PRELIMINARY LESSON

LESSON PREVIEW

This lesson introduces the student to the design of the course as well as some basic Nemeth symbols. *Complete this lesson before studying Lesson 1.* Practice exercises are self-scored, and a short reading exercise is offered in Addendum 1.

P1 Philosophy

The Nemeth braille code is especially designed for the representation and transcription of mathematical notation encountered in educational materials on the subjects of mathematics and the sciences. Its purpose is to convey, as accurately as possible, a clear conception of the printed text to the braille reader. Using braille indicators in conjunction with the 63 braille characters, this code is capable of providing equivalent symbols for the hundreds of mathematical and scientific print signs now in use and yet to be devised. The one-to-one correspondence between braille and print symbols makes it possible to produce an accurate transference from print to braille or from braille to print.

P2 Literary vs. Technical Texts

P2.1 **Literary Texts.** Literary works which use only occasional mathematical notation are transcribed in accordance with the rules of Unified English Braille ("UEB"), using mathematical symbols and rules given in the most recent edition of *The Rules of Unified English Braille* and *Unified English Braille Guidelines for Technical Material*.

P2.2 **Technical Texts.** When mathematical notation is encountered in educational materials or in technical documents in the fields of mathematics, statistics, physics, or chemistry, the rules of the Nemeth Code are followed. Nonmathematical narrative is transcribed using the symbols and

rules of UEB, and mathematical notation is transcribed using the symbols and rules of the Nemeth Code. Shrewd use of code switch indicators clearly demarcates the technical material.

INTRODUCTION TO NUMERALS AND THE NUMERIC INDICATOR

Note: This section does not cover all of the rules regarding the use/nonuse of the numeric indicator.

P3 Representation of Arabic Numerals

In the transcription of a technical text, digits are represented in two ways:

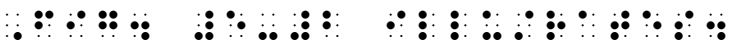
P3.1 **English Braille Numerals.** Numbers used to label figures, tables, sections, etc. as well as any associated punctuation are transcribed in UEB. Print page numbers, braille page numbers, and page numbers referred to within the text are transcribed in UEB.

Example P-1

Refer to Table 5.7 on page 391. Fig. 5-2 illustrates.

1 

2 

3 

4 ...

25 

The number at the end of line 1 is print page number b390. The last number represents braille page 46 on line 25 of the braille page.

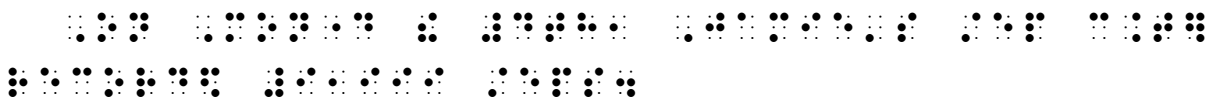
a. **Definition of Freestanding and Unmodified.** Numbers that have mathematical meaning within the narrative may be transcribed in UEB as long as the number is freestanding and is unmodified. "Unmodified" in this context means there is no symbol associated with the number, such as a monetary symbol or a percent sign, for example. "Freestanding and unmodified" includes numbers with an internal comma, ordinals, and plurals. An unmodified number that touches literary punctuation is considered to be freestanding.

Example P-2

9 inches and 15 inches are 2 feet.

Example P-3

On Monday the 4th, Jamie's step counter recorded 9,999 steps.



Example P-4

Which is greater: two 3's or three 2's?

P3.2 **Nemeth Digits.** Nemeth digits are used to represent Arabic numerals which occur in a mathematical expression. Nemeth digits are also required for a freestanding mathematical number within narrative that is not "unmodified," as defined in Section P3.1.a. Examples of a modified number include a negative number, a decimal, a number associated with a monetary symbol, a number associated with a percent sign.

The ten Nemeth digits are represented by the letters "a" through "j" dropped to the lower part of the braille cell.

1	2	3	4	5	6	7	8	9	0
⠁	⠃	⠉	⠙	⠑	⠋	⠛	⠓	⠊	⠚

Assume mathematical context in the isolated examples presented throughout the remainder of this lesson, even though the rules allow that unmodified, freestanding mathematical numbers can be transcribed in UEB.

