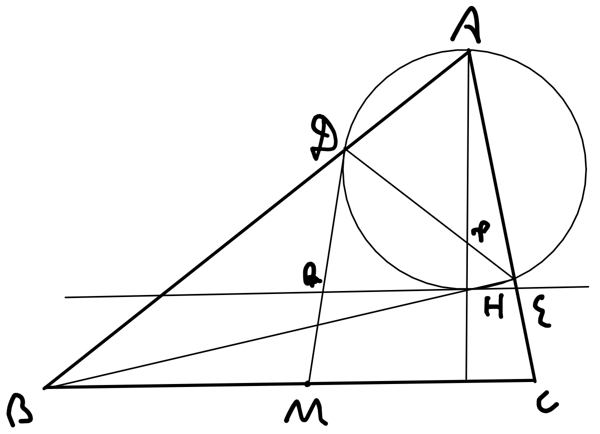
Enoch Yu

H is the orthocenter of an acute triangle ABC, and let M be the midpoint of BC. Suppose (AH) meets AB and AC at D, E respectively. AH meets DE at P, and the line through H perpendicular to AH meets DM at Q. Prove that P, Q, B are collinear.



$E \equiv E'$

$\therefore B, H, E$ are collinear

$B = AD \cap HE$

$P = AH \cap DE$

$Q = DD \cap HH$

↳ D, H are tangent to (AH)

$$\begin{array}{c|c|c} AD & AH & DD \\ HE & DE & HH \end{array}$$

$$\begin{array}{c|c|c} AD & DE & HH \\ HE & AH & DD \end{array}$$

$$\begin{array}{c|c|c} AD & DE & HH \\ EH & HA & DD \end{array}$$

A D D E H H
E H H A D D

By Pascal's Theorem with hexagon ADDEHH, P Q B are collinear.

$\square$