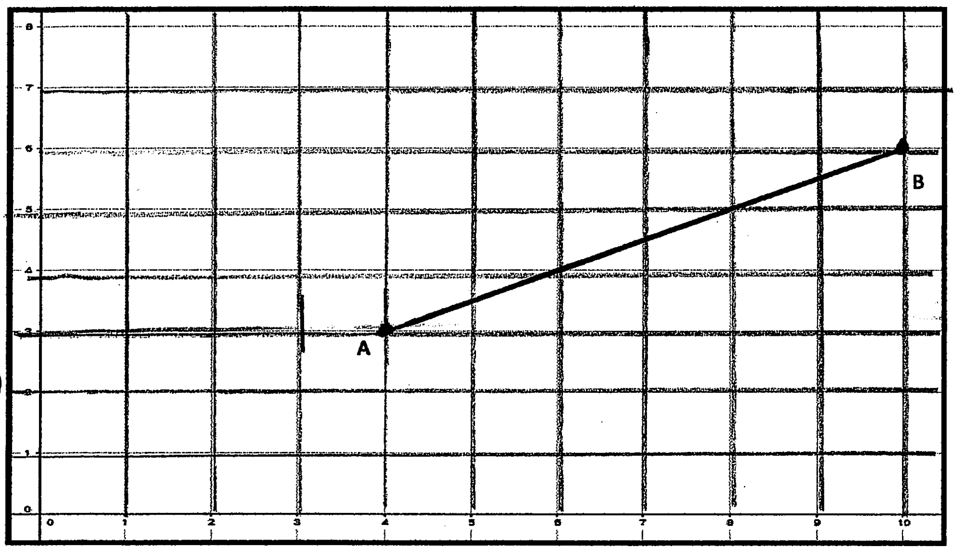
Geometry **Partitioning Line Segments Notes**

A Directed Line Segment is a line segment that has a direction associated with it, moving from a starting point to an ending point. **Partitioning a line segment** means to find a point part way between 2 points.

Steps finding point on a partitioned segment:

1) Convert the ratio into a fraction: **Example:** Ratio of 3: 2 is written as $\frac{3}{3+2}$ or $\frac{3}{5}$
2) Label points: Starting point is (x_1, y_1) Ending point is (x_2, y_2)
3) Find the horizontal distance Δx ("delta x") between the 2 points $(x_2 - x_1)$.
4) Find the horizontal distance Δy ("delta y") between the 2 points $(y_2 - y_1)$.
5) Find the Location of New Ordered Pair
   a. X-coordinate: $\boldsymbol{ratio} \times \Delta x + x_1$
   b. Y-coordinate: $\boldsymbol{ratio} \times \Delta y + y_1$



Ex. 1:Find the coordinate of point P along directed line segment AB if A(4, 3) and B(10, 6) in a ratio of 2:1

a) Find ratio: __________ and label points

b) Find horizontal distance Δx ($\Delta x = x_2 - x_1$)

Δx = ______________

c) Find vertical distance Δy ($\Delta y = y_2 - y_1$)

Δy = ______________

d) Find point P

i) X-coordinate: $\boldsymbol{ratio} \times \Delta x + x_1$

____

ii) Y-coordinate: $\boldsymbol{ratio} \times \Delta y + y_1$

____

Point P: ______________

Ex. 2: Find the coordinate of point P along directed line segment AB if A(3, 5) and B(-7, 0) in a ratio of 3:2

a) Find ratio: ____________

b) Find horizontal distance Δx ($\Delta x = x_2 - x_1$)

Δx = ______________

c) Find vertical distance Δy ($\Delta y = y_2 - y_1$)

Δy = ______________

d) Find point P

i) X-coordinate: $\boldsymbol{ratio} \times \Delta x + x_1$

____

ii) Y-coordinate: $\boldsymbol{ratio} \times \Delta y + y_1$

____

Point P: _______________

3) Find the coordinate of point P along directed line segment AB if A(3, 4) and B(6, 10) in a ratio of 3:2

