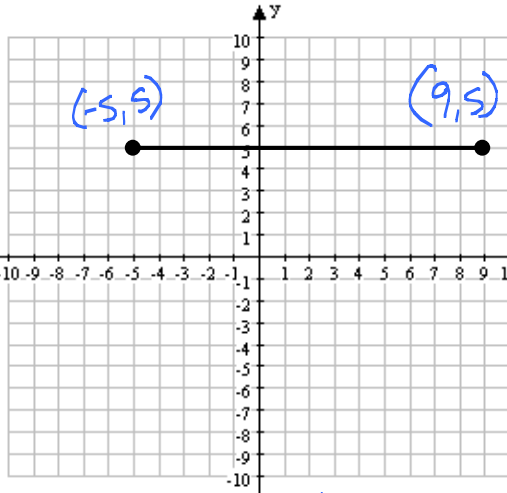


1. Find the **length** of the following segments

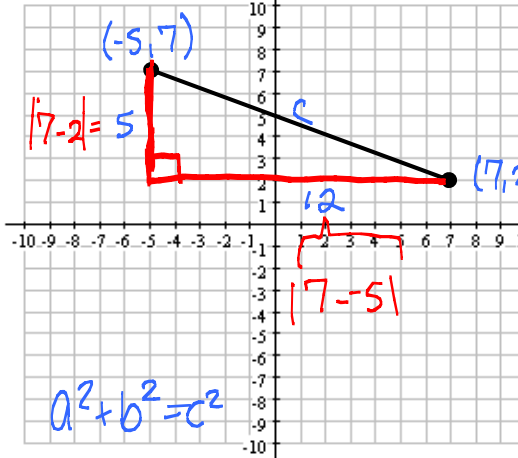
$$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$$

