

Section 1.7: Distance and Midpoint Formulas

Pythagorean Theorem: $a^2 + b^2 = c^2$

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

Distance Formula Example 1:

Given: A(0,0) B (2,4)

$$(2 - 0)^2 + (4 - 0)^2$$

$$2^2 + 4^2 = 4 + 16 = 20$$

$$\sqrt{20} = 4.47 = 4.5$$

$$\sqrt{4} * \sqrt{5} = 2\sqrt{5}$$

Distance Formula Example 2: (-7, 5) (4, -3)

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

(-7-4) square + (5--3) square

$$(-11)(-11) + 8*8 = 121 + 64$$

$$\sqrt{185} = 13.6$$

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

Distance Formula example 3: S(-2,14) R(3, -1)

$$d = \sqrt{(-2 - 3)^2 + (14 - (-1))^2} = \sqrt{(-5)^2 + (15)^2} = \sqrt{250} = 15.8$$

Midpoint formula

$$M = \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}$$

Example 1 using the midpoint formula

T(-14, -18) U(6, 10) find the midpoint

$$\frac{-14+6}{2} = \frac{-18+10}{2}$$

M(-4, -4)

Example 2 for finding the midpoint:

Given: E(5, 11), F(23, 33): What is the midpoint?

$$\frac{5+23}{2}, \frac{11+33}{2}$$

M(14 , 22)

Example 3 Find the midpoint:

W(-4, 8) X(10, -14) find the midpoint of WX

$$\frac{-4+10}{2} = \frac{8+(-14)}{2}$$

(3, -3)

Midpoint Formula: example 1: where you need to find the **endpoint**

A (2, 8) M(6, 12) B(?,?)

$$\frac{2+X}{2} = 6 \quad \frac{8+Y}{2} = 12$$

$$2+x = 12 \quad 8+y = 24$$

$$X = 10 \quad y = 16$$

B (10 , 16)

Example 2: where you need to find the mystery point

Given: the midpoint M(4, -9) and an endpoint: A (-3, -5) what's the other endpoint B(X, Y)?

$$\begin{aligned}\frac{-3+x}{2} &= 4 & \frac{-5+y}{2} &= -9 \\ -3+x &= 8 & -5+y &= -18 \\ X &= 11, & y &= -13 \\ (11, -13)\end{aligned}$$