

# **AN INTRODUCTION TO BRAILLE MATHEMATICS USING UEB WITH NEMETH**

## **A Course for Transcribers**

Revised by Lindy B. Walton  
Barbara Taffet, advisor

[www.loc.gov/nls](http://www.loc.gov/nls)

***National Library Service  
for the Blind and  
Physically Handicapped***

***The Library of Congress***





I believe that I could not have reached my potential in mathematics without the Nemeth Code. With it, I am able to read and write mathematics, as well as other sciences, at all levels, limited only by my talent and my ambition.

—Dr. Abraham Nemeth, creator of the braille code for mathematics and science notation

## DEDICATION

I credit my interest in the continued training of braille transcribers in the Nemeth Code to my friend and mentor, Helen Hay, whose fascination and enthusiasm about this braille code was contagious.

## THANKS

I offer my gratitude to the original authors of this lesson manual, Helen Roberts, Bernard M. Krebs, and Barbara Taffet, for their insight into the learning process and for their eye for detail. Many of the excellent examples from the original book are preserved in this edition. I also wish to thank my supervisors and colleagues in the Madison Metropolitan School District for realizing the importance of the development of this curriculum.

—Lindy Walton

## ABOUT THE PROGRAM

This course is designed for the UEB certified transcriber who is ready to take on the challenge of transcribing print mathematics and science materials into braille using the Nemeth Braille Code for Mathematics and Science Notation. The program operates under a contract with the National Library Service for the Blind and Print Disabled, Library of Congress (NLS). All transcribing and proofreading course lessons and tests are administered under the National Federation of the Blind Braille Certification Training Program (BCTP). The following information is copied from the (2022) cover letter that the enrolled student will receive when accepted into the course. Up-to-date instructions will be sent at the time of enrollment.

The course is based on The Nemeth Braille Code for Mathematics and Science Notation, 2022, a publication of the Braille Authority of North America (BANA). Course materials do not supersede the authority of the official BANA code book.

### *Eligibility*

- United States citizenship or residency
- High school diploma or equivalent
- Knowledgeable in recommended braille formats for textbooks

### *Prerequisite*

- Library of Congress certification in literary braille transcribing (UEB) for a minimum of six months

### *Equipment*

Any of the following methods may be used in order to submit lesson exercises in braille: a forty-cell slate, a braillewriter, or a computer application that allows for direct input of 6-key braille. Use of back translation is allowed but 6-key entry is a necessity as well. A line length of forty cells is required, regardless of production method.

### *The Lesson Material*

The lessons are available by following the “Mathematics Braille Transcribing” link at [www.nfb.org/transcribers](http://www.nfb.org/transcribers). If you are unable to utilize the material from the website, please contact us at [transcribers@nfb.org](mailto:transcribers@nfb.org) or (410) 659-9314, extension 2510, and we will work with you to ensure you receive the material in a format that is usable for you.

Most lessons conclude with an exercise, which is to be submitted to your grader for evaluation. Students are encouraged to submit their work on a regular basis (at least monthly) and may submit only one lesson at a time.

Revisions to the online course lessons are occasionally necessary. The student should check the website to ensure that any lesson being completed is the current version. To report errors in this instruction manual, please send your message to [transcribers@nfb.org](mailto:transcribers@nfb.org).

### *Your Grader*

A student must take the course by correspondence with the NFB. After receiving your transcription of the first exercise, a grader will be assigned. Your grader will evaluate your first submission and will be your point of contact for the rest of the course.

### *The Certification Test*

Upon completion of the course, the student may apply for the certification test. When requesting the test, students who have taken the course locally must include a letter from their Library of Congress certified mathematics braille instructor attesting that the student has successfully completed the course. Certification tests are distributed and evaluated by the National Federation of the Blind. Instructions for preparation and submission will accompany the exam. The Library of Congress remains the certifying authority. Candidates scoring a passing grade will receive a Library of Congress certificate.

### *How to Enroll*

Whether intending to take the course with a local teacher or through correspondence, prospective students must submit the application form before beginning the course. Applicants can enroll in the course in one of two ways.

- Complete the application online at <https://nfb.org/programs-services/braille-certification/mathematics-braille-transcribing>
- Or mail a print application to the address shown below.

National Federation of the Blind  
Braille Certification Training Program  
200 East Wells Street at Jernigan Place  
Baltimore, MD 21230

### *Further Information*

For more information about the braille certification training program, you may email, call, or write:

- email: [transcribers@nfb.org](mailto:transcribers@nfb.org)
- call: 410-659-9314, extension 2510
- write to the address shown above.

