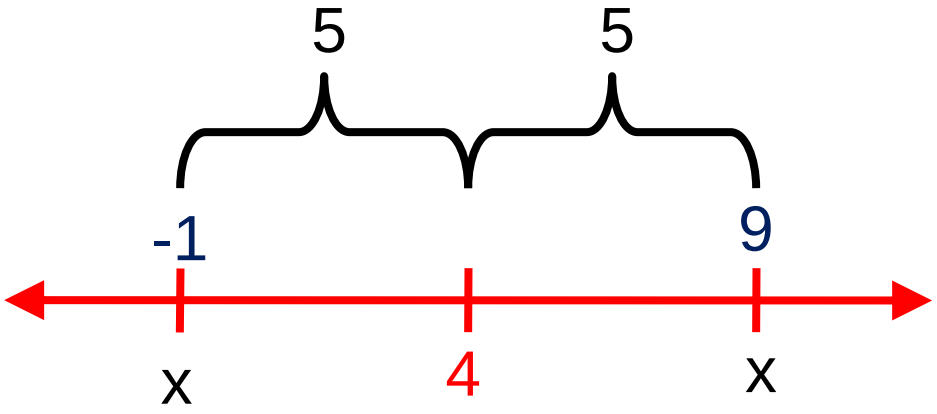
$|x - 4| = 5$

(English): What numbers are exactly 5 units from the center number “4”?

$x = 4 \pm 5$

$|x - (+4)| = 5$

$x = -1, 9$



x = 4 - 5

x = -1

x = 4 + 5

x = 9

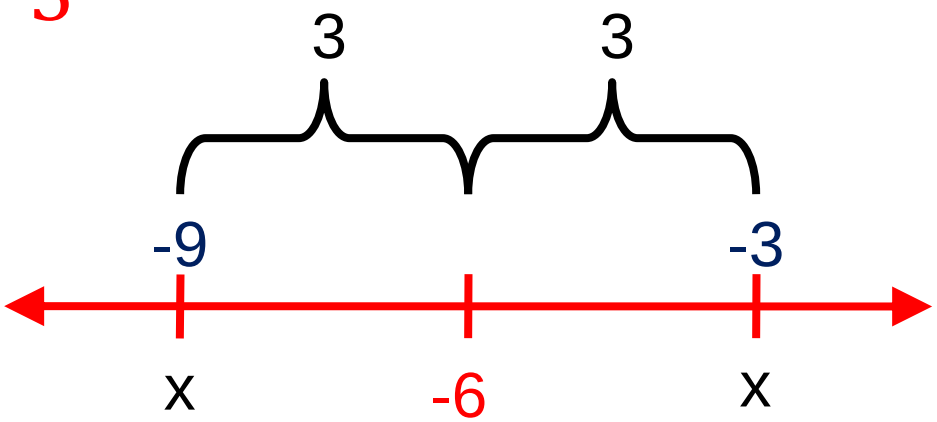
$|x+6|=3$

(English): What numbers are exactly 3 units from the center number “-6”?

$x=-6\pm 3$

$|x-(-6)|=3$

$x=-9,-3$



x = -6 - 3

x = -9

x = -6 + 3

x = -3

Solve the equations. Draw a picture if necessary.

$$|x+1|=3$$

$$|x-4|=5$$

$$|x-5|=1$$

Another way to think about it

$$|-1| = 1 \qquad |+1| = 1$$

$$|x - 5| = 1 \qquad |x - 5| = 1$$

$x - 5 = -1$ $\qquad$ $x - 5 = 1$

$x = 4$ $\qquad$ $x = 6$

Another way to think about it.

$$|x+4|=5$$

$$|-5|=5 \qquad |5|=5$$

$x + 4 = -5$ $\qquad$ $x + 4 = 5$

$x = -9$ $\qquad$ $x = 1$

For some problems, this is a better way to think about it.

Solve algebraically

$$|2x-1|=5$$

$$|-5|=5 \qquad |5|=5$$

$$2x-1=-5 \qquad 2x-1=5$$

$+1 \quad +1$ $\qquad$ $+1 \quad +1$

$$2x=-4 \qquad 2x=6$$

$\div 2 \quad \div 2$ $\qquad$ $\div 2 \quad \div 2$

$$x=-2 \qquad x=3$$

Solve $|x-10|=-4$

This distance between ‘x’ and ‘10’ is negative 4.

