Section 5-3: Medians and Altitudes of Triangles

Warm-up:

1. What is the name of the point where the angle bisectors of a triangle intersect?

2. Find the midpoint of the segment with the given endpoints (–7, 2) and (–3, –8).

3. Write an equation of the line containing the points **(**3, 1**)** and **(**2, 10**)** in point-slope form.

A ______________ of a triangle is a segment whose endpoints are a ______________ of the triangle and the ______________ of the opposite side.

Every triangle has _______________ medians, which are concurrent.

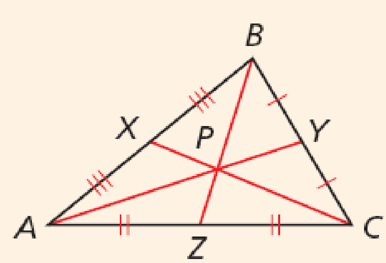
The point of concurrency of the medians of a triangle is the _______________ of the triangle.

- This is always inside the triangle.
- It is also called the center of ________________.

Theorem 5-3-1 Centroid Theorem

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

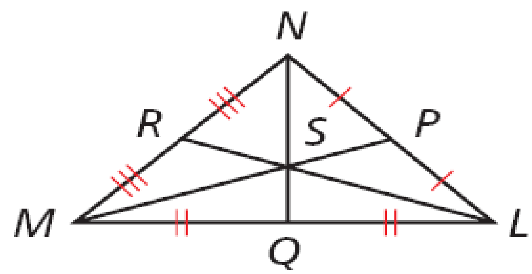
$AP = \frac{2}{3}AY$ $\quad BP = \frac{2}{3}BZ$ $\quad CP = \frac{2}{3}CX$



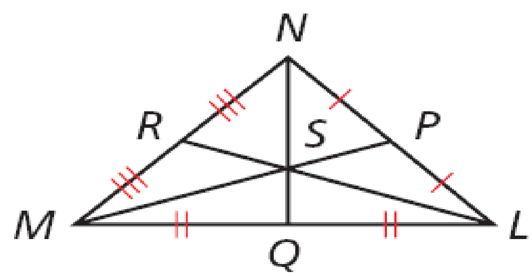
Examples:

1. In ΔLMN, $RL = 21$ and $SQ = 4$.

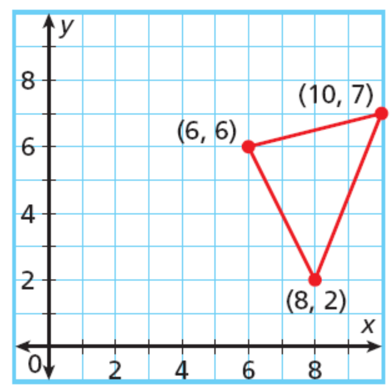
a. Find LS.



b. Find NQ.



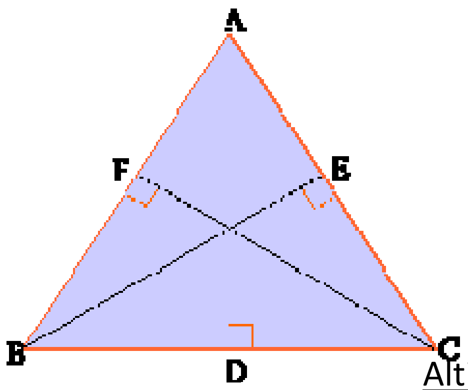
2. A sculptor is shaping a triangular piece of iron that will balance on the point of a cone. At what coordinates will the triangular region balance?



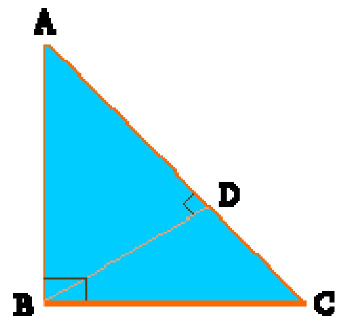
An ________________ of a triangle is a perpendicular segment from a vertex to the line containing the opposite side.

- Every triangle has three _____________________.
- They can be inside, outside, or on the triangle.

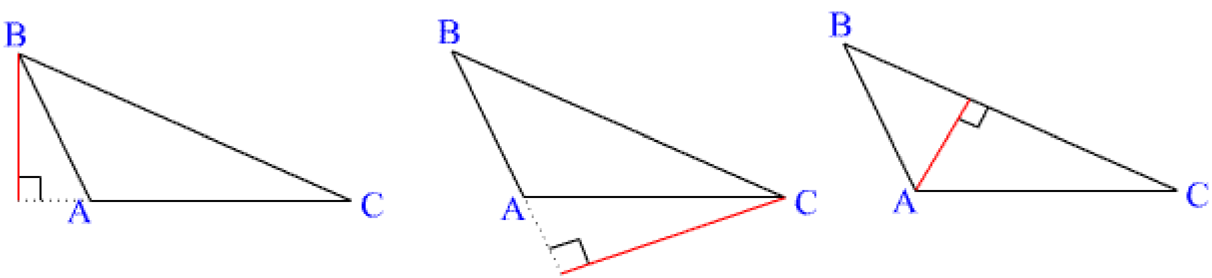
<u>Altitudes of acute triangle</u>



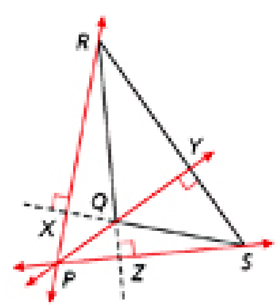
<u>Altitudes of right triangle</u>



<u>Altitudes of obtuse triangle</u>



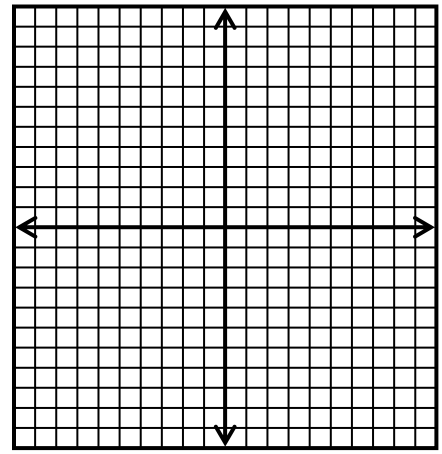
The point of concurrency of the altitudes of a triangle is called the __________________________ of the triangle.



Example:

3. Find the orthocenter of ΔXYZ with vertices *X*(3, –2), *Y*(3, 6), and *Z*(7, 1).

a. Graph the triangle.



b. Find an equation of the line containing the altitude from *Z* to $\overline{XY}$.

c. Find an equation of the line containing the altitude from *Y* to $\overline{XZ}$.

d. Solve the system to find the coordinates of the orthocenter.

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