## FOREWORD TO THE 2017 EDITION

The first edition of the *Introduction to Braille Mathematics* was published in 1978 and was written by the late Helen Roberts and Bernard M. Krebs. It was my privilege to complete the text with Mr. Krebs after Helen passed away. Since that time, numerous corrections and updates have been made both to the Nemeth Code itself and to this manual. Now, however, a major change has necessitated a complete rewriting of the lessons. 2016 was the implementation year in the United States for new transcriptions to be produced using the Unified English Braille Code. Because Nemeth Code works *within* UEB, many of the rules of Nemeth Code must be modified.

After the first lesson most examples, practices, and exercises are shown in a text-like context. In this way, the student can see how the Nemeth Code works in a real setting such as found in texts of many grade levels and complexities.

The practices within each lesson are available for self checking by the student. Answers to the practices are given at the end of each lesson. Braille reading practice is offered in Appendix A. Lessons conclude with an exercise which will be graded and evaluated by your teacher or by your NFB-assigned grader.

The student should understand that the Nemeth Code itself is the authoritative source for all mathematics transcriptions. The student should also be thoroughly familiar with the sourcebooks listed in the PREREQUISITES which follow this Foreword.

It has long been my hope that this manual could be brought into the present era. Lindy Walton, an experienced transcriber who works with the NLS Nemeth certification program, led the writing of this Second Edition. Once again, it is my honor to work with an exceptional member of the braille transcriber community.

Both Lindy and I thank the following for their support and help: Mary Denault, Peggy Jackson, Bill Jackson, Kyle DeJute, Julie Sumwalt, Lynnette Taylor, the members of the BANA Nemeth Code Technical Committee, and the Grafton Braille Service Center. We would also like to thank the National Federation of the Blind which has lent support to the development and publication of this comprehensive manual.

—Barbara Taffet

## PREREQUISITES

A prerequisite to the study of the Nemeth Code within UEB context is certification in Unified English Braille, adequate experience in literary braille transcription, and confidence in your production method. Before beginning this course of study the student should also be thoroughly familiar with current methods for transcribing a textbook. Rules and guidelines are found in the following sourcebooks, all of which are available from the Braille Authority of North America (BANA) at [www.brailleauthority.org](http://www.brailleauthority.org). Dates shown below are the editions used as a resource in this lesson manual.

*The Rules of Unified English Braille, Second Edition 2013*

*Braille Formats: Principles of Print-to-Braille Transcription, 2016*

*The Nemeth Braille Code for Mathematics and Science Notation, 2022*

*Guidelines and Standards for Tactile Graphics, 2022*

*Chemical Notation Using Nemeth Braille Code, 2022*

## STUDY TIPS

### HOW TO BECOME AN EXCELLENT NEMETH BRAILLE TRANSCRIBER

Don't race through the lesson material.

- Read carefully and deliberately as the narrative is compact and the language is exact.
- Study the examples and understand the point being made with each one but do not rely on the examples alone for an understanding of the rules. Transcribe the examples to reinforce the rule.
- Do the practice drills. Proofread them before checking the answers. See more tips below.
- Try back translating the braille examples and practices without looking at the print.
- Take special note of rules regarding spacing, punctuation, abbreviations, and format.
- Make lists to help you remember differences between Nemeth and UEB rules.
- Don't be afraid to underline, highlight, or write notes in the margins of your lesson manual.

If the braille or the print doesn't make sense to you ...

- Compare new information to similar topics learned in previous lessons.
- Some of the lesson material is grouped in "use of" and "nonuse of." Compare them and look closely at the braille examples.

### THE PRACTICE MATERIAL

- Slow down. By using 6-key entry instead of a translator you will better understand the braille from the reader's point of view.
- Compare your braille transcription to the answers to the practice material found at the end of each lesson. Read each cell closely.
- At the end of each line, look at the braille cell in the line above and in the line below and compare it to the answer key. Any misalignment indicates an error on that line.
- When you identify your errors, return to the lesson to review the applicable rule.

### PREPARING THE EXERCISE FOR GRADING

- Don't try to copy braille examples that look like the exercise material. Instead, understand and apply the rule.
- Don't guess. Don't rely on the proofreader's report to find your mistakes.
- Proofread carefully before turning in for grading. Your knowledge and understanding of the Nemeth Code will improve dramatically if you proofread from an embossed copy or from a simulated braille (print) copy, without looking at the print.
- Make note of items you are unsure of. If your transcription is correct, look these items over again after receiving your report to reinforce the rule.

### RESEARCH/REVIEW

- Analyze the mistakes found in your exercise and make sure you understand your errors before moving ahead to the next lesson. Ask questions until you are sure of the rule.
- Return to earlier lessons. Topics will make more sense to you in retrospect.



