

Warm Up

I. Distance Formula:

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

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

1. Determine the length of a line segment that joins the ordered pairs $(-1, 3)$ and $(5, -3)$.
2. Determine the distance from the origin to the ordered pair $(\sqrt{7}, -5)$
3. Determine the radius of a circle having the ordered pairs $(-2, 5)$ and $(1, 1)$ as the endpoints of a diameter.
4. Given $\triangle RST$ has vertices $R(-3, 4)$, $S(1, -2)$ and $T(3, 8)$, determine each of the following....
 - (a) the equation of side ST
 - (b) the midpoint of side RS
 - (c) the length of side RT
 - (d) the slope of a line perpendicular to side RS
 - (e) the slope of the line joining S to the midpoint of the opposite side

1. Determine the length of a line segment that joins the ordered pairs $(-1, 3)$ and $(5, -3)$.

$$\begin{aligned}d &= \sqrt{(6)^2 + (-6)^2} = \sqrt{36 + 36} \\d &= \sqrt{72} \\d &= 6\sqrt{2}\end{aligned}$$

~~$$\begin{aligned}&= \sqrt{36 + 36} \\&= 6 + 6 \\&= 12\end{aligned}$$~~

2. Determine the distance from the origin to the ordered pair $(\sqrt{7}, -5)$ $(0, 0)$

$$\begin{aligned}d &= \sqrt{(\sqrt{7})^2 + (-5)^2} \\d &= \sqrt{7 + 25} \\d &= \sqrt{32} \\d &= 4\sqrt{2}\end{aligned}$$

3. Determine the radius of a circle having the ordered pairs $(-2, 5)$ and $(1, 1)$ as the endpoints of a diameter.

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

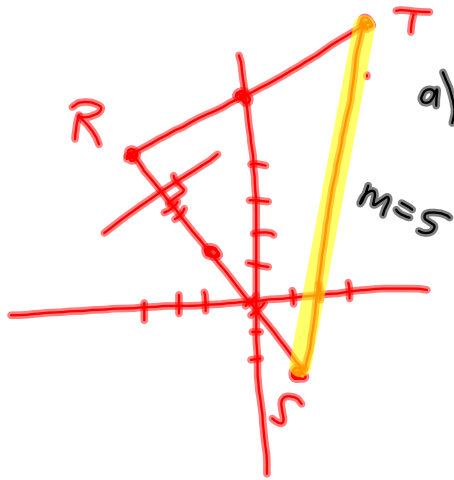
$$d = \sqrt{25}$$

$$d = 5 \text{ (diameter)}$$

$$\text{Radius} = \underline{2.5 \text{ units}}$$

4. Given $\triangle RST$ has vertices $R(-3, 4)$, $S(1, -2)$ and $T(3, 8)$, determine each of the following....

- (a) the equation of side ST
- (b) the midpoint of side RS
- (c) the length of side RT
- (d) the slope of a line perpendicular to side RS
- (e) the slope of the line joining S to the midpoint of the opposite side



a) $m = \frac{10}{2} = 5$

$$y - 8 = 5(x - 3)$$

$$y - 8 = 5x - 15$$

$$0 = 5x - y - 7$$

b) $MP_{RS} = \left(\frac{-3+1}{2}, \frac{4+(-2)}{2} \right)$
 $= (-1, 1)$

c) $d_{RT} = \sqrt{36 + 16}$
 $= \sqrt{52}$
 $= 2\sqrt{13}$

d) $m_{RS} = \frac{6}{-4} = -\frac{3}{2}$

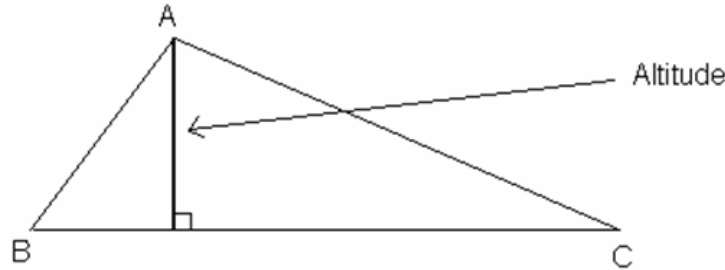
$\therefore \perp m = \frac{2}{3}$

e) $MP_{RT} = (0, 6)$ & $(1, -2)$

$$m = \frac{8}{-1} = -8$$

Properties of Triangles...

(1) Altitude \rightarrow a **perpendicular** line drawn from a vertex to the opposite side in a triangle



To get equation, find...

- m_{BC}
- $m_{\perp BC} \leftarrow$ slope
- point A \leftarrow point

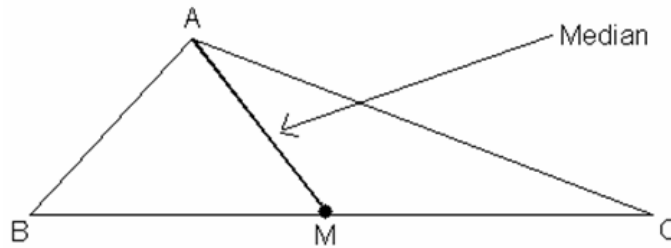
Example: $\triangle ABC$ has vertices A (3, 4); B(-3, 2) & C(1, -2).

Determine the equation of the **altitude** from B to AC.

(Provide a sketch)

$B(-3, 2)$ $A(3, 4)$ $C(1, -2)$
 $m = -\frac{1}{3}$
 $M_{AC} = \frac{6}{2} = 3$
 $y = -\frac{1}{3}x + b$
 $2 = -\frac{1}{3}(-3) + b$
 $2 = 1 + b$
 $b = 1$
 $y = -\frac{1}{3}x + 1$
 $3y = -x + 3$
 $x + 3y - 3 = 0$

(2) Median \rightarrow a line drawn from a vertex to the **midpoint** of the opposite side in a triangle



To get equation, find...

- midpoint of BC
- $m_{AM} \leftarrow$ slope
- point A or M \leftarrow point

To get length, find...

- midpoint of BC
- $d_{AM} \leftarrow$ 2 points

Example: $\triangle ABC$ has vertices A (4, 5); B(-2, 3) & C(2, -3).

Determine the equation of the **median** from C to AB.

Determine the length of the **median** from C to AB.