Which polygon inscribed in a circle has an area closest to π square feet?
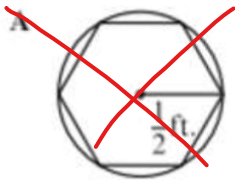
A

$\frac{1}{2}$ ft.

$A_\circ = \pi r^2$

$\pi r^2 = \pi$

$\pi (1)^2 = \pi$

B

$\frac{1}{2}$ ft.

C

1 ft.

D

1 ft.
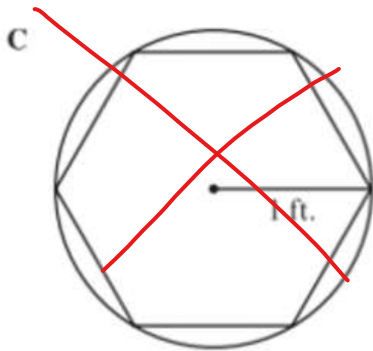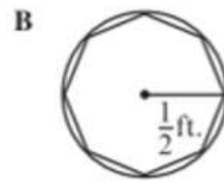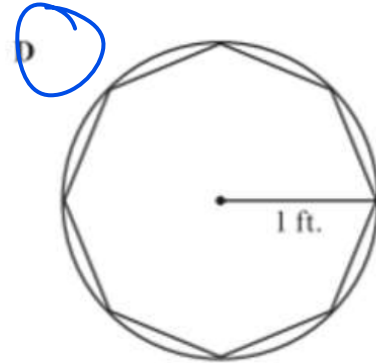
Midpoint

Given 2 ordered pairs, it's the

average of the x's and

average of the y's.

average

Midpoint Formula

average

total # of parts

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Find the midpoint.

1. (3, 7) and (-2, 4)

$x_1 \quad y_1 \qquad\qquad x_2 \quad y_2$

$x: \quad \dfrac{3+(-2)}{2} = \dfrac{1}{2} \qquad y: \dfrac{7+4}{2} = \dfrac{11}{2}$

$\left(\dfrac{1}{2}, \dfrac{11}{2}\right)$

2. (5, -2) and (6, 14)

$x_1 \quad y_1 \qquad\qquad x_2 \quad y_2$

$\dfrac{5+6}{2} \qquad\qquad \dfrac{-2+14}{2}$

$\dfrac{11}{2} \qquad\qquad \dfrac{12}{2} = 6$

$\left(\dfrac{11}{2}, 6\right)$

Find the midpoint.

3. (3, -9) and (14, 16)

x_1 y_1 x_2 y_2

$\frac{3+14}{2} = \frac{17}{2}$ $\frac{-9+16}{2} = \frac{7}{2}$

$\left(\frac{17}{2}, \frac{7}{2}\right)$ $(8.5, 3.5)$

4. (12, 17) and (-7, 9)

x_1 y_1 x_2 y_2

$\frac{12+(-7)}{2}$ $\frac{17+9}{2}$

$\frac{5}{2}$ $\frac{26}{2} = 13$

$\left(\frac{5}{2}, 13\right)$

Given the midpt and one endpt, find the other endpt.

Endpoint ↑ $-1, -9$

✓ E   ✓ m   ✓ Ē   7. Midpoint (3, -6)

Endpoint (7, -3)

$-1, -9$

$$\boxed{(-1, -9)}$$

$$\left(\frac{x_1 + x_2}{2} = m_x \; , \; \frac{y_1 + y_2}{2} = m_y \right)$$

$(2) \; \frac{x_1 + 7}{2} = 3(2)$

$x_1 + 7 = 6$
$-7 \quad -7$
$\boxed{x_1 = -1}$

$(2) \; \frac{y_1 + -3}{2} = -6 (2)$

$y_1 - 3 = -12$
$+3 \quad +3$
$\boxed{y_1 = -9}$

Given the midpoint and one endpoint, find the other endpoint.

E $\quad\quad$ $(-5, 4)$

8. Midpoint $(-1, 2)$

   Endpoint $(3, 0)$

$(-5, 4)$

$(2)\ \dfrac{x_1 + 3}{2} = -1\ (2)$ $\quad\quad$ $(2)\dfrac{y_1 + 0}{2} = 2\ (2)$

$x_1 + 3 = -2$ $\quad\quad\quad$ $y_1 = 4$

$\quad\ \dfrac{-3 \quad -3}{}$

$\quad\quad x_1 = -5$

$(-5, 4)$

Given the midpoint and one endpoint, find the other endpoint.