- Read the index. Terminology used there will help you understand the language of Nemeth braille.
- Review format rules learned in earlier lessons. Study the examples.
- Go back to an earlier lesson exercise and back translate the practices or your braille exercise by writing in longhand. Don't look at the print copy until you are finished. Giving yourself some distance from the lesson material is a good review strategy.
- In later lessons, research the topic in the Nemeth Code in addition to studying the lesson book. Not only will this enrich your understanding of the current subject, you will also review material already learned in a new context.

## **PROOFREADING TIPS**

Accuracy is crucially important in technical work. Your proofreading skills will be challenged.

- Is your lighting adequate?
- Use a magnifier when print is questionable.
- Use a straightedge when levels are in question.
- Take breaks when your concentration wanes. Then go back a few pages when resuming proofreading.
- Read the braille dots. Compare often to the print copy.
- Vary your reading medium -- don't always proofread from the screen or from simulated braille or from embossed braille.

## **BRAILLE TRANSLATION SOFTWARE**

Many students of the Nemeth Code have been transcribing for years and have thousands of pages of braille to their credit. They also have been taking advantage of the many electronic input and proofreading aids available to transcribers and are quite adept at turning out high quality work. We expect you are one of those transcribers.

You are undertaking a serious study of one of the technical braille codes, and we would like you to consider stepping back a bit and learning the old fashioned way, using 6-key entry in your braille software program. It is our experience that the best transcribers are those that can read and write braille as the 6-dot code that it is, not solely reading a back translation or a source file and not using another input code to 'type' math problems. Using proofreading and production aids for more accurate and faster work is certainly something you will continue to use – it is important that you understand how your particular software and translation tools work in Nemeth mode – but we are convinced you will understand the Code better if you take the 6-key approach while learning.

## CONTENTS

About the Program iv  
Foreword to the 2017 Edition vi  
Prerequisites vii  
Study Tips viii

### **Preliminary Lesson**

- P1 Philosophy
- P2 Literary vs. Technical Texts

#### *INTRODUCTION TO NUMERALS AND THE NUMERIC INDICATOR*

- P3 Representation of Arabic Numerals
- P4 Numeric Indicator

#### *THE PRACTICE MATERIAL*

##### *Practice A*

#### *THE MATHEMATICAL COMMA AND DECIMAL POINT*

- P5 Mathematical Comma
- P6 Mathematical Decimal Point
- P7 *Format: General Principles*

##### *Practice B*

#### *INTRODUCTION TO SIGNS OF OPERATION*

- P8 Signs of Operation

##### *Practice C*

#### *INTRODUCTION TO SIGNS OF COMPARISON*

- P9 Signs of Comparison

##### *Practice D*

#### *MONETARY, PERCENT, AND PRIME SIGNS*

- P10 Monetary Signs
- P11 Percent and Per Mille Signs
- P12 Prime Sign

##### *Practice E*

#### *EUROPEAN SYMBOLS*

- P13 The European Comma
- P14 The European Decimal Point

#### *Answers to Practice Material*

### **Lesson 1**

#### *INTRODUCTION TO CODE SWITCHING*

- 1.1 A Complete Transcription
- 1.2 Use of the Code Switch Indicators

*Practice 1A*

- 1.3 Which Code?
- 1.4 Placement of Literary Punctuation

*Practice 1B*

- 1.5 *Format: Keep Together*—General Principle Regarding  
Mathematical Expressions

*Placement of the Switch Indicators*

*Practice 1C*

- 1.6 Consistency with Mathematical Symbols

*Practice 1D*

*THE HYPHEN AND THE DASH*

- 1.7 The Hyphen and the Dash As Punctuation

*Practice 1E*

*SIGNS OF OMISSION*

- 1.8 General Use of Signs of Omission
- 1.9 Ellipsis
- 1.10 Long Dash
- 1.11 General Omission Symbol
- 1.12 Spacing of the Ellipsis and Long Dash
- 1.13 Other Omission Symbols
- 1.14 Paragraph Margins for Narrative Portions of Text (3-1)

*Practice 1F*

*INTRODUCTION TO IDENTIFIERS*

- 1.15 Terminology
- 1.16 *Format: Margins for Itemized Material with No Subdivisions* (1-3)

*Practice 1G*

*FORMAT SUMMARY #1*

*Answers to Practice Material*

*EXERCISE 1*

## **Lesson 2**

*MORE ABOUT PUNCTUATION*

- 2.1 Punctuation Mode
- 2.2 Spacing of UEB Punctuation and Code Switch Indicators
- 2.3 Nemeth Punctuation

*Practice 2A*

*PUNCTUATION IN NEMETH CODE*

- 2.4 Background

*The Punctuation Indicator*

- 2.5 Role of the Punctuation Indicator

- 2.6 Punctuation with Omission Signs
- 2.7 Punctuation and Spacing of Plural or Possessive Endings
  - Practice 2B*
- 2.8 Summary of the Use and Nonuse of the Punctuation Indicator

