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CC GEOMETRY

Date: 4/17/18
TROICI

**LESSON #2: MIDPOINT FORMULA**

*Do Now:*

**WHAT IS THE DISTANCE FORMULA?** $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

The vertices of a quadrilateral are $A(0,-2), B(5,-2), C(8,2), D(3,2)$. Prove that the quadrilateral is a rhombus using the distance formula.

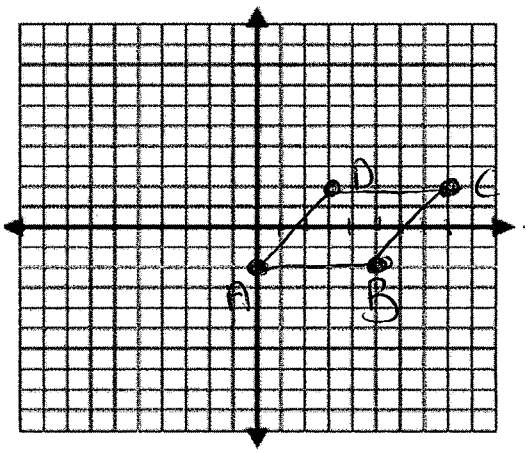
Rhombus → 4 ≅ sides

$\overline{AB} = \sqrt{(-2-2)^2 + (5-0)^2} = \sqrt{25} = 5$

$\overline{BC} = \sqrt{(2-2)^2 + (8-5)^2} = \sqrt{25} = 5$

$\overline{CD} = \sqrt{(2-2)^2 + (3-8)^2} = \sqrt{25} = 5$

$\overline{AD} = \sqrt{(2-2)^2 + (3-0)^2} = \sqrt{25} = 5$




Quad ABCD is a rhombus b/c all sides are =

Given $A(-4,5)$ *and* $B(12,13)$.

a) Draw right triangle $\Delta ABC$ with right $\angle C$ and hypotenuse $\overline{AB}$.

b) What are the lengths of $\overline{AC}$ *and* $\overline{BC}$?

AC = 16 BC = 8

c) Mark the halfway point of $\overline{AC}$ and label it P. State the coordinates of P.

(4, 5)

d) Mark the halfway point on $\overline{BC}$ and label it R. State the coordinates of R.

(12, 9)

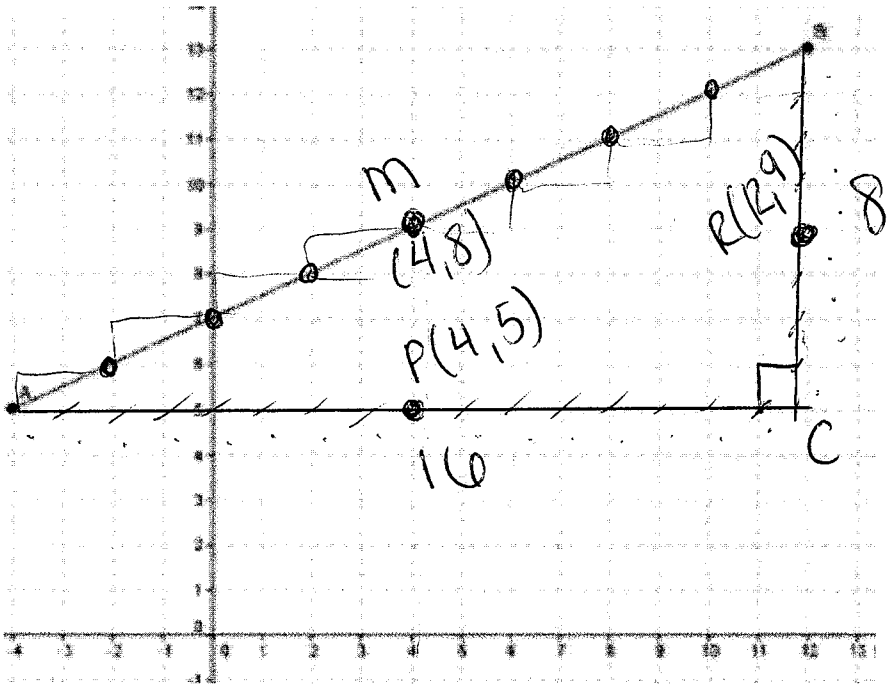
e) What is the slope of $\overline{AB}$?

$\frac{8}{16} = \frac{1}{2}$

f) Find the halfway point on $\overline{AB}$ and label it M. State the coordinates of M.

(4, 8)

g) How can we find the midpoint of $\overline{AB}$ algebraically?




