

Name: Kly

Date: _____

UNIT 7

LESSON 5

AIM: HOW DO WE DIVIDE SEGMENTS PROPORTIONALLY?

Do Now: Given m is the midpoint of line segment \overline{AB} :

a) What **ratio** does M split the segment into?

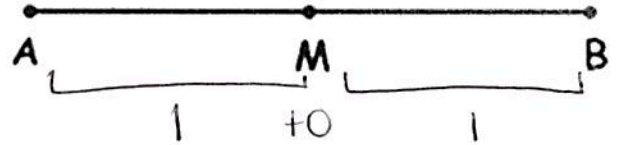
1:1

b) How many **total parts** are in the segment?

2

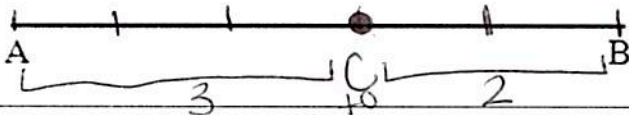
c) What **fraction** of the way from A to B is the midpoint M ?

$\frac{1}{2}$

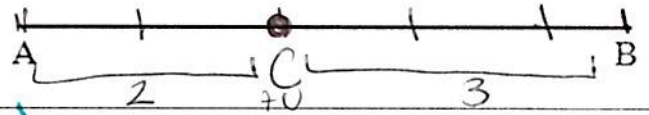


→ ORDER MATTERS!

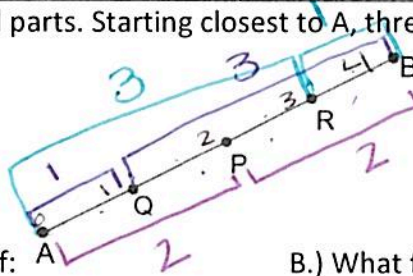
1) Partition the following segments, given the ratio 3:2 of the directed line segment AB (initial point A). How many total equal parts are there? 5



2) Partition the following segments, given the ratio 3:2 of the directed line segment AB (initial point B). How many total equal parts are there? 5



3) Segment AB is split into four equal parts. Starting closest to A , three points Q , P , and R respectively split the segment.



A.) State the **partition ratio** of:

a. AQ:QB 1:3

b. AP:PB 2:2

c. AR:RB 3:1

B.) What **fraction** of the way along AB is:

a. AQ $\frac{1}{4}$

b. AP $\frac{2}{4}$ or $\frac{1}{2}$

c. AR $\frac{3}{4}$

4 parts

C.) Can you find the **relationship** between the **partition ratio** and the **fraction**?

$\frac{\text{1st \# of ratio}}{\text{sum of ratio (\# of parts)}}$

• A directed line segment has both length and direction. In other words, the order of the letters matters!

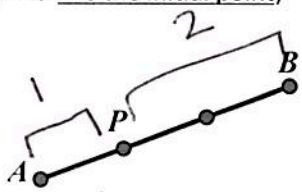
$\overline{AB} \neq \overline{BA}$

• **Partition Ratio:** left side : right side → part to part

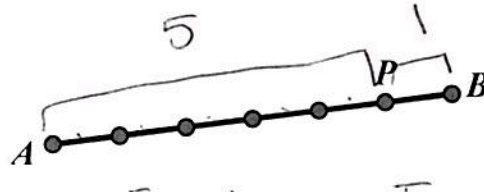
• **Fraction:** $\frac{\text{position}}{\text{total parts}}$ → position to whole

• **(K) Dilatation Scale Factor:** $\frac{\text{1st \# of ratio}}{\text{sum of ratio}}$ → relationship between partition and fraction

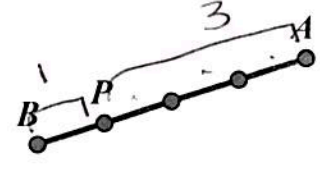
Example 3: Determine the ratio and fraction of the way of the directed line segment \overline{AB} when partitioned by point P.
 (Hint: A is the initial point)



a) $\underline{1} : \underline{2}$ Fraction? $\frac{1}{3}$



b) $\underline{5} : \underline{1}$ Fraction? $\frac{5}{6}$



c) $\underline{1} : \underline{3}$ Fraction? $\frac{1}{4}$

FINDING SPECIFIC POINTS USING DIRECTED LINE SEGMENTS

GRAPHICALLY:

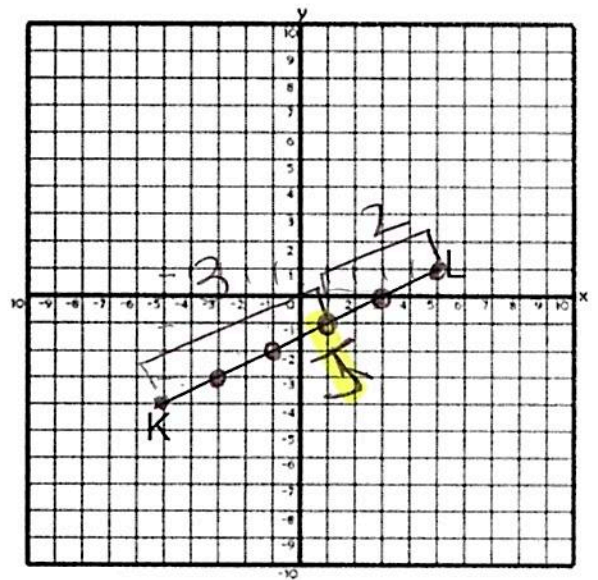
Example 4: Directed line segment KL has endpoints whose coordinates are $K(-5, -4)$ and $L(5, 1)$. Determine the coordinates of point M that divides the segment in the ratio 3:2.