#### *INTRODUCTION TO SIGNS OF GROUPING*

- 2.9 Definition
- 2.10 Signs of Grouping with Numerals
- 2.11 Punctuation with Grouping Symbols
- 2.12 Nested Grouping Symbols

#### *Code-Switching Considerations*

- 2.13 Enclosed Technical Material
- 2.14 Paired Symbols

#### *Spacing with Signs of Grouping*

- 2.15 Spacing Inside of the Grouping Signs
- 2.16 Spacing Outside of the Grouping Signs

#### *Practice 2C*

#### *IDENTIFIERS, cont.*

- 2.17 Identifiers and Braille Page Turns
- 2.18 Code Switching and Identifiers
  - Practice 2D*
- 2.19 *Format: Keep Together*—Hyphenated Expressions
- 2.20 *Format: Margins for Itemized Material with No Subdivisions*—Side-by-Side Layout

#### *Answers to Practice Material*

#### *EXERCISE 2*

## **Lesson 3**

### *WORDS*

- 3.1 Words in Mathematical Context
- 3.2 Words in Narrative
- 3.3 Punctuation With Words

#### *Practice 3A*

#### *Introduction to Abbreviations*

- 3.4 Abbreviations
- 3.5 Numbers with Ordinal Endings

#### *Practice 3B*

#### *Single-Word Switch Indicator*

- 3.6 The Single-Word Switch Indicator
- 3.7 More About Switch Indicators at Braille Page Turns

*Practice 3C*

3.8 New Print Page

*LETTERS*

3.9 Single English Letters in Narrative

3.10 Single English Letters in Nemeth Code

*Introduction to the English Letter Indicator*

3.11 Use of the English Letter Indicator with a "Single Letter"

*Practice 3D*

3.12 Nonuse of the English Letter Indicator with a "Single Letter"

3.13 Letters as Identifiers

*Practice 3E*

*Mathematical Letter Combinations*

3.14 Mathematical Letter Sequence

3.15 Capitalized Letter Sequence

3.16 Shortform Letter Combinations

*Practice 3F*

*FORMAT SUMMARY #2*

*Answers to Practice Material*

*EXERCISE 3*

## **Lesson 4**

*MORE ABOUT LETTERS*

*Variables*

4.1 Mathematical Variables

*Practice 4A*

*Roman Numerals*

4.2 Code Switching with Roman Numerals

4.3 Capital Roman Numerals

4.4 Lowercase Roman Numerals

4.5 Punctuation with Roman Numerals

4.6 Roman Numerals Used as Identifiers

4.7 Mathematical Letter Combinations Similar to Roman Numerals

*Review: Nonuse of the English-letter Indicator*

*Practice 4B*

*Nondecimal Bases*

4.8 Letters Used to Represent Numerals in Nondecimal Bases

4.9 Nonalphabetic Symbols Used to Represent Numerals

*Practice 4C*

*OTHER ALPHABETS*

4.10 Alphabetic Indicators

- 4.11 The Greek Alphabet  
*Practice 4D*
- 4.12 The German Alphabet
- 4.13 The Hebrew Alphabet
- 4.14 The Russian Alphabet  
*Practice 4E*
- 4.15 A Sequence of Unspaced Letters
- 4.16 Mathematical Constant  
*Practice 4F*

*ENCLOSED LISTS*

- 4.17 Special Case—Definition of "Enclosed List"  
*Practice 4G*

*MORE ABOUT ENGLISH LETTERS*

- 4.18 An English Letters Touching Only One Grouping Symbol
- 4.19 English Letters with Plural, Possessive, or Ordinal Endings  
*Practice 4H*

*MORE ABOUT ABBREVIATIONS*

- 4.20 More Spacing Rules
- 4.21 Single-Letter Abbreviations
- 4.22 Abbreviations Whose Letters Correspond to a Shortform
- 4.23 Context Clues
- 4.24 Fully Capitalized Abbreviations – Acronyms and Initialisms

*CODE SWITCHING, cont.*

- 4.25 Initiating Nemeth Code Before Itemized Material, Following a Heading
- 4.26 Transcriber's Notes  
*Practice 4I*

*Answers to Practice Material*

*EXERCISE 4*

## **Lesson 5**

*SIGNS OF OPERATION, cont.*

- 5.1 Review of Signs of Operation
- 5.2 Signs of Operation Using Plus and Minus
- 5.3 Signs of Operation That Look Like Literary Symbols  
*Practice 5A*
- 5.4 Signs of Operation Unique to Mathematics

*Format: Simple Tables*

- 5.5 Introduction to Table Format

*Practice 5B*

*SIGNS OF COMPARISON, cont.*

- 5.6 More Comparison Signs
- 5.7 Special Case: A Colon Meaning "Such That"