***SO LET'S TALK ABOUT MIDPOINTS!!***

*What is a midpoint?*

The middle of a line segment
Divides the segment directly in half

***Midpoint Formula:*** $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

*Example #1:*

Line segment $\overline{AB}$ has endpoints $A(1, 7)$ *and* $B(5, 1)$. What are the coordinates of the midpoint of $\overline{AB}$?

$x_1 y_1 \quad x_2 y_2$

$m = \left(\left(\frac{1+5}{2}\right), \left(\frac{7+1}{2}\right)\right)$

$\boxed{m = (3, 4)}$

*Example #2:*

Line segment $\overline{AB}$ has endpoints $A(-2, 5)$ *and* $B(8, 7)$. What are the coordinates of the midpoint of $\overline{AB}$?

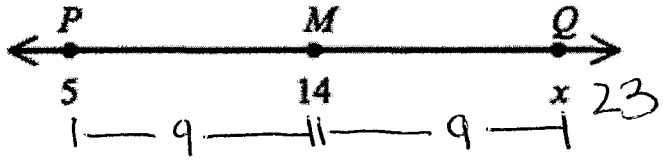
$x_1 y_1 \quad x_2 y_2$

$m = \left(\frac{-2+8}{2}, \frac{5+7}{2}\right)$

$\boxed{m = (3, 6)}$

*Example #3:*

If *M* is the midpoint of $\overline{PQ}$, find the value of *x*.

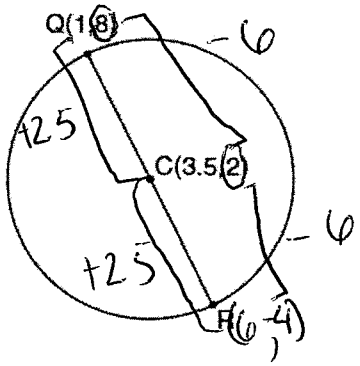



$14 + 9 = \boxed{23}$

*Example #4:*

In the diagram below of circle *C*, $\overline{QR}$ is a diameter , and $Q(1,\ 8)$ *and* $C(3.5, 2)$ are points on a coordinate plane. Find and state the coordinates of point *R*.

$\boxed{R = (6, -4)}$

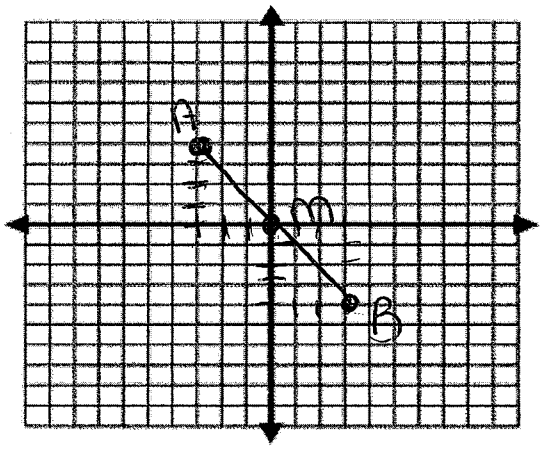


*Example #5:*

The midpoint M of line segment $\overline{AB}$ has coordinates $(0, 0)$. If point A is $(-3, 4)$, what are the coordinates of point B.

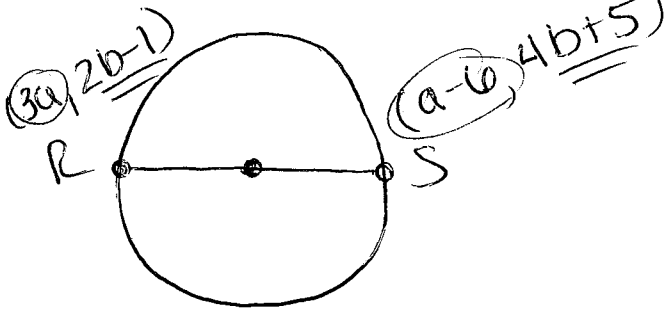
$B = (3, -4)$

use slope $\frac{-4}{3}$




*Example #6:*

In circle *O*, diameter $\overline{RS}$ has endpoints $R(3a, 2b - 1)$ *and* $S(a - 6, 4b + 5)$. Find the coordinates of point *O*, in terms of *b*. Express your answer in simplest form.




