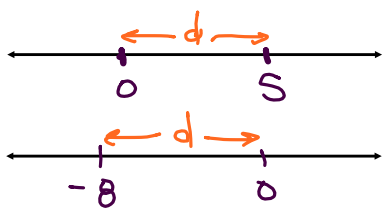


## 7.1 Absolute Value

\* The absolute value of a real number is its **distance** from zero on a number line.

ex.



notation for abs. value

$$|5| = 5$$

$$|-8| = 8 \quad \text{same}$$

$-(-8) = 8$

Consequently:

$$1 < |-3| < |-5| < 8 < |-10|$$

We can conclude that:

$$|n| = \begin{cases} n & \text{if } n \geq 0 \\ -n & \text{if } n < 0 \end{cases}$$

\* When evaluating an expression with an absolute value, it operates as a **bracket**. In other words, consider it **first** in the order of operations.

B  
E  
F  
D  
M  
A  
S

ex.  $3 - 2|-12 + 8| =$

$$= 3 - 2|-4|$$

$$= 3 - 2(4)$$

$$= 3 - 8$$

$$= -5$$

ex.  $|12(-3) + 5 - 3(4+5)^2|$

$$= |12(-3) + 5 - 3(9)^2|$$

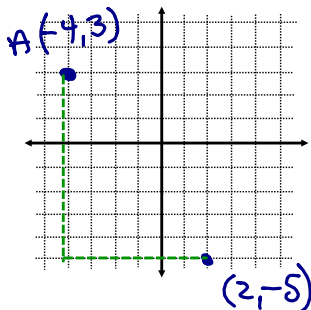
$$= |12(-3) + 5 - 3(81)|$$

$$= |-36 + 5 - 243|$$

$$= |-274| = 274$$

Applications: We often use absolute values to calculate distances or total variations in values.

ex. Consider the points A(-4, 3) and B(2, -5). What is the horizontal and vertical distance between the points?



$$d_{\text{horiz.}} = |x_B - x_A| = |2 - (-4)| = |6| = 6$$

$$d_{\text{vert.}} = |y_B - y_A| = |-5 - 3| = |-8| = 8$$

$$m = \left| \frac{\Delta y}{\Delta x} \right| \text{ would mean how steep regardless of sign.}$$

ex. Consider the points A(-4, y) and B(x, -5). What is the horizontal and vertical distance between the points?

$$d_{\text{horiz.}} = |x - (-4)|$$

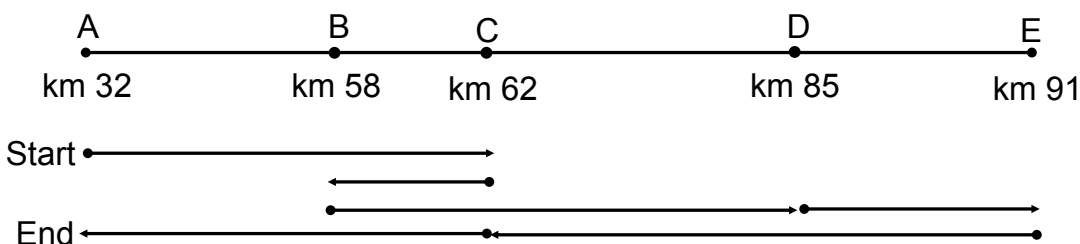
$$= |x + 4|$$

$$d_{\text{vert.}} = |-5 - y|$$

$$= |-(5 + y)|$$

$$= |5 + y|$$

ex. A father with 4 kids must drive them to their Saturday activities. The diagram below illustrates the distances and the route followed. How many total kilometers did the father drive?



$$d_{\text{total}} = |62 - 32| + |58 - 62| + |91 - 58| + |32 - 91|$$

$$= |30| + |-4| + |33| + |-59|$$

$$= 30 + 4 + 33 + 59$$

$$= 126 \text{ km}$$