9. Midpoint (-4, 6)
   Endpoint (2, 1)

$$(-10, 11)$$

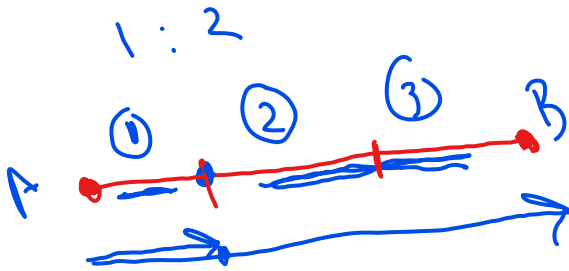# What if you want to cut it some other way?

Instead of in half, divide it in a ratio 1:2 or 1/3rd of the way? Or some other ratio?

Partition Line Segments

$$\left(\frac{bx_1 + ax_2}{b+a}, \frac{by_1 + ay_2}{b+a} \right)$$

Coordinates of point which partitions a directed line segment AB at the ratio of $a:b$ from $A(x_1, y_1)$ to $B(x_2, y_2)$

$$(x, y) = \left(\frac{bx_1 + ax_2}{b + a}, \frac{by_1 + ay_2}{b + a}\right)$$

OR

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

AB of (1,2) and (7,8) in a ratio of 2:1.

$a:b$

(5,6)

(5,6)

total
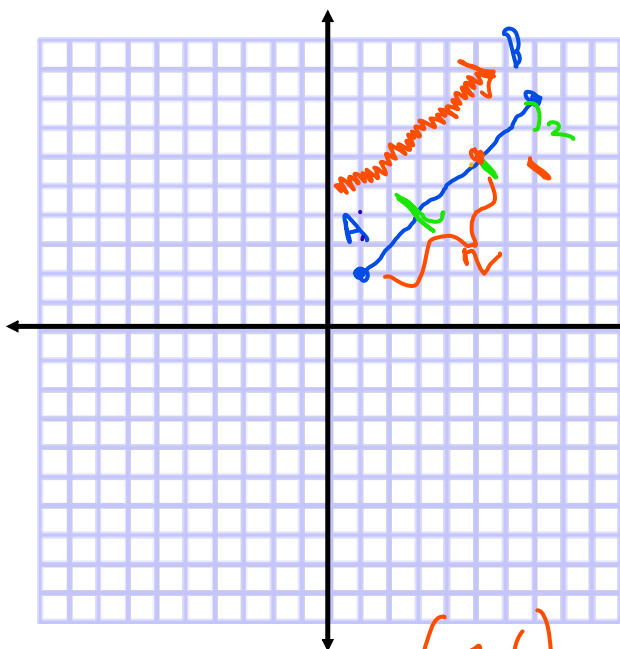$2 + 1 = 3$

$1 \longrightarrow 7 \quad 7 - 1 = 6$

$x: 1 + \frac{2}{3}(6) = 5$

starting portion of travel total x
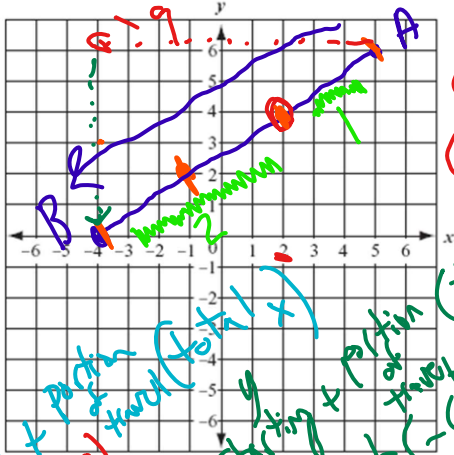
$y: 2 + \frac{2}{3}(6)$
$2 + 4 = 6$

$8 - 2 = 6$

(5, 6)

Partition a Line Segment

$$\left(\frac{bx_1+ax_2}{b+a}, \frac{by_1+ay_2}{b+a}\right)$$

Ex. 1 Line segment AB has endpoints (5,6) and (-4,0).
What coordinate divides A to B in the ratio of 1:2?

