PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Module:	Modern Euclidean Geometry	Paper:	Final Exam
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Problems 1 to 6: Circle the best choice, 2 points each.

1. Three lines are concurrent; the meaning is

   (a) they all intersect at one point
   (b) they are all parallel
   (c) they are all congruent to each other
   (d) they are not parallel to each other

2. What is a definition of AB < CD ?

   (a) there is E such that A*B*E and BE ≈ CD
   (b) there is E such that C*D*E and CE ≈ AB
   (c) there is E such that A*E*B and AE ≈ CD
   (d) there is E such that C*E*D and CE ≈ AB

3. What is a bisector of ∠BAC ?

   (a) a line that intersects both lines AB and AC
   (b) a ray AD between AB and AC such that ∠BAD ≈ ∠DAC
   (c) half of the angle BAC
   (d) any point D which is interior of ∠BAC

4. There exist 3 points which are not collinear. The negation of this statement is

   (a) There are 3 points which are collinear.
   (b) There are less than 3 points which are not collinear.
   (c) Given 3 points, they are collinear.
   (d) Given a line, there exist 3 points on the line.

5. Given a line l and a point P not on l. Which statement cannot be proved in Neutral Geometry?

   (a) There exists a line through P perpendicular to l.
   (b) There exists a unique line through P perpendicular to l.
   (c) There exists at least one line through P parallel to l.
   (d) There exists a unique line through P parallel to l.

6. AAA is a theorem in

   (a) Neutral Geometry
   (b) Hyperbolic Geometry only
   (c) Euclidean Geometry only
   (d) Euclidean and Hyperbolic Geometries

Problems 7 to 10 are related to the following model, 2 points each.

Points:	A, B, C, D, E
Lines:	{A, B}, {A, C}, {C, D}, {B, C, E}, {D, E}

7. In this model the Incidence Axiom 1 is (a) true (b) false.

8. In this model the Incidence Axiom 2 is (a) true (b) false.

9. In this model the Incidence Axiom 3 is (a) true (b) false.

10. This model satisfies the parallel postulate of
    - (a) Euclidean geometry
    - (b) Elliptic geometry
    - (c) Hyperbolic geometry
    - (d) none of them

Problems 11 to 13: Give the definitions, 2 points each.

11. the opposite of ray AB

12. A and B are on opposite sides of a line l

13. $\angle BAC < \angle EDF$

Problems 14 to 16: Write the propositions in detail, 2 points each.

14. Angle Addition

15. SAA Criterion

16. Alternate Interior Angle Theorem

Problems 17 to 19 are related to the following axioms, 2 points each.

Axiom 1: There exist 2 parallel lines
Axiom 2: There exist 3 points which are collinear
Axiom 3: Given 2 points, there exists a unique line incident with them

17. Give a model such that Axioms 1, 2, 3 are all true.

18. Give a model such that only Axiom 1 is true, the others false.

19. Give a model such that only Axiom 2 is true, the others false.

20. Fill in the blanks to complete the proof, 2 points each.

Given ΔABC and ΔABD where C and D are on opposite sides of line AB.
If AC ≈ AD and BC ≈ BD then ΔABC ≈ ΔABD.

Proof.

1. ∠ACD ≈ ∠ADC ( )
2. ∠BCD ≈ ∠BDC (same as 1)
3. ∠ACB ≈ ∠ADB ( )
4. ΔABC ≈ ΔABD ( )

21. Prove the following proposition, 6 points each.

Given ∠BAC and a point D on the line BC.
Prove that if D is in the interior of ∠BAC then B*C*D.