

3. Two triangles, having a common base, being supposed to have their two vertices on a common parallel to the base; shew that the four parallelograms, on the same base, having their four sides for diagonals, are equal in area.

4. By aid of the preceding, or otherwise, construct, on a given base, a triangle of given area, having its vertex on a given indefinite right line not parallel to the base; and determine the number of solutions.

5. Two chords of a circle, intersecting at a point within the circumference, being supposed to make equal angles with the line connecting the point with the centre; shew that the two segments of either are equal to the two segments of the other.

6. By aid of the preceding, or otherwise, construct an isosceles triangle of given vertical angle, having its vertex at a given point within a given circle, and both extremities of its base on the circumference of the circle; determine also the number of solutions.

7. A quadrilateral, of the ordinary form, being supposed inscribed in a circle; shew that the sum of either pair of its opposite angles is equal to the sum of the other pair.

8. The quadrilateral, in the preceding property, being supposed to be a parallelogram; shew, as a consequence from the property, or otherwise, that its two diagonals pass through the centre of the circle.

9. A quadrilateral, of the ordinary form, being supposed circumscribed about a circle; shew that the sum of either pair of its opposite sides is equal to the sum of the other pair.

10. The quadrilateral, in the preceding proposition, being supposed to be a parallelogram; shew, as a consequence, from the proposition, or otherwise, that its two diagonals pass through the centre of the circle.

11. Divide a given finite right line into two unequal segments, so that the rectangle contained by the whole line and the lesser segment shall be equal to the square of the greater segment.

12. By aid of the preceding, or otherwise, construct, on a given base, an isosceles triangle, each of whose base angles shall be double of its vertical angle; and complete, by aid of it, the construction of a regular pentagon on the base.

NATURAL PHILOSOPHY.

Examiners—Prof. W. G. Adams, M.A., F.R.S., and Wm. Garnett, Esq., M.A.

[N.B.—Not more than *eight* questions are to be answered.]

1. Define force. What is meant by the resultant of a number of forces? Give a geometrical construction for finding the resultant of any number of forces acting at a point.

2. Define the moment of a force about a point. Shew how to find the resultant of two parallel forces which act in opposite directions but not in the same straight line.

3. What is the centre of gravity of a body? A line is drawn across an equilateral triangle, of 12 inches side, parallel to its base, and so as to cut off one-fourth of its area. Find the distance of the base from the centre of gravity of the remainder.

4. Equal forces act for the same time upon bodies of different mass. What is the relation between the effects which they produce? Describe fully the unit of force implied in the equation $P=mv$.

5. A body is allowed to fall freely from rest. Find an expression for its velocity at any point in terms of the distance through which it has fallen and the acceleration of gravity. If $g=981$ centimetre-second units, from what height must a body fall in order that it may have a velocity of 50 metres per second on striking the ground?

6. A cubic foot of water may be assumed to contain 1,000 ounces, while a gallon contains 10 lbs. Two gallons of water are placed in a cylindrical can, 10 inches in diameter. Find the whole pressure upon the curved surface of the can.

7. How would you determine the specific gravity of a solid lighter than water? A