First Division

1. Define and illustrate vertical angles, perimeter, rhomboid, trapezium, corollary.

2. Prove that if two parallel straight lines are cut by a straight line the alternate interior angles are equal.

3. Prove that if two triangles have their sides respective proportional they are similar.

4. In equal circles, angles at the center have the same ratio as their intercepted arcs. Prove for the case of incommensurable arcs.

5. Prove that the area of a parallelogram is equal to the product of the base by the altitude.

Second Division

6. Find the area of a triangle whose sides are 51, 53, 100.

7. The sides of a triangle are 8, 10, 12; find the segments of the opposite side formed by the bisector of the largest angle.

8. A tangent and a secant are drawn from the same point to a circle whose radius is 5 inches; the length of the tangent is 12 inches; the secant passes through the center of the circle. Find the distance from the point to the circumference.

9. ABC is an isosceles triangle inscribed in a circle; the vertical angle A is 30° and D is the middle point of the arc AC. If the line BD intersects side AC in O, what is the value of the angle AOD?

10. The base of a triangle is 10 inches and its altitude 4 inches; find the area of a trapezoid cut off by a line 3 inches from the vertex.

Third Division

11. Construct a line parallel to a given line and tangent to a given circle.

12. Prove that the side of a regular hexagon is equal to the radius of the circumscribed circle.

13. ABC is a triangle in which \( \angle A = \angle B = \angle C \); show that if the bisector of angle A meets the opposite side at D, \( \triangle ABD \) is a mean proportional between BD and BC.

14. Prove that the bisectors of the angles of a rhomboid for a rectangle.

15. Given a line \( a \); construct a line that shall be incommensurable with \( a \).