Æ

 \oplus

A

QUEEN'S COLLEGE, CORK. HONOR EXAMINATION,

JUNIOR CLASS, JUNE 1st, 1859

1. Prove that $x^m \times x^n = x^{m+n}$ for all values of the indices m and n, positive, negative, integral, and fractional.

2. Simplify
$$\left\{\frac{x+\sqrt{x^2-1}}{x-\sqrt{x^2-1}} - \frac{x-\sqrt{x^2-1}}{x+\sqrt{x^2-1}}\right\} \div \frac{x^2-1}{\sqrt{x^2+1}}.$$

3. Prove the rule for G C M. Find the G C M of $6x^4 - 25x^2 - 9$ and $3x^3 - 15x^2 - 5$. Also of $x^3 + y^3 + z^3 - 3xyz$ and $x^2 + 2xy + y^2 - z^2$.

4. Solve the equations $(x+5)^{\frac{1}{m}} = (x^2+40x+16)^{\frac{1}{2m}}$ $x^2-x+b = (x^2-x-b^2)^{\frac{1}{2}}$

$$x^2 - x + b = (x^2 - x - x)^2$$

5. Solve the simultaneous equations— x+y+z=6 x-2y+x=0 and $x^2+xy+2y^2=74$ $x^2-xy+3y^2=69$ 3x - y + 5z = 16

6. Explain the genesis of equations of the higher orders from simple equations. Construct a quadratic whose roots shall be $3 + \sqrt{5}$ and $3 - \sqrt{5}$; also a cubic whose roots shall be 0, 2, and 3.

7. Prove that in a geometric progression the product an any two terms equidistant from a given term is always the same. What is the corresponding theorem in arithmetical progression?

8. The first term of an arithmetical series is $2\frac{1}{2}$, the last $55\frac{1}{2}$, the number of terms = 100; find the sum of the series.

9. Extract the cube root of .7854 to three places of decimals.

10. Given two sides of a triangle and the included angle, deduce formulæ for solving the triangle.

11. Prove the following formulæ of plane trigonometry, viz.:-

$$\tan(180^\circ + A) = \tan A$$
$$\cos(180^\circ - A) = -\cos A$$
$$1 + \cos(A + B)\cos(A - B) = \cos^2 A + \cos^2 B$$
$$\cot A = \cot 2A \pm \sqrt{1 + \cot^2 2A}$$

12. Shew a priori that a formula expressing $\frac{A}{2}$ in terms of sin A ought to have four values; while one expressing $\tan \frac{A}{2}$ in terms of $\tan A$ ought to have two values.

13. Shew how to find the distance between two inaccessible points-1st, when in the horizontal plane; 2ndly, when not in that plane. 14. If a circle roll within another of twice its diameter, any point in the circumference of the former will describe a straight line.

15. Explain Euclid's doctrine of ratio and of proportion; shew that his definition of ratio is imperfect unless accompanied by his definition of proportion. Does Euclid's definition of proportion furnish a direct and immediate test for determining whether four magnitudes are proportional or not?

> GEORGE BOOLE, F.R.S., Professor of Mathematics.

Boole's Exam Scrapbook, folio 77

"MA9959Sum
59" — 2015/6/26 — 15:04 — page 2 — #2

 \oplus

 \oplus

 \oplus

 \oplus

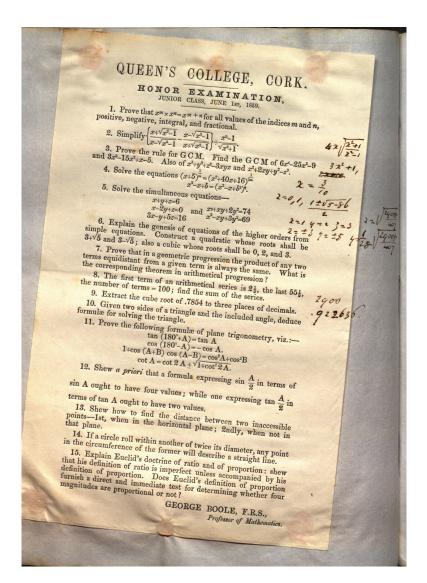
 \oplus

 \oplus

 \oplus

 \oplus

Library Archives, UCC Library



Transcribed and re-typeset by the Academic and Collaborative Technologies Group in IT Services, UCC