$\left(\frac{3a+a-6}{2}, \frac{2b-1+4b+5}{2}\right)$

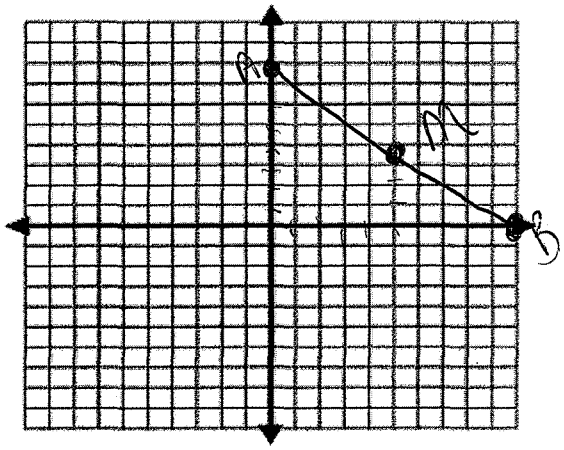
$\left(\frac{4a-6}{2}, \frac{6b+4}{2}\right)$

$O = (2a-3, 3b+2)$

***MORE PRACTICE PROBLEMS***

$x_1\ y_1 \quad x_2\ y_2$

7. Line segment $\overline{AB}$ has endpoints $A(0,8)$ *and* $B(10,0)$. What are the coordinates of the midpoint of $\overline{AB}$?

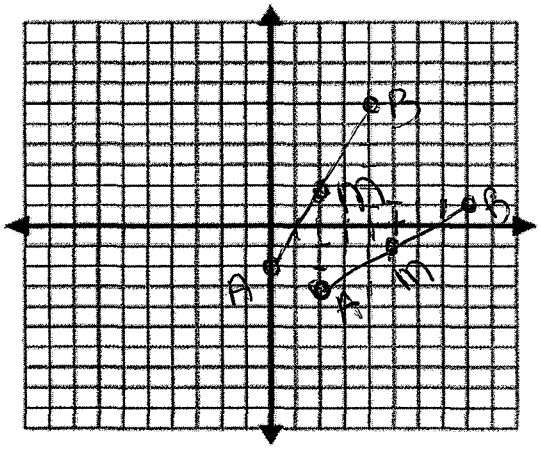



$\left(\frac{0+10}{2}, \frac{8+0}{2}\right)$

$MP = (5, 4)$

$x_1\ y_1 \quad x_2\ y_2$

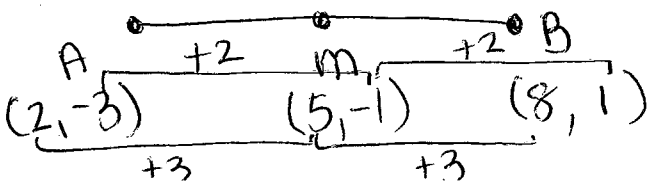
8. Line segment $\overline{AB}$ has endpoints $A(0,-2)$ *and* $B(4,6)$. What are the coordinates of the midpoint of $\overline{AB}$?

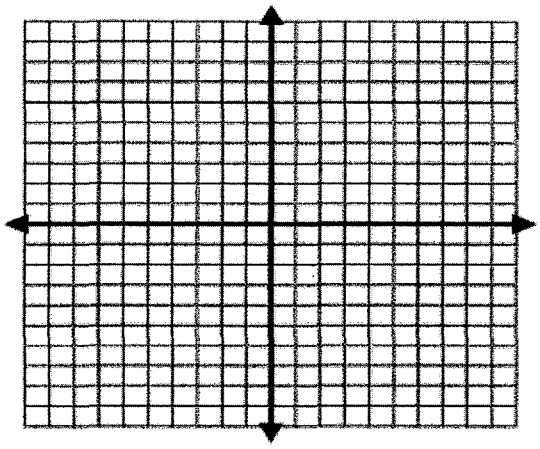



$\left(\frac{0+4}{2}, \frac{-2+6}{2}\right)$

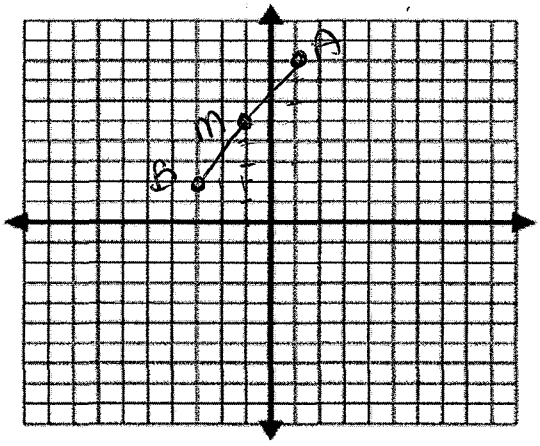
$(2, 2) = MP$

9. The midpoint of $\overline{AB}$ is $(5,-1)$. If the coordinates of *A* are $(2,-3)$, what are the coordinates of *B*?





10. The midpoint of $\overline{AB}$ is $(-1, 5)$. If the coordinates of $B$ are $(-3, 2)$, what are the coordinates of $A$?




$A = (1, 8)$