LESSON 1

Read about this PROVISIONAL EDITION in the front matter to this book.
Check the NFB website periodically for updates to this 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*
- *CONTINENTAL SYMBOLS*

FORMAT

- *General Principles*

1.1 Philosophy: The braille code for mathematics is especially designed for the representation and transcription of mathematical and scientific notation. 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.

1.2 Non-technical and Technical Texts

1.2.1 Non-technical Texts: As defined in the Nemeth Code, the designation "non-technical" implies only the absence of mathematical or scientific notation. A work in law or medicine may be quite technical in its field but is regarded as non-technical in the sense just mentioned.

> The BANA Nemeth Code Technical Committee is discussing details regarding the term "non-technical text." This section will be completed after decisions are made.

1.2.2 Technical Texts: A technical text is any work in which mathematical or scientific notation appears. Narrative is transcribed in accordance with the rules of Unified English Braille ("UEB"). The mathematical or scientific notation is transcribed in accordance with the rules of the Nemeth Code. Technical text is referred to as "mathematical context" in this document.

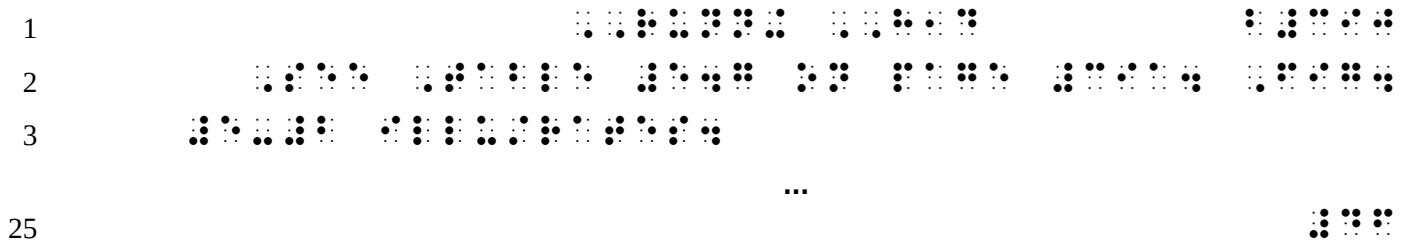
INTRODUCTION TO NUMERALS AND THE NUMERIC INDICATOR

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

1.3 Representation of Arabic Numerals: In the transcription of a technical text, digits are represented in two ways:

1.3.1 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 1.3-1 See Table 5.7 on page 391. Fig. 5-2 illustrates.



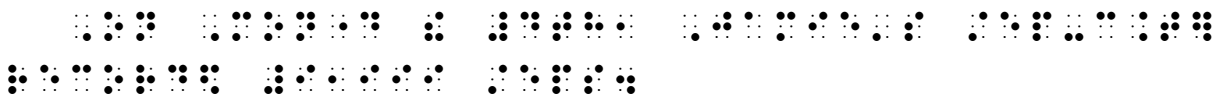
The number at the end of line 1 is print page number b390. The last number represents braille page 46 on line 25 of the braille page.

Numbers that have mathematical meaning within narrative context 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.)

Example 1.3-2 9 inches and 15 inches are 2 feet.

"Freestanding and unmodified" includes numbers with an internal comma and numbers with an ordinal ending. Also note that a number that touches literary punctuation is considered to be freestanding.

Example 1.3-3 On Monday the 4th, Jamie's step-counter recorded 9,999 steps.



1.3.2 Nemeth Code Digits: Nemeth Code digits are used to represent Arabic numerals which occur in mathematical context, as well as a freestanding mathematical number in narrative context which is combined with anything other than an internal comma (e.g., a minus sign or a decimal point). The ten Arabic 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
⠁	⠃	⠉	⠙	⠑	⠋	⠛	⠓	⠊	⠚

Although unmodified, freestanding mathematical numbers can be brailled in UEB, assume mathematical context in the isolated examples presented throughout the remainder of this lesson.

1.4 Numeric Indicator: Unless otherwise stated, the numeric indicator is required before a numeral that <u>follows a space</u> or before a numeral that <u>begins a braille line</u>.

Numeric Indicator ⠼

Example 1.4-1 5 10 15 20

⠼⠑ ⠼⠁⠚ ⠼⠁⠑ ⠼⠃⠚

1.4.1 SPECIAL CASE—Segmented Numbers: The numeric indicator is <u>not</u> used following a space that partitions a number into segments. *The numeric space indicator of UEB is not used in a technical transcription. Segmented numbers must be transcribed in Nemeth Code .*

Example 1.4-2 987 654 321

⠼⠊⠛⠉ ⠋⠖⠙ ⠉⠃⠁

Note: 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 first-hand experience with the topics presented in each lesson and you will be better prepared to braille the exercise for grading. Many of the points discussed in the lesson are illustrated only in the practice material. The Study Tips on pages i-ii offer more ways to get the most out of these activities.

Use a 40-cell line when transcribing the practice material. Check your work by comparing your transcription to the simulated braille located at the end of each lesson.

