QUESTIONS PROPOSED AT THE MATHEMATICAL EXAMINATIONS IN OXFORD, FROM 1828 TO THE PRESENT TIME

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Questions proposed at the mathematical examinations in Oxford, from 1828 to the present time
by Various

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VARIOUS

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Trieste

OXFORD

MATHEMATICAL EXAMINATION

QUESTIONS

FROM THE YEAR 1828 TO THE PRESENT TIME.

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QUESTIONS

PROPOSED AT THE

MATHEMATICAL EXAMINATIONS

IN OXFORD

FROM THE YEAR 1828 TO THE PRESENT TIME.

OXFORD,
D. A. TALBOYS.
1831.

OXFORD

MATHEMATICAL EXAMINATION.

EASTER TERM, 1828.

GEOMETRY, ALGEBRA, ETC.

I.

1. What decimal of a week is 1 hour 27 minutes and 14 seconds?

2. Given $\begin{cases} 4x^4 + \dfrac{x}{2} = 4x^3 + 33 \text{ to find } x. \\ 4x^4 + 8x^3 - 89x^2 + 28x + 49 = 0 \\ \quad \text{to find } x. \end{cases}$

3. If an equilateral triangle be inscribed in a circle, and the adjacent arcs cut off by two sides be bisected, the line joining the points of bisection will be trisected.

4. Given the tangent of an angle to find the tangent of half the complement.

5. By means of Conic Sections inscribe in a given circle an equilateral and equiangular nonagon.

6. Define the parameter to any diameter of the ellipse or hyperbola; and shew what relation the ordinate passing through the focus has to the conjugate diameter.

7. The sides and altitude of a triangle are in arithmetic progression. Find the two sides, the base being given $= a$.

8. State and prove Cardan's rule, and apply it to the equation $x^3 - 3x + 2 = 0$.

II.

1. Clear the following equations from surds:

$$\sqrt[4]{a} + \sqrt[4]{b} + \sqrt[4]{c} = 0$$
$$\sqrt[3]{a} + \sqrt[3]{b} + \sqrt[3]{c} = 0.$$

2. Demonstrate generally in all the Conic Sections, that the rectangle under the abscissæ varies as the square of the ordinate.

3. Shew the use of logarithms in calculating the value of $\frac{(a^2 - b^2)\,(c^{\frac{1}{4}}d^{\frac{1}{3}} + c^{\frac{3}{4}}d^{\frac{1}{5}}).}{\sqrt[n]{e.f.^2}}$

4. Prove that secant $(60 + A) = \frac{2 \text{ sec. } A}{1 - \sqrt{3}. \text{ tang. } A}$

5. If A, B, C be the angles a, b, c, the sides of a plane triangle, sin. (A—B) : sin. C :: $a^2 - b^2 : c^2$.

6. In an ellipse the product of the tangents of the angles which any two conjugates make with the axis $= 1 - e^2$, e being the eccentricity to major axis=unity.

7. The equations to two straight lines are $y = ax + b$, and $y = \alpha x + \beta$. Find the sine of the angle contained by them.

8. $\begin{cases} x^3 y + x y^3 = 3 \\ x^6 y^2 + x^2 y^6 = 7. \end{cases}$ Find x and y.

III.

1. Prove geometrically, that if A and B be any two arcs, rad. × cos. (A — B) = cos. A × cos. B + sin. A × sin. B.

2. Shew that impossible roots enter equations by pairs.

3. In the equilateral hyperbola, if at any point an ordinate to the axis be taken, and a tangent drawn, a perpendicular upon that tangent from the centre produced will meet the curve at the opposite extremity of the ordinate.

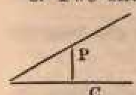
4. The same construction remaining, find the locus of the concourse of the perpendicular and the tangent.

5. With rectangular axes and the origin upon the curve, trace out the locus of the equation

$$x^3 + (c - b)\,x^2 - b\,c\,x + (x - c)\,y^2 = 0,$$

distinguishing the several cases it includes, and giving the geometrical construction of any case which admits it.

6. Two straight lines are drawn forming any acute angle; a perpendicular moves along one of them parallel to itself and terminated by the other. From a fixed centre in the base line, with a radius always = the perpendicular, a circular arc cuts the perpendicular: find geometrically the locus of the point of section.



7. The difference between the arithmetic and geometric mean between two numbers is 5, and the difference between the geometric and harmonic is 4: find the numbers.

8. Right lines being drawn bisecting the interior and exterior angles of a triangle; determine the conditions on which the rectangle under the sides of the triangle will be an arithmetic, a geometric, and an harmonic mean between the rectangle under the segments of the base made by the interior bisector, and the rectangle under the segments by the exterior bisector.