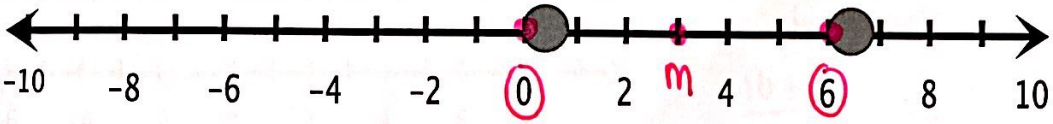
Day 5 – Partitioning a Segment in 1 & 2 Dimensions – Notes

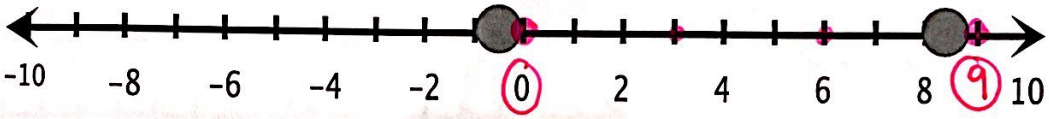
Last week you learned how to calculate the midpoint of a line segment. Think back...

- How many segments does the midpoint split a segment into?
- Are these segments equal in length?

This is called a 1 to 1 ratio (1:1), which means the length of the first segment is one times as big (or equal to) as the second segment. Since the ratio is 1:1, you can also think of it as dividing a segment into two equal parts.



A 2:1 ratio would be interpreted as a segment being divided into three equal parts (2 + 1) with two equal parts representing the "2" in the ratio and the other remaining equal part representing the "1".



When we divide or separate a line segment, we are **partitioning the segment**. Today, we are going to learn how to partition a segment using a given ratio, other than 1:1 (midpoint). When partitioning a segment, it is necessary to determine the total number of parts that the line segment must be divided into. In the following ratios below, determining the total number of parts:

a. 2:5 — 7

b. 3:5 — 8

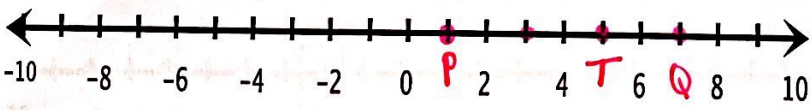
c. 1:2 — 3

d. 3:8 — 11

Partitioning a Line Segment on a Number Line

1. Given: P is at 1 and Q is at 7. Find the point T, so that T partitions P to Q in a 2:1 ratio.

↳ 3 parts



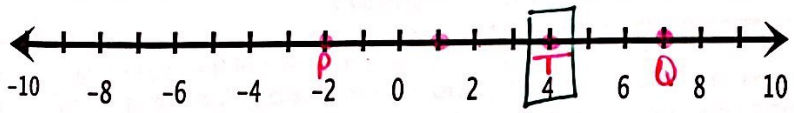
$\frac{6 \text{ total parts}}{3 \text{ parts}} = 2$ parts for each length of segment

Partitioning in One Dimension:

1. Plot endpoints (x_1 & x_2)
2. Determine number of equal parts.
3. Determine length of segment.
4. Count the number of equal parts in the 1st part of the ratio and plot the point.

Formula: $(x_2 - x_1)(\frac{a}{a+b}) + x_1$

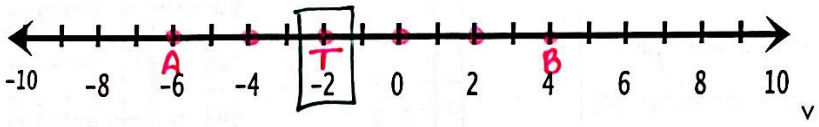
2. Given: P is at -2 and Q is at 7. Find the point T, so that T partitions P to Q in a 2:1 ratio.



