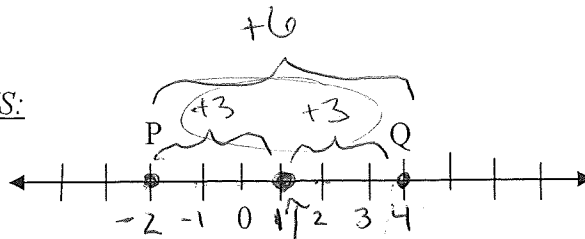_THE MIDPOINT BETWEEN 2 POINTS:_

***Midpoint on a Number Line

$Midpoint = \dfrac{a+b}{2}$ $\dfrac{(-2)+4}{2} = \dfrac{2}{2} = 1$

Example: Find the _number coordinate_ of the midpoint of $\overline{PQ}$ above.

***Midpoint on the Coordinate Plane
The midpoint formula can be used to find the coordinates of the point that is exactly between two other points on the coordinate plane:

$$Midpoint = \left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2} \right)$$

NOTE: Mid_POINT_ is a POINT—an ordered pair!!! Distance is a LENGTH—a number!!!

Examples $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

1. Find the distance between the points $(-1, 3)$ and $(-5, -7)$. (Round to the nearest tenth.)

$d = \sqrt{(-5,-1)^2 + (-7-3)^2}$ $\underset{x_1\, y_1}{\quad} \underset{x_2\, y_2}{\quad}$

$d = \sqrt{(-4)^2 + (-10)^2} = \sqrt{16 + 100} = \sqrt{116} = 10.7\overline{7}$ $\boxed{10.8}$

2. Find the midpoint of the line segment whose endpoints are $(-7, 3)$ and $(-5, 8)$.

$\left(\dfrac{(-7 + -5)}{2}, \dfrac{3+8}{2} \right)$ $\left(\dfrac{-12}{2}, \dfrac{11}{2} \right)$ $(-6, 5.5)$ $\underset{x_1\, y_1}{\quad} \underset{x_2\, y_2}{\quad}$

Remember – the distance formula will give you a single number answer. The midpoint formula gives you TWO answers, one for the x-coordinate and one for the y-coordinate.

Example: Find AB if B is the midpoint of $\overline{AC}$.

$4x - 5 = 11 + 2x$
$-2x \qquad\qquad -2x$

$2x - 5 = 11$
$\quad +5 \;\; +5$

$2x = 16$

$x = 8$
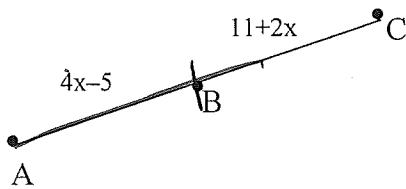
$4x - 5$
$4(8) - 5$
$32 - 5$
$\boxed{27}$

Segment Bisector: Something that intersects a segment at its __mid point__ .

Example: $\overline{AC}$ is bisecting $\overline{XY}$. Find x.

$\dfrac{2x}{2} = \dfrac{6}{2}$

$x = 3$