4) Find the coordinate of point P along directed line segment AB if A(-1, 2) and B(7, 8) in a ratio of 3:1

Homework:

Steps:

a) Convert the ratio into a fraction: **Example:** Ratio of 3: 2 is written as $\frac{3}{3+2}$ or $\frac{3}{5}$
b) Find the horizontal distance Δx ("delta x") between the 2 points $(x_2 - x_1)$.
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1. **Find Point Z that partitions the directed line segment *XY* in a ratio of 5:3. *X*(−2, 6) and *Y*(−10, −2)**

2. **Find Point *Z* that partitions the directed line segment *XY* in a ratio of 2:3. *X*(2, −3) and *Y*(7,2)**

3. **Find Point *Z* that partitions the directed line segment *YX* in a ratio of 1:3. *X*(−2, −4) and *Y*(−7, 5) (Note the direction change in this segment.)**

4. **Find Point *Z* that partitions the directed line segment *YX* in a ratio of 3: 4. *X*(5, -6) and *Y*(1, 2) (Note the direction change in this segment.)**

Review Circle Problems

Circle Equation in Standard Form: **$(x-h)^2 + (y-k)^2 = r^2$** **Center: (h, k)** **Radius: r**

Write the below equations in **standard form,** then identify **center** and **radius** of circle:

5. $x^2 + y^2 - 8x - 16y + 71 = 0$

6) $x^2 + y^2 - 32x - 24y + 396 = 0$

Write the slope-intercept form of the equation of the line described.

Steps: 1) Put equation of line in slope-intercept form (**y = mx + b**) and find the slope of the given line

2) Identify the appropriate slope we need:

a) Parallel slope means use **<u>same slope</u>** as the equation's slope

b) Perpendicular slope means use **<u>opposite reciprocal</u>** of the equation's slope

3) Plug in point (**x,y**) and slope (**m**) into equation **y = mx + b** to solve for **b**.

4) Write new equation in slope-intercept form: **y = mx + b** m = slope, b = y-intercept

7. through: $(3, -4)$, parallel to $3y = -5x - 1$

8. through: $(3, 5)$, perp. to $y = -4x - 3$

Geometry **Partitioning Line Segments Notes** Key

A Directed Line Segment is a line segment that has a direction associated with it, moving from a starting point to an ending point. **Partitioning a line segment** means to find a point part way between 2 points.

Steps finding point on a partitioned segment:

1) Convert the ratio into a fraction: **Example**: Ratio of 3: 2 is written as $\frac{3}{3+2}$ or $\frac{3}{5}$
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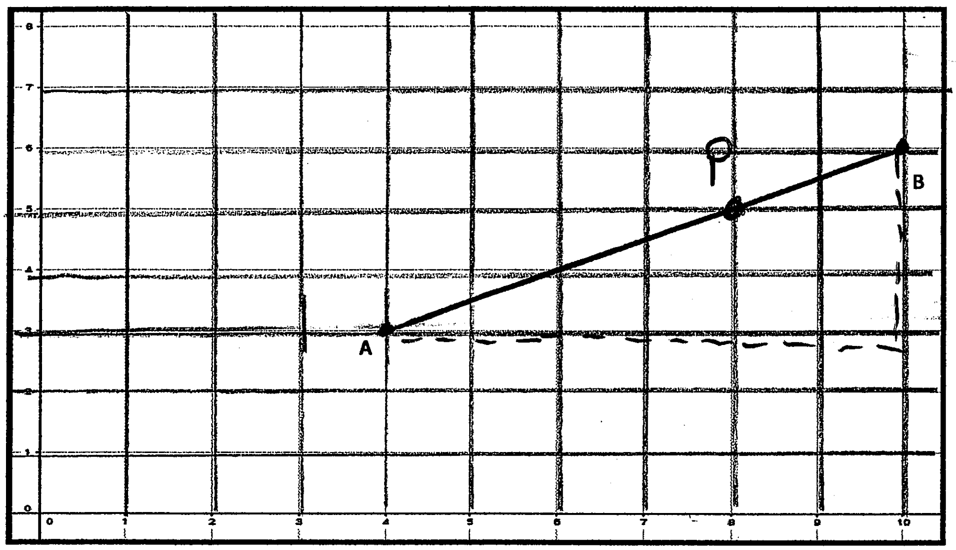