1. Graph the Line (if not already done)
2. Find slope and mark all points using slope

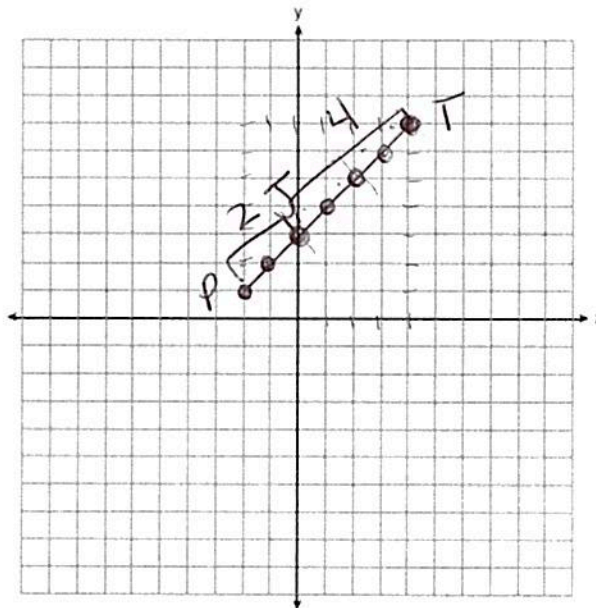
$$m = \frac{5}{10} = \left(\frac{1}{2}\right)$$

3. Find the point J that will partition the directed segment into 3:2 ratio (starting from K)

$$J = (1, -1)$$



NYTO (Now You Try One): Directed line segment PT has endpoints whose coordinates are $P(-2, 1)$ and $T(4, 7)$. Determine the coordinates of point J that divides the segment in the ratio 2 to 4. **★ FIX! ★**



$$m = \frac{6}{6} = \frac{1}{1}$$

$$J = (0, 3)$$

ALGEBRAICALLY:

DIRECTED LINE SEGMENT FORMULA!

$$(x_1 + k(x_2 - x_1), y_1 + k(y_2 - y_1))$$

Where:

(x_1, y_1)	First (initial) point
k	direction scale factor
(x_2, y_2)	second point

Example 5: The coordinates of the endpoints of \overline{AB} are $A(-6, -5)$ and $B(4, 0)$. Point P is on \overline{AB} . Determine and state the coordinates of point P , such that $AP:PB$ is $2:3$.

$$x_1 = -6$$

$$y_1 = -5$$

$$k = \frac{2}{5}$$

$$x_2 = 4$$

$$y_2 = 0$$

$$\left(\underbrace{-6 + \frac{2}{5}(4 - (-6))}_{\text{PUT IN CALC}}, \underbrace{-5 + \frac{2}{5}(0 - (-5))}_{\text{EXACTLY LIKE THIS}} \right)$$

$$P = (-2, -3)$$

EVALUATE SEPARATELY!

NYTO (Now You Try One): Point P is on segment AB such that $AP:PB$ is $4:5$. If A has coordinates $(4, 2)$, and B has coordinates $(22, 2)$, determine and state the coordinates of P .

$$x_1 = 4$$

$$y_1 = 2$$

$$k = \frac{4}{9}$$

$$x_2 = 22$$

$$y_2 = 2$$

$$\left(\underbrace{4 + \frac{4}{9}(22 - 4)}, \underbrace{2 + \frac{4}{9}(2 - 2)} \right)$$

$$P = (12, 2)$$

PARTNER PRACTICE:

- 1) The endpoints of \overline{DEF} are $D(1,4)$ and $F(16,14)$. Determine and state the coordinates of point E, if $DE:EF = 2:3$.

$$K = \frac{2}{5}$$

$$\left(1 + \frac{2}{5}(16-1), 4 + \frac{2}{5}(14-4) \right)$$

$$\boxed{E = (7, 8)}$$

- 2) Point Q is on \overline{MN} such that $MQ:QN = 2:3$. If M has coordinates $(3,5)$ and N has coordinates $(8,-5)$, the coordinates of Q are

$$K = \frac{2}{5}$$

$$\left(3 + \frac{2}{5}(8-3), 5 + \frac{2}{5}(-5-5) \right)$$

$$Q = (5, 1)$$

- Ⓐ (5, 1)
- Ⓑ (5, 0)
- Ⓒ (6, -1)
- Ⓓ (6, 0)

