

# TABLE OF CONTENTS

---

	PAGE
<i>Reference tables of length, weight, and money</i>	XV
<i>Definition of terms used in this book</i>	xvii
<b>Introduction: brain and mind</b>	<b>1</b>
<i>Senses—comparison with animals—how we think— memory—abstract thought—relationships</i>	
<b>Introductory review</b>	<b>3</b>
CHAPTER	
<b>1. The mind at work</b>	<b>5</b>
<i>Decisions—motives—conscience—propositions affected by conditions—‘true’ and ‘false’—symbols 1 and 0—sets of conditions</i>	
<b>First review</b>	<b>6</b>
<b>2. Man writing numbers</b>	<b>10</b>
<i>Names and symbols—‘scoring’—Roman numerals— modern notation—invention of zero—denary base and other bases—changing the base—multiplying by ‘duplica- tion’—indices—binary—1 and 0—electric circuits— thinking machines—computers—logic v principles— programming</i>	
<b>Second review</b>	<b>17</b>
<b>3. Mathematese—the language of mathematics</b>	<b>20</b>
<i>Words and symbols—hieroglyphics—fractions—decimal point—the nouns, verbs, and adjectives of mathematese— elements, operators, classifiers and relators—infinity— negative number—odd and even—geometrical concepts— algebraic notation—angle-sum—polygons—deduction— elements and sets—algebra of number and of sentences</i>	
<b>Third review</b>	<b>28</b>

**4. The algebra of sentences****34**

*Emotional and factual language—propositions and conditions—‘and’ ‘or’—definition of effective and ineffective—conditions as elements  $A$ ,  $B$ , etc. use of  $\wedge$  and  $\vee$  as operators—truth tables—1 and 0—‘Boolean’ algebra—logic and electrical circuits—series and parallel—decisions dependent upon conditions—‘blockade’, astronauts, railway points*

**Fourth review****41****5. Illustrating the language****45**

*Use of diagrams—graphs as relationships between two sets of elements—ready reckoner graphs—average speed—travel-graphs—equations—functions—gradient of slope—Venn diagrams and Euler circles—single and double conditions—‘both’ and ‘either’—negatives as reversals or complements*

**Fifth review****55****6. Extending the language****60**

*Restrictive effect of  $\wedge$ —diffusive effect of  $\vee$ —truth tables—each area of diagram defined by conjunction—patterns of shading illustrate different combinations of effectiveness—matching patterns with algebraic relationships—need for new operator—analysis of situation and definition of  $\underline{\vee}$  as meaning ‘either but NOT both’—equivalence of  $[A' \underline{\vee} B]$  and  $[A \underline{\vee} B']$  and also of  $[A \underline{\vee} B]$  and  $[A' \underline{\vee} B']$ —electrical circuits as models*

**Sixth review****67****7. Becoming more familiar with the language****71**

*Need for practice—words, symbols, and diagrams—equivalence and complement—modifications to language*

## CHAPTER

## PAGE

—definitions of conjunction, inclusive and exclusive disjunction—omission of  $\wedge$  so that  $[A \wedge B]$  becomes simply  $AB$ —rule for changing  $[A' \vee B]$  into  $[AB \vee A'B']$ —operations on geometrical shapes—definitions of empty and universal sets

**No separate review for this chapter**

## 8. Other related ideas 89

Zero again—rational choice—complex problems broken down into alternatives—investigation into Venn diagram—conditions, area, and patterns—scientific method—hypotheses—3 circles can produce 256 patterns—number sequences—Pascal's triangle—point, line, square, cube—truth-checking diagram—programming—flow-charts—sub-routines

**Eighth review 100**

## 9. Number bases 126

Order and group-size—octal, decimal, and duo-decimal numbers—the binary system—numerals—'den' and 'lev'—the family of arithmetic processes—octal and duo-decimal multiplication tables—binary addition and multiplication tables—base-changing and expansion—'grating' multiplication—Napier's rods—mechanical calculating devices

**Ninth review 139**

## 10. Men; mathematics; and machines 150

Computers—diagram—memory store—punched cards—paper and magnetic tape—conversion tables for binary, octonary, and denary—examples of punched strip—indexing and classifying

**Tenth review 168**

**Conclusion. Outline for further development of topics 179**

**Reviews Full revision papers A to J 188**

	PAGE
<b>List of illustrations</b>	<b>201</b>
<b>List of tables</b>	<b>204</b>
<b>Index</b>	<b>205</b>
<b>Answers to exercises</b>	<b>209</b>

## LIST OF PLATES

---

*Between pages 150 and 151*

PLATE

1. The headquarters of I.C.T.
2. A complete computer installation
3. Magnetic tape units
4. A card reader
5. A printing unit
6. A card sorter