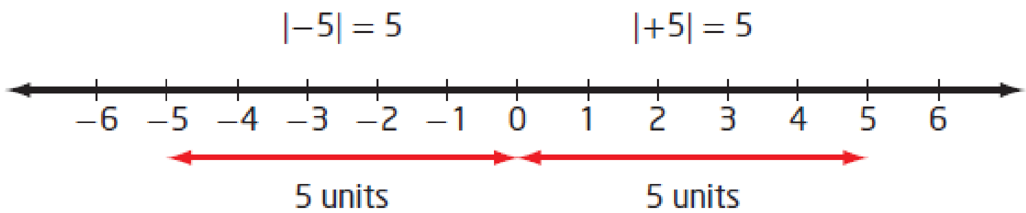
Absolute Value

The absolute value of a real number a, written as $|a|$, represents the distance from zero on a number line, regardless of the direction.



Two vertical bars around a number or expression are used to represent the *absolute value* of that number or expression. The absolute value of a real number a is always non-negative.

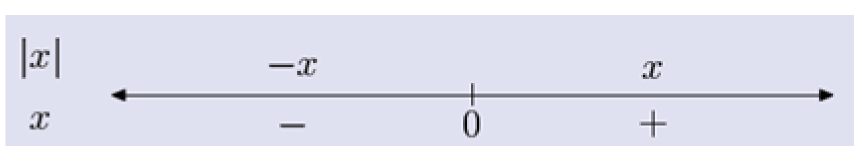
In general, the absolute value of a real number a is defined as

$$|a| = \begin{cases} a, \text{if } a \geq 0 \\ -a, \text{if } a < 0 \end{cases}$$

To understand this definition of absolute value:

- If $a \geq 0$, then use the first rule, $|a| = a$. That is, if a is positive or zero, then the absolute value is a. For example, $|9| = 9$.
- If $a < 0$, then use the second rule, $|a| = -a$. That is, if a is negative, then the absolute value is $-a$. For example, $|-3| = -(-3) = 3$.

Summarizing the Definition on a Number Line



Example 1: Determining the Absolute Value of a Number

Evaluate the following:

a. $|25|$ = __________ b. $|-8|$ = __________ c. $-|-6|$ = __________

Example 2: Evaluating Absolute Value Expressions

Evaluate the following:

a. $|5|-|-7|$ =

b. $|5-6|$ =

c. $|2|-|3(-4)|$ =

d. $6-2|3-5|$ =

e. $\left|5\left(-2^2+7(-3)-15\right)\right|$ =

Example 3: Absolute Value Application

Katie volunteers at a local hospital because she is interested in a career in health care. One day, she takes the elevator from the first floor up to the sixth floor to see her supervisor. Her list of tasks for the day sends her down to the second floor to work in the gift shop, then up to the fourth floor to visit with patients, and down to the first again to greet visitors.

a. What is the total change in floors for Katie that day?

b. What is the net change in floors?

Solution:

a. Total change =

b. Net change =