↳ 3 parts

$\frac{9 \text{ total}}{3 \text{ parts}} = 3$

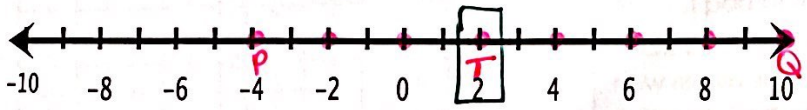
3. Given: A is at -6 and B is at 4. Find the point T, so that T partitions A to B in a 2:3 ratio.



↳ 5 parts

$\frac{10 \text{ total}}{5 \text{ parts}} = 2$

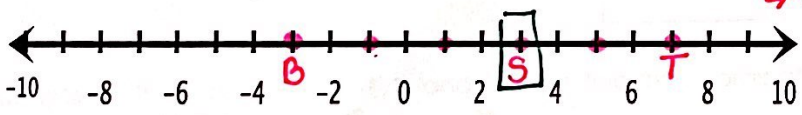
4. Given: P is at -4 and Q is at 10. Find the point T, so that T partitions P to Q in a 3:4 ratio.



↳ 7 parts

$\frac{14 \text{ total}}{7 \text{ parts}} = 2$

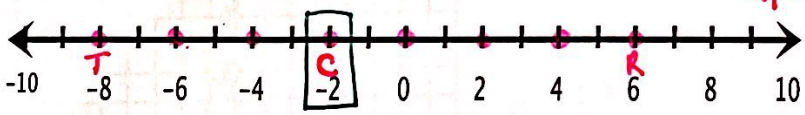
5. Given: T is at 7 and B is at -3. Find S so BT is partitioned in a 3:2 ratio.



↳ 5 parts

$\frac{10 \text{ total}}{5 \text{ parts}} = 2$

6. Given: T is at -8 and R is at 6. Find C, so that TC is three-sevenths of TR



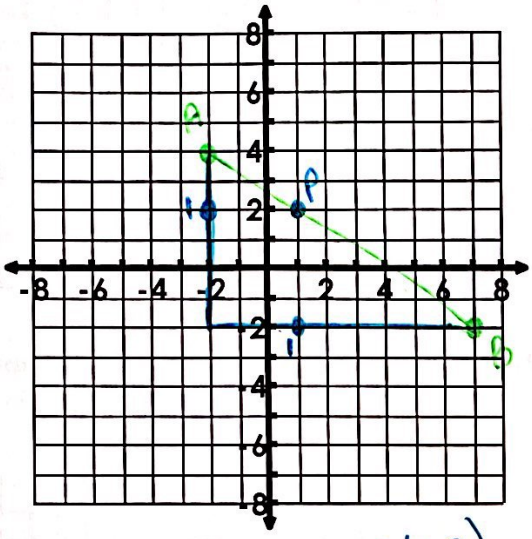
$\frac{3}{7} \rightarrow$ 7 parts

$\frac{14 \text{ total}}{7 \text{ parts}} = 2$

Partitioning a Segment in Two Dimensions

Partitioning a segment in two dimensions means you are partitioning a line segment in a coordinate plane. It is very similar to partitioning a segment in one dimension except instead of multiplying your fraction by the length; you will be multiplying by the rise (y-coordinate) and run (x-coordinate) of the segment.

Example 1: Given the points A(-2, 4) and B(7, -2), find the coordinates of the point P on the line segment AB that partitions AB in the ratio 1:2. 3 parts



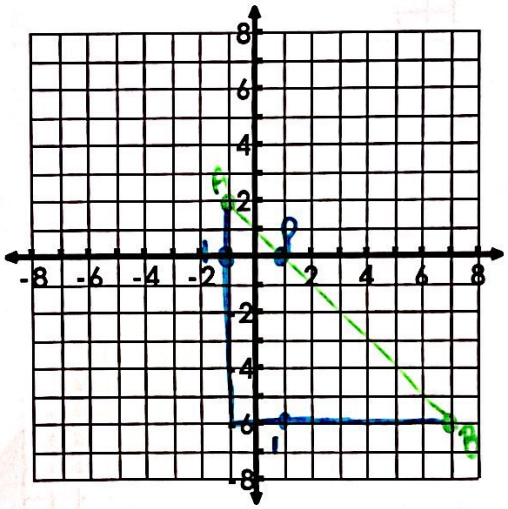
Partitioning in Two Dimensions:

1. Plot points (x_1, y_1) & (x_2, y_2).
2. Determine your slope $(\frac{rise}{run})$.
3. Multiply the **rise** by the fraction that represents the first part of the ratio $(\frac{a}{a+b})$.
4. Multiply the **run** by the fraction that represents the first part of the ratio $(\frac{a}{a+b})$.
5. Go back to point A and plot a point using your new rise over run value.
6. The plotted point represents the given ratio.

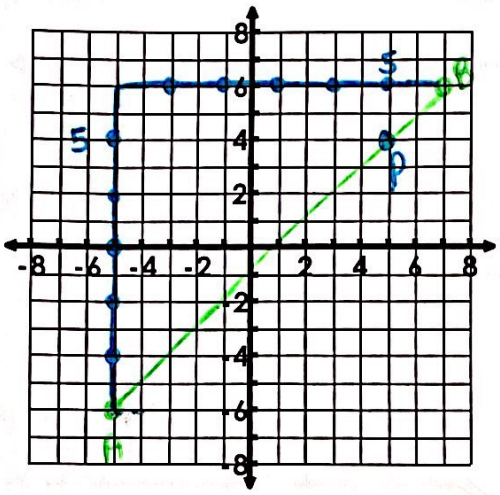
Formula:

$$\left((x_2 - x_1)\left(\frac{a}{a+b}\right) + x_1,\ (y_2 - y_1)\left(\frac{a}{a+b}\right) + y_1\right)$$

Example 2: Given the points A(-1, 2) and B (7, -6), find the coordinates of the point P on the line segment AB that partitions AB in the ratio 1:3. 4 parts

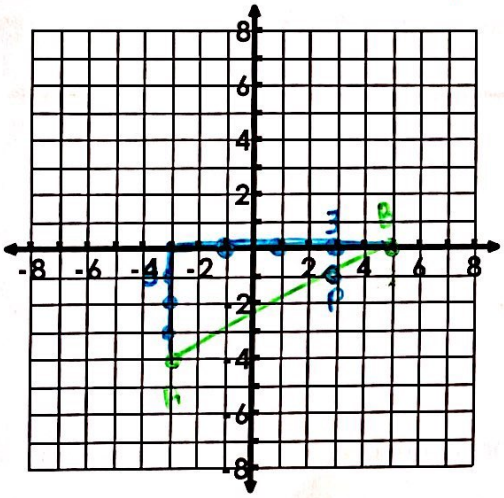


Example 3: Given the points A(-5, -6) and B (7, 6), find the coordinates of the point P on the line segment AB that partitions AB in the ratio 5:1. 6 parts



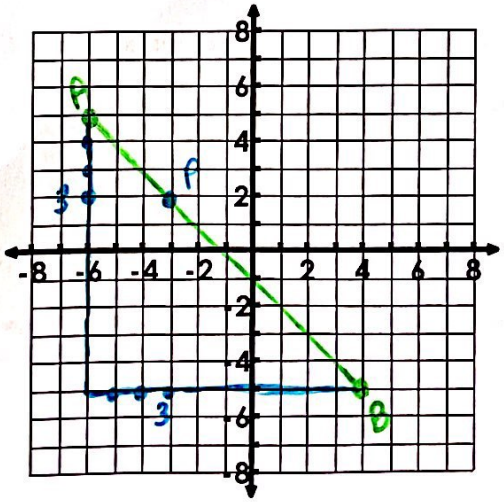
P(5,4)

Example 4: Given the points A(-3, -4) and B(5, 0), find the coordinates of the point P on the line segment AB that partitions AB in the ratio 3 to 1. 4 parts



P(3,-1)

Example 5: Given the points A(-6, 5) and B(4, -5), find the coordinates of the point P on the line segment AB that partitions AB in the ratio 3:7. 10 parts



P(-3,2)