*Practice 5C*

- 5.8 Signs of Comparison Compounded Vertically

*Practice 5D*

- 5.9 Signs of Comparison Compounded Horizontally

- 5.10 Negated Signs of Comparison

*Practice 5E*

*Format: Instructions*

- 5.11 Margins for Instructions Preceding Itemized Material (5-3)

- 5.12 Narrative Directions

*Practice 5F*

*Answers to Practice Material*

*EXERCISE 5*

## **Lesson 6**

*Format:*

- 6.1 Margins for Itemized Material with Subdivisions (1-5; 3-5)

*Practice 6A*

*LEVEL INDICATORS*

- 6.2 Definition

*Superscripts*

- 6.3 Superscript Level Indicator

*Practice 6B*

- 6.4 Returning to the Baseline Level

- 6.5 Raised Hollow Dot

*Practice 6C*

*Introduction to the Baseline Indicator*

- 6.6 Function of the Baseline Indicator

*Practice 6D*

- 6.7 Higher Levels of Writing

- 6.8 Certain Raised Signs

*Practice 6E*

*Subscripts*

- 6.9 Subscript Level Indicators

*Practice 6F*

- 6.10 Returning to the Baseline Level

*Practice 6G*

- 6.11 Special Case: Nonuse of the Subscript Level Indicator

*Practice 6H*

- 6.12 Spaces Within Superscripts and Subscripts

*Practice 6I*

*More about Superscripts and Subscripts*

- 6.13 Superscript and Subscript Combinations

*Practice 6J*

- 6.14 Left Subscripts and Superscripts

- 6.15 Further Combinations

- 6.16 Consecutive Superscripts and Subscripts

- 6.17 Simultaneous Superscripts and Subscripts

- 6.18 Nonsimultaneous Superscripts and Subscripts

- 6.19 Detached Superscripts and Subscripts

- 6.20 Literary Symbols and Level Indicators

*Summary*

*Practice 6K*

- 6.21 More About Grouping Symbols and Level Indicators

*Practice 6L*

*Answers to Practice Material*

*EXERCISE 6*

## **Lesson 7**

*DISPLAYED FORMATS*

- 7.1 Displayed Mathematical Material

*Practices 7A, 7B, 7C*

- 7.2 Displayed Material with Labels

- 7.3 Displayed Narrative Material

*Practice 7D*

*TYPEFORM*

- 7.4 General Guidelines Regarding Typeform

- 7.5 The Five Mathematical Typeform Indicators

- 7.6 Typeform of Letters

*Practices 7E, 7F, 7G*

- 7.7 Typeform of Numerals

*Practice 7H*

- 7.8 Nonregular Typeform in Contact with a Grouping Symbol

*Practice 7I*

- 7.9 Boldface Mathematical Symbols

*Practice 7J*

- 7.10 Barred Grouping Symbols and Other Signs of Grouping

*Practice 7K*

- 7.11 Further Details Regarding Typeform of Letters and Numerals



*Practice 7L*

*Answers to Practice Material*

*EXERCISE 7*

**Lesson 8**

*INTRODUCTION TO FRACTIONS*

*Simple Fractions*

- 8.1 Definition
- 8.2 Simple Fraction Indicators
- 8.3 The Horizontal Simple Fraction Line

*Practice 8A*

- 8.4 The Diagonal Simple Fraction Line

*Practice 8B*

*Mixed Numbers*

- 8.5 Definition of Mixed Number

*Practice 8C*

*Complex Fractions*

- 8.6 Definition of Complex Fraction

*Practice 8D*

*More Fraction Rules*

- 8.7 Fractions and the Baseline Indicator
- 8.8 Further Observations Regarding Spacing
- 8.9 Fractions and the Ellipsis and Long Dash
- 8.10 Fractions in an Enclosed List

*Practice 8E*

*RADICAL EXPRESSIONS*

- 8.11 Terminology
- 8.12 The Termination Indicator
- 8.13 Spacing
- 8.14 Index of Radical
- 8.15 Nested Radical Expressions
- 8.16 Radical Expressions and the Baseline Indicator
- 8.17 Radical Expressions and the Ellipsis and Long Dash
- 8.18 Radical Expressions and Abbreviations
- 8.19 Enclosed Lists with Radical Expressions

