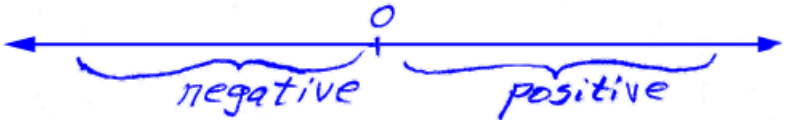
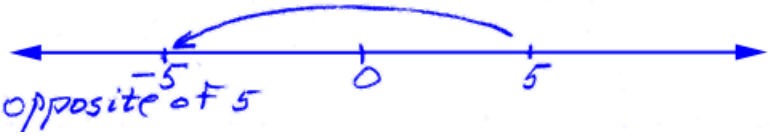
Unit 1: Lesson 02

Negative numbers, opposites, absolute value
Inequalities

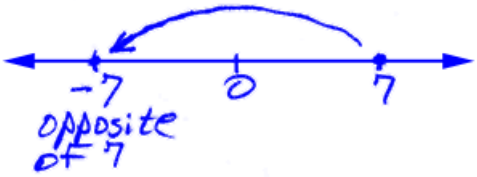
Negative numbers are to the left of the origin (0) while positive numbers are to the right.



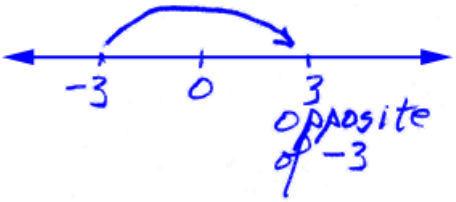
Opposite numbers are mirror images of each other across the origin.



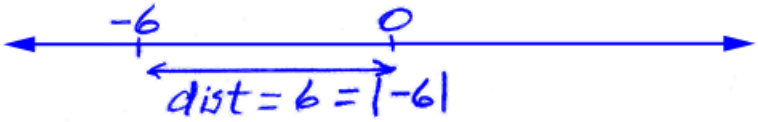
Example 1: Locate 7 on a number line and then locate its opposite.



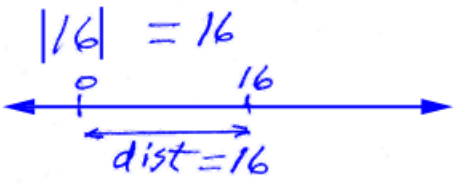
Example 2: Locate –3 on a number line and then locate its opposite.



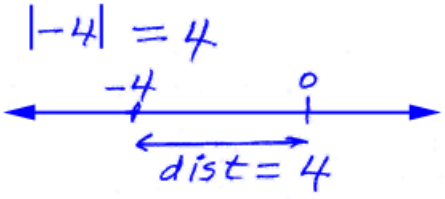
The **absolute value** of a number (indicated with vertical bars, $|4|$) is the distance of a number from the origin. The absolute value of a number is **always positive**.



Example 3: $|16| = ?$



Example 4: $|-4| = ?$



When an expression is inside an absolute value,

- simplify the expression with PEMDAS (down to a **single number**),
- and then take the absolute value of that number.

Example 5: $|9 - 2 \cdot 3|$

$|9-2\cdot3| = |9-6| = |3| = \boxed{3}$

Example 6: In the following table, fill in the blank areas with the appropriate integer that best describes the phrase, its opposite, and its absolute value.

Description	Integer	Opposite	Absolute value
A price **increase** of \$4	**4**	**– 4**	**4**
Ten degrees **below** freezing	**– 10**	**10**	**10**
A bank **deposit** of \$40	**40**	**–40**	**40**
3 points **off** on a test question	**–3**	**3**	**3**
A five point **bonus** on a test	**5**	**–5**	**5**

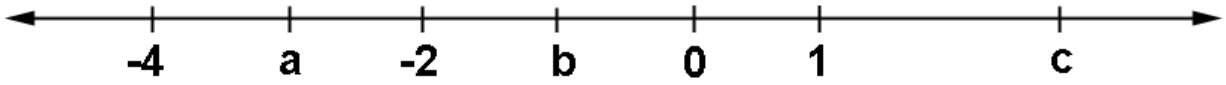
Any number, *a*, that lies to the **left** on a number line of another number, *b*, is said to be **less** than *b*:

a < b (read this as, "*a* is less than *b*.")

Any number, *c*, that lies to the **right** on a number line of another number, *d*, is said to be **greater** than *d*:

c > d (read this as, "*c* is greater than *d*.")

An easy way to remember the **symbols** of these **inequality** relationships is, "The alligator eats the big one."



Use the number line above to fill in the appropriate symbol (< , >, or =) in the blanks in the examples below. Give the reasons for your choices.

Example 7: –4 **<** –2 *because -4 lies to the left of -2*

Example 8: 1 **>** –2 *because 1 lies to the right of -2*

Example 9: b **>** a *because b lies to the right of a*

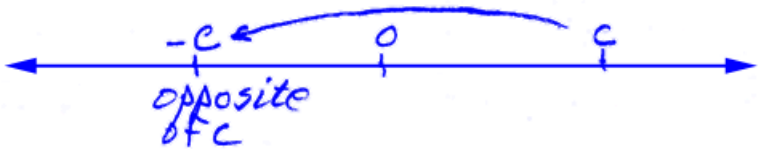
Example 10: a **<** c *because a lies to the left of c*

Example 11: |–2| **=** 2 *because absolute value is always positive*

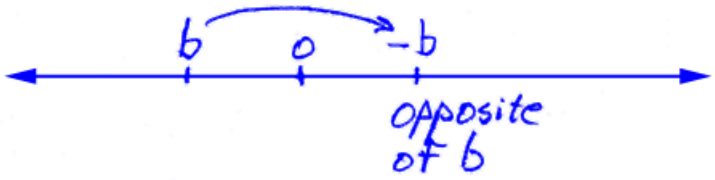
Consider –2 on a number line as seen at the top of this page. It is represented to the **left** of the origin since it is a negative number. The point *b* is also to the left of the origin, so what would be the meaning of –b?

