M4005 Test 1 February 22, 2006   **Name:**_____

Part A. Short questions. 5 points each.

1. What is a mathematical definition?

2. What is a primitive term?

3. Why does every mathematical theory have primitive terms?

4. Give an example of a defined term in Euclidean geometry and give its definition.

5. What is a postulate?

6. What is a proposition (or theorem)?

7. Why must a deductive system have postulates?

8. State Playfair's Postulate.

9. Give the definition of similarity between two labeled triangles.

10. State the SSS criterion for triangle congruence.

Part B. Proofs.

1. (20 points) Euclid's Proposition 17 asserts that the sum of any two angles in a triangle is less than two right angles. Use this to prove the following:
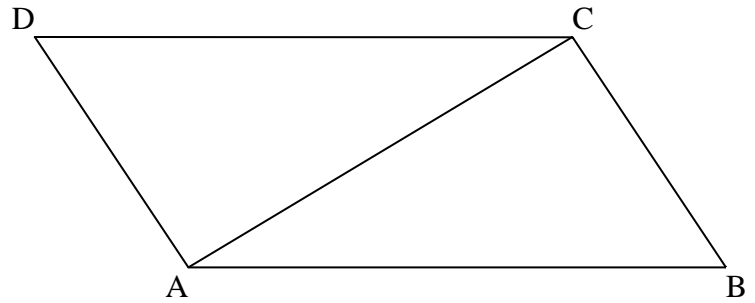
**Assertion.** Two different lines that are both perpendicular to a third line are parallel to one another.

Proof.

2. (15 points) Complete the following proof:

Assertion. A diagonal of a parallelogram cuts it into two congruent triangles.

Proof. Let ABCD be a parallelogram, as illustrated, with diagonal AC. We must show that triangle ABC is congruent to triangle CAD.

3. (15 points) Euclid's Proposition 35, Book I is illustrated as follows:
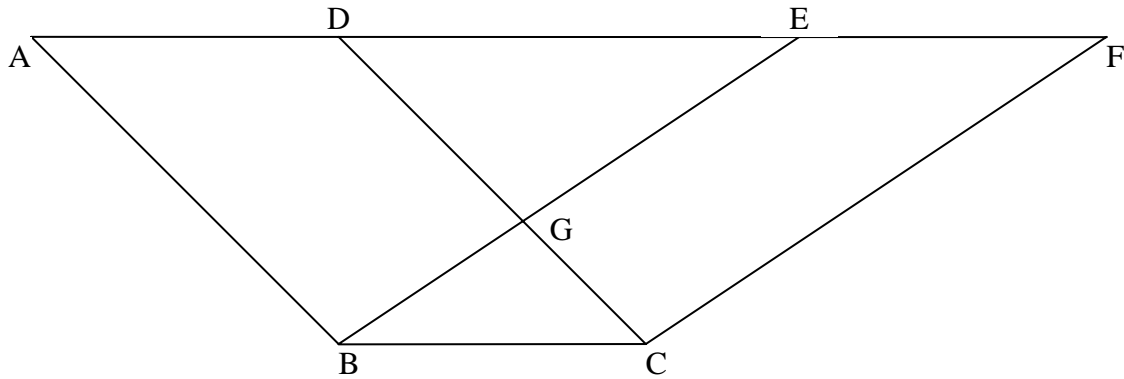
Here, ABCD and EBCF are parallelograms. Proposition 35 asserts that the areas of the two parallelograms ABCD and EBCF are equal. The proof of 35 uses Proposition 34, which states that opposite sides of a parallelogram are congruent. A key step is the proof of 35 is the following:

Assertion: Triangle *EAB* is congruent to the triangle *FDC*.

In this problem, you are asked to prove the assertion above. You are to assume ABCD and EBCF are parallelograms and you may use Proposition 34.