Absolute value of an expression

We aren't limited to taking the absolute value of just a number. In fact, we can take the absolute value of any mathematical expression (e.g., an expression for addition, subtraction, multiplication, or division, or an expression that includes two or more of those operations), and we enclose the entire expression in a pair of absolute value bars.

While it's true that the absolute value bars make whatever's inside them positive (unless the value of the expression is 0, in which case it makes the absolute value 0), there's one important thing we need to say. We MUST evaluate the expression inside the absolute value bars before taking the absolute value. As an example, consider

$$|-3-4|$$

We might be tempted to think that the absolute value operation just takes away the negative sign that goes with the 3, and we would probably get 1 as the answer:

$$|-3-4|$$

$$|3-4|$$

$$|-1|$$

$$1$$

But this is wrong, because we would have performed the absolute value operation first, by taking away the first negative sign inside the absolute value bars. What we need to do instead is evaluate the expression inside the absolute value bars first, and THEN take the absolute value. This is how we should solve it:

$$|-3-4|$$

$$|-7|$$

$$7$$

Notice how we first dealt with the subtraction problem inside the absolute value bars, by evaluating $-3-4$ as -7. Only then, once we had evaluated that expression, did we take the absolute value.

Example

Simplify the expression.

$$2+|5-9|-|-3|$$

Whenever we have an expression like this one, we have to deal with everything inside the absolute value bars first, and then do the rest of the operations.

$$2+|5-9|-|-3|$$

$$2+|-4|-|-3|$$

Absolute value bars tell us that we need to find the distance from 0 of whatever's inside the absolute value bars. Since -4 is 4 units from 0, we get

$$2 + 4 - |-3|$$

Since -3 is 3 units from 0, we get

$$2 + 4 - 3$$

The $|-3|$ was simplified to 3, but we still have the subtraction from the previous expression that was in front of the absolute value.

$$6 - 3$$

$$3$$
