Distance and Midpoint Instruction

Pythagorean Theorem:

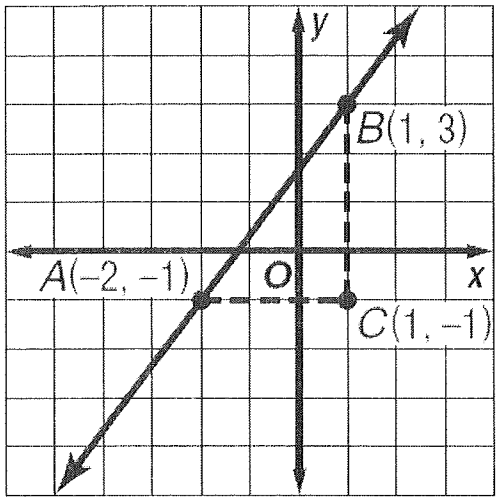
$a^2 + b^2 = c^2$

Distance Formula:

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

(x_1, y_1)

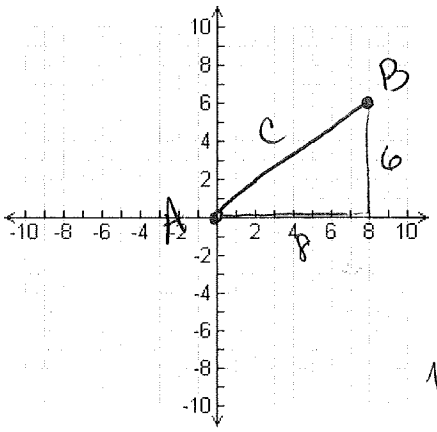
(x_2, y_2)



Let's Practice!

Directions: Use the Pythagorean Theorem or Distance Formula to find the distance of each.

1. A(0,0), B(8,6)



P.T.

$6^2 + 8^2 = c^2$

$100 = c^2$

$10 = c$

D.F.

0, 0

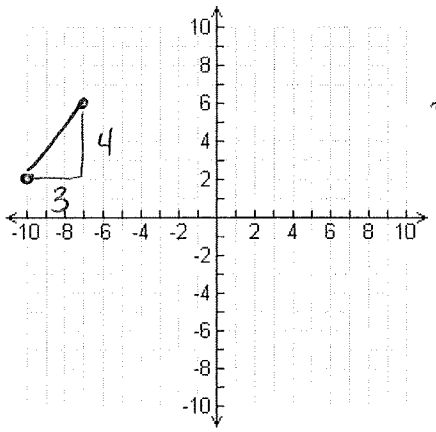
– 8, 6

$\sqrt{(-8)^2 + (-6)^2}$

$= \sqrt{100}$

$d = 10$

2. C(-10,2), D(-7,6)



D.F.

-10, 2

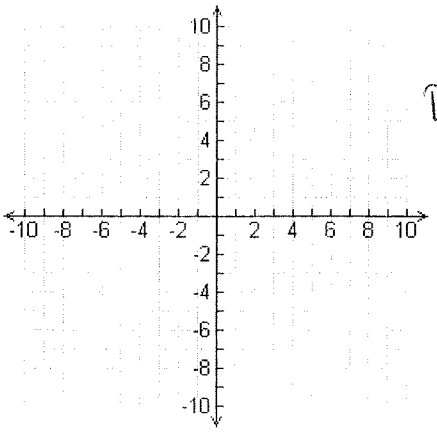
– –7, 6

$(-3)^2 + (-4)^2$

$\sqrt{9 + 16} = \sqrt{25}$

$d = 5$

3. L(-2,-3), M(4,0)



D.F.

-2, -3

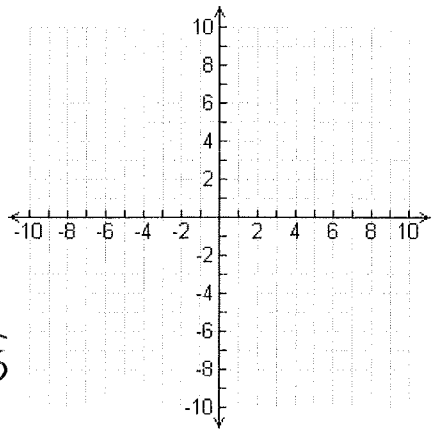
– 4, 0

-6, -3

$36 + 9 = \sqrt{45}$

$= 3\sqrt{5}$

4. L(3, 5), M(7,9)



D.F.

3, 5

– 7, 9

-4 -4

$16 + 16 = \sqrt{32}$

$= 4\sqrt{2}$

Distance and Midpoint Instruction Continued

Midpoint on a Coordinate Plane | If a segment has endpoints with coordinates (x_1, y_1) and (x_2, y_2), then the ~~coordinates~~ average of the midpoint of the segment are $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$.

Directions: Find the coordinates of the midpoint M of $\overline{JK}$ having the given endpoints.

1. J(-1,2) and K(6,1)

$x_1\ y_1$ $x_2\ y_2$

$\frac{-1+6}{2}, \frac{2+1}{2}$

$= \left(\frac{5}{2}, \frac{3}{2}\right) = (2.5, 1.5)$

2. J(8,-6) and K(-14,12)

$\left(\frac{8+-14}{2}, \frac{-6+12}{2}\right) = \left(\frac{-6}{2}, \frac{6}{2}\right)$

$= (-3, 3)$

3. J(5,12) and K(-4,8)

$\left(\frac{5+-4}{2}, \frac{12+8}{2}\right) = \left(\frac{1}{2}, \frac{20}{2}\right)$

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

4. J(0,0) and K(8,6)

$\left(\frac{0+8}{2}, \frac{0+6}{2}\right) = (4, 3)$

Directions: M is the midpoint of $\overline{AB}$. Find the missing coordinates based on the given information.

A m B

5. M(-1,6), B(2,8) Find A(x,y).

A(-4,4)

$\left(\frac{x+2}{2}, \frac{y+8}{2}\right) = (-1, 6)$

$\frac{x+2}{2} = -1$ and $\frac{y+8}{2} = 6$

$x+2 = -2$ $\quad y = 4$

$x = -4$

6. M(-5,10), A(-8,6) Find B(x,y)

$\left(\frac{x+-8}{2}, \frac{y+6}{2}\right) = (-5, 10)$

$\frac{x-8}{2} = -5$ $\quad \frac{y+6}{2} = 10$

$x = -2$ $\quad y = 14$

B(-2,14)

7. M(-6,4), B(-5,-3) Find A(x,y)

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

$x = -7$ $\quad y = 11$

A(-7,11)

8. M(0,5.5) A(-3,6) Find B(x,y)

$\left(\frac{x+-3}{2}, \frac{y+6}{2}\right) = (0, 5.5)$

$x = 3$ $\quad y = 5$

B(3,5)