

#9 a) HJ  $\Rightarrow$  perp. bi

b)  $M = (0, -\frac{1}{2})$

c)  $m(EF) = \frac{1}{2}$

$$m_{\perp} = -2.$$

d)  $y = -2x + b$

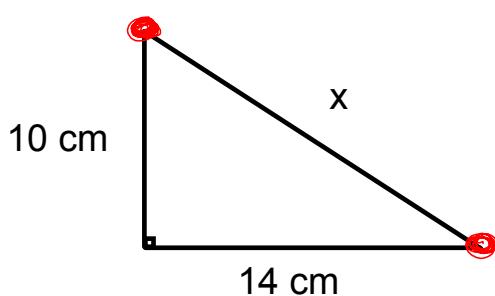
$$-\frac{1}{2} = 0 + b$$

$$y = -2x - \frac{1}{2}$$

## 2.4 Distance Between Points

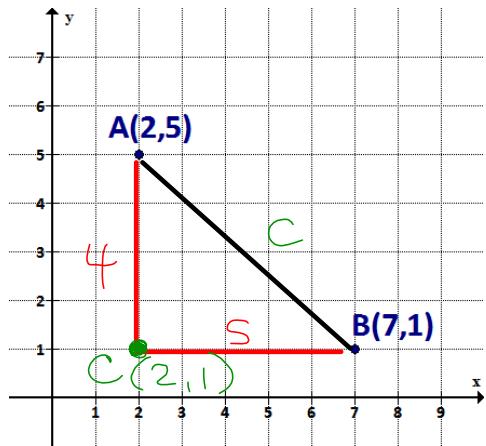
Recall:

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.



$$\begin{aligned}a^2 + b^2 &= c^2 \\10^2 + 14^2 &= c^2 \\296 &= c^2 \\\sqrt{296} &= c, \quad c > 0\end{aligned}$$

