

CONTENTS

	PAGE
I. Indices, logarithms and surds	
The index laws	1
Logarithmic form of the index laws	1
Change of base	2
Surds	3
Equations involving surds	3
II. Variation	
Direct proportion	8
The linear law	9
Inverse proportion	10
Variation as the square	11
The inverse square law	12
y proportional to any power of x	13
Joint variation	14
III. The Theory of quadratic equations	
Real, equal and imaginary roots	18
Sum and product of the roots	18
Symmetrical functions of the roots	18
Forming equations	19
Maximum and minimum values of quadratic expressions	19
Maximum and minimum values of certain fractions	19
IV. Factors and some developments	
Test for factors	23
Remainder theorem	23
Cubic equations	23
Factors of $a^3 + b^3$ and $a^3 - b^3$	23
Symmetry	24
Cyclic symmetry	24
Σ notation	24
Equating of coefficients	24
Partial fractions	25

	PAGE
V. Permutations and combinations	
Terminology	29
Notation	29
Evaluation of ${}_n P_r$	29
Permutations with repetitions	30
Permutations of n things, n at a time	30
Evaluation of ${}_n C_r$	30
Special cases of ${}_n C_r$	30
To divide n things into groups of p, q, r, \dots	31
Total number of combinations of n things	31
VI. The binomial theorem (for a positive integral index)	
Pascal's triangle	37
The binomial theorem for a positive integral index	38
Special cases	38
Sum of the coefficients	38
Expansion of $(1 - x)^n$	38
Expansion of $(a + x)^n$	39
Ratio of successive terms	39
VII. Probability	
Introduction	41
Assumptions	42
Definition	42
Addition of probabilities	43
Multiplication of probabilities	44
Representation of probabilities by algebraic expansions	44
Binomial probability-distributions	45
VIII. Finite series	
Arithmetic and geometric progressions	50
Sum of an arithmetic progression	51
Sum of a geometric progression	51
The method of differences	52
First differences and summation of some standard series	52
Methods of application	54
Arithmetic and geometric means	54
Inequality theorem	55

CONTENTS	ix
IX. Infinite series	PAGE
Introduction	59
Infinite geometric series	60
‘Sum to infinity’ of a geometric series	60
Divergent geometric series	61
Definition of convergence	61
Divergence of $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots$	61
D’Alembert’s test for convergence	61
Series of alternately positive and negative terms	62
Binomial series	62
Special cases	63
Expansion of $(a + x)^n$	63
Approximations	64
Error in approximations	64
The exponential series	64
Greatest term, etc.	65
Logarithmic series	65
Other series	66
 X. Statistics	
Introduction	73
Statistics	73
Frequency distributions	74
Normal curve of errors	75
Mode	75
Median and quartiles	76
Mean and standard deviation	76
Coefficient of variation	79
Probable error	80
Standard errors of mean and standard deviation	80
Linear regression	80
Correlation	83
 Answers	 95
Index	101