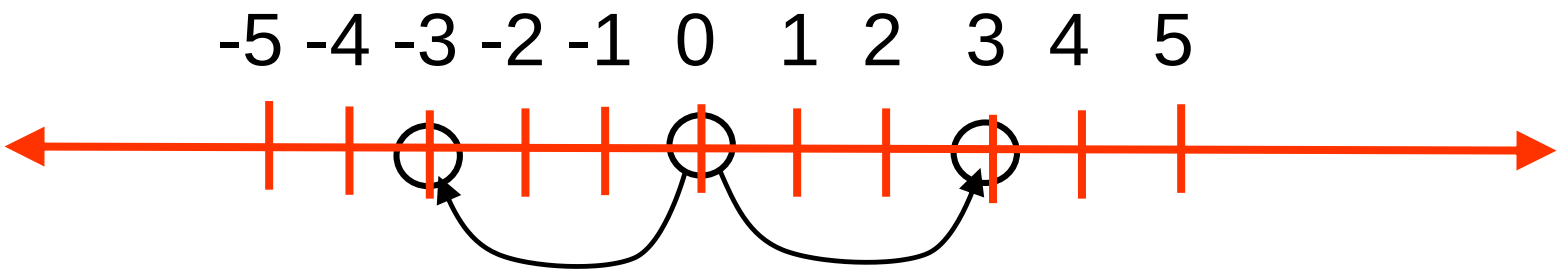
Distances are NOT negative.

The absolute value always equals a positive number.

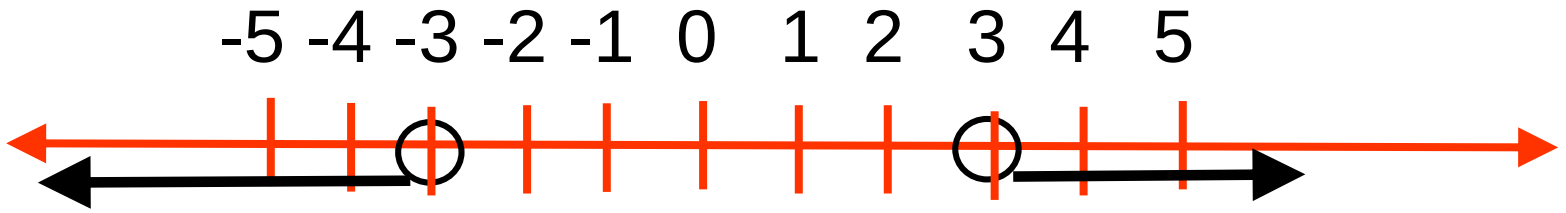
No solution!!!!

$|x| > 3$ What numbers are greater than 3 units away from zero on the number line?

Find the numbers that are exactly 3 way from zero.



Shade all the numbers that are further away from 0 than -3 and +3



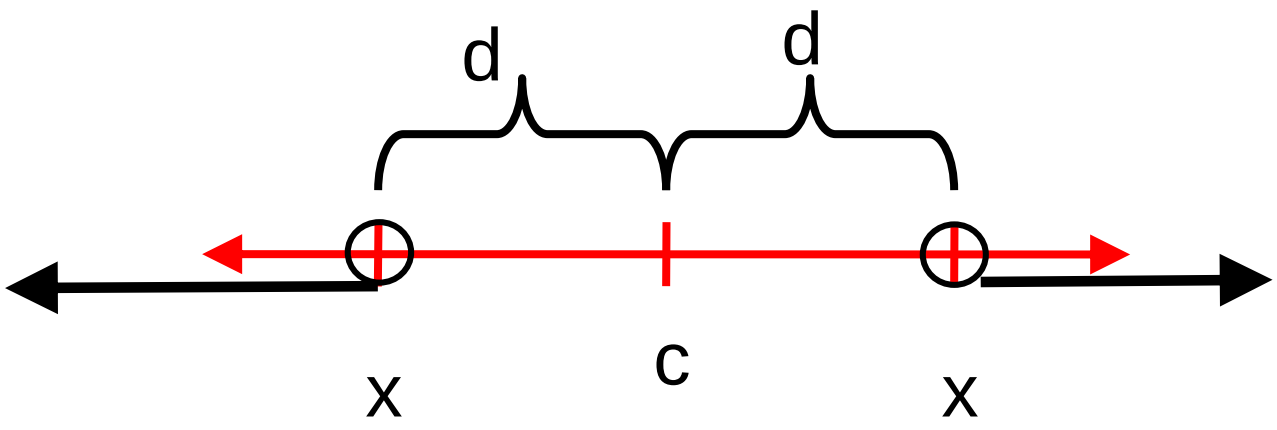
$|x| > 3 \rightarrow x < -3 \quad OR \quad x > 3$