PRACTICE 1A

Instructions: Do not braille a heading for any of the practices in this lesson. Using a 40-cell braille line, 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

1.5 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 brailled in UEB, assume mathematical context in the isolated examples presented below.

Example 1.5-1 987,654,321

⠼⠊⠈⠋⠑⠛⠁⠉⠙⠂⠉⠓⠁⠉⠃

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

Example 1.5-2 997, 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 **1.14** for a discussion of the Continental decimal point, which is depicted by the same print symbol as a mathematical comma.*

1.6 Mathematical Decimal Point

Mathematical Decimal Point	⠨

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

Example 1.6-1 3.14159

⠼⠉⠨⠁⠙⠑⠁⠑

1.6.2 The Decimal Point and the Numeric Indicator: The numeric indicator is required before a decimal point that precedes a numeral when the decimal point <u>follows a space</u> or <u>begins a braille line</u>.

Example 1.6-2 .25 .5 .75

⠼⠨⠃⠑ ⠼⠨⠑ ⠼⠨⠛⠑

Reminder: When a decimal is part of a numeric label to a figure, table, section, etc., UEB is used. See 1.3.1.

FORMAT

1.7 General Principles: "Formatting" 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 Code 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 1B

Instructions: Begin the list on line 1 of the braille page. Use Nemeth Code numerals for all numbers in this list. Using a 40-cell braille line, 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

1.8 Signs of Operation: The most common signs of operation are listed below.

Plus	$+$	⠖
Minus	$-$	⠤
Multiplication (times)		
Cross (Cartesian product)	$\times$	⠦⠔
Dot	$\cdot$	⠨⠄
Division (divided by)	$\div$	⠔⠦

Since the minus sign and the hyphen are represented by the same symbol in both print and braille, the transcriber must determine the meaning of the symbols from their context.

*SYMBOL RECOGNITION See **1.13** for a discussion of the Continental comma, which is depicted by the same print symbol as the multiplication dot.*

1.8.1 Spacing with Signs of Operation: Unless otherwise stated, a sign of operation is <u>unspaced</u> from its related mathematical terms regardless of the print spacing. A numeric indicator is generally not needed within an unspaced expression.

Example 1.8-1 $834 + 75$ $53{,}613 - 2{,}016$ 19×18 $950 \cdot 92.3$ $40.3 \div 1.7$

⠼⠓⠉⠖⠛⠑ ⠼⠑⠉⠂⠋⠁⠖⠤⠃⠂⠚⠁⠋ ⠼⠁⠊⠦⠔⠁⠓ ⠼⠊⠚⠨⠄⠊⠃ ⠼⠙⠄⠚⠔⠼⠁⠄⠛

1.8.2 Positive and Negative Numbers: 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. *Numerals preceded by a $+$ sign or a $-$ sign must be brailled in Nemeth Code.*

Example 1.8-2 -3 -2 -1 0 $+1$ $+2$ $+3$

⠤⠼⠉ ⠤⠼⠃ ⠤⠼⠁ ⠼⠚ ⠖⠼⠁ ⠖⠼⠃ ⠖⠼⠉

Note: These are seven separate numerals.

1.8.2.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 1.8-3 –.75, –.5, –.25, 0.0, +.25, +.5

PRACTICE 1C

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	$3{,}951 \div 7$

INTRODUCTION TO SIGNS OF COMPARISON

1.9 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)	$:$	⠐⠂

1.9.1 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 1.9-1 $72{,}539 \times 33.3 = 2{,}415{,}548.7$

⠼⠛⠃⠉⠁ ⠼⠉⠉ ⠨⠅ ⠼⠃⠄⠁⠄⠁⠄⠁⠄⠛

Example 1.9-2 $-3 < 0 < +3$

⠤⠼⠉ ⠐⠅ ⠼⠚ ⠐⠅ ⠬⠼⠉

Example 1.9-3 $6 : 9 :: 2 : 3$

⠼⠋ ⠐⠂ ⠼⠊ ⠈⠈ ⠼⠃ ⠐⠂ ⠼⠉

PRACTICE 1D

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

1.10 Monetary Signs

> The BANA decision regarding construction of monetary signs has not yet been posted but the symbols used are given in the text below.

The monetary signs of UEB are used in math as well.

Cent	¢	⠈⠉
Dollar	$	⠈⠎
Euro	€	⠈⠑
Franc	₣	⠈⠋
Naira	₦	⠈⠝
Pound Sterling	£	⠈⠇
Yen	¥	⠈⠽

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.