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



$$\text{length} = 14$$

$$9 - -5 = 14$$



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

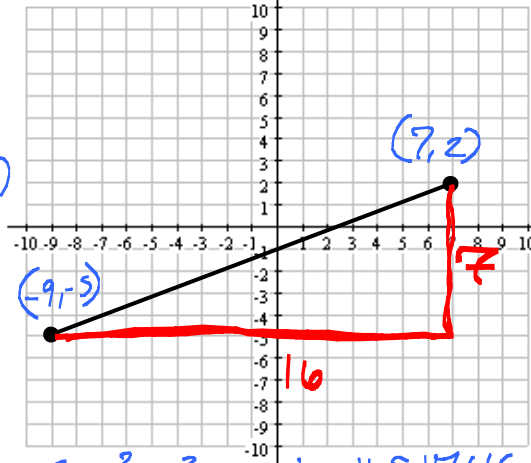
$$5^2 + 12^2 = c^2$$

$$25 + 144 = c^2$$

$$\sqrt{169} = \sqrt{c^2}$$

$$13 = c$$

$$\text{length} = 13$$



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

$$16^2 + 7^2 = c^2$$

$$256 + 49 = c^2$$

$$\sqrt{305} = \sqrt{c^2}$$

$$17.46 \approx c$$

$$\text{length} \approx 17.46$$

$$d = \sqrt{(7 - -9)^2 + (2 - -5)^2}$$

$$= \sqrt{16^2 + 7^2}$$

$$= \sqrt{256 + 49}$$

$$= \sqrt{305}$$

2. Given A(-2,7), B(4,5), C(-7,-1), and D(3,-6), find the **length** of the following segments

a. Segment $\overline{AB}$

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

$$d = \sqrt{(4 - -2)^2 + (5 - 7)^2}$$

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

$$= \sqrt{36 + 4}$$

$$= \sqrt{40} = 2\sqrt{10} \approx 6.32$$

$$\sqrt{40}$$

$$4 \sqrt{10}$$

$$2 \sqrt{10}$$

b. Segment $\overline{BA}$

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

$$= \sqrt{(-2 - 4)^2 + (7 - 5)^2}$$

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

$$= \sqrt{36 + 4} = \sqrt{40}$$

$$= \sqrt{40} = 2\sqrt{10} \approx 6.32$$

c. Segment $\overline{DC}$

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

$$= \sqrt{(-7 - 3)^2 + (-1 - -6)^2}$$

$$= \sqrt{(-10)^2 + (5)^2}$$

$$= \sqrt{100 + 25}$$

$$= \sqrt{125} = 5\sqrt{5}$$

$$\approx 11.18$$

$$\sqrt{125}$$

$$5 \sqrt{25}$$

$$5 \sqrt{5}$$

d. Segment $\overline{AD}$

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

$$= \sqrt{(3 - -2)^2 + (-6 - 7)^2}$$

$$= \sqrt{(5)^2 + (-13)^2}$$

$$= \sqrt{25 + 169}$$

$$= \sqrt{194} \approx 13.93$$

$$\sqrt{194}$$

$$2 \sqrt{97}$$

PRIME
CAN'T
BE SIMPLIFIED

3. Given the point A is located at (2,1), which points below are a distance of 5 units away from point A?

a. (5, 5)

$$\begin{aligned} d &= \sqrt{(2-5)^2 + (1-5)^2} \\ &= \sqrt{(-3)^2 + (-4)^2} \\ &= \sqrt{9+16} \\ &= \sqrt{25} = 5 \checkmark \end{aligned}$$

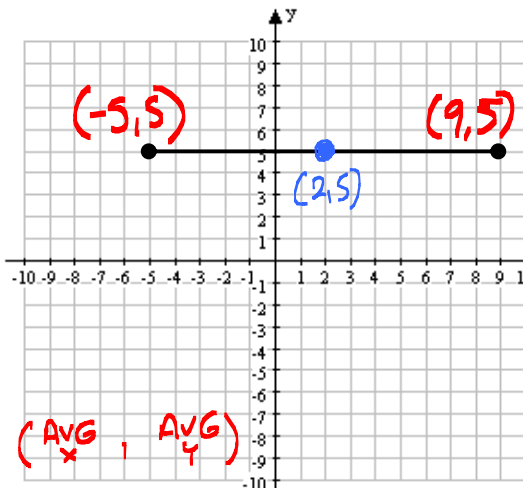
b. (-1, 4)

$$\begin{aligned} d &= \sqrt{(2-(-1))^2 + (1-4)^2} \\ &= \sqrt{(3)^2 + (-3)^2} \\ &= \sqrt{9+9} \\ &= \sqrt{18} = \sqrt{9 \cdot 2} = 3\sqrt{2} \\ &\approx 4.24 \times \end{aligned}$$

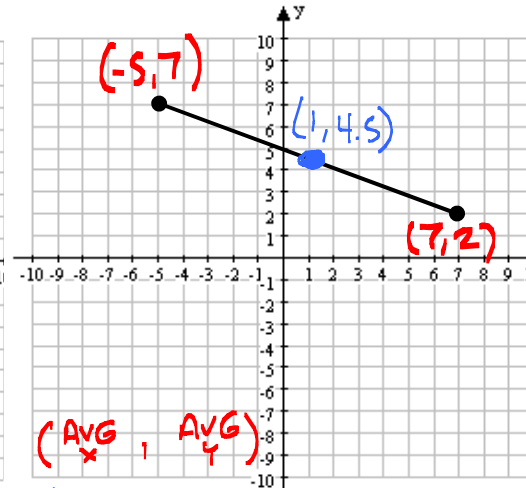
c. (7, 1)

$$\begin{aligned} d &= \sqrt{(2-7)^2 + (1-1)^2} \\ &= \sqrt{(-5)^2 + (0)^2} \\ &= \sqrt{25+0} \\ &= \sqrt{25} = 5 \checkmark \end{aligned}$$

