CHOICE AND CHANCE

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WILLIAM ALLEN WHITWORTH

CHOICE AND CHANCE

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CHOICE AND CHANCE

BY THE REV.

WILLIAM ALLEN WHITWORTH, M. A.

FELLOW OF ST. JOHN'S COLLEGE, CAMBRIDGE.

Second Edition, Enlarged.

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PREFACE.

In this second edition I have enlarged the appendices so as to meet the wants of advanced students. I have also added a collection of upwards of one hundred miscellaneous examples, which I think will add very much to the utility of the book.

It should be observed that the two chapters headed respectively Choice and Chance are simply arithmetic, and ought not to be beyond the comprehension of the ordinary reader who has never seen an algebraical symbol. But while expressly written for unscientific readers, they have been found very helpful to the young mathematician, when he was about to read in his algebra the hitherto difficult and embarrassing chapters on permutations and combinations, or on probability.

The appendices are addressed entirely to algebraical students. In the first appendix the usual theorems respecting permutations and combinations are established by new proofs, the same reasoning which was pursued with as little technicality as possible in the body of the work, being here expressed in algebraical language.

In the second and third appendices, which are newly added in this edition, a series of propositions are given which are not usually found in text books of algebra.

But I can see no reason why examples of such simple propositions as the xiiith and xxvth should be excluded from elementary treatises in which more complex but essentially less important theorems generally find place.

The classification of a variety of propositions under the titles of Distribution and Derangement will contribute (it is hoped) to disentangle the confusion in which all questions involving selection or arrangement are commonly massed together, and will facilitate in some degree that precision of language and clearness of expression which ought always to be aimed at in mathematics.

In the fourth appendix I have exhibited the seeming paradox that a wager which is mathematically fair is mathematically disadvantageous to both contracting parties. And I have endeavoured to cast into a simple and intelligible form the principles upon which the difficulties of the celebrated Petersburg problem are explained.

W. ALLEN WHITWORTH.

St. John's College,
1st January, 1870.

PREFACE TO THE FIRST EDITION.

THE following pages are a reproduction of lectures on Arithmetic, given in Queen's College, Liverpool, in the Michaelmas Term, 1866. Many of the students to whom the lectures were addressed were just entering upon the study of algebra, and it seemed well, while the greater part of their time was devoted to the somewhat mechanical solution of examples necessary to give them a practical facility in algebraical work, that their logical faculties should be meanwhile exercised in the thoughtful applications of the arithmetical art with which they were already familiar.

I had already discovered, that the usual method of treating questions of selection and arrangement was capable of modification and so great simplification, that the subject might be placed on a purely arithmetical basis; and I deemed that nothing would better serve to furnish the exercise which I desired for my classes, and to elicit and encourage a habit of exact reasoning, than to set before them, and establish as an application of arithmetic, the principles upon which such questions of "choice and chance" might be solved.

The success of my experiment has induced me to publish the present work, in the hope that the expositions already accepted by a limited audience may

prove of service in a wider sphere, in conducing to a more thoughtful study of arithmetic than is common at present; extending the perception and recognition of the important truth, that arithmetic, or the art of counting, demands no more science than good and exact common sense.

In the first chapter I have set down and established as arithmetical rules all the principles usually required in estimating the choice which is open to us in making a selection or arrangement out of a number of given articles under given conditions. In the second chapter I have explained how different degress of probability are expressed arithmetically, and how the principles of the preceding chapter are applied to the calculation of chances. These two chapters will prove intelligible to any one who understands the first principles of arithmetic, provided he will consider each step as he goes on; not content with the mere statement of any rule, but careful to follow the explanations given and to recognise the reason of each successive principle.

For the sake of mathematical students I have added, as an appendix, a new treatment of permutations and combinations with algebraical symbols. In my experience as a teacher I have found the proofs here set forth more intelligible to younger students than those given in the text books in common use.

LIVERPOOL, 1st *February*, 1867.