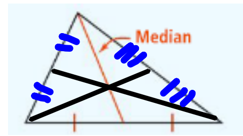
5-4 Medians and Altitudes

Content Standards
G.CO.10 Prove theorems about triangles . . . the medians of a triangle meet at a point.
Also G.SRT.5

Objective To identify properties of medians and altitudes of a triangle

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



Essential Understanding A triangle's three medians are always concurrent.

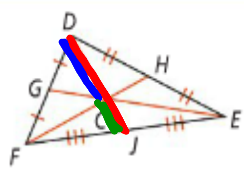
In a triangle, the point of concurrency of the medians is the **centroid of the triangle.** The point is also called the *center of gravity* of a triangle because it is the point where a triangular shape will balance. For any triangle, the centroid is always inside the triangle.

take note

Theorem 5-8 Concurrency of Medians Theorem

The medians of a triangle are concurrent at a point that is two thirds the distance from each vertex to the midpoint of the opposite side.

$DC = \frac{2}{3}DJ$ $\quad EC = \frac{2}{3}EG$ $\quad FC = \frac{2}{3}FH$

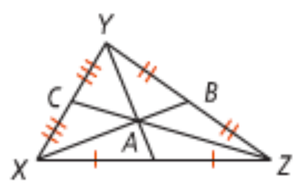


You will prove Theorem 5-8 in Lesson 6-9.

Vertex $= \frac{2}{3}$ whole

side $= \frac{1}{3}$ whole

Got It? 1. a. In the diagram for Problem 1, $ZA = 9$. What is the length of $\overline{ZC}$?



ZA = vertex = 9

ZC = whole = ? = X

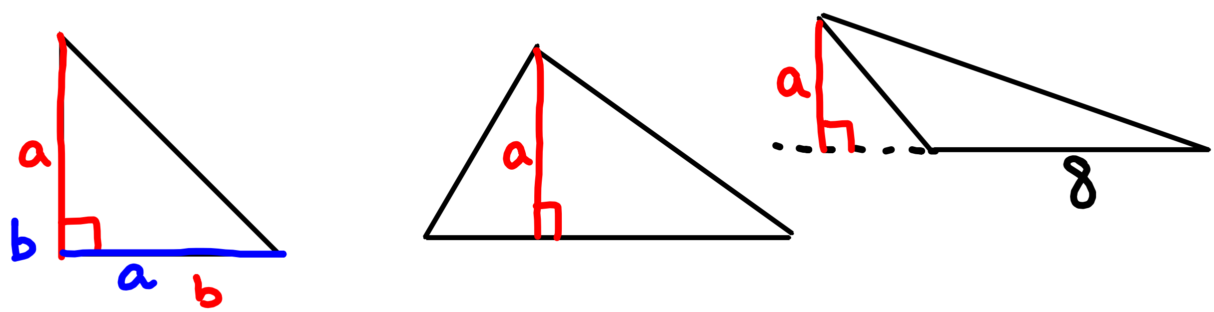
$$\frac{3}{2} \cdot 9 = \frac{2}{3} x$$

$$\frac{27}{2} = x$$

$$13.5 = x$$

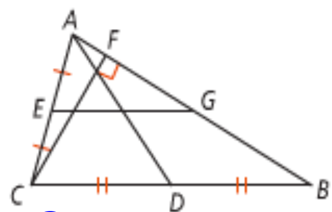
November 13, 2017

An altitude of a triangle is the perpendicular segment from a vertex of the triangle to the line containing the opposite side. An altitude of a triangle can be inside or outside the triangle, or it can be a side of the triangle.



Got It? **2.** For $\triangle ABC$, is each segment a *median*, an *altitude*, or *neither*? Explain.

a. $\overline{AD}$ **b.** $\overline{EG}$ **c.** $\overline{CF}$



a. median
starts @ vertex goes to middle of opp. side

b. neither
G is not a vertex

c. altitude
starts @ vertex goes to opp. side @ 90° ∠

take note

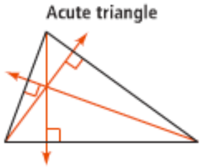
Theorem 5-9 Concurrency of Altitudes Theorem

The lines that contain the altitudes of a triangle are concurrent.

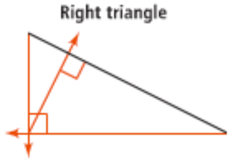
You will prove Theorem 5-9 in Lesson 6-9.

The lines that contain the altitudes of a triangle are concurrent at the **orthocenter of the triangle.** The orthocenter of a triangle can be inside, on, or outside the triangle.

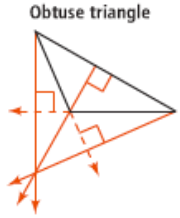
Acute triangle



Right triangle



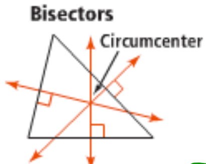
Obtuse triangle



take note

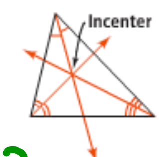
Concept Summary Special Segments and Lines in Triangles

Perpendicular Bisectors

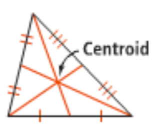


5.3

Angle Bisectors

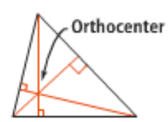


Medians



$\frac{2}{3}\ \frac{1}{3}$

Altitudes



5.4