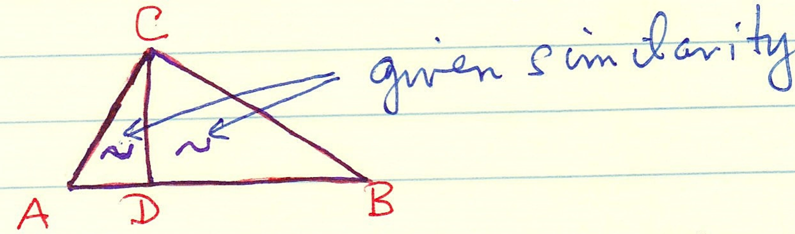
Hints for the problems in

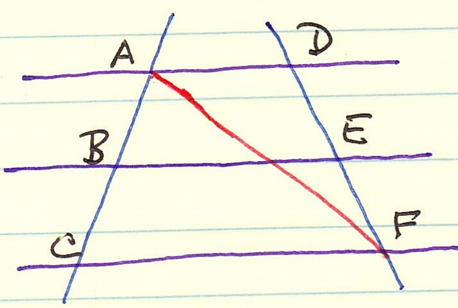
…/aab Update 15f13.pdf

1. AD is the perpendicular bisector of [BC], and [AD bisects $\measuredangle BAC$. — To find examples where some points do not lie on (AD), take $|\measuredangle BAC|$ close to $180°$. (see page 3)

2. 

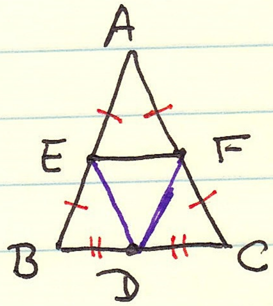
First show $AB \perp CD$, then show that $AC \perp BC$.

3. Show that the ratios of similitude for the two similarities are the same (note that [AG] and [DH] are sides of two triangles in the hypotheses). Using the equality of the ratios, imitate the proof of Problem 1 on Examination 2.

4. 

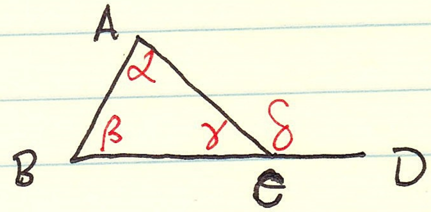
This drawing may be helpful.

What does the parallelism condition in the converse problem imply about $E-B$ and $D-A$?
vector subtraction

5. 

Why are $d(A,E)$, $d(E,B)$, $d(A,F)$ and $d(F,C)$ all equal?

Prove that $\Delta EBD \cong \Delta FCD$. Why does this imply that AD is the perpendicular bisector of $[EF]$?

6. 

$\gamma + \delta = 180°$

What does the Saccheri-Legendre Theorem imply? What are the stronger conclusions that hold if the plane is Euclidean or hyperbolic?

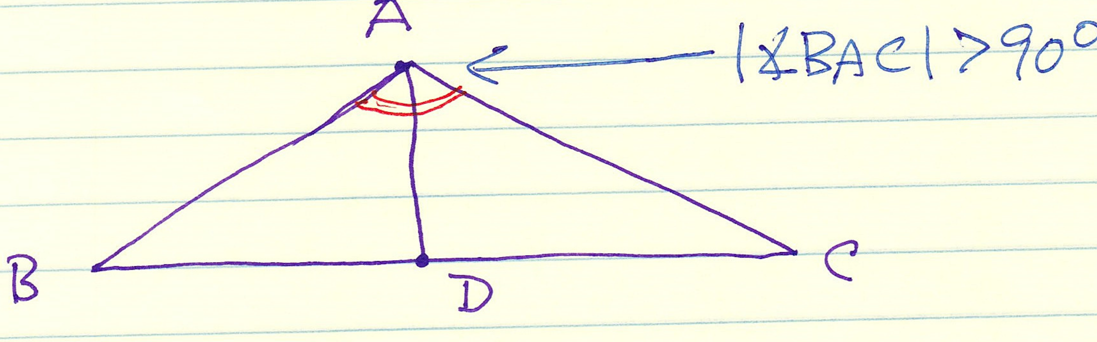
7. How many acute angles are there in a $\left\{ \begin{array}{l} \text{Lambert} \\ \text{Saccheri} \end{array} \right\}$ quadrilateral?

(also see p. 3)

8. The point Q is equidistant from A, B, C.

9. For one direction, this follows from a result in Section III. 2; for the other, this follows from a result in Section III. 6.

Additional drawings for #1



Neither the circumcenter nor the orthocenter lies on (AD) — where do they lie?

Note that both the centroid and incenter ALWAYS lie on (AD).

FOOTNOTE FOR #8

To see that the perpendicular bisectors of AB & BC are distinct, notice that if they were the same line L, then $L \perp AB$ & $L \perp BC$ would imply $AB \parallel BC$ or $AB = BC$, and neither of the latter is true.