Ex. 1:Find the coordinate of point P along directed line segment AB if A(4, 3) and B(10, 6) in a ratio of 2:1

$x_1 \; y_1 \qquad x_2 \; y_2$

a) Find ratio: $\frac{2}{1+2} = \boxed{\frac{2}{3}}$ and label points

b) Find horizontal distance Δx $(\Delta x = x_2 - x_1)$

$\Delta x =$ $10-4=6$

c) Find vertical distance Δy $(\Delta y = y_2 - y_1)$

$\Delta y =$ $6-3=3$

d) Find point P

horizontal distance traveled from starting x-value location

i) X-coordinate: $\boldsymbol{ratio} \times \Delta x + x_1$

$\frac{2}{3}(6)+4 = 8$

vertical distance travelled starting y-value location

ii) Y-coordinate: $\boldsymbol{ratio} \times \Delta y + y_1$

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

Point P: $(8,5)$

$x_1\ y_1 \qquad x_2\ y_2$

Ex. 2: Find the coordinate of point P along directed line segment AB if A(3, 5) and B(-7, 0) in a ratio of 3:2

a) Find ratio: $\frac{3}{3+2} = \frac{3}{5}$

b) Find horizontal distance Δx ($\Delta x = x_2 - x_1$)

$\Delta x = -7-3 = -10$

c) Find vertical distance Δy ($\Delta y = y_2 - y_1$)

$\Delta y = 0-5 = -5$

d) Find point P

i) X-coordinate: $\textit{ratio} \times \Delta x + x_1$

$\frac{3}{5}(-10) + 3 = -3$

ii) Y-coordinate: $\textit{ratio} \times \Delta y + y_1$

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

Point P: $(-3, 2)$

$x_1\ y_1 \qquad x_2\ y_2$

3) Find the coordinate of point P along directed line segment AB if A(3, 4) and B(6, 10) in a ratio of 3:2

ratio: $\frac{3}{3+2} = \frac{3}{5}$

$\Delta x = 6-3 = 3$

$\Delta y = 10-4 = 6$

X-coord: $\frac{3}{5}(3) + 3 = 4.8$

y-coord: $\frac{3}{5}(6) + 4 = 7.6$

$\boxed{P(4.8, 7.6)}$

$x_1\ y_1 \qquad x_2\ y_2$

4) Find the coordinate of point P along directed line segment AB if A(-1, 2) and B(7, 8) in a ratio of 3:1

ratio $= \frac{3}{3+1} = \frac{3}{4}$

$\Delta x = 7-(-1) = 8$

$\Delta y = 8-2 = 6$

X-coord: $\frac{3}{4}(8) + -1 = 5$

y-coord: $\frac{3}{4}(6) + 2 = 6.5$

$\boxed{P(5, 6.5)}$

Homework:

Steps:

a) Convert the ratio into a fraction: **Example**: Ratio of 3: 2 is written as $\frac{3}{3+2}$ or $\frac{3}{5}$

b) Find the horizontal distance Δx ("delta x") between the 2 points $(x_2 - x_1)$.

c) Find the horizontal distance Δy ("delta y") between the 2 points $(y_2 - y_1)$.