x_1, y_1 x_2, y_2

1:6

$b(y_1) + a(y_2)$
$b+a$

$2(6) + 1(0)$
$2+1$

$12 + 0$
3

4

(2,4) (2,4)

(2,4)

$b(x_1) + a(x_2)$
$b+a$

$2(5) + 1(-4)$
$2+1$

$10 + -4$
3 $\frac{6}{3} = 2$

-4 - 5

-9

Starting + portion (total x)

$5 + \frac{1}{3}(-9)$

$5 - 3 = 2$
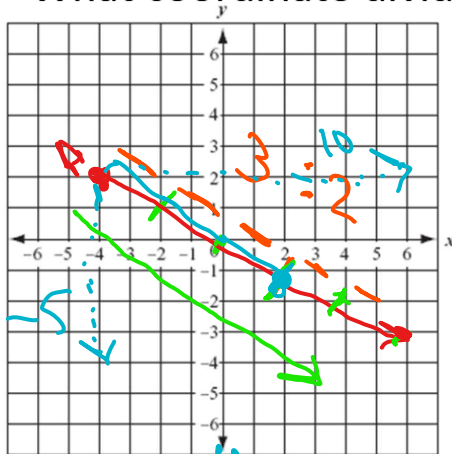
Starting + portion (total y)

$6 + \frac{1}{3}(-6)$

$6 - 2$
4

Partition a Line Segment

$$\left(\frac{bx_1+ax_2}{b+a}, \frac{by_1+ay_2}{b+a}\right)$$

Ex. 2 Line segment AB has endpoints (-4,2) and (6,-3).
What coordinate divides A to B in the ratio of 3:2?

$(2,-1)$

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

$$\frac{2(-4)+3(6)}{2+3} \qquad \frac{2(2)+3(-3)}{2+3}$$

$$\frac{-8+18}{5} \qquad \frac{4+-9}{5}$$

$$\frac{10}{5} \qquad \frac{-5}{5}$$

$$(2, -1)$$

X:
$-4 + \frac{3}{5}(10) \qquad 2 + \frac{3}{5}(-5)$

$-4+6 \qquad\qquad 2-3$

$(2 \qquad , \qquad -1)$

Section Formula $(x,y) = \left(\frac{bx_1 + ax_2}{b+a}, \frac{by_1 + ay_2}{b+a}\right)$ Name_____ Block _____

$a:b$ = 8 sections

1. Line segment AB has endpoints (-2, 4) and (6, 0). What coordinate divides A to B in the ratio of 5:3?

$A \longrightarrow B$

$\frac{3(4) + 5(6)}{3+5}$
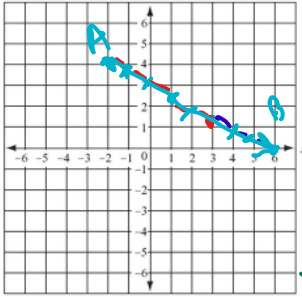
$\frac{-5+30}{8} = \frac{24}{8} = 3$
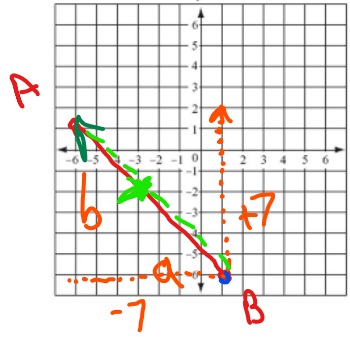
$\frac{3(4) + 5(0)}{3+5}$

$\frac{12+0}{8} = \frac{3}{2} = 1.5$

$(3, 1.5)$ or $(3, \frac{3}{2})$

2. Line segment AB has endpoints (-6, 1) and (1, -6). What coordinate divides B to A in the ratio of 4:3?

x_2, y_2 x, y_1
$A \longleftarrow B$

$a:b = 4+3 = 7$ sections

$x: 1 + \frac{4}{7}(-7)$

$1 - 4$

$x = -3$

$y: -6 + \frac{4}{7}(7)$

$-6 + 4$

-2

starting + portion traveled (total)

