Name: Date: Period: 5

Medians and Altitudes of Triangles

Lesson Objective IWBAT apply thms ≈ centroids ; find locations of centroids and orthocenters in coordinate plane

Median: A median of a triangle is a segment from a vertex to the midpoint of the opposite side

The three medians of the triangle are *concurrent*. This point of concurrency is called the centroid.

The ratio of **larger : smaller** segments within the median is 2 : 1.

What would the ratio of the larger segment of the median to the ENTIRE median be?

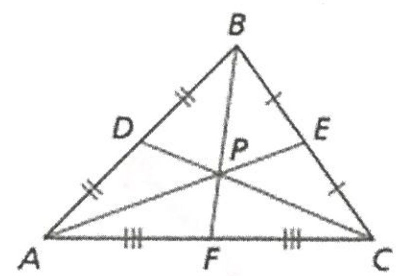
2 : 3

Centroid Theorem

The centroid of a triangle is $\frac{2}{3}$ of the distance from each vertex to the midpoint of the opposite side.

The medians of ΔABC meet at point P, and…

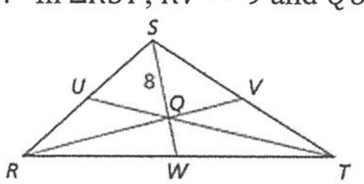
$AP = \frac{2}{3}(AE)$; $BP = \frac{2}{3}(BF)$; $CP = \frac{2}{3}(CD)$



The centroid is also called the " balance point " or " center of gravity "

Example:

1. In ΔRST, $RV = 9$ and $QU = 2.4$. Find RQ and TU.



$RQ = \frac{2}{3}RV$

$= \frac{2}{3}(9)$ $\boxed{RQ = 6}$

QU : TQ is 1 : 2

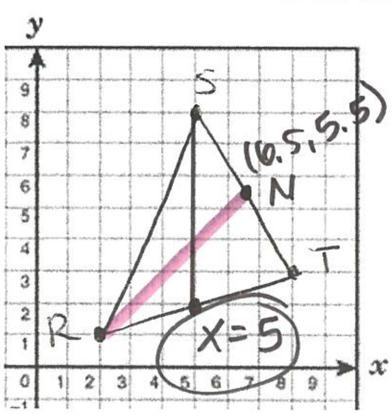
$TQ = 2(2.4) = 4.8$

$TU = TQ + QU$

$= 4.8 + 2.4$

$\boxed{TU = 7.2}$

2. Find the coordinates of the centroid of Δ RST where R(2, 1), S(5, 8), T(8, 3).



$m_{\overline{RN}} = \frac{5.5 - 1}{6.5 - 2} = \frac{4.5}{4.5} = 1$

$y - 1 = 1(x - 2)$

$y - 1 = x - 2$

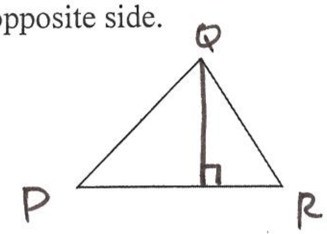
$y = x - 1$

$y = 5 - 1$

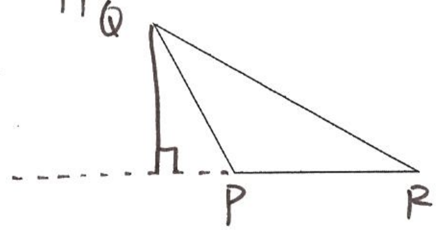
$y = 4$

$\boxed{(5, 4)}$

Altitude: An altitude of a triangle is the $\perp$ segment from a vertex to the opposite side OR the line that contains the opposite side.



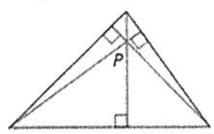
Altitude from Q to $\overleftrightarrow{PR}$



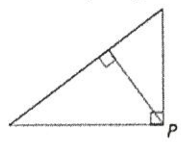
The lines containing the altitudes of a triangle are concurrent.

This point of concurrency is the orthocenter of the triangle.

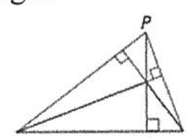
The location of the orthocenter (P, in the diagram below) depends on the type of triangle.



inside Δ
(acute Δ)



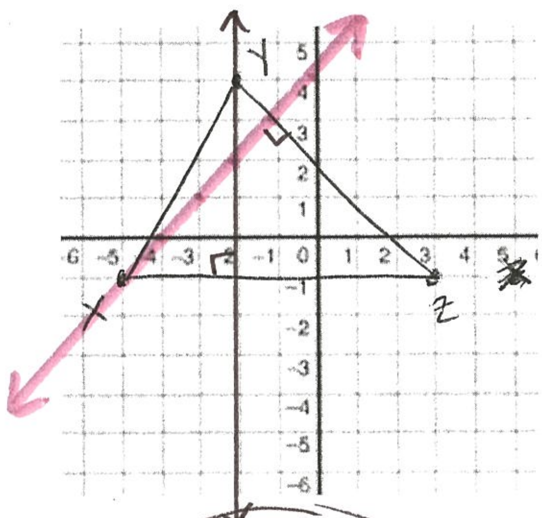
on vertex of rt. $\angle$
(right Δ)



outside Δ
(obtuse Δ)

Example:

3. Find the coordinates of the orthocenter of ΔXYZ with vertices X(-5, -1), Y(-2, 4) and Z(3, -1)



$x = -2$

altitude from X

$m_{\overline{YZ}} = -1$

$m_{\perp} = 1$

$y - (-1) = 1(x - (-5))$

$y + 1 = x + 5$

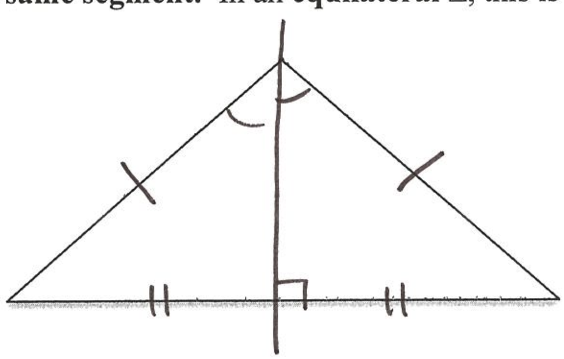
$y = x + 4$

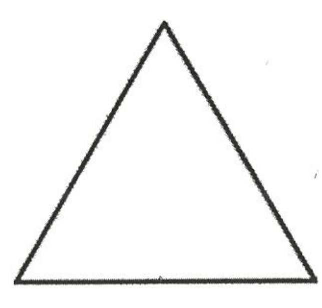
$y = -2 + 4$

$y = 2$

$\boxed{(-2, 2)}$

In an **isosceles** Δ, the perpendicular bisector, angle bisector, median, and altitude **from the vertex angle to the base are all the same segment.** In an **equilateral** Δ, this is true for **any vertex**.





See pg 323 for summary chart for circumcenter, incenter, centroid and orthocenter