# *MATH 341 — FALL 2011*
# *ASSIGNMENT 5*
# *Due Sept 30, 2011*

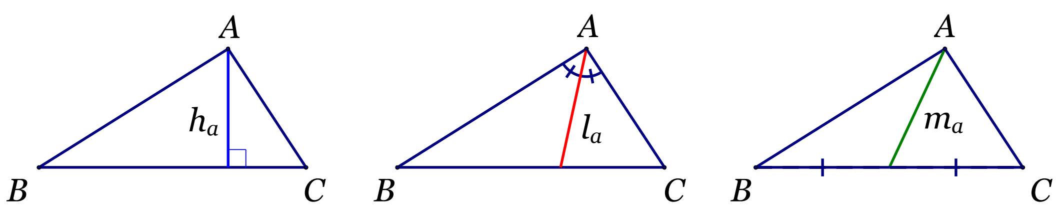
September 13, 2011

*Geometry for College Students* by Martin Isaacs, pages 32-33:

1F.3 Let $P$ be a point exterior to a circle centered at point $O$ and draw the two tangents to the circle from $P$. Let $S$ and $T$ be the two points of tangency. Show that $OP$ bisects $\angle SPT$ and $PS \cong PT$.

1F.5 In $\triangle ABC$ prove that $\angle A$ is a right angle if and only if the length of the median from $A$ to $BC$ is exactly half the length of side $BC$.

For the remainder of the semester we will use the following notation. For $\triangle ABC$ we let $a$, $b$, and $c$ denote the lengths of the sides opposite $A$, $B$ and $C$ respectively, *i.e.* $a = BC$, $b = AC$, and $c = AB$. Define the *semiperimeter* $s$ to be $s = \frac{a+b+c}{2}$. Let $h_a$, $h_b$, and $h_c$ denote the lengths of the altitudes from $A$, $B$, and $C$, respectively. Let $l_a$, $l_b$, and $l_c$ denote the lengths of the segments of the angle bisectors from $A$, $B$, and $C$, respectively, from the vertex to the opposite side. Let $m_a$, $m_b$, and $m_c$ denote the lengths of the medians from $A$, $B$, and $C$, respectively.




The above figure shows $h_a$, $l_a$, and $m_a$.

3. Consider $\triangle ABC$ with $a = 8$, $b = 3$ and $c = 6$. Let $AD$ be the altitude at $A$, $AF$ the bisector at $A$, and $AM$ be the median at $A$.

   a) Find $CD$, $CF$, and $CM$.

   b) Find $h_a$, $l_a$, and $m_a$.

4. Given any triangle $\triangle ABC$ show that $h_a$ can be expressed by the following formula without using Stewart's Theorem

$$h_a = \frac{2}{a}\sqrt{s(s-a)(s-b)(s-c)}$$