12.1 Directed Line segments

- a segment that has distance and a direction
magnitude and direction = (vector)

- The directed line segment implies that we are starting at point A and going towards point B. This means that the initial point is A.

***This is important because when we partition (or divide up) the segment into a ratio, the ratio will reference a starting point and a direction.

** if the unknown point is ON the line segment, all three points must be Collinear!

Collinear points have the same slope!

Recall… $m = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{y - y_1}{x - x_1}$ used as a Distance

Partitioning a segment.

Find the coordinates of point P that lies on the directed line segment from A(3, 4) to B (6,10) and partitions the segment into the ratio 3 to 2.

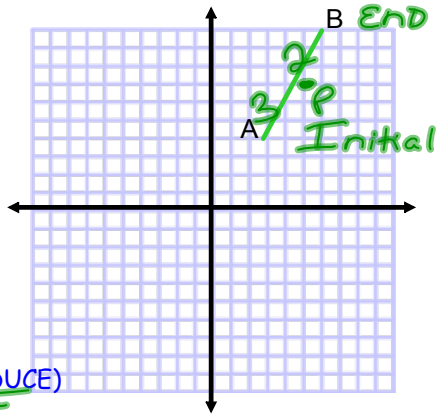
STEPS: Initial Point A(3,4)

A. Find the Distance Ratio of the segment from the initial point. (part : whole). Express as a fraction. Scale factor

$\frac{AP}{AB} = \frac{3}{5}$

B. Find the rise & run of AB (End pt - Initial Pt - Do NOT REDUCE)

$\frac{\Delta x}{\Delta y} = \frac{6-3}{10-4} = \frac{3}{6}$



the coordinates of P are:

(4.8, 7.6)

C. (x,y) Coordinates of P use the following formula:

x-coordinate of P = x value of initial point ± (distance ratio)(run)

$3 + \frac{3}{5}(3) = 4.8$

y-coordinate of P = y value of initial point ± (distance ratio)(rise)

$4 + \frac{3}{5}(6) = 7.6$

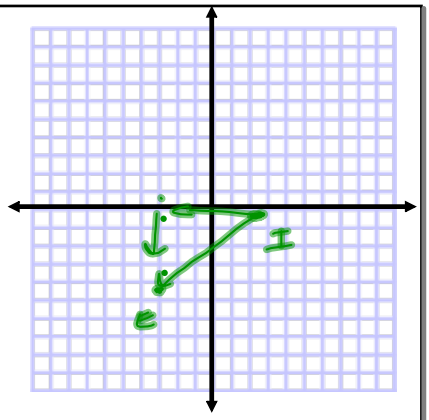
Find the point that partitions the directed segment with endpoints of (2, -1) and (-3, -5) into the ratio of 1:2.

I E

1 + 2 = 3

Distance Ratio

$\frac{\text{Part}}{\text{Whole}} = \frac{1}{3}$



Distance Ran / Rise

$\frac{\Delta x}{\Delta y} = \frac{-3-2}{-5+1} = \frac{-5}{-4}$

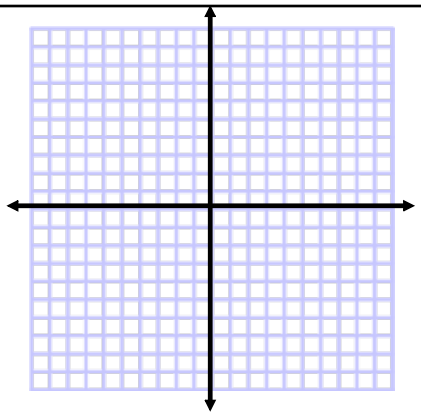
(x, y)

$x = 2 + \frac{1}{3}(-5) = \frac{1}{3}$

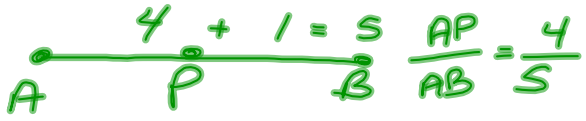
$y = -1 + \frac{1}{3}(-4) = -2\frac{1}{3}$

$P(\frac{1}{3}, -2\frac{1}{3})$

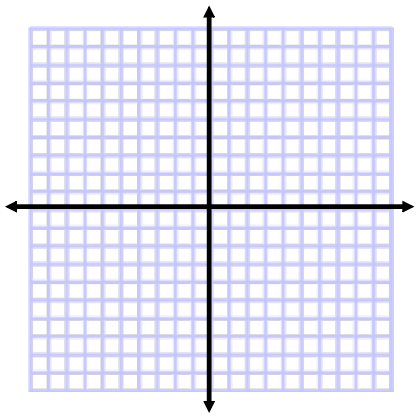
Find point Q that lies on the directed line segment from R(-2, 4) to S(18, -6) into the ratio 3:7.



Given A (1, 1) and B (7, 3).
Find the point P on AB *such* that $AP = 4 \cdot PB$.



$4 + 1 = 5 \quad \frac{AP}{AB} = \frac{4}{5}$



Distance

$\frac{\text{Rise}}{\text{Run}} = \frac{3-1}{7-1} = \frac{2}{6} \quad \begin{matrix} y \\ x \end{matrix}$

$P\,(5.8, 2.6)$

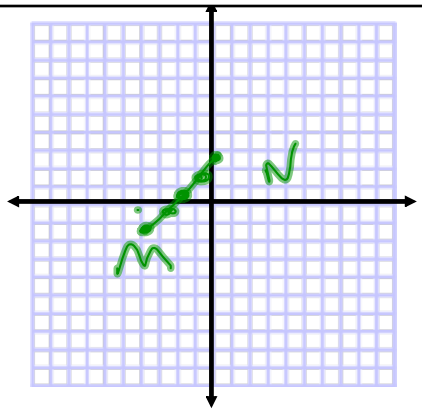
(x, y)

$x = 1 + \frac{4}{5}(6) = 5.8$

$y = 1 + \frac{4}{5}(2) = 2.6$

Given M (–4, –1) and N (0, 3).
Find the point P on MN such that $MP = 3 \cdot PN$.

$3 + 1 = 4 \quad \frac{MP}{MN} = \frac{3}{4}$



$\frac{\text{Run}}{\text{Rise}} = \frac{0-(-4)}{3-(-1)} = \frac{4}{4}$

$P(-1, 2)$

(x, y)

$x = -4 + \frac{3}{4}(4) = -1$

$y = -1 + \frac{3}{4}(4) = 2$

Homework:

Worksheet