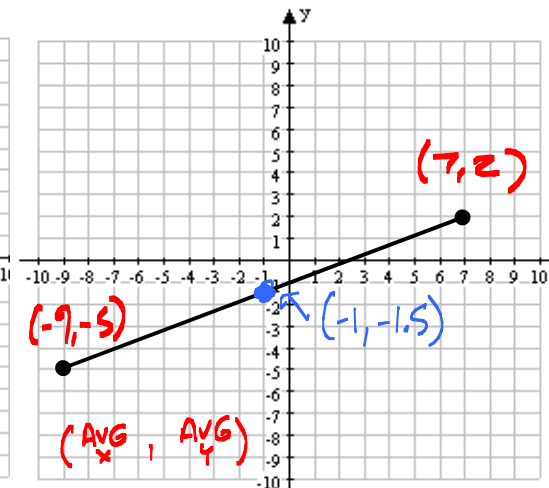
4. Find the midpoint of the following segments



$$\begin{aligned} &(\text{AVG}_x, \text{AVG}_y) \\ &\left(\frac{-5+9}{2}, \frac{5+5}{2}\right) \\ &\left(\frac{4}{2}, \frac{10}{2}\right) \Rightarrow (2, 5) \\ &\text{MIDPOINT} \end{aligned}$$



$$\begin{aligned} &(\text{AVG}_x, \text{AVG}_y) \\ &\left(\frac{-5+7}{2}, \frac{7+2}{2}\right) \\ &\left(\frac{2}{2}, \frac{9}{2}\right) \Rightarrow (1, 4.5) \\ &\text{MIDPOINT} \end{aligned}$$



$$\begin{aligned} &(\text{AVG}_x, \text{AVG}_y) \\ &\left(\frac{-9+7}{2}, \frac{-5+2}{2}\right) \\ &\left(\frac{-2}{2}, \frac{-3}{2}\right) \Rightarrow (-1, -1.5) \\ &\text{MIDPOINT} \end{aligned}$$

5. Given A(-2,7), B(4,5), C(-7,-1), and D(3,-6), find the midpoint of the following segments

a. Segment $\overline{AB}$ (-2, 7), (4, 5)

$$\begin{aligned} &(\text{AVG}_x, \text{AVG}_y) \\ &\left(\frac{-2+4}{2}, \frac{7+5}{2}\right) \\ &\left(\frac{2}{2}, \frac{12}{2}\right) \Rightarrow (1, 6) \\ &\text{MIDPOINT} \end{aligned}$$

c. Segment $\overline{DC}$ (3, -6), (-7, -1)

$$\begin{aligned} &(\text{AVG}_x, \text{AVG}_y) \\ &\left(\frac{3+(-7)}{2}, \frac{-6+(-1)}{2}\right) \\ &\left(\frac{-4}{2}, \frac{-7}{2}\right) \Rightarrow (-2, -3.5) \\ &\text{MIDPOINT} \end{aligned}$$

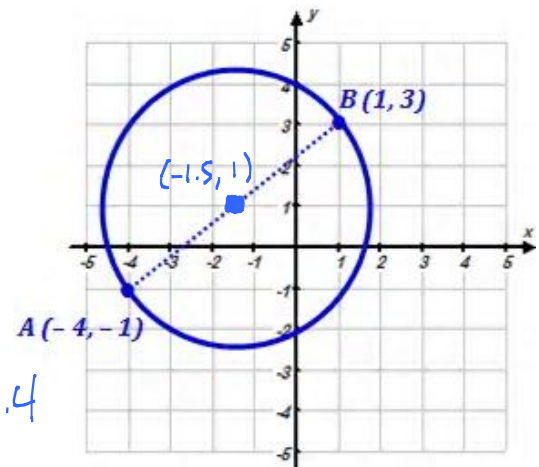
d. Segment $\overline{AD}$ (-2, 7), (3, -6)

$$\begin{aligned} &(\text{AVG}_x, \text{AVG}_y) \\ &\left(\frac{-2+3}{2}, \frac{7+(-6)}{2}\right) \\ &\left(\frac{1}{2}, \frac{1}{2}\right) \Rightarrow (0.5, 0.5) \\ &\text{MIDPOINT} \end{aligned}$$