*Practice 8G*

*LINKED EXPRESSIONS*

- 8.20 Definition of Linked Expression
- 8.21 Division of Linked Expressions

*Practice 8H*

8.22 Special Case—Nested Linked Expressions

*Practices 8I, 8J*

*Answers to Practice Material*

*EXERCISE 8*

## **Lesson 9**

### *ARROWS*

9.1 Arrows Used in Mathematics

9.2 Construction of Braille Arrows

9.3 Spacing and Punctuation with Arrows

9.4 Horizontal Arrow Shafts

9.5 Barbed Arrowheads

9.6 Special Case: The Contracted Form of the Right-Pointing Arrow

*Practice 9A*

9.7 Blunted, Straight, and Curved Arrowheads

9.8 Arrows With Dotted Ends

*Practice 9B*

*Vertical, Slanted, and Curved Arrow Shafts*

9.9 Arrow Direction Indicators

*Practice 9C*

*Boldface and Compounded Arrows*

9.10 Boldface Arrow

9.11 Arrows Used as Signs of Comparison Compounded Vertically

9.12 Arrows Used as Signs of Comparison Compounded Horizontally

9.13 Nonmathematical Arrows

### *INTRODUCTION TO SPATIAL ARRANGEMENTS*

9.14 Background

*Spatial Arrangements with Addition and Subtraction*

9.15 Separation Line

9.16 Alignment with Addition and Subtraction

9.17 Placement of Symbols

9.18 Side-by-Side Layout

*Practice 9D*

9.19 Omissions in Work Arranged Spatially for Computation

9.20 Spatially Arranged Polynomials

9.21 Abbreviations

9.22 Fractions

9.23 Placement of Identifiers

*Practice 9E*

9.24 Regrouping Numbers in Addition Problems

*Introduction to Cancellation*

9.25 Cancellation in Subtraction Problems

*Practice 9F*

*Arrangement on the Page*

9.26 Blank Lines

9.27 Wide Arrangements

9.28 Itemized Spatial Problems with Subdivisions

*Placement of Code Switch Indicators*

9.29 Code Switching with Unitemized Spatial Arrangements

9.30 Code Switching with Itemized Spatial Arrangements

9.31 Code Switching with Headings and with the Page Change Indicator

*Answers to Practice Material*

*EXERCISE 9*

## **Lesson 10**

*Review of Format for Spatial Arrangements*

*SPATIAL ARRANGEMENT WITH MULTIPLICATION*

10.1 Alignment

10.2 Placement of Multiplication Symbol

10.3 Separation Line

*Alignment of Partial Products*

10.4 Partial Products

*Practice 10A*

10.5 Omissions in Spatial Multiplication Problems

10.6 Fractions and Mixed Numbers

10.7 Polynomials

10.8 Subscripts Denoting Nondecimal Bases

10.9 Regrouping Numbers with Multiplication

10.10 Placement of Identifiers with Spatial Multiplication

*Practice 10B*

*DIVISION PROBLEMS*

10.11 Notation Devices

10.12 Linear (Nonspatial) Representation of Division Problems

*Practice 10C*

10.13 Spatial Representation of Division Problems

*Practice 10D*

10.14 Omissions in Spatial Division Problems

10.15 Regrouping in Division

10.16 Cancellation in Long Division

10.17 Placement of Identifiers with Spatial Division

10.18 Other Layouts

*Practice 10E*

*REVISITING SOME RULES*

- 10.19 Summary of the Use and Nonuse of the Numeric Indicator
- 10.20 Review of Rules for Signs of Grouping

*Answers to Practice Material*

*EXERCISE 10*

**Lesson 11**

*SIGNS OF SHAPE*

11.1 Definition

*Basic Shapes*

- 11.2 Basic Signs of Shape Represented by Numbers—Regular Polygons
- 11.3 Basic Signs of Shape Represented by Letters—Irregular Polygons
- 11.4 Other Basic Signs of Shape Represented by Letters
- 11.5 Basic Signs of Shape Represented by Other Dot Combinations
- 11.6 Filled-In and Shaded Shapes

*Practice 11A*

*Shapes with Structural Modification*

- 11.7 Definition and Construction
- 11.8 Structurally Modified Triangles
- 11.9 Structurally Modified Angles
- 11.10 Unlisted Shapes with Structural Modification

*Practice 11B*

*Shapes with Interior Modification*

- 11.11 Definition and Construction
- 11.12 Circles with Interior Modification
- 11.13 Angles with Interior Modification
- 11.14 Rectangles and Squares with Interior Modification
- 11.15 Words Enclosed in Shapes
- 11.16 Two or More Vertically Arranged Modifiers
- 11.17 Two or More Horizontally Arranged Modifiers
- 11.18 Unlisted Shapes with Interior Modification

*Practice 11C*

*Other Details*

- 11.19 Spacing with Signs of Shape
- 11.20 Punctuation with Signs of Shape
- 11.21 Plurals/Possessives
- 11.22 Further Considerations Regarding Transcriber-Devised Shapes

