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MATHEMATICS. PAPER I
ADVANCED

WEDNESDAY 14 JUNE 1961, 9.30-12.30

Answer seven questions.

1. (a) Given the simultaneous equations

$$x^2 - 6xy + 11y^2 = 3a^2,$$

$$x^2 - 2xy - 3y^2 = 5a^2,$$

derive an equation in x and y only, and hence solve the equations for x and y in terms of a .

(b) Write down the n th term of the arithmetic series with first term a and common difference d .

In each of a set of n separate arithmetic series, the first term is 1. The common difference of the first series is 1, of the second 2, of the third 2^2 , and so on. Find, in its simplest form, a formula for the sum of the n th terms of the n series.

2. (a) Find the ranges of values of k for which the equation

$$x^2 + (k-3)x + k = 0$$

has (i) real distinct roots, (ii) roots of the same sign.

- (b) Solve the equation

$$x^2 + 4x + 20 = 0,$$

giving the roots in the form $p \pm iq$, where p and q are real.

- (c) If $z^3 = 1$, find the two possible values of $1 + z + z^2$.

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Michael Hoelscher

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