Using the Midpoint Formula

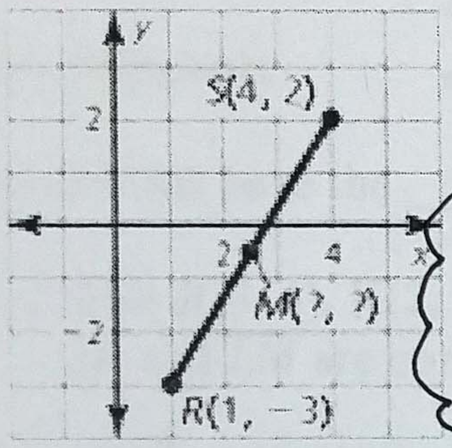
The Midpoint Formula: The coordinates of the midpoint of a segment are the AVERAGE of the x-coordinates and the AVERAGE of the y-coordinates of the endpoints.

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

(x_m, y_m)

Examples:

5. The endpoints of $\overline{RS}$ are shown in the diagram. Find the coordinates of the midpoint M.



R(1, −3) → x_1 y_1

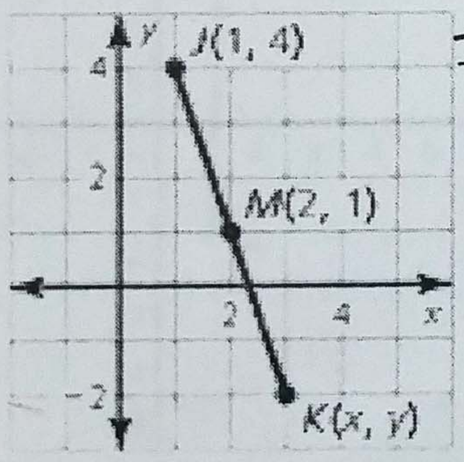
S(4, 2) → x_2 y_2

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

$$= \left(\frac{1+4}{2}, \frac{-3+2}{2}\right)$$

$$= \boxed{\left(\frac{5}{2}, \frac{-1}{2}\right) \text{ OR } (2.5, -0.5)}$$

6. The midpoint of $\overline{JK}$ and endpoint J are given. Find the coordinates of the other endpoint, K.



J(1, 4) → x_1 y_1

M(2, 1) → x_m y_m

K(?, ?) → x_2 y_2

$$M\ (x_m, y_m) = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

$$(2, 1) = \left(\frac{1+x_2}{2}, \frac{4+y_2}{2}\right)$$

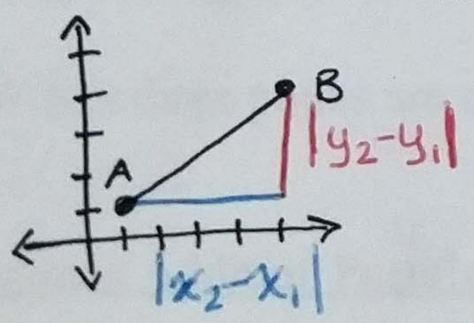
$2 = \frac{1+x_2}{2}$ | $1 = \frac{4+y_2}{2}$

$4 = 1+x_2$ | $2 = 4+y_2$

$3 = x_2$ | $-2 = y_2$

$\boxed{K(3, -2)}$

The Distance Formula: If A(x_1 , y_1) and B(x_2 , y_2) are points in the coordinate plane, then the distance between A and B is:



$c^2 = a^2 + b^2$

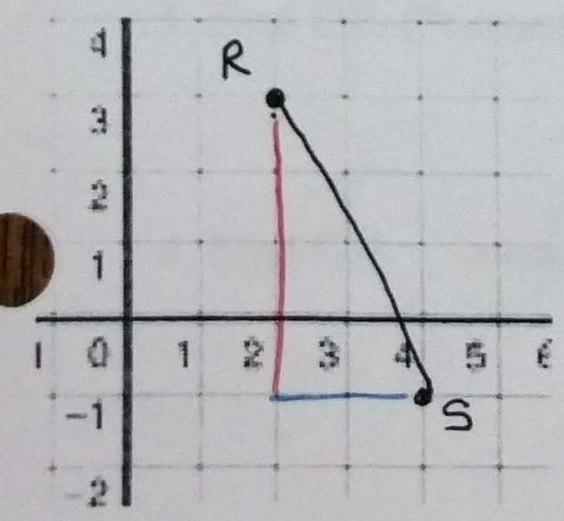
$c = \sqrt{a^2+b^2}$

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

DISTANCE FORMULA:

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

Example: 7. Find the distance between R(2, 3) and S(4, -1). Make a sketch on the coordinate plane provided.



x_1 y_1 x_2 y_2

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

$$d = \sqrt{(4-2)^2+((-1)-3)^2}$$

$$d = \sqrt{(2)^2+(-4)^2}$$

$$d = \sqrt{4+16}$$

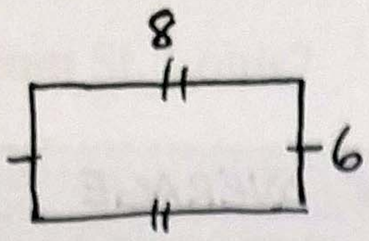
$$d = \sqrt{20}$$

$$d = 2\sqrt{5}$$

20 → 5, 4 → 2, 2

1.4 Notes

EXAMPLE:

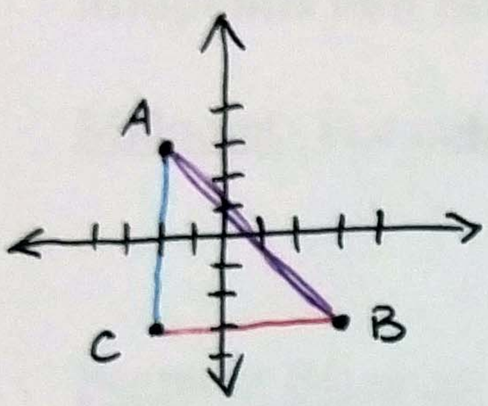


PERIMETER = 8+8+6+6
= 28

EXAMPLE 2:

FIND THE PERIMETER OF $\triangle ABC$ WITH VERTICES

A(-2,3), B(3,-3), C(-2,-3)



$AC = \overset{\text{vert. line} \rightarrow}{\underset{\text{y-coords}}{}} = |3-(-3)| = 6$

$BC = \overset{\text{horz. line} \rightarrow}{\underset{\text{x-coords}}{}} = |-2-3| = 5$

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

$= \sqrt{(3-(-2))^2+(-3-3)^2}$

$= \sqrt{5^2+(-6)^2}$

$= \sqrt{25+36}$

$= \sqrt{61}$

PERIMETER = $6+5+\sqrt{61}$

$= \boxed{11+\sqrt{61}}$