d) Find the Location of New Ordered Pair

i) X-coordinate: $ratio \times \Delta x + x_1$

ii) Y-coordinate: $ratio \times \Delta y + y_1$

$ratio = \frac{5}{3+5} = \frac{5}{8}$

1. Find Point Z that partitions the directed line segment XY in a ratio of 5:3.
X(−2, 6) and Y(−10, −2)

$x_1\ y_1 \qquad x_2\ y_2$

$\Delta x = -10-(-2) = -8$

$\Delta y = -2-6 = -8$

x-coord: $\frac{5}{8}(-8) + -2 = -7$

y-coord: $\frac{5}{8}(-8) + 6 = 1$

$\boxed{Z(-7, 1)}$

$ratio = \frac{2}{2+3} = \frac{2}{5}$

2. Find Point Z that partitions the directed line segment XY in a ratio of 2:3.
X(2, −3) and Y(7,2)

$x_1\ y_1 \qquad x_2\ y_2$

$\Delta x = 7-2 = 5$

$\Delta y = 2--3 = 5$

x-coord: $\frac{2}{5}(5) + 2 = 4$

y-coord: $\frac{2}{5}(5) + -3 = -1$

$\boxed{Z(4, -1)}$

$ratio = \frac{1}{1+3} = \frac{1}{4}$

3. Find Point Z that partitions the directed line segment YX in a ratio of 1:3.
X(−2, −4) and Y(−7, 5) (Note the direction change in this segment.)

$x_2\ y_2 \qquad x_1\ y_1$

$\Delta x = -2-(-7) = 5$

$\Delta y = -4-5 = -9$

x-coord: $\frac{1}{4}(5) + -7 = -5.75$

y-coord: $\frac{1}{4}(-9) + 5 = 2.75$

$\boxed{Z(-5.75, 2.75)}$

$ratio = \frac{3}{3+4} = \frac{3}{7}$

4. Find Point Z that partitions the directed line segment YX in a ratio of 3: 4.
X(5, -6) and Y(1, 2) (Note the direction change in this segment.)

$x_2\ y_2 \qquad x_1\ y_1$

$\Delta x = 5-1 = 4$

$\Delta y = -6-2 = -8$

x-coord: $\frac{3}{7}(4) + 1 = 2.714$ or $\frac{19}{7}$

y-coord: $\frac{3}{7}(-8) + 2 = -1.428$ or $\frac{-10}{7}$

$\boxed{Z\left(\frac{19}{7}, \frac{-10}{7}\right)}$

Review Circle Problems

Circle Equation in Standard Form: **$(x-h)^2 + (y-k)^2 = r^2$** **Center: (h, k)** **Radius: r**

Write the below equations in **standard form,** then identify **center** and **radius** of circle:

5. $x^2 + y^2 - 8x - 16y + 71 = 0$

$x^2 - 8x + \underline{16} + y^2 - 16y + \underline{64} = -71 + \underline{16} + \underline{64}$

	x	-4
x		
-4		16

	y	-8
y		
-8		64

$$\boxed{(x-4)^2 + (y-8)^2 = 9}$$

$$\boxed{C:(4,8) \quad r=3}$$

6) $x^2 + y^2 - 32x - 24y + 396 = 0$

$x^2 - 32x + \underline{256} + y^2 - 24y + \underline{144} = -396 + \underline{256} + \underline{144}$

	x	-16
x		
-16		

	y	-12
y		
-12		144

$$\boxed{(x-16)^2 + (y-12)^2 = 4}$$

$$\boxed{C:(16,12) \quad r=2}$$

Write the slope-intercept form of the equation of the line described.

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a) Parallel slope means use **<u>same slope</u>** as the equation's slope

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4) Write new equation in slope-intercept form: **y = mx + b** m = slope, b = y-intercept

7. through: $(3, -4)$, parallel to $3y = -5x - 1$

x y

$y = -\frac{5}{3}x - \frac{1}{3}$

$m_1 = -5/3$

$y = mx + b$

$-4 = \frac{-5}{3}(3) + b$

$1 = b$

$$\boxed{y = \frac{-5}{3}x + 1}$$

8. through: $(3, 5)$, perp. to $y = -4x - 3$

x y

$m_1 = -4$

$\boxed{m_2 = 1/4}$

$y = mx + b$

$5 = \frac{1}{4}(3) + b$

$5 = 3/4 + b$

$5 - 3/4 = b$

$b = 4.25$

$$\boxed{y = \frac{1}{4}x + 4.25}$$