*Practice 11D*

*Calculators and Keyboards*

- 11.23 The Keystroke Indicator

11.24 Other Details Concerning Keystrokes

11.25 Long Keystroke Constructions

*Icons*

11.26 Consistency in Representation of Icons

*Shapes Used as Signs of Omission*

11.27 Spacing

11.28 The English-letter Indicator and Comparison Signs

11.29 Use of the Multipurpose Indicator

11.30 Omissions in Spatially Arranged Problems

*Practice 11E*

*Identified Signs of Shape*

11.31 Spacing

11.32 A Shape Within a Superscript or a Subscript

11.33 A Shape Which Carries a Superscript or a Subscript

11.34 The English-letter Indicator

11.35 Use of the Numeric Indicator in an Enclosed List

*Practice 11F*

*TYPEFORM INDICATORS FOR MATHEMATICAL WORDS AND PHRASES*

11.36 Italic and Boldface Typeform Indicators

11.37 Code Switching Within an Emphasized UEB Passage

*MATHEMATICAL STATEMENTS*

11.38 Axioms, Corollaries, Definitions, Laws, Lemmas, Propositions, Theorems

*Practice 11G*

*Answers to Practice Material*

*EXERCISE 11*

## **Lesson 12**

*MODIFIERS AND MODIFIED EXPRESSIONS*

12.1 Definition

12.2 Construction of Simple Modified Expressions – The Five-Step Rule

*Common Modifiers*

12.3 Arrows as Modifiers

*Practice 12A*

12.4 Carets as Modifiers

12.5 Horizontal Bar as a Modifier

*Practice 12B*

12.6 Other Symbols Used as Modifiers

12.7 Expressions as Modifiers

*Practice 12C*

12.8 Spacing with Modified Expressions

*Practice 12D*

*Modified Expressions and Superscripts/Subscripts*

12.9 Modified Expression on the Baseline of Writing

*Practice 12E*

12.10 Modified Expression Within a Superscript or Subscript

*Practice 12F*

*Modified Signs of Comparison*

12.11 Definition

12.12 Transcription

*Practice 12G*

*Expressions with More Than One Modifier*

12.13 Modifiers of Higher Order

12.14 Individual Modifiers

12.15 Simultaneous Modifiers

*Practice 12H*

*Format*

12.16 Formal Proof

*Practices 12I, 12J*

*Answers to Practice Material*

*EXERCISE 12*

## **Lesson 13**

*MISCELLANEOUS SYMBOLS*

*Unspaced Symbols*

13.1 Spacing Rules for Unspaced Symbols

*Practice 13A*

*Spaced Symbols*

13.2 Spacing Rules for Spaced Symbols

*Practice 13B*

*Spacing with the Angstrom Unit and Tally Marks*

13.3 Angstrom Unit

13.4 Tally Mark

*Practice 13C*

*SUPERPOSED SIGNS*

13.5 Definition and Analysis

13.6 Transcription of Superposed Signs

*Practice 13D*

*AMBIGUOUS SIGNS*

13.7 Context

*MULTIPURPOSE INDICATOR*

13.8 Review

13.9 Additional Uses of the Multipurpose Indicator

*REFERENCE SIGNS AND SYMBOLS*

13.10 Reference Signs and Symbols

*Practice 13E*

*Answers to Practice Material*

*EXERCISE 13*

## **Lesson 14**

*FUNCTION NAMES AND THEIR ABBREVIATED FORMS*

14.1 List of Common Function Names and Their Abbreviated Forms

14.2 Code Switching and Punctuation

*Practice 14A*

14.3 Spacing of Abbreviated Function Names

*Practice 14B*

14.4 Nonuse of the English-letter Indicator

14.5 Keep Together

14.6 Clarification—Abbreviated Function Names in an Enclosed List

*Practice 14C*

14.7 Superscripts and Subscripts

*Practice 14D*

14.8 Modifiers

*Practice 14E*

*Spatial Arrangements, cont.*

*SQUARE ROOT DIVISION*

14.9 Review of Terminology

14.10 Spatial Arrangement for Square Root Problems

14.11 Placement of Identifiers with Spatial Radical Expressions

*Practice 14F*

*OTHER PRINT LAYOUTS SHOWING DIVISION*

14.12 Partial Quotients

*Practice 14G*

14.13 Synthetic Division

*Practice 14H*

*Answers to Practice Material*

*EXERCISE 14*

## Lesson 15

### *MATHEMATICAL EXPRESSIONS REQUIRING RUNOVERS*

- 15.1 Review
- 15.2 Mathematical Units
- 15.3 Step i: Divide Before a Comparison Sign on the Baseline  
*Practice 15A*
- 15.4 Step ii: Divide Before an Operation Sign on the Baseline  
*Practice 15B*
- 15.5 Step iii: Divide Before a Mathematical Unit  
*Practices 15C, 15D*
- 15.6 Step iv: Divide After a Termination Indicator  
*Practice 15E*
- 15.7 Function Notation, Integral Notation, Sigma Notation, and Pi Notation  
*Practices 15F, 15G, 15H, 15I*