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

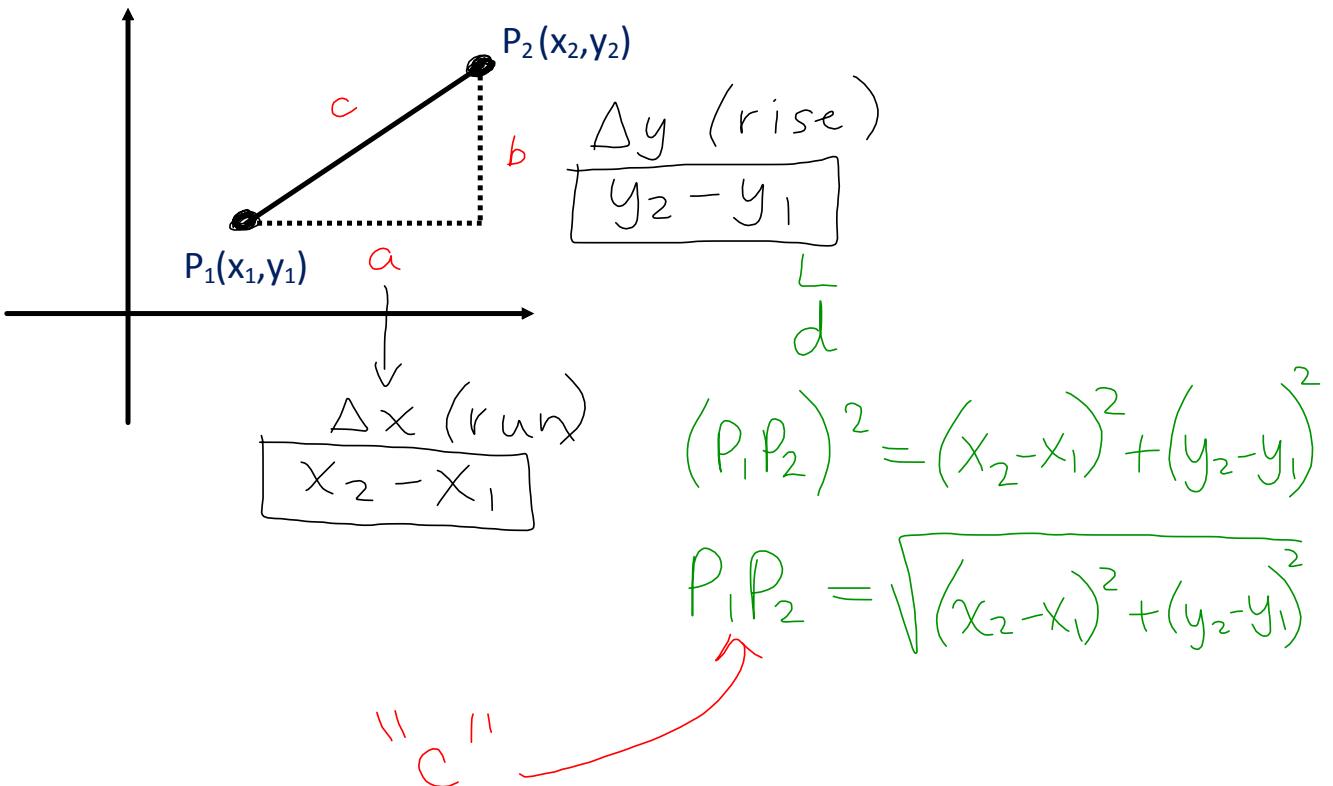


We can create a right triangle and use the Pythagorean Theorem.

Add the point  $C(2,1)$ .

$$\begin{aligned}(AB)^2 &= (AC)^2 + (BC)^2 \\(AB)^2 &= 4^2 + S^2 \\AB^2 &= 16 + 25 \\AB^2 &= 41 \\AB &= \sqrt{41} \\AB &\approx 6.4\end{aligned}$$

We can derive a general formula using the same method.



Distance Formula:

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

**MEMORIZE!**

$$d_{P_1P_2}$$

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

$$\begin{aligned}
 d &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\
 &= \sqrt{(-1 - 0)^2 + (-4 - 0)^2} \\
 &= \sqrt{1 + 16} \\
 &= \sqrt{17} \quad \text{exact} \\
 &\approx 4.1 \quad \text{approximate}
 \end{aligned}$$

Ex. 2 Find the length of the line segments with the following endpoints.  $d_{AB} = L_{AB} = AB$

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

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

$$\begin{aligned}
 d_{AB} &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\
 &= \sqrt{(-3 - (-3))^2 + (2 - 0)^2} \\
 &= \sqrt{0 + 2^2} \\
 &= \sqrt{4} \quad (-7)(-7) \\
 &= 2
 \end{aligned}$$

$$\begin{aligned}
 d_{CD} &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\
 &= \sqrt{(3 - (-4))^2 + (1 - 7)^2} \\
 &= \sqrt{(-7)^2 + (-6)^2} \\
 &= \sqrt{49 + 36} \\
 &= \sqrt{85} \\
 &\approx 9.2
 \end{aligned}$$

$$\begin{aligned}
 \sqrt{72} &= \boxed{6\sqrt{2}} \\
 \sqrt{36 \cdot 2} &= \boxed{6\sqrt{2}} \\
 6\sqrt{2} &= \boxed{6 \times \sqrt{2}}
 \end{aligned}$$

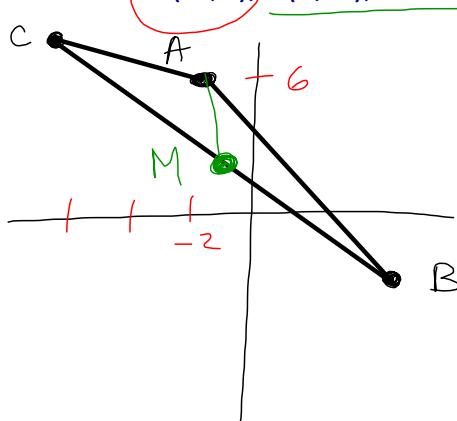
Ex. 3 Given A (2, -3) and B (-1, 6), determine:

a)  $L_{AB}$

b)  $M_{AB}$

c)  $m_{AB}$

Ex. 4 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).



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

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

$$M_{CB} = (-1, 2)$$

$$\begin{aligned} d_{AM} &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(-2 - (-1))^2 + (6 - 2)^2} \\ &= \sqrt{(-1)^2 + (4)^2} \\ &= \sqrt{1 + 16} \end{aligned}$$

$$= \sqrt{17}$$

$$d_{AM} = 4.1$$

P. 77



## Attachments

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act1.mov

act3.mov