PRELIMINARY LESSON

- INTRODUCTION TO NUMERALS AND THE NUMERIC INDICATOR
- THE MATHEMATICAL COMMA AND DECIMAL POINT
- INTRODUCTION TO SIGNS OF OPERATION
- INTRODUCTION TO SIGNS OF COMPARISON
- MONETARY, PERCENT, AND PRIME SIGNS
- EUROPEAN SYMBOLS

Format

- General Principles

Answers to Practice Material

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 Appendix A.

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. Non mathematical 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 demarcate 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.

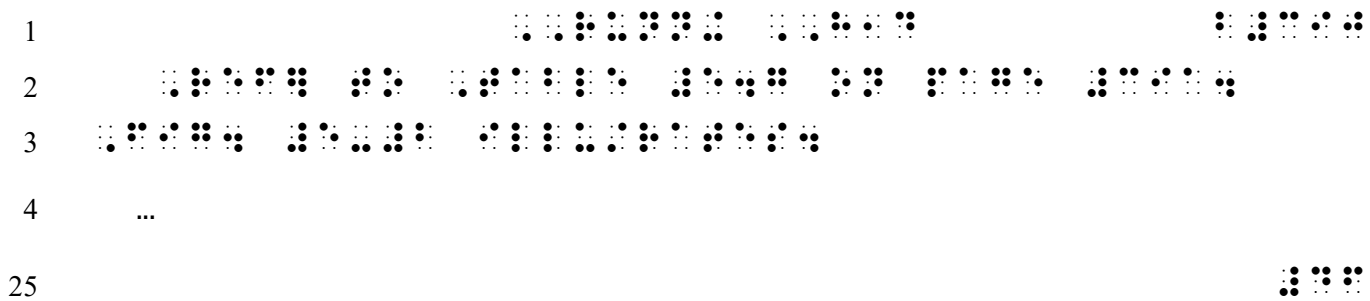
P3 Representation of Arabic Numerals

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.



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.

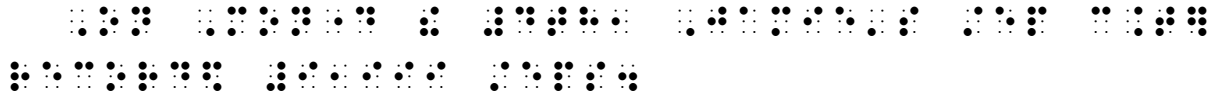
Numbers that have mathematical meaning within the narrative may be transcribed in UEB as long as the number is freestanding and is unmodified. "Unmodified" in this context means there is no symbol associated with the number, such as a monetary symbol or a percent sign, for example.
"Freestanding and 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 P3.1. 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 on pages viii-ix 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 digits of the Nemeth Code. 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.

Symbol Recognition: See Section P14 for a discussion of the European decimal point.

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 Appendix C of this course.

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 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.

Symbol Recognition: See Section P13 for a discussion of the European comma.

P8.1 **Spacing with Signs of Operation.** Unless otherwise stated, a sign of operation is unspaced from its related mathematical terms regardless of the print spacing. A numeric indicator is generally 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 sign requires a numeric indicator when the minus sign follows a space or begins a braille line. A numeral preceded by a plus sign does not require a numeric indicator even when the plus sign 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 sign and a decimal point that precedes a numeral when the minus sign follows a space or begins a braille line. A numeral

preceded by a plus sign and a decimal point does not require a numeric indicator even when the plus sign 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 below.

⠨⠅	Equals	$=$
⠨⠂	Greater Than (is greater than)	$>$
⠨⠁	Less Than (is less than)	$<$
⠨⠨	Proportion (as)	$::$
⠨⠂	Ratio (is to)	$:$

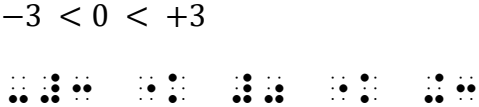
P9.1 **Spacing with Signs of Comparison.** A space is required between a sign of comparison and a sign of operation or any other expression which precedes or follows it. *Reminder*: A numeric indicator is usually required when a numeral is preceded by a space.

Example P-14

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

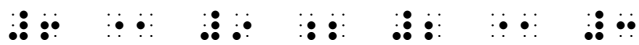
Example P-15

$-3 < 0 < +3$



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 signs of the Nemeth Code are the same as those used in UEB.

⠈⠉	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 one following the same "dot 4" pattern shown above.

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

Example P-17

$3.50 = 350¢

⠈⠎⠼⠉⠑⠚ ⠶ ⠼⠉⠑⠚⠈⠉

P11 Percent and Per Mille Signs

⠈⠴	Percent sign	%
⠈⠴⠴	Per mille sign	‰

P11.1 **Spacing with Percent and Per Mille Signs.** No space is left between these signs and their related quantities or symbols.

Example P-18

45% = 0.45

⠼⠙⠑⠴ ⠶ ⠼⠚⠲⠙⠑

Example P-19

$35‰ = .035$

P12 Prime Sign

⠄	Prime Sign	'
⠄⠄	(two prime signs)	"

The braille symbol for the prime sign is used wherever the print symbol appears in mathematical context regardless of its meaning. When more than one prime sign is used in print, the equivalent number of signs are used in braille. Prime signs must be unspaced from each other and from the quantity to which they apply. In the following example, the prime sign is used to denote feet and inches.

Example P-20

$4'3" > 43"$

PRACTICE E

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

$25¢ - 5¢ = 20¢$

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

$36‰ \times 100 = 3.6$

$5'8" = 68"$

$\$1 = £0.633456$

EUROPEAN SYMBOLS

P13 The European Comma

The print symbol for the European comma is different from the comma used in the United States. The braille symbol follows print.

⠰	European Mathematical Comma .

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.

P14 The European Decimal Point

The print symbol for the European decimal point is different from the decimal used in the United States. The braille symbol follows print.

⠰	European Decimal Point ,

Example P-22

$19.99 < £19,99

⠈⠲⠊⠊ ⠨⠅ ⠈⠇⠊⠊⠂⠊⠊

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

For further practice, see Appendix A—Reading Practice.

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.