*Summary*

*Answers to Practice Material*

*EXERCISE 15*

## Lesson 16

### *SPATIAL ARRANGEMENTS OF FRACTIONS*

- 16.1 Spatial Fraction Line
- 16.2 Numerator and Denominator
- 16.3 Placement of Identifiers with Spatially Arranged Fractions

*Situations Requiring Spatial Presentation of Simple Fractions*

- 16.4 Fractions Arranged Spatially for Illustration  
*Practice 16A*
- 16.5 Cancellation With Replacement Values  
*Practices 16B, 16C*
- 16.6 Cancellation Without Replacement Values  
*Practice 16D*

### *HYPERCOMPLEX FRACTIONS*

- 16.7 Definition and Recognition
- 16.8 Transcription of Hypercomplex Fractions
- 16.9 Higher Orders of Complexity  
*Practice 16E*

### *CONTINUED FRACTIONS*

- 16.10 Definition and Recognition  
*Practice 16F*

### *INSTRUCTIONAL COMMENTARY*

- 16.11 Format for Instructional Commentary



*Practice 16G*

*STEM-AND-LEAF PLOTS*

- 16.12 Recognition
- 16.13 The Table
- 16.14 The Key
- 16.15 Data Consisting of More Than One Character; Punctuation Between Entries
- 16.16 Alphabetic Data
- 16.17 Blank Entries
- 16.18 Runovers Within the Table
- 16.19 Back-To-Back Plot

*Practice 16H*

*Answers to Practice Material*

*EXERCISE 16*

**Lesson 17**

*SYSTEM OF EQUATIONS*

- 17.1 Definition and Recognition
- 17.2 Transcription Rules for Systems of Equations

*Practice 17A*

*Enlarged Signs of Grouping*

- 17.3 A Unified Expression
- 17.4 Transcription Rules for Enlarged Signs of Grouping
- 17.5 Embedded Vertical Groupings

*Practice 17B*

- 17.6 Enlarged Parentheses
- 17.7 Placement of Symbols
- 17.8 Placement of Identifiers and Punctuation
- 17.9 Nested Grouping Symbols

*Practice 17C*

- 17.10 Conditions or Commentary Printed Next to Spatial Arrangements

*Practice 17D*

- 17.11 More Enlarged Signs of Grouping

*Practice 17E*

*DETERMINANTS AND MATRICES*

- 17.12 Definition and Recognition
- 17.13 Transcription Rules for Determinants and Matrices

*Practice 17F*

*Further Considerations with Determinants and Matrices*

- 17.14 Multiplying Arrays
- 17.15 Ellipses and Blank Fields

*Practice 17G*

- 17.16 Augmented Matrix
- 17.17 Runovers in Arrays

*Practice 17H*

- 17.18 Row Matrix
- 17.19 Embedded Arrays

*Practice 17I*

- 17.20 Use of Tactile Graphics for Enlarged Grouping Signs

*Answers to Practice Material*

*EXERCISE 17*

## **Lesson 18**

*TABLES*

- 18.1 Structure of Tables
  - 18.2 Table Label and Title
  - 18.3 Column Headings
  - 18.4 Table Entries
- Practice 18A*
- 18.5 When Row Headings are Words
- Practice 18B*

*Boxed Tables*

- 18.6 Code Switching and Box Lines
- Practice 18C*

*More Table Rules Specific to the Nemeth Code*

- 18.7 A Table of Numbers
- Practice 18D*

*FIGURES AND DIAGRAMS*

- 18.8 Which Code?
- 18.9 Switch Indicators and Tactile Graphics
- 18.10 Number Lines
- 18.11 Diagrams in Exercise Material
- 18.12 Molecular Diagrams

*Practice 18E*

*KEYING TECHNIQUE*

- 18.13 Keying
- Practice 18F*

*Answers to Practice Material*

*EXERCISE 18*

## **Final Lesson**

- F1 Preparing for the Certification Exam
- F2 The Nemeth Code Book
- F3 Beyond the Nemeth Code

### *Structuring a Textbook*

- F4 Transcriber-Generated Pages and Front Matter
  - Practice A*
- F5 Body of Text

### *Four Practices*

- Practice B*
- Practice C*
- Practice D*
- Practice E*

### *Answers to Practice Material*

## **Appendices**

- Appendix A Reading Practice
- Appendix B Glossary Of Terms
- Appendix C Nemeth Code Format Summaries

To report errors in this instruction manual,  
please send your message to [transcribers@nfb.org](mailto:transcribers@nfb.org).