The Midpoint Formula

$$\text{midpoint } (x_m, y_m) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

1. Find the midpoint between the two points.

a) $(-4,-1)$ and $(-2,9)$

$x_1\ y_1 \qquad x_2\ y_2$

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

$= \left(\frac{-4+-2}{2}, \frac{-1+9}{2} \right)$

$= \left(\frac{-6}{2}, \frac{8}{2} \right) = (-3,4)$

b) $(5,-6)$ and $(-4,3)$

$x_1\ y_1 \qquad x_2\ y_2$

$(x_m, y_m) = \left(\frac{5+-4}{2}, \frac{-6+3}{2} \right)$

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

OR

$(.5, -1.5)$

2. If the coordinates of *P* are (-5, 1) and the midpoint between *P* and *Q* is (2, -3) find the coordinates of *Q*. (x_2, y_2)

$x_1, y_1 \qquad x_m\ y_m$

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

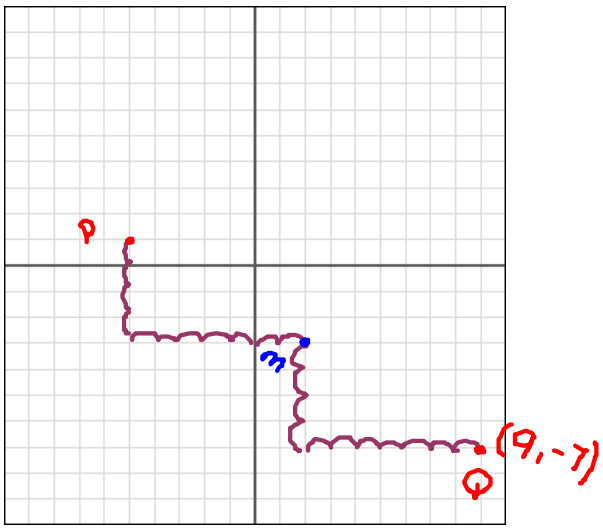
$x_m = \frac{x_1+x_2}{2} \qquad y_m = \frac{y_1+y_2}{2}$

$\frac{2}{1} = \frac{-5+x_2}{2} \qquad \frac{-3}{1} = \frac{1+y_2}{2}$

$-5 + x_2 = 4 \qquad 1 + y_2 = -6$

$+5 \quad +5 \qquad -1 \quad -1$

$x_2 = 9 \qquad y_2 = -7$



$Q(9,-7)$

$x_1, y_1 \quad x_2 y_2$

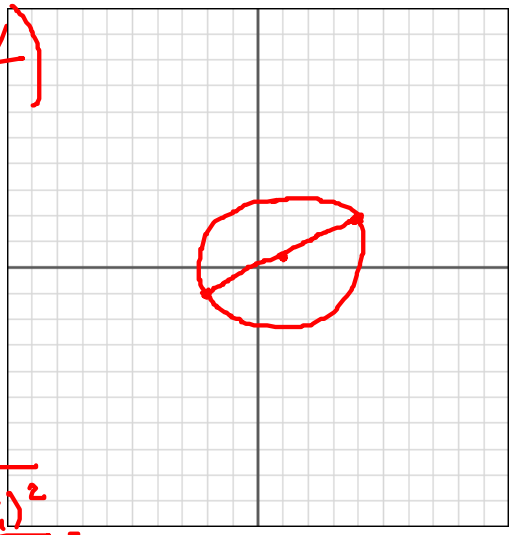
3. Find the coordinates of the center of the circle if the endpoints of the diameter are (-2, -1) and (4, 2), then find the radius.

Center: $(x_m, y_m) = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

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

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

$: \boxed{\left(1, \frac{1}{2}\right)}$



Diameter: $d = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$d = \sqrt{(4--2)^2+(2--1)^2}$

$d = \sqrt{(6)^2+(3)^2}$

$d = \sqrt{36+9}$

$d = \sqrt{45}$

$d = 6.7$

diameter = 6.7

radius = $\frac{6.7}{2} = \boxed{3.4}$