$(-3, -2)$

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

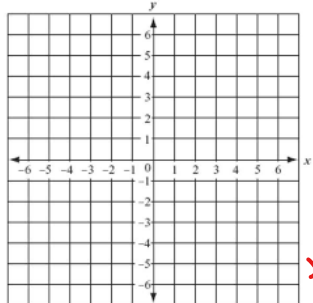$\frac{3(1) + 4(-6)}{3+4}$

$\frac{3-24}{7}$

$\frac{-21}{7}$

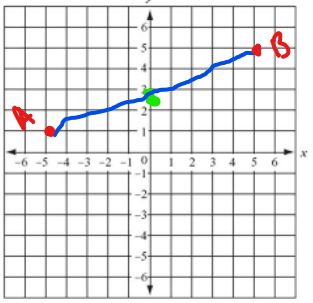$\frac{3(-6) + 4(1)}{3+4}$

$\frac{-18+4}{7}$

$\frac{-14}{7}$

$(-3, -2)$

3. Line segment AB has endpoints (2,6) and (-1,-3). What coordinate divides A to B in the ratio of 1:2?

$x_2 y_2$ x, y_1
$A \longleftarrow B$

$a:b$

4. Line segment AB has endpoints (-5, 1) and (5, 5). What coordinate divides B to A in the ratio of 2:2?

midpoint

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

$\frac{2(5) + 2(-5)}{2+2}$
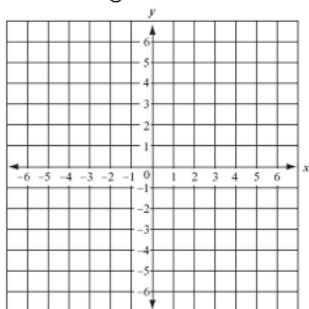
$\frac{10 - 10}{4}$

$\frac{b(y_1) + a(y_2)}{b+a}$
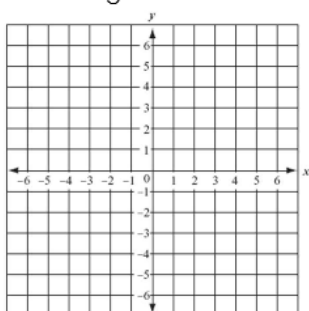
$\frac{2(5) + 2(1)}{2+2}$

$\frac{10+2}{4}$

$(0, 3)$

14

5. Line segment *AB* has endpoints (7, 2) and (4, 6). What coordinate divides *A to B* in the ratio of 2:3?
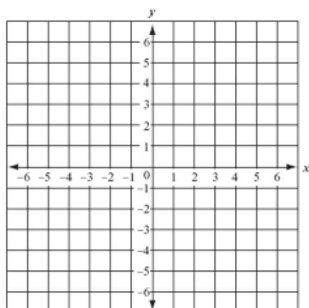
6. Line segment *AB* has endpoints (-3,8) and (3, -4). What coordinate divides *B to A* in the ratio of 4:2?

7. In line segment AB, point A is (1, 6) and (0, 3) is a coordinate that divides A to B in the ratio 1:2. What is point B?
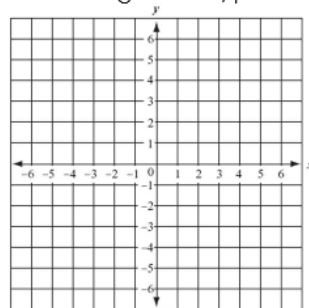
8. In line segment AB, point A is (-5,4) and (-2,3) is a coordinate that divides B to A in the ratio 3:1. What is point B?

Geometry   5 – Connecting Algebra and Geometry Though Coordinates   Homework

Name: _____ Date: _____

Partitioning Line Segments in 2 Dimensions Homework

MCC9-12.G.GPE.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

1. Given the points A(–1, 2) and B(7, 14), find the coordinates of the point P on directed line segment $\overline{AB}$ that partitions $\overline{AB}$ in the ratio 1:3. $\frac{4}{3}$ = # total sections

$x: -1 + \frac{1}{4}(8)$ $y: 2 + \frac{1}{4}(12)$

$-1 + 2$ $2 + 3$

$x: 1$ $y: 5$

$\boxed{(1, 5)}$

2. Given the points A(-2, 4) and B(7, -2), find the coordinates of the point P on directed line segment $\overline{AB}$ that is located ¼ the way from A to B.