6. Consider the graph of the circle shown. Determine the location of the center of the circle and length of the radius.

$$\begin{aligned} &\text{CENTER:} \\ &(\text{AVG}_x, \text{AVG}_y) \\ &\left(\frac{-4+1}{2}, \frac{-1+3}{2}\right) \\ &\left(\frac{-3}{2}, \frac{2}{2}\right) \\ &(-1.5, 1) \end{aligned}$$

$$\begin{aligned} &\text{RADIUS:} \\ &d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &\text{DIAMETER} = \sqrt{(-4 - 1)^2 + (-1 - 3)^2} \\ &= \sqrt{(-5)^2 + (-4)^2} \\ &= \sqrt{25+16} = \sqrt{41} \approx 6.4 \\ &\text{RADIUS} = \frac{\sqrt{41}}{2} \approx 3.2 \end{aligned}$$



7. Consider the graph of the square ABCD. Determine the location of the center of the square and the length of a diagonal.

$$B(-3, 2) \quad D(3, 0)$$

CENTER

$$\left(\frac{\text{AVG } x}{}, \frac{\text{AVG } y}{} \right)$$

$$\left(\frac{-3+3}{2}, \frac{2+0}{2} \right)$$

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

$$(0, 1)$$

LENGTH OF DIAGONAL

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

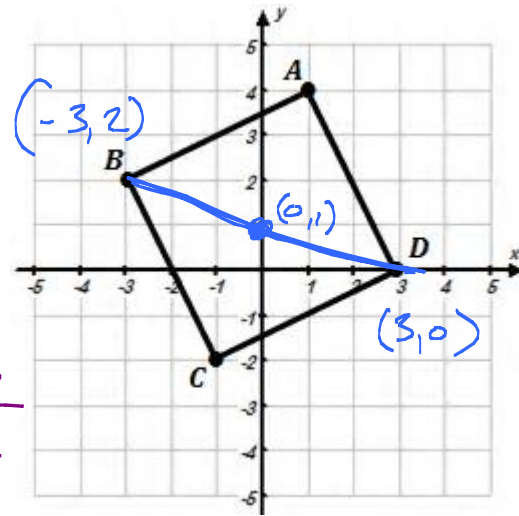
$$d = \sqrt{(3 - (-3))^2 + (0 - 2)^2}$$

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

$$= \sqrt{36 + 4}$$

$$= \sqrt{40} = 2\sqrt{10} \approx 6.32$$

$$\begin{aligned} &\sqrt{40} \\ &\quad \swarrow \quad \searrow \\ &4 \quad 10 \\ &\quad \swarrow \quad \searrow \\ &2 \quad 2 \quad 2.5 \\ &\quad \swarrow \quad \searrow \\ &\sqrt{4 \cdot 10} \\ &\quad \swarrow \quad \searrow \\ &\sqrt{4} \cdot \sqrt{10} \\ &\quad \swarrow \quad \searrow \\ &2 \sqrt{10} \end{aligned}$$



8. Find the point R that is on the directed line segment $\overrightarrow{PQ}$ that is $\frac{1}{4}$ the distance from P to Q, given $P(-4, -2)$ and point $Q(4, -2)$.

