

**Section 1 – Topic 5**  
**Partitioning a Line Segment – Part 1**

What do you think it means to *partition*?

How can a line segment be partitioned?

In the previous section, we worked with the \_\_\_\_\_, which partitions a segment into a 1: 1 ratio.

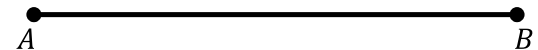
**STUDY  
EDGE  
TIP**

A **ratio** compares two numbers.

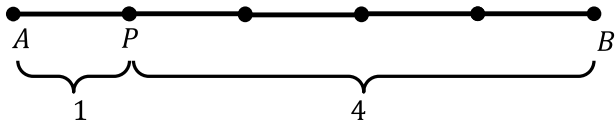
A 1: 1 **ratio** is stated as, or can also be written as, “1 to 1”.

Why does the midpoint partition a segment into a 1: 1 ratio?

How can  $\overline{AB}$  be divided into a 1: 3 ratio?



Consider the following line segment where point  $P$  partitions the segment into a 1:4 ratio.



How many sections are between points  $A$  and  $P$ ?

How many sections are between points  $P$  and  $B$ ?

How many sections are between points  $A$  and  $B$ ?

In relation to  $\overline{AB}$ , how long is  $\overline{AP}$ ?

In relation to  $\overline{AB}$ , how long is  $\overline{PB}$ ?

Let's call these ratios,  $k$ , a fraction that compares a part to a whole.

If partitioning a directed line segment into two segments, when would your ratio  $k$  be the same for each segment? When would it be different?

The following formula can be used to find the coordinates of a given point that partition a line segment into ratio  $k$ .

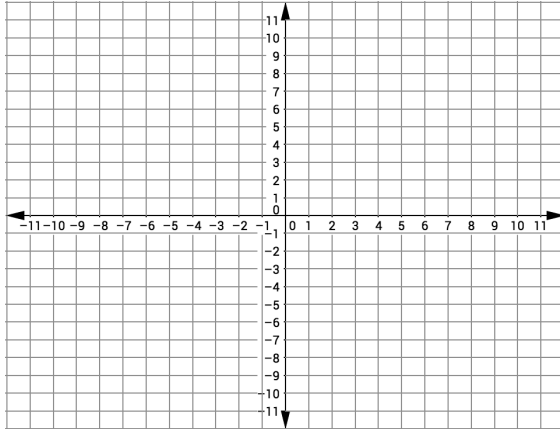
$$(x, y) = (x_1 + k(x_2 - x_1), y_1 + k(y_2 - y_1))$$

### Let's Practice!

1. What is the value of  $k$  used to find the coordinates of a point that partitions a segment into a ratio of 4:3?
2. Determine the value of  $k$  if partitioning a segment into a ratio of 1:5.

**Try It!**

3.  $A$  has coordinates  $(2, 4)$ .  $B$  has coordinates  $(10, 12)$ . Find the coordinates of point  $P$  that partition  $\overline{AB}$  in the ratio  $3:2$ .



4. Points  $C$ ,  $D$ , and  $E$  are collinear on  $\overline{CE}$ , and  $CD:DE = \frac{3}{5}$ .  $C$  is located at  $(1, 8)$ ,  $D$  is located at  $(4, 5)$ , and  $E$  is located at  $(x, y)$ . What are the values of  $x$  and  $y$ ?

**Section 1 – Topic 6**  
**Partitioning a Line Segment – Part 2**

Consider  $M$ ,  $N$ , and  $P$ , collinear points in  $\overline{MP}$ .

What is the difference between the ratio  $MN:NP$  and the ratio of  $MN:MP$ ?

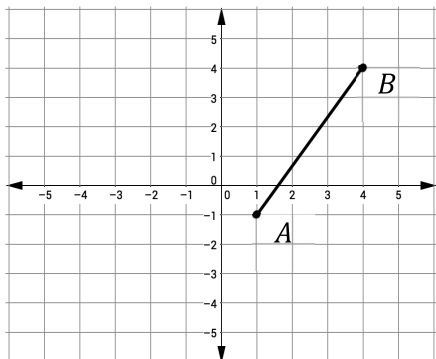
What should you do if one of the parts of a ratio is actually the whole line instead of a ratio of two smaller parts or segments?

**Let's Practice!**

1. Points  $P$ ,  $Q$ , and  $R$  are collinear on  $\overline{PR}$ , and  $PQ:PR = \frac{2}{3}$ .  $P$  is located at the origin,  $Q$  is located at  $(x, y)$ , and  $R$  is located at  $(-12, 0)$ . What are the values of  $x$  and  $y$ ?



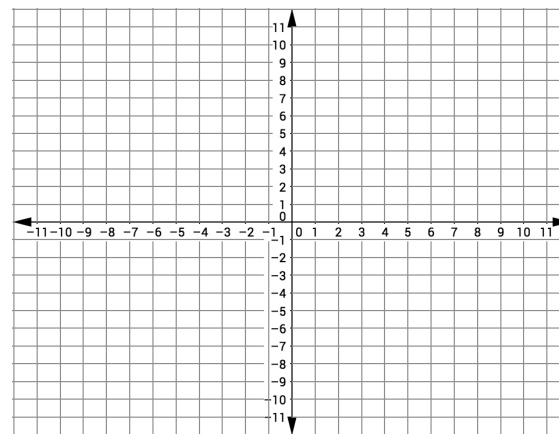
2. Consider the line segment in the graph below.



- a. Find the coordinates of point  $P$  that partition  $\overline{AB}$  in the ratio 1:4.
- b. Suppose  $A$ ,  $R$ , and  $B$  are collinear on  $\overline{AB}$ , and  $AR:AB = \frac{1}{4}$ . What are the coordinates of  $R$ ?

**Try It!**

3.  $\overline{JK}$  in the coordinate plane has endpoints with coordinates  $(-4, 11)$  and  $(8, -1)$ .
- a. Graph  $\overline{JK}$  and find two possible locations for point  $M$ , so  $M$  divides  $\overline{JK}$  into two parts with lengths in a ratio of 1:3.



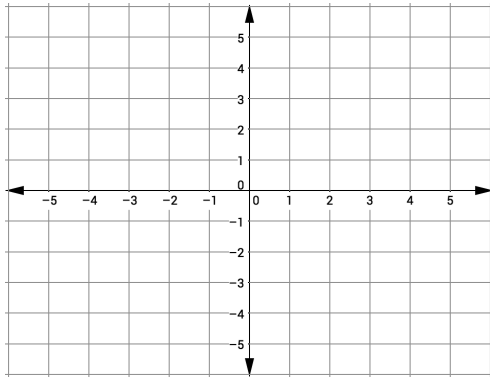
- b. Suppose  $J$ ,  $P$ , and  $K$  are collinear on  $\overline{JK}$ , and  $JP:JK = \frac{1}{3}$ . What are the coordinates of  $P$ ?



### **BEAT THE TEST!**

1. Consider the directed line segment from  $A(-3, 1)$  to  $Z(3, 4)$ . Points  $L, M,$  and  $N$  are on  $\overline{AZ}$ .

$L(-1, 2)$	$M\left(0, \frac{5}{2}\right)$	$N(1, 3)$
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Complete the statements below.

The point \_\_\_\_\_ partitions  $\overline{AZ}$  in a 1:1 ratio.

The point \_\_\_\_\_ partitions  $\overline{AZ}$  in a 1:2 ratio.

The point \_\_\_\_\_ partitions  $\overline{AZ}$  in a 2:1 ratio.

The ratio  $AL: AZ =$  \_\_\_\_\_.