The meaning of the **negative of a variable** is that it is the **opposite** of that variable.

Example 12: Redraw the number line at the top of this page and locate – c.

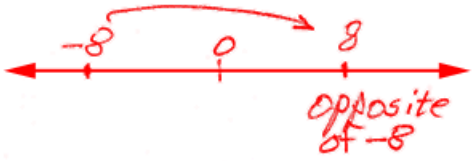


Example 13: Redraw the number line at the top of this page and locate – b.

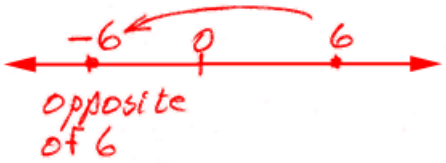


Assignment:

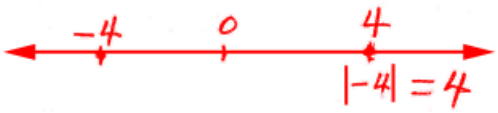
1. Locate –8 on a number line and then locate its opposite.



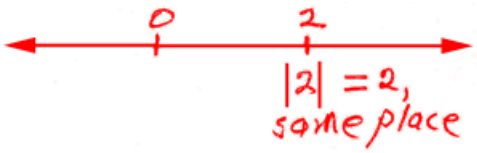
2. Locate 6 on a number line and then locate its opposite.



3. Locate –4 on a number line and then locate its absolute value.



4. Locate 2 on a number line and then locate its absolute value.



5. How far from the origin is |–10|?

$\boxed{10}$

6. What is the value of 7 – |–7|?

$7 - |-7| = 7 - 7$

$= \boxed{0}$

7. Simplify |17 – 6 – 1|.

$|17-6-1| = |11-1|$

$= |10|$

$= \boxed{10}$

8. Simplify |(17 – 6 – 1)/2|.

$|(17-6-1)/2|$

$= |(11-1)/2|$

$= |10/2| = |5|$

$= \boxed{5}$

9. Simplify $|-2| + 6 - 7$

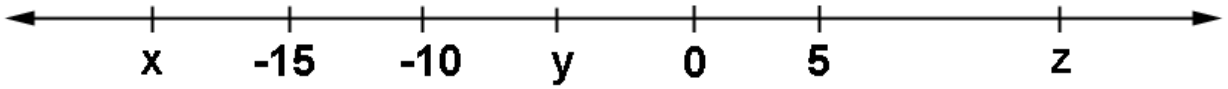
$|-2| + 6 - 7$
$= 2 + 6 - 7$
$= 8 - 7 = \boxed{1}$

10. Simplify $(5 + |-17|) - 3^2$

$(5 + |-17|) - 3^2$
$= (5 + 17) - 3^2$
$= 22 - 9$
$= \boxed{13}$

11. In the following table, fill in the blank areas with the appropriate integer that best describes the phrase, its opposite, and its absolute value.

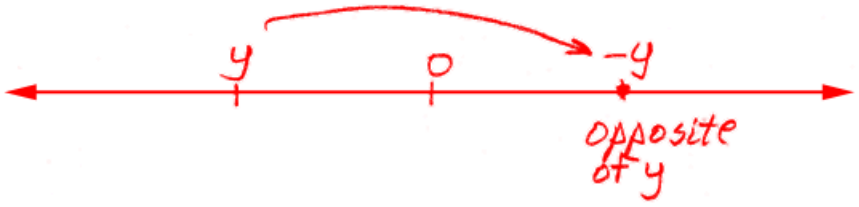
Description	Integer	Opposite	Absolute value
A 15 yard penalty	**–15**	**15**	**15**
An 11 yard gain	**11**	**–11**	**11**
A bank **withdrawal** of $36	**–36**	**36**	**36**
8 points **off** on a test question	**–8**	**8**	**8**
Thrown for a loss of 3 yards	**–3**	**3**	**3**
4 points above average	**4**	**–4**	**4**



Use the number line above to fill in the appropriate symbol (< , >, or =) in the blanks in the examples below. Give the reasons for your choices.

12.	5 **>** –15	*because 5 lies to the right of -15*
13.	–15 **<** –10	*because -15 lies to the left of -10*
14.	x **<** y	*because x lies to the left of y*
15.	z **>** 0	*because z lies to the right of 0*
16.	|–10| **>** –10	*Because |-10| = 10 & is to the right of -10*
17.	0 **>** x	*because 0 is to the right of x*
18.	|y| **=** 5	*Because |y| is 5 units to the left of 0 & = 5*
*19.	–x **>** y	*because -x is the opposite of x*

20. Redraw the number line given on the previous page and locate – y.



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21. Redraw the number line given on the previous page and locate – z.