$x = (-\infty, -3) \cup (3, \infty)$

Absolute Value: $|x-c|>d$

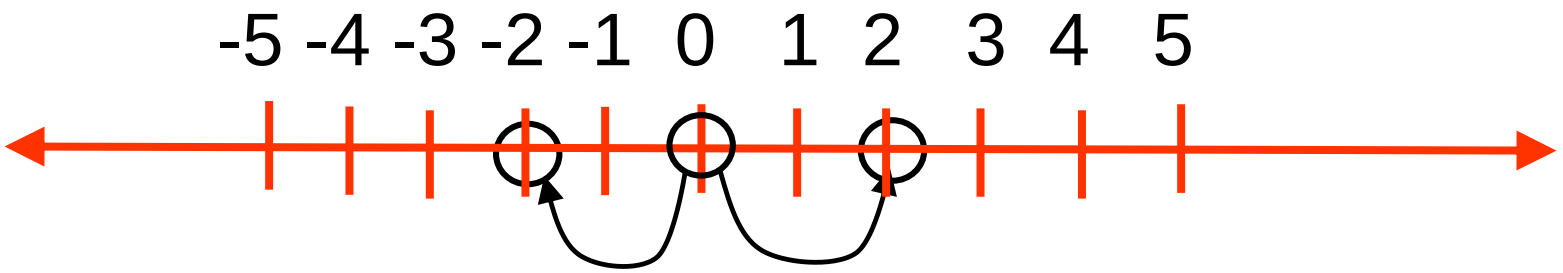
"What numbers are greater than "d" units away from the center number "c" on the number line?

$|x-(c)|>d$

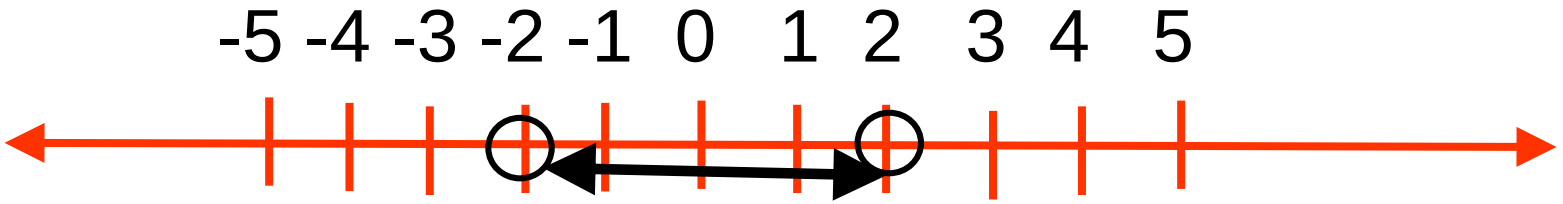


What numbers are less than 2 units away from zero on the number line?

Find the numbers that are exactly 2 way from zero.



Shade all the numbers that are closer to 0 than -2 and +2



$|x| < 2 \quad \rightarrow \quad x > -2 \ \ AND \ \ x < 2$

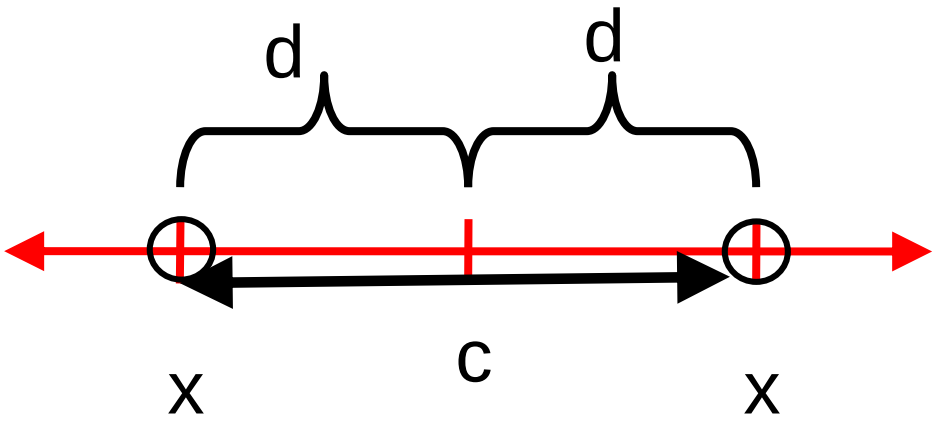
$-2 < x < 2$

$x = (-2, 2)$

Absolute Value: $|x-c|<d$

"What numbers are less than "d" units away from the center number "c" on the number line?

"c" is the "center number" and the distance from 'c' is less than "d" units



Solve the Inequality. Write the solution as:

a) Compound inequality
b) Interval notation
c) graph

$$|x - 5| > 1$$

$$|x + 4| < 6$$

$$|2x - 3| < 7$$

$|x-(-4)|>6$ The center number is '-4'.

The distance is 6.

$x = -4 - 6$ $\qquad$ $x = -4 + 6$

$x = -10$ $\qquad$ $x = 2$

The boundary numbers are -10 and 2.

The solution are the numbers that are further away from 5 than the boundary numbers.

$x > -10$ and $x < 2$