$x_1 \ y_1$

$x_2 \ y_2$

X-COORDINATE

$$\text{HORIZONTAL CHANGE} = x_2 - x_1$$

$$= 4 - (-4)$$

$$= 8$$

$$\text{SCALE FACTOR} \cdot \text{HORIZONTAL CHANGE}$$

$$\left(\frac{1}{4} \right) \cdot 8 = 2$$

$$X\text{-COORD} = x_1 + 2$$

$$= -4 + 2 = \boxed{-2}$$

Y-COORDINATE

$$\text{VERTICAL CHANGE} = y_2 - y_1$$

$$= -2 - (-2)$$

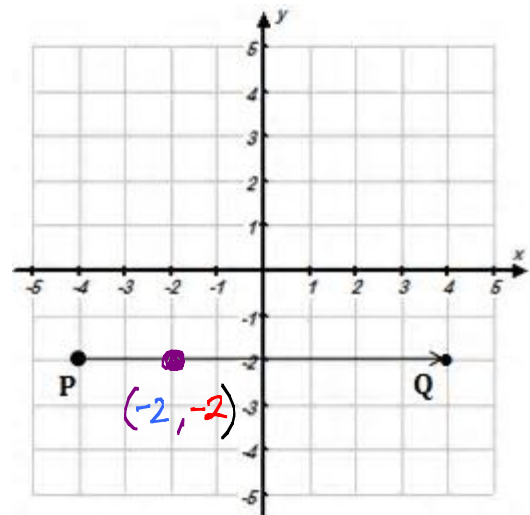
$$= 0$$

$$\text{SCALE FACTOR} \cdot \text{VERTICAL CHANGE}$$

$$\left(\frac{1}{4} \right) \cdot (0) = 0$$

$$Y\text{-COORD} = y_1 + 0$$

$$= -2 + 0 = \boxed{-2}$$



9. Find the point E that is on the directed line segment $\overrightarrow{CD}$ that is $\frac{3}{4}$ the distance from C to D, given $C(2, -4)$ and point $D(-2, 4)$.

X-COORDINATE

$$\text{HORIZONTAL CHANGE} = x_2 - x_1$$

$$-2 - 2 = -4$$

$$\text{SCALE FACTOR} \cdot \text{HORIZONTAL CHANGE}$$

$$\left(\frac{3}{4} \right) \cdot (-4) = -3$$

$$X\text{-COORD} = x_1 + (-3)$$

$$2 + (-3) = \boxed{-1}$$

Y-COORDINATE

$$\text{VERTICAL CHANGE} = y_2 - y_1$$

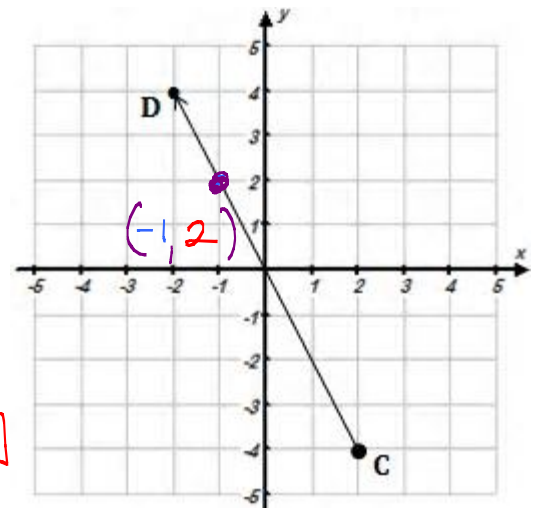
$$4 - (-4) = 8$$

$$\text{SCALE FACTOR} \cdot \text{VERTICAL CHANGE}$$

$$\left(\frac{3}{4} \right) \cdot (8) = 6$$

$$Y\text{-COORD} = y_1 + 6$$

$$-4 + 6 = \boxed{2}$$



10. Find the point O that is on the directed line segment $\overrightarrow{MN}$ that is $\frac{2}{5}$ the distance from M to N, given $M(-4, -1)$ and point $N(4, 3)$.

X-COORDINATE

$$\begin{array}{l} \text{HORIZONTAL} \\ \text{CHANGE} : X_2 - X_1 \\ 4 - (-4) = 8 \end{array}$$

SCALE FACTOR $\cdot$ HORIZONTAL CHANGE

$$\left(\frac{2}{5}\right) \cdot (8) = 3.2$$

$$X\text{-COORD} = X_1 + 3.2$$

$$-4 + 3.2 = \boxed{-0.8}$$

Y-COORDINATE

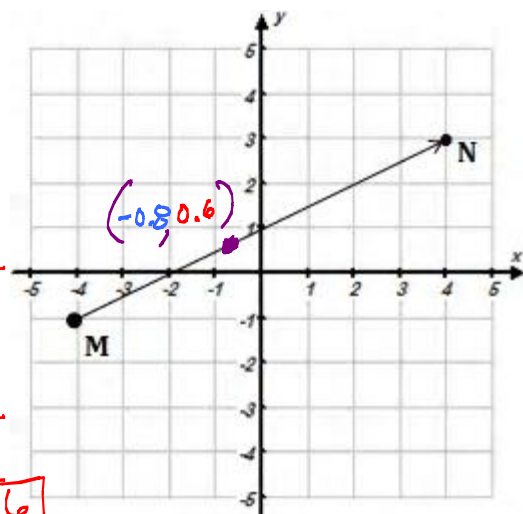
$$\begin{array}{l} \text{VERTICAL} \\ \text{CHANGE} : Y_2 - Y_1 \\ 3 - (-1) = 4 \end{array}$$

