

5.3

Medians and Altitudes

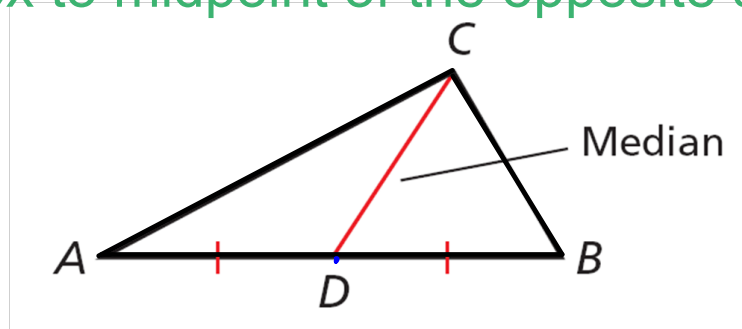
**Objectives**

Apply properties of medians of a triangle.

Apply properties of altitudes of a triangle.

A **median of a triangle** is a segment whose endpoints are a vertex of the triangle and the midpoint of the opposite side.

Vertex to midpoint of the opposite side.



Every triangle has three medians, and the medians are concurrent.

The medians of a triangle meet at the **centroid of the triangle**.

The centroid is always inside the triangle.

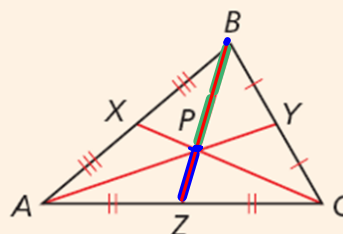
Theorem 5-3-1 Centroid Theorem

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

P is the centroid.

\overline{PZ} is $\frac{1}{2}$ of \overline{PB} and $\frac{1}{3}$ of \overline{ZB} .

\overline{PB} is 2 times as long as \overline{PZ} .

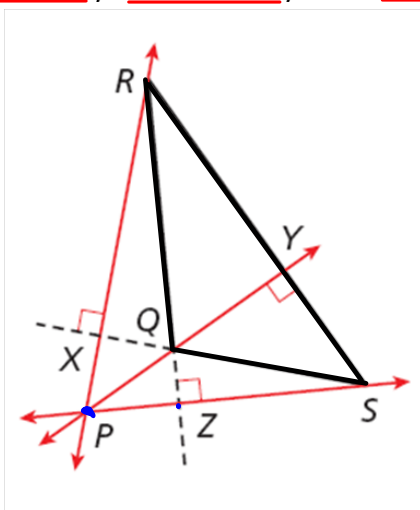


Helpful Hint

The Centroid of a triangle is the balance point of the triangle.

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

Every triangle has three altitudes. An altitude can be inside, outside, or on the triangle.



The altitudes meet at the **orthocenter of the triangle**.

Helpful Hint

The height of a triangle is the length of an altitude.

Examples 1-4

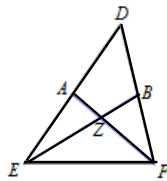
If given "whole" divide by 3 to get the short.

If given "long" divide by 2 to get the short.

If given "short" multiply by 2 to get the long.

Each figure shows a triangle with one or more of its medians.

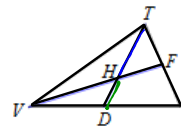
1) Find FZ if $EA = 28.8$



FA is the "whole" so divide by 3 to get AZ .

$AZ = 9.6$. AZ is the "short" so multiply by 2 to get ZF the long. $ZF = 19.2$.

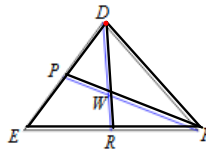
2) Find HD if $TH = 5.7$



TH is the "long" so divide by 2 to get the short.

$HD = 2.85$

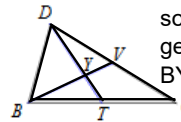
3) Find DR if $DW = 20$



DW is the "long" so divide by 2 to get WR .

$WR = 10$. Now to find DR use the segment addition postulate. $DR = 30$.

4) Find BY if $YV = 15.4$



YV is the "short" so multiply by 2 to get BY the long. $BY = 30.8$.

Example 5

In $\triangle LMN$, $RL = 21$ and $SQ = 4$.

Find LS , RS , NS and NQ .

$$LS = \underline{14}$$

$$RS = \underline{7}$$

$$NS = \underline{8}$$

$$NQ = \underline{12}$$