- 3) What are the coordinates of the point on the directed line segment from $K(-5,-4)$ to $L(5,1)$ that partitions the segment into a ratio of 3 to 2?

$$K = \frac{3}{5}$$

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

$$(1, -1)$$

- 1) (-3, -3)
- 2) (-1, -2)
- 3) $\left(0, -\frac{3}{2} \right)$
- Ⓐ (1, -1)

4. Point P is on the directed line segment from point $X(-6,-2)$ to point $Y(6,7)$ and divides the segment in the ratio 1:5. What are the coordinates of point P?

$$1) \left(4, 5\frac{1}{2} \right) \rightarrow K = \frac{1}{6}$$

$$\left(-6 + \frac{1}{6}(6-(-6)), -2 + \frac{1}{6}(7-(-2)) \right)$$

$$\left(-4, -\frac{1}{2} \right)$$

- 2) $\left(-\frac{1}{2}, -4 \right)$
- 3) $\left(-4\frac{1}{2}, 0 \right)$
- Ⓐ $\left(-4, -\frac{1}{2} \right)$

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UNIT 7

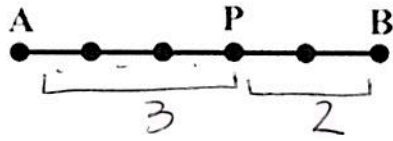
LESSON 5

HOMEWORK

5. Given the diagram below with initial point A.

$AP : PB = 3 : 2$

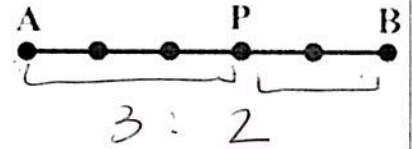
TRUE OR FALSE



6. Given the diagram below with initial point A.

$AP : AB = 2 : 5$

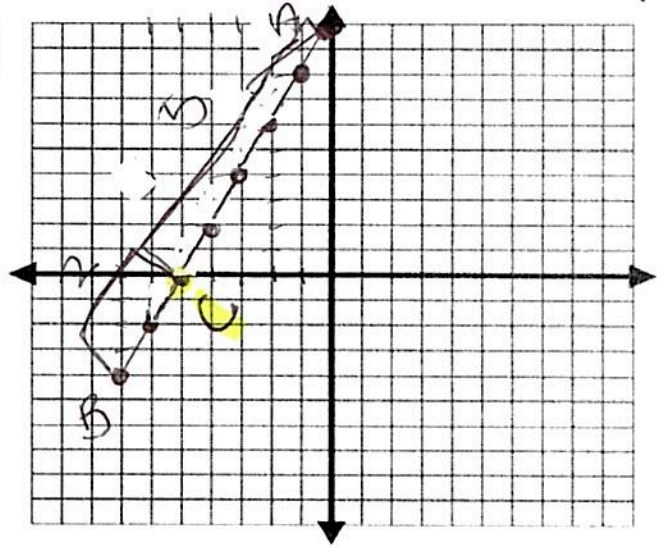
TRUE OR FALSE



7. \overline{AB} is drawn from $A(0, 10)$ to $B(-7, -4)$. Find point C that partitions \overline{AB} in the ratio 5:2. $k = \frac{5}{7}$

$$\left(0 + \frac{5}{7}(-7-0), 10 + \frac{5}{7}(-4-10) \right)$$

$$\boxed{(-5, 0)}$$

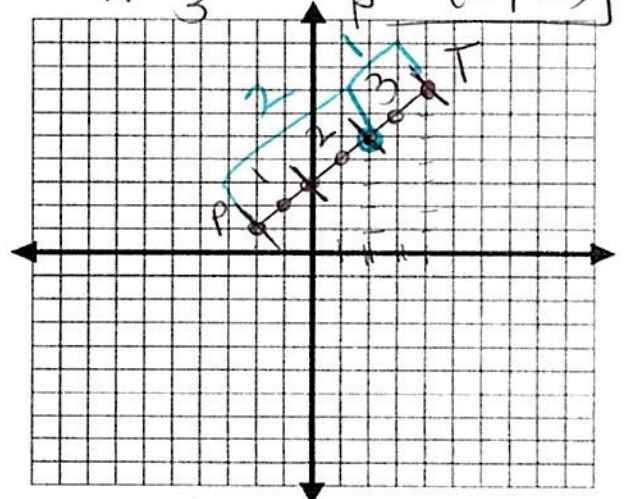


$C = (-5, 0)$ $m = \frac{14}{7} = \frac{2}{1}$

8. Directed line segment PT has endpoints whose coordinates are $P(-2, 1)$ and $T(4, 7)$. Determine the coordinates of point J that divides the segment in the ratio 2 to 1. $k = \frac{2}{3}$

$$\left(-2 + \frac{2}{3}(4-(-2)), 1 + \frac{2}{3}(7-1) \right)$$

$$\boxed{(2, 5)}$$



$m = \frac{1}{1}$ but we need 3 parts