$\overline{a+b=9}$

$1:3$

3. Given the points A(-3, -4) and B(5, 0), find the coordinates of the point P on directed line segment $\overline{AB}$ that is located 2/5ths of the way from A to B.
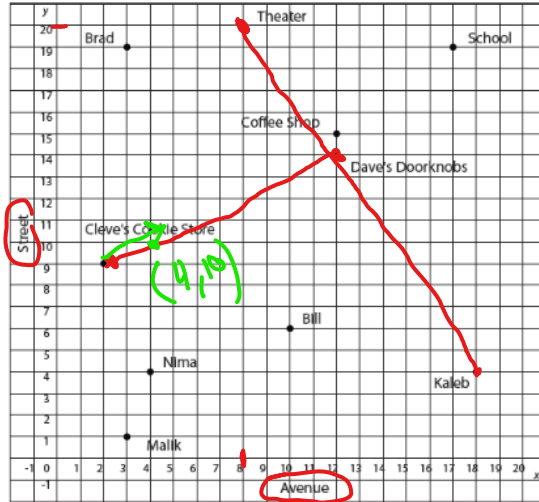
$2:3$

4. The map shows a straight highway between two towns. Highway planners want to build two new rest stops between the towns so that the two rest stops divided the highway into three equal parts. Find the coordinates of the points at which the rest stops should be built.
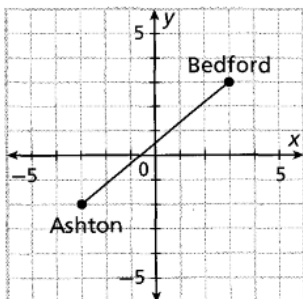
Problems #5-9Adapted from: Walch Education Resources: CCGPS Coordinate Algebra Teacher Resource Binder

Geometry   5 – Connecting Algebra and Geometry Though Coordinates   Homework

Use the map and the information given to solve each problem that follows.

(handwritten annotations: "(4,10)" near Cleve's Cookie Store; "(8,20)" and "(18,4)" below the map)

5. Luis works at a theater on 8th Avenue and 20th Street. Kaleb lives at the corner of 18th Avenue and 4th Street. What is a possible location that is midway between them?

Dave's Doorknobs

6. Nima lives at the corner of 4th Avenue and 4th Street. Bill lives at the corner of 10th Avenue and 6th Street. Their favorite bakery is located midway between them. What is one possible location for the bakery?

7. Cleve's Cookie Store is located at the corner of 2nd Avenue and 9th Street. Dave's Doorknobs is located at the corner of 12th Avenue and 14th Street. Located 1/5 of the distance from Cleve's Cookie Store is the post office. Where is the post office?

(handwritten work:)

A (2,9)

B (12,14)

C: 1/5 total

a:b
1:4

$x: 2 + \frac{1}{5}(10)$ $y: 9 + \frac{1}{5}(5)$

$2 + 2$ $9 + 1$

$x: 4$ $y: 10$

$(4, 10)$

Problems #5-9 Adapted from: Walch Education Resources: CCGPS Coordinate Algebra Teacher Resource Binder

8. Malik and Brad both live on 3rd Avenue. Malik lives at the corner of 1st Street, and Brad lives at the corner of 19th Street. 2/3 the distance from Malik's apartment to Brad's apartment is a market. Where is the market?

9. The main entrance to the high school is located at the corner of 17th Avenue and 19th Street. On his way from school to the bank, Luis stops at the coffee shop located at 12th Avenue and 15th Street. The coffee shop is the midpoint of this trip. What is the location of the bank?

$$\left(X_1 + \frac{a}{a+b}(x_2 - x_1) \quad , \quad Y_1 + \frac{a}{a+b}(y_2 - y_1)\right)$$

$$\frac{(a+b)}{(a+b)} \frac{X_1}{1} + \frac{ax_2 - ax_1}{a+b} \qquad \frac{(a+b)y_1}{(a+b)_1} + \frac{ay_2 - ay_1}{a+b}$$

$$\frac{ax_1 + bx_1 + ax_2 - ax_1}{a+b} \qquad \frac{ay_1 + by_1 + ay_2 - ay_1}{a+b}$$

$$\left(\frac{bx_1 + ax_2}{b+a} \quad , \quad \frac{by_1 + ay_2}{b+a}\right)$$