MEDIAN AND ALTITUDE

LEARNING GOALS

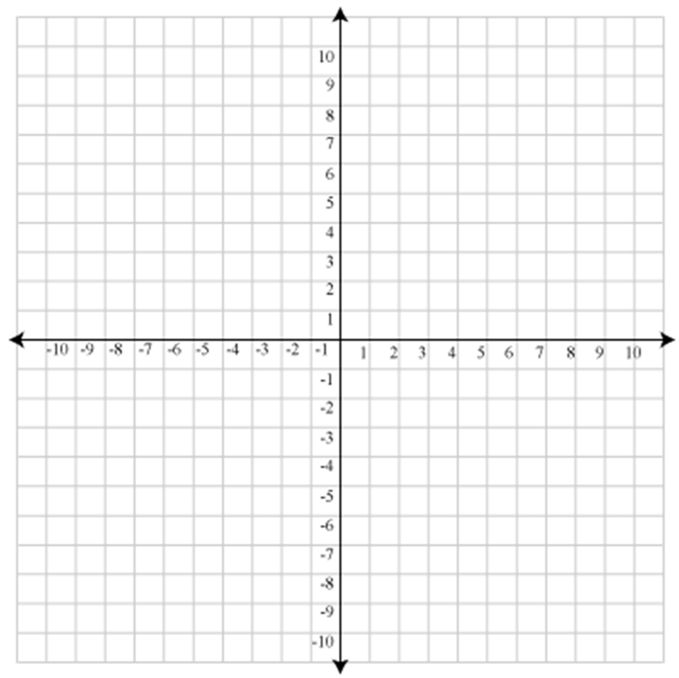
Students will:

- Learn how to find the altitude of a triangle.

REVIEW: MEDIAN

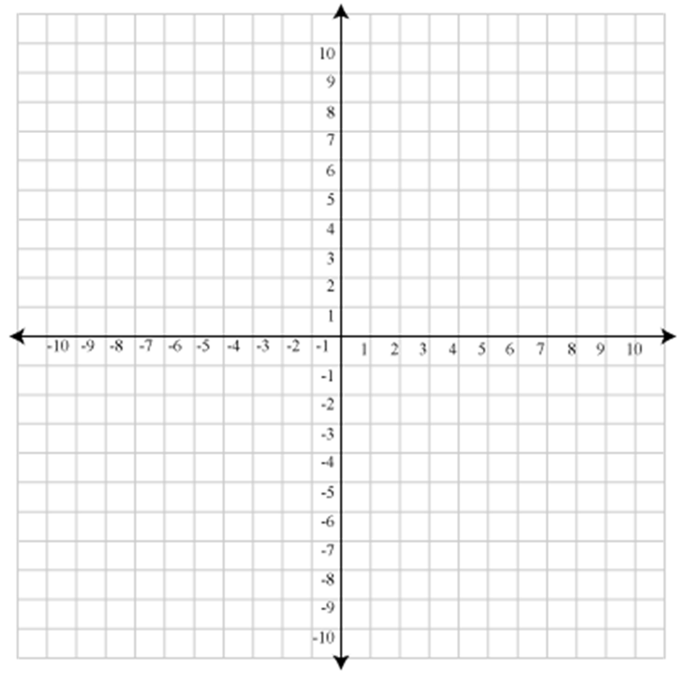
EXAMPLE 1: DETERMINE A GEOMETRIC PROPERTY ALGEBRAICALLY

The vertices of triangle ABC are A (5, 5), B (-3, -1), and C (1, -3). Determine whether triangle ABC is a right triangle.



EXAMPLE 2: MEDIAN TO HYPOTENUSE

Show that the median from the right angle of the triangle in Example 2, is half as long as the hypotenuse.



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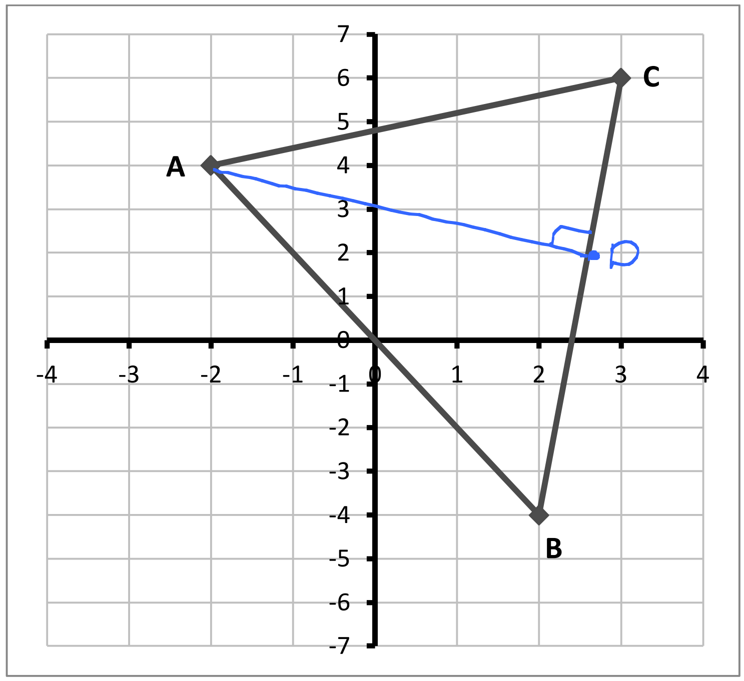
Pg. 90-91 Q2-6, 17

ALTITUDE

Altitude	The line that connects a vertex to the opposite and intersects at 90°.

EXAMPLE 3: AREA OF A TRIANGLE

Show that the altitude from vertex A of ΔABC can be used to find the area of the triangle.



① $m_{BC} = \dfrac{y_2 - y_1}{x_2 - x_1}$

$= \dfrac{6-(-4)}{3-2}$

$= 10$

② $m_{AD} = -\dfrac{1}{m_{BC}} = -\dfrac{1}{10}$

③ $y = 10x + b$ (BC)

Sub B(2,−4) into (BC)

$-4 = 10(2) + b$

$b = -24$

④ $y = \dfrac{-1}{10}x + b$ (AD)

Sub A(−2,4) into (AD)

$4 = -\dfrac{1}{10}(-2) + b$ $\quad b = 4 - \dfrac{1}{5} = \dfrac{19}{5}$

$y = 10x - 24$ ①

$y = -\dfrac{1}{10}x + \dfrac{19}{5}$ ②

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Pg 90-91 Q18, 21, 27

$$y = 10x - 24 \quad (1)$$
$$y = -\frac{1}{10}x + \frac{19}{5} \quad (2)$$

Sub (1) into (2)

$$10x - 24 = -\frac{1}{10}x + \frac{19}{5}$$
$$10x + \frac{1}{10}x = \frac{19}{5} + 24$$
$$\frac{100}{10}x + \frac{1}{10}x = \frac{19}{5} + \frac{120}{5}$$
$$\left(\frac{101}{10}x = \frac{139}{5}\right) \times 10$$
$$\left(101x = \frac{1390}{5}\right) \div 101$$
$$x = \frac{1390}{5} \times \frac{1}{101}$$
$$\boxed{x = \frac{1390}{505} = \frac{278}{101}} \quad (3)$$

Sub (3) into (1)

$$y = 10\left(\frac{278}{101}\right) - 24$$
$$\boxed{y = \frac{356}{101}}$$

$$D\left(\frac{278}{101}, \frac{356}{101}\right)$$

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

$$A_{\triangle ABC} = \frac{1}{2}bh$$
$$= \frac{1}{2}D_{AD}D_{BC}$$