SCALE FACTOR $\cdot$ VERTICAL CHANGE

$$\left(\frac{2}{5}\right) (4) = 1.6$$

$$Y\text{-COORD} = Y_1 + 1.6$$

$$-1 + 1.6 = \boxed{0.6}$$



11. Find the point R that breaks the directed segment $\overrightarrow{ST}$ in a ratio of 1:2, given $S(-4, -2)$ and point $T(5, 1)$.

SCALE FACTOR : $\frac{1}{1+2} = \frac{1}{3}$



X-COORDINATE

$$\begin{array}{l} \text{HORIZONTAL} \\ \text{CHANGE} : X_2 - X_1 \\ 5 - (-4) = 9 \end{array}$$

SCALE FACTOR $\cdot$ HORIZONTAL CHANGE

$$\left(\frac{1}{3}\right) \cdot (9) = 3$$

$$X\text{-COORD} : X_1 + 3$$

$$-4 + 3 = \boxed{-1}$$

Y-COORDINATE

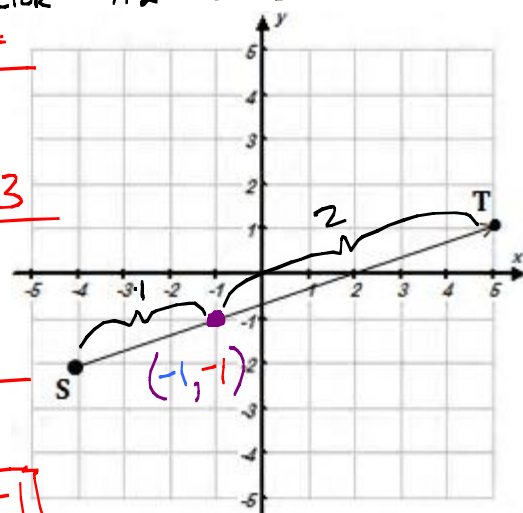
$$\begin{array}{l} \text{VERTICAL} \\ \text{CHANGE} : Y_2 - Y_1 \\ 1 - (-2) = 3 \end{array}$$

SCALE FACTOR $\cdot$ VERTICAL CHANGE

$$\left(\frac{1}{3}\right) \cdot (3) = 1$$

$$Y\text{-COORD} : Y_1 + 1$$

$$-2 + 1 = \boxed{-1}$$



12. Find the point I that breaks the directed segment $\overrightarrow{GH}$ in a ratio of 1:4, given $G(-3, 3)$ and point $H(4, -2)$.

SCALE FACTOR : $\frac{1}{1+4} = \frac{1}{5}$

X-COORDINATE

$$\begin{array}{l} \text{HORIZONTAL} \\ \text{CHANGE} : X_2 - X_1 \\ 4 - (-3) = 7 \end{array}$$

SCALE FACTOR $\cdot$ HORIZONTAL CHANGE

$$\left(\frac{1}{5}\right) \cdot (7) = 1.4$$

$$X\text{-COORDINATE} : X_1 + 1.4$$

$$-3 + 1.4 = \boxed{-1.6}$$

Y-COORDINATE

$$\begin{array}{l} \text{VERTICAL} \\ \text{CHANGE} : Y_2 - Y_1 \\ -2 - 3 = -5 \end{array}$$

SCALE FACTOR $\cdot$ VERTICAL CHANGE

$$\left(\frac{1}{5}\right) \cdot (-5) = -1$$

$$Y\text{-COORD} : Y_1 + -1$$

$$3 + -1 = \boxed{2}$$

