

Introduction

Two major difficulties present themselves when a book of this kind is planned.

In the first place those who use it may desire to apply it in a variety of ways and will be concerned with widely different problems to which trigonometry supplies the solution.

In the second instance the previous mathematical training of its readers will vary considerably.

To the first of these difficulties there can be but one solution. The book can do no more than include those parts which are fundamental and common to the needs of all who require trigonometry to solve their problems. To attempt to deal with the technical applications of the subject in so many different directions would be impossible within the limits of a small volume. Moreover, students of all kinds would find the book overloaded by the inclusion of matter which, while useful to some, would be unwanted by others.

Where it has been possible and desirable, the bearing of certain sections of the subject upon technical problems has been indicated, but, in general, the book aims at putting the student in a position to apply to individual problems the principles, rules and formulae which form the necessary basis for practical applications.

The second difficulty has been to decide what preliminary mathematics should be included in the volume so that it may be intelligible to those students whose previous mathematical equipment is slight. The general aim of the volumes in the series is that, as far as possible, they shall be self-contained. But in this volume it is obviously necessary to assume some previous mathematical training. The study of trigonometry cannot be begun without a knowledge of arithmetic, a certain amount of algebra, and some acquaintance with the fundamentals of geometry.

It may safely be assumed that all who use this book will have a sufficient knowledge of arithmetic. In algebra the student is expected to have studied at least as much as is contained in the volume in this series called *Teach Yourself Algebra*.

The use of an electronic calculator is essential and there can be no progress in the application of trigonometry without having access to a calculating aid. Accordingly chapter 2 is devoted to using a calculator and unless you are reasonably proficient you should not proceed with the rest of the book until you have covered this work. Ideally a scientific calculator is required, but since trigonometric tables are included at the end of the book, it is in fact possible to cover the work using a simple four rule calculator.

No explanation of graphs has been attempted in this volume. In these days, however, when graphical illustrations enter so generally into our daily life, there can be few who are without some knowledge of them, even if no study has been made of the underlying mathematical principles. But, although graphs of trigonometrical functions are included, they are not essential in general to a working knowledge of the subject.

A certain amount of geometrical knowledge is necessary as a foundation for the study of trigonometry, and possibly many who use this book will have no previous acquaintance with geometry. For them chapter 1 has been included. This chapter is in no sense a course of geometry, or of geometrical reasoning, but merely a brief descriptive account of geometrical terms and of certain fundamental geometrical theorems which will make the succeeding chapters more easily understood. It is not suggested that a great deal of time should be spent on this part of the book, and no exercises are included. It is desirable, however, that you make yourself well acquainted with the subject-matter of it, so that you are thoroughly familiar with the meanings of the terms employed and acquire something of a working knowledge of the geometrical theorems which are stated.

The real study of trigonometry begins with chapter 3, and from that point until the end of chapter 9 there is very little that can be omitted by any student. Perhaps the only exception is the 'product formulae' in sections 86- 88. This section is necessary, however, for the proof of the important formula of section 98, but a student who is pressed for time and finds this part of the work troublesome, may be content to assume the truth of it when studying section 98. In chapter 9 you will reach what you may

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consider the goal of elementary trigonometry, the 'solution of the triangle' and its many applications, and there you may be content to stop.

Chapters 10, 11 and 12 are not essential for all practical applications of the subject, but some students, such as electrical engineers and, of course, all who intend to proceed to more advanced work, cannot afford to omit them. It may be noted that previous to chapter 9 only angles which are not greater than 180° have been considered, and these have been taken in two stages in chapters 3 and 5, so that the approach may be easier. Chapter 11 continues the work of these two chapters and generalises with a treatment of angles of any magnitude.

The exercises throughout have been carefully graded and selected in such a way as to provide the necessary amount of manipulation. Most of them are straightforward and purposeful; examples of academic interest or requiring special skill in manipulation have, generally speaking, been excluded.

Trigonometry employs a comparatively large number of formulae. The more important of these have been collected and printed on pp. 171–173 in a convenient form for easy reference.