P4 Numeric Indicator

Unless otherwise stated, the numeric indicator is required before a numeral that follows a space or before a numeral that begins a braille line.

⠼	Numeric Indicator

Example P-5

5 10 15 20

P4.1 **Special Case—Partitioned Numbers.** The numeric indicator is not used following a space that partitions a number into segments. Partitioned numbers must be transcribed in Nemeth because the numeric space indicator of UEB is not to be used in a Nemeth transcription.

Example P-6

987 654 321

A particular book may show large numbers in this manner rather than using commas to delineate place value. Check for context clues to be sure this represents 987 million 654 thousand 321 and not three separate 3-digit numbers.

THE PRACTICE MATERIAL

By transcribing the practice material you will gain firsthand experience with the topics presented in each lesson and you will be better prepared to transcribe the exercise for grading. Many of the points discussed in the lesson are illustrated only in the practice material. The Study Tips at the end of this lesson offer more ways to get the most out of these activities.

Check your work by comparing your transcription to the simulated braille located at the end of each lesson.

PRACTICE A

Instructions: Transcribe the following numbers using the lower-cell Nemeth digits. Begin in cell 1. Leave one blank cell between each number. Begin a new line in cell 1 when you do not have room on a line to complete a number. None of these numbers are partitioned into segments—each is a new number. Check your accuracy by comparing your transcription to the practice answers at the end of this lesson.

123 456 7890 295 431 61 507 3196 15837 808 46 282 2802

61640 74 9559 404 75134 13579

THE MATHEMATICAL COMMA AND DECIMAL POINT

P5 Mathematical Comma

The mathematical comma is used for a comma occurring in a long numeral. It is also used for a comma which follows a numeral or other mathematical expression.

⠨	Mathematical Comma ,

Although numbers with commas can be transcribed in UEB, for illustrative purposes, please assume mathematical context in the isolated examples presented below.

Example P-7

987,654,321

This represents the number 987 million, 654 thousand, 321.

Example P-8

997, 998, 999, 1,000

These are four individual numbers, separated by a comma and a space. The last number contains an internal comma.

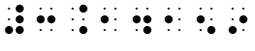
P6 Mathematical Decimal Point

⠨	Mathematical Decimal Point .

P6.1 **Spacing of the Decimal Point.** In a numeral, no space is left between the decimal point and the digits to which it applies.

Example P-9

3.14159



P6.2 **The Decimal Point and the Numeric Indicator.** The numeric indicator is required before a decimal point that precedes a numeral when the decimal point follows a space or begins a braille line.

Example P-10

.25 .5 .75

Reminder: When a decimal is part of a numeric label to a figure, table, section, etc., UEB is used. See Section P3.1.

Format

P7 General Principles

"Format" refers to layout on the page, such as indentations (margins), line spacing (blank lines), centering, and pagination. *The Nemeth Braille Code for Mathematics and Science Notation* specifies certain formats which are covered in these lessons and are also summarized in Addendum 3 of this course ("Nemeth Format Summaries").

When an item in a UEB transcription requires the use of Nemeth symbols, format rules of *The Nemeth Braille Code for Mathematics and Science Notation* are to be applied to the entire transcription including those portions transcribed in UEB. When a format is not specifically addressed in the Nemeth Code, the principles provided in *Braille Formats* should be followed.

PRACTICE B

Instructions: Begin the list on line 1 of the braille page. Use Nemeth numerals for all numbers in this list. Duplicate the columnar format shown. Following *Braille Formats* guidelines for the layout, you will leave a column of two blank cells between the end of the longest item in each column and the left-hand margin of the next column. These columns are unrelated therefore guide dots are not used.

592	.75	345	4.6692
206	6.4	29,254	98.6
46	59.1	1.234	3.14159
.240	0.37	1791	31,536,000
3,250	0	70.2	365.2422
8,086	987,654	.008382	273.15

INTRODUCTION TO SIGNS OF OPERATION

P8 Signs of Operation

The most common signs of operation are listed in the box below.

