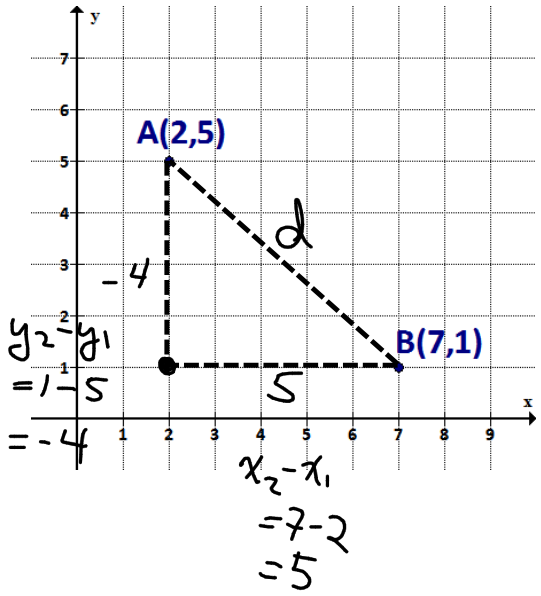
2.4 Distance Between Points

Recall:
The Pythagorean Theorem: the square of the hypotenuse is equal to the sum of the squares of the other two sides in a right triangle.

What is the distance between the points A(2,5) and B(7,1)?



We can create a right triangle and use the Pythagorean Theorem.

Add the point C(2, 1).

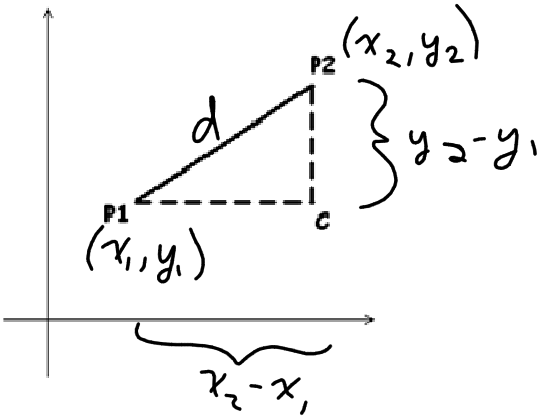
$d^2 = (-4)^2 + 5^2$

$d^2 = 16 + 25$

$d = \pm\sqrt{41}$

$\therefore d > 0$, $\therefore d = \sqrt{41}$

We can derive a general formula using the same method.



$$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$$

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

Distance Formula:

$$P_1P_2 = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

MEMORIZE!

Ex. 1 What is the distance from the origin to the point (-1,-4)?

$(0,0)$ & $(-1,-4)$

$d = \sqrt{(\Delta x)^2 + (\Delta y)^2}$

$= \sqrt{(-1-0)^2 + (-4-0)^2}$ $\therefore \sqrt{17}$ units

$= \sqrt{1+16}$

$= \sqrt{17}$

Ex.2 Find the length of the line segments with the following endpoints.

a) A (-3,0) and B (-3,2)

$l_{AB} = \sqrt{(-3-(-3))^2 + (2-0)^2}$

$= \sqrt{0 + 4}$

$= 2$

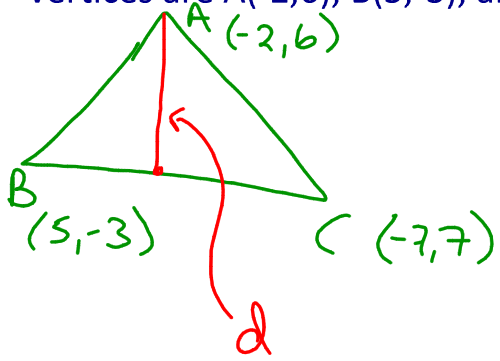
b) C(-4,7) and D (3,1)

$l_{CD} = \sqrt{(3-(-4))^2 + (1-7)^2}$

$= \sqrt{49+36}$

$= \sqrt{85}$

Ex. 3 Determine the length of the median from vertex A of a triangle whose vertices are A(-2,6), B(5,-3), and C(-7,7).



① Midpoint BC

$$M_{BC} = \left(\frac{-7+5}{2}, \frac{7+(-3)}{2}\right)$$

$$= (-1, 2)$$

② Distance from A to M_{BC}

(-2,6) (-1,2)

$$d = \sqrt{(\Delta x)^2 + (\Delta y)^2}$$

$$= \sqrt{(-1-(-2))^2 + (2-6)^2}$$

$$= \sqrt{1 + 16}$$

$$= \sqrt{17}$$

∴ length of median is $\sqrt{17}$ units

FBUHL

Basic: Pg. 77 #C3,2bd,3bc,8
Regular: Pg. 77 #5,10,12
Challenge: Pg. 79 #20