EUCLID.

Examiner, A. K. BLAKADAR, B. A.

1. Any two sides of a triangle are together greater than the third side.

If a point be taken within a parallelogram, the sum of its perpendicular distances from the sides of the parallelogram is less than the sum of the diagonals.

2. If the side of any triangle be produced, the exterior angle is equal to the two interior and opposite angles, and the three interior angles of every triangle are together equal to two right angles.

From the base BA, or BA produced, of the isosceles triangle ABC, BD is cut off equal to the side BC; from DC, DE is cut off equal to BC; prove that the angle DCA is double of the angle CBE.

3. Triangles upon equal bases, and between the same parallels, are equal to one another.

The angle BCA of the triangle ABC is bisected by the straight line CE which meets AB in E; CA is produced to D so that AD is equal to BC; prove that the triangle CED is equal to the triangle ABC.

4. If a straight line be bisected, and produced to any point, the rectangle contained by the whole line thus produced, and the part of it produced, together with the square on half the line bisected, is equal to the square on the straight line which is made up of the half and the part produced.

Produce a given line so that twice the rectangle contained by the whole line produced and the part produced may be equal to the square on the given line.

5. The angles in the same segment of a circle are equal to one another.

ABC is a triangle in the circle ABC; AOD is drawn from A bisecting the arc BC in D and meeting the side BC in O; prove that DB is a tangent to the circle through A, O, B.

6. If two straight lines cut one another within a circle, the rectangle contained by the segments of one of them shall be equal to the rectangle contained by the segments of the other.

Two circles with centres C and E touch each other internally at the point A; from the centre C of the smaller circle, CB is drawn at right angles to CE meeting the circumference of the larger circle in B; and from E the centre of the larger circle ED is drawn parallel to CB meeting the circumference of the small circle in D; prove that the straight line AB is equal to straight line AD.

7. To describe a circle about a given triangle.

O is the centre of the circle inscribed in the triangle ABC, circles are described about the triangles BOC, COA, AOB, having as centres A', B', C', respectively; prove that

$$AO.OA' = BO.OB' = CO.OC'.$$

8. Define *similar rectilineal figures* and *reciprocal triangles*.

ACB, ADB are two triangles upon the same base AB and between the same parallels; AD and BC meet in O; show that AOB, COD are *similar* triangles and COA, DOB are *reciprocal* triangles. Also, if EOF be drawn through O parallel to AB, show that the quadrilaterals $CDOE$, $CDOF$ are equal.

9. In a right angled triangle, if a perpendicular be drawn from the right angle to the base, the triangles on each side of it are similar to the whole triangle, and to one another.

Construct a right angled triangle, having given the hypotenuse and the difference of the squares on the two sides.

10. In equal circles, angles, whether at the centres or at the circumferences, have to one another the same ratio as the arcs on which they stand.