⠬	Plus	+
⠤	Minus	−
⠐⠔	Multiplication Asterisk	*
⠐⠦	Multiplication Cross	×
⠐⠄	Multiplication Dot	·
⠐⠌	Division (divided by)	÷

Since the minus sign and the hyphen are represented by the same symbol in braille, the reader determines the meaning of the symbols from context.

P8.1 **Spacing with Operation Symbols.** Unless otherwise stated, an operation symbol is unspaced from its related mathematical terms regardless of the print spacing. A numeric indicator is usually not needed within an unspaced expression. However, because the asterisk symbol includes dots 3456, a numeric indicator is required for the numeral following the asterisk.

Example P-11

$2 + 5 \quad 613 - 16 \quad 19 \times 8 \quad 5 \cdot 3 \quad 98 * 7 \quad 40 \div 5$

⠼⠃⠬⠢ ⠼⠋⠁⠒⠤⠁⠋ ⠼⠁⠊⠦⠓ ⠼⠢⠐⠄⠉ ⠼⠊⠓⠐⠔⠛ ⠼⠙⠴⠌⠢

P8.2 **Positive and Negative Numbers.** Numerals preceded by a plus sign or a minus sign must be transcribed in Nemeth. A numeral preceded by a minus symbol requires a numeric indicator when the minus symbol follows a space or begins a braille line. A numeral preceded by a plus symbol does not require a numeric indicator even when the plus symbol follows a space or begins a braille line.

Example P-12

$-3 \quad -2 \quad -1 \quad 0 \quad +1 \quad +2 \quad +3$

⠤⠼⠉ ⠤⠼⠃ ⠤⠼⠁ ⠼⠴ ⠬⠼⠁ ⠬⠼⠃ ⠬⠼⠉

Note: These are seven separate numerals.

a. **Decimals.** The numeric indicator is required between a minus symbol and a decimal point that precedes a numeral when the minus symbol follows a space or begins a braille line. A

numeral preceded by a plus symbol and a decimal point does not require a numeric indicator even when the plus symbol follows a space or begins a braille line.

Example P-13

$-.75,\ -.5,\ -.25,\ 0.0,\ +.25,\ +.5$

PRACTICE C

Instructions: Transcribe these unrelated columns using a two-column format.

$+592$	$9.75 + 16.22$
-7.5	$10{,}000 - 3{,}560$
404.8	19×18
$-.9$	$512 \cdot 63$
$.708$	$3{,}951 \div 9 * 7$

INTRODUCTION TO SIGNS OF COMPARISON

P9 Signs of Comparison

A few signs of comparison and their braille equivalents are listed in the box below.

⠨⠅	Equals	=
⠨⠂	Greater Than (is greater than)	>
⠐⠅	Less Than (is less than)	<
⠰⠆	Proportion (as)	∷
⠐⠂	Ratio (is to)	:

P9.1 **Spacing with Comparison Symbols.** A space is left on either side of a comparison symbol, with some exceptions which will be presented in a later lesson.

Example P-14

$72{,}539 \times 33.3 = 2{,}415{,}548.7$

⠼⠶⠆⠠⠢⠒⠔⠈⠡⠒⠒⠨⠒ ⠨⠅ ⠼⠆⠠⠲⠂⠢⠠⠢⠲⠦⠨⠶

> *Reminder: A numeric indicator is required when a numeral begins a line or is preceded by a space.*

Example P-15

$-3 < 0 < +3$

⠤⠼⠒ ⠐⠅ ⠼⠴ ⠐⠅ ⠬⠒

> *Reminder: A numeric indicator is required when a negative numeral begins a line. A numeric indicator is not needed when a numeral begins with a plus symbol.*

Example P-16

$6 : 9 :: 2 : 3$

⠼⠖ ⠐⠂ ⠼⠔ ⠰⠆ ⠼⠆ ⠐⠂ ⠼⠒

PRACTICE D

Instructions: Begin each mathematical expression on a new line in cell 1.

