common divisor of two algebraic polynomials and prove this divisor to be the lowest common multiple of all the common divisors.

Find the H. C. D. of

$$18x^4+9x^3-17x^2-4x+4;$$
$$8x^4+4x^3-6x^2-x+1;$$

and resolve these quantities into simple factors.

6. Reduce to a single fraction

$$\frac{3}{4(1-x)}+\frac{3}{8(1-x)}+\frac{1}{8(1+x)}-\frac{1-x}{4(1+x^2)}$$

7. What is the distinction between an equation and an identity?

To which class, having regard to x, does the following belong:

$$\left(x+\frac{5a}{2}\right)\left(x-\frac{3a}{2}\right)+ax.$$

$$=(x+5a)(x-3a)+11\tfrac{1}{4}?$$

If $a=1$, how then?

8. Find the Arithmetic, Geometric and Harmonic means between two quantities.

If a, b, c, be in Harmonical progression, then will $\frac{ab}{a+b}$, $\frac{ac}{a+c}$, $\frac{bc}{b+c}$, be in H. P.

and $\frac{b+c}{a}$, $\frac{c+a}{b}$, $\frac{a+b}{c}$, in A. P.

9. If a varies as b and c varies as d, then will ad vary as bc.

There are two circles each of radius 3 and form others of radii 4, 5, 6, 7, respectively, show that they can all be made up into a single circle of radius 12, assuming that the area of a circle varies as the square of its radius.

10. Given the first and last of a given number of quantities in arithmetical progression, find their sum.

Find a series where, the first term being 11, the sum of the first three terms is equal to that of the first nine terms.

11. Given any two terms of a geometric series, show how to construct it.

Find a series where the first term is 3, the fifth term $\frac{16}{27}$, and the sum of the first five terms $2\frac{1}{27}$.

12. Find the limit of the sum of a geometric series indefinitely extended, the common ratio being less than unity.

Deduce the ordinary arithmetic rule for finding the value of a recurring decimal.

Prove that $\sqrt{1.\dot{7}7}=1.\dot{3}3$.

13. The latter half of $2n$ terms of an arithmetic series is one-third of the sum of $3n$ terms of the same series.

If a denote the sum of n terms of $1+5+9+\ldots$, and b the sum of $3+7+11+\ldots$ to $n-1$ or n terms then will $a+b=(a-b)^2$.

The fraction $\frac{1}{81}$ on being converted to a decimal will continually produce successively in order the digits 0 to 9 with the exception of 8. Explain this.

14. How are equations divided into orders?

Prove that every equation in x involving x^2 and no higher power of x, has two and only two roots.

Prove that the roots of

$$ax^2-bx=a^2x-ab$$

are rational.

15. Solve the equations

(1.) $(a+x)(b+x)=nab.$

(2.) $1+\sqrt{x}=6x.$

(3.) $\sqrt{x}+\sqrt{x-1}=\sqrt{x+1}.$

(4.) $x+y+z=\frac{a^3}{x}=\frac{b^2}{y}=\frac{c^2}{z}.$

NATURAL PHILOSOPHY.

London University Matriculation.

STATICS.

1. Squares are described upon the three sides of an isosceles right angled triangle.