MATH 303 EXAMINATION

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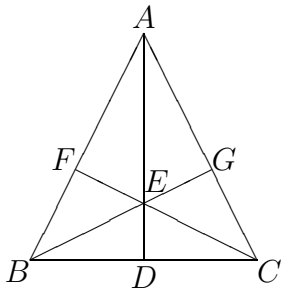
Problem 1. What is wrong with the following proof that all triangles are isosceles?—:

1. Let a triangle be given, namely ABC.
2. Let BC be bisected at D.
3. Let a straight line, DE, be drawn at right angles to BC.
4. Let also the straight line AE bisect the angle BAC.
5. Let the straight lines BE and CE be drawn.
6. $BE = CE$.
7. Let the straight line EF be drawn perpendicular to AB.
8. Let the straight line EG be drawn perpendicular to AC.
9. $AF = AG$ and $EF = EG$.
10. $BF = CG$.
11. $AF + FB = AG + GC$.
12. $AF + FB = AB$ and $AG + GC = AC$.
13. $AB = AC$; in particular, ABC is isosceles.



Problem 2. Write English translations of the following words:
(a) θεώρημα, (b) πρόβλημα, (c) ἀνάλυσις, (d) συνθέσις, (e) πολύγωνον, (f) τρίγωνον.

Problem 3. Write the letters of the Greek alphabet in the standard order. Give only the capital letters *or* only the minuscule letters.

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Problem 4. Proclus writes:

> Every problem and every theorem that is furnished with all its parts should contain the following elements:
> (1) an *enunciation* (πρότασις),
> (2) an *exposition* (or *setting out:* ἔκθεσις),
> (3) a *specification* (or *definition of goal:* διορισμός),
> (4) a *construction* (κατασκευή),
> (5) a *proof* (ἀπόδειξις), and
> (6) a *conclusion* (συμπέρασμα).

Below is the enunciation (in Heath's translation) of Proposition I.6 of Euclid's *Elements.* Supply the remaining parts (in your own words, which may or may not be Euclid's).

> *If in a triangle two angles be equal to one another, the sides which subtend the equal angles will also be equal to one another.*

Problem 5. *Without* using Euclid's method of 'application', prove Proposition I.8 of the *Elements,* whose enunciation is,

> *If two triangles have two sides equal to two sides respectively, and have also the base equal to the base, they will also have the angles equal which are contained by the equal straight lines.*

Problem 6. In triangle ABC, suppose BC is bisected at D, and straight line AD is drawn. Assuming AB is greater than AC, prove that angle BAD is less than DAC.