$8.5 < 74$

$85 > 9.6$

$29 \cdot 3 = 3 \cdot 29$

$14 : 2 :: 7 : 1$

$19{,}530 - 2{,}016 \times 8.25 + 6.75 = 262{,}710.00$

MONETARY, PERCENT, AND PRIME SIGNS

P10 Monetary Signs

The monetary symbols of the Nemeth Code are constructed the same way as the UEB symbols.

⠸⠉	Cent	¢
⠸⠎	Dollar	$
⠸⠑	Euro	€
⠸⠋	Franc	₣
⠸⠝	Naira	₦
⠸⠇	Pound Sterling	£
⠸⠺	Won	₩
⠸⠽	Yen or Yuan	¥

If a monetary sign is printed for which there is no established symbol, the transcriber should create a symbol following the same "dot 4" pattern shown above.

P10.1 **Spacing with Monetary Symbols.** No space is left between a monetary symbol and its related quantity. A number which immediately follows a monetary symbol does not need a numeric indicator.

Example P-17

25¢
$3.50
⠼⠃⠑⠸⠉
⠸⠎⠼⠉⠴⠑

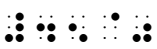
P11 Percent and Per Mille Signs

⠸⠏	Percent	%
⠸⠏⠏	Per mille	‰

P11.1 **Spacing with Percent and Per Mille Symbols.** No space is left between the symbol and its related quantity.

Example P-18

45%



Example P-19

35‰

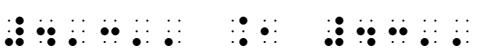
P12 Prime Sign

⠄	Prime	'
⠄⠄	(two primes)	"

The braille symbol is used wherever the print sign appears in mathematical context, regardless of its meaning. When more than one prime sign is used in print, the equivalent number of symbols are used in braille. Prime symbols must be unspaced from each other and from the quantity to which they apply. In Example P-20, the prime sign denotes feet and inches.

Example P-20

4'3" > 43"



PRACTICE E

Instructions: Retain the simple vertical listing, beginning each line in cell 1.

$25¢ - 5¢ = 20¢$

$\$4.89 + 5.5\% = \$5.16$

$36‰ \times 100 = 3.6$

5'8" = 68"

$\$1 = £0.633456$

THE EUROPEAN COMMA AND DECIMAL

P13 The European Mathematical Comma

In some European publications, the print sign for the mathematical comma looks different from the comma used in the United States. The braille symbol follows print, using dots 46 for the European mathematical comma.

⠨	European Mathematical Comma	.

The example below shows three different ways to notate “twenty-seven thousand”.

Example P-21

27,000
27.000
27 000

⠼⠃⠶⠚⠚⠚
⠼⠃⠲⠚⠚⠚
⠼⠃⠀⠚⠚⠚

The symbol transcribed for each comma follows print. Dot 6 represents the American comma; dots 46 represent the European comma. See Section P4.1 regarding the space used in the partitioned number.

P14 The European Decimal

In many European countries, the print sign used to for the decimal (the “decimal comma”) is different from the print sign used in the United States (the “decimal point”). The braille symbol follows print, using dot 6 for the European decimal.

⠨	European Decimal	,

Example P-22

$19.99 < £19,99

⠈⠎⠼⠁⠊⠲⠊⠊ ⠈⠣ ⠈⠇⠼⠁⠊⠂⠊⠊

The symbol transcribed for each decimal follows print: Dots 46 represent the American decimal point; dot 6 represents the European decimal comma.

For further practice, see Addendum 1—Reading Practice.

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STUDY TIPS

This is a self-guided course. There are many features to help you learn the material. Examples with commentary illustrate the rules. Practice drills reinforce topics recently presented and answers are provided so you can monitor your progress. Reading practice is offered in Addendum 1. The following study tips will help you get the most out of the lessons.

LEARNING THE MATERIAL

— Do not 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.
— In the print examples, circle or highlight the Nemeth portion. Transcribe the examples to reinforce the rule.
— 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.
— Underline, highlight, and write notes in the margins of your lesson manual.
— 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.
— Ask for clarification when a rule does not make sense to you.

