

expenses," wages, and materials in that year?

### GEOMETRY.

[Candidates are at liberty to use all intelligible abbreviations in writing out their answers]

1. Two angles of a triangle being supposed equal in magnitude; show, by any method, that the two sides opposite to them are equal in length.

2. Assuming the preceding property, or otherwise, show that every parallel to the base of an isosceles triangle cuts off equal lengths on the sides measured from the vertex of the triangle.

3. Two sides of a triangle being supposed given in magnitude; show, by any method, that the greater the angle between them the greater the third side.

4. Assuming the preceding property, or otherwise, show that, of the two diagonals of a parallelogram which is not a rectangle, the greater connects the two acute and the lesser the two obtuse angles of the figure.

5. Two chords of a circle being supposed to bisect each other, show by any method that they intersect at the centre of the circle.

6. Assuming the preceding property, or otherwise, show that, of every parallelogram inscribed to a circle, the two diagonals intersect at the centre of the circle.

7. Two chords of a circle being supposed to subtend equal angles at any point on the circumference of a circle; show, by any method, that they are equal in length.

8. Assuming the preceding property, or otherwise, show that, of a quadrilateral inscribed in a circle, when two of the opposite sides are parallel, the remaining two are equal.

9. Three points on the circumference of a circle being supposed to determine an isosceles triangle inscribed to the circle; show, by any method, that the three tangents at them determine an isosceles triangle circumscribed to the circle.

10. The two isosceles triangles in the preceding question being supposed to have equal vertical angles; show, by any method, that they are both equilateral.

11. A rectilinear segment of any length being supposed divided equally and unequally; show, by any method, that the rectangle under the equal parts exceeds the rectangle under the unequal parts by the square of the interval between the points of section.

12. Assuming the preceding property, or otherwise, show how to divide a rectilinear segment of any length into two parts the rectangle under which shall be equal to three-fourths of the square of half the segment.

### NATURAL PHILOSOPHY.

[Not more than eight questions are to be answered, of which at least two must be selected from section A.]

#### A

1. State your reason for regarding a pound as a unit of mass and not of force. What is the most convenient unit of force when a foot, a pound, and a second are units of length, mass and time respectively.

2. State the conditions necessary for the equilibrium of a body free to move in one plane. To what do these conditions reduce when one point in the body is fixed?

3. A solid right circular cone of homogeneous iron is 64 inches in height, and its mass is 8,192 lbs. The cone is cut by a plane perpendicular to the axis so that the mass of the small cone removed is 686 lbs. Find the height of the centre of gravity of the truncated portion remaining above the base of the cone.

4. A heavy body starting from rest slides down a smooth plane inclined  $30^\circ$  to the horizon. How many seconds will it occupy in sliding 240 feet down the plane, and what will be its velocity after traversing this distance? [ $g=32$ .]