THE PRACTICE MATERIAL

— Circle or highlight everything that should be transcribed in Nemeth.
— Slow down. By using 6-key entry instead of a translator you will better understand the braille from the reader's point of view.
— Proofread carefully before looking at the answers. Check that every opening Nemeth Code indicator is paired with a Nemeth Code terminator. Similarly, check for other paired symbols, such as fraction indicators, modified expression symbols, and level indicators.
— When comparing your braille transcription to the answer key, 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

— You will have two chances to turn in a near-perfect transcription of each exercise. Ask questions and review the rules before turning in your work.
— You are expected to turn in high quality work and not to use your grader as a proofreading tool.
— Do not try to copy braille examples that look like the exercise material. Instead, understand and apply the rule.
— Make note of items of which you are unsure. After receiving your report, even if your transcription is correct, look these items over again to reinforce the rule.

RESEARCH/REVIEW

— Analyze the mistakes found in your work and make sure you understand your errors before moving ahead to the next lesson. Ask questions until you are confident.
— Return to earlier lessons. Topics will make more sense to you in retrospect.
— Read Addendum 3 of this course ("Nemeth Format Summaries").
— Return to an earlier lesson exercise and back-translate the practices or your braille exercise by writing in longhand. Do not 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 small.
— Use a straightedge when levels are difficult to determine.
— Take breaks when your concentration wanes.
— 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 Nemeth students 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.

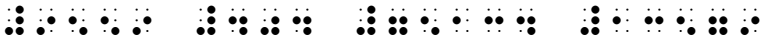
You are undertaking a serious study of one of the technical braille codes, and we would like you to consider stepping back a bit and learning the old fashioned way, using 6-key entry in your braille software program. It is our experience that the best transcribers are those that can read and write braille 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 material better if you take the 6-key approach while learning.

ANSWERS TO PRACTICE MATERIAL

PRACTICE A

1 

2 

3 

PRACTICE B

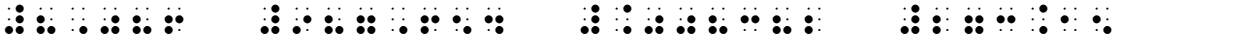
1 

2 

3 

4 

5 

6 

Did You Know? The numbers in the rightmost column are significant scientific or mathematical numbers.

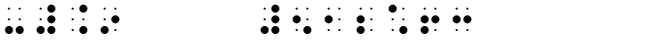
4.6692	the first six digits of one of Feigenbaum's constants from chaos theory
98.6	average healthy human body temperature in degrees Fahrenheit
3.14159	the first six digits of pi
31,536,000	the number of seconds in a year
365.2422	the number of days in a solar year
273.15	degrees Kelvin equivalent to zero degrees Celsius

PRACTICE C

1 

2 

3 

4 

5 

PRACTICE D

1 ⠼⠦⠨⠢ ⠐⠅ ⠼⠶⠲

2 ⠼⠦⠢ ⠨⠂ ⠼⠔⠨⠖

3 ⠼⠆⠔⠡⠒ ⠨⠅ ⠼⠒⠡⠆⠔

4 ⠼⠂⠲ ⠐⠂ ⠼⠆ ⠰⠆ ⠼⠶ ⠐⠂ ⠼⠂

5 ⠼⠂⠔⠠⠢⠒⠴⠤⠆⠠⠴⠂⠖⠈⠡⠦⠨⠆⠢⠴⠖⠨⠶⠢ ⠨⠅ ⠼⠆⠖⠆⠠⠶⠂⠴⠨⠴⠴

PRACTICE E

1 ⠼⠂⠢⠈⠉⠤⠢⠈⠉ ⠨⠅ ⠼⠆⠴⠈⠉

2 ⠈⠎⠲⠨⠦⠔⠬⠢⠨⠢⠈⠴ ⠨⠅ ⠈⠎⠢⠨⠂⠖

3 ⠼⠒⠖⠈⠴⠴⠈⠡⠂⠴⠴ ⠨⠅ ⠼⠒⠨⠖

4 ⠼⠢⠄⠦⠄⠄ ⠨⠅ ⠼⠖⠦⠄⠄

5 ⠈⠎⠂ ⠨⠅ ⠈⠇⠴⠨⠖⠒⠒⠲⠢⠖

This lesson has no exercise to hand in. Proceed to Lesson 1.