1.10.1 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 1.10-1 $3.50 = 350¢

⠈⠎⠼⠉⠑⠊⠚ ⠨⠅ ⠈⠉⠼⠉⠑⠊⠚⠫

1.11 Percent and Per Mille Signs

Percent sign	%	⠨⠴
Per mille sign	‰	⠨⠴⠴

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

Example 1.11-1 $45\% = 0.45$

⠹⠑⠲⠙⠑ ⠨⠅ ⠼⠙⠲⠲⠙⠑⠲

Example 1.11-2 $35‰ = .035$

⠹⠑⠲⠙⠑⠲ ⠨⠅ ⠼⠲⠚⠑⠲

1.12 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 1.12-1 $4'3" > 43"$

⠼⠙⠄⠉⠄⠄ ⠨⠂ ⠼⠙⠉⠄⠄

PRACTICE 1E

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

$25¢ - 5¢ = 20¢$

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

$36‰ \times 100 = 3.6$

$5'8" = 68"$

$\$1 = £0.633456$

CONTINENTAL SYMBOLS

1.13 The Continental Comma

American Mathematical Comma	,	⠂
Continental Mathematical Comma	·	⠂

The print symbol for the continental comma is different from the comma used in the United States. The difference is <u>not</u> shown in braille—dot 6 is used to represent either comma. A transcriber's note is required to inform the reader of the Continental usage in the print edition. In this example the TN could say "The print copy uses a continental mathematical comma in the second numeral."

Example 1.13-1 27,000 = 27·000 = 27 000

⠼⠆⠚⠚⠚ ⠨⠅ ⠼⠆⠚·⠚⠚⠚ ⠨⠅ ⠼⠆⠚ ⠚⠚⠚

1.14 The Continental Decimal Point

American Decimal Point	.	⠲
Continental Decimal Point	,	⠲

The print symbol for the continental decimal point is different from the decimal used in the United States. The difference is <u>not</u> shown in braille—the braille symbol (46) is used to represent either decimal point. A transcriber's note is required to inform the reader of the Continental usage in the print edition. In this example the TN could say "The print copy uses a continental decimal point in the second numeral."

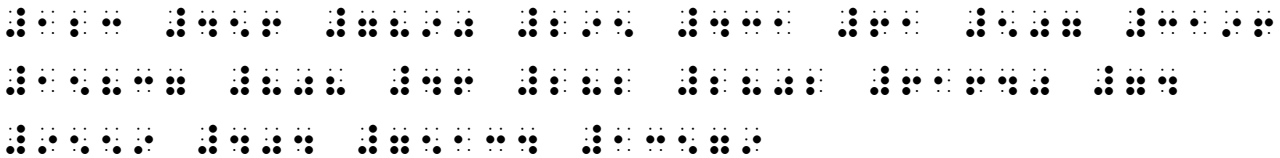
Example 1.14-1 $19.99 < £19,99

⠈⠎⠼⠁⠊⠲⠊⠊ ⠈⠅ ⠈⠇⠼⠁⠊,⠊⠊

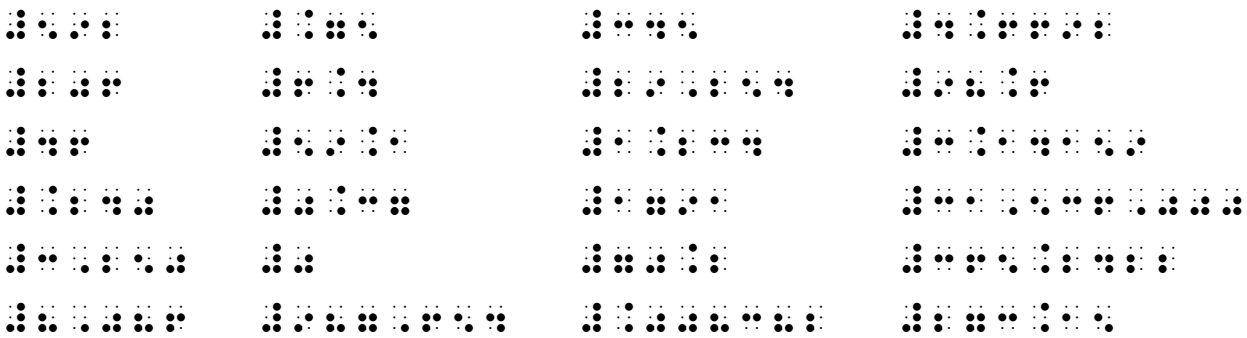
For further practice, see Appendix A—Reading Practice.

ANSWERS TO PRACTICE MATERIAL

PRACTICE 1A



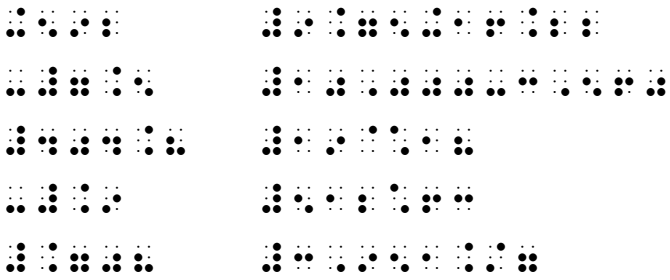
PRACTICE 1B



Fun Fact: 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 1C



PRACTICE 1D

⠼⠦⠨⠢ ⠐⠅ ⠼⠶⠲

⠼⠦⠢ ⠨⠂ ⠼⠔⠨⠖

⠼⠆⠔⠡⠒ ⠨⠅ ⠼⠒⠡⠆⠔

⠼⠂⠲ ⠐⠂ ⠼⠆ ⠰⠆ ⠼⠶ ⠐⠂ ⠼⠂

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

PRACTICE 1E

⠼⠆⠢⠈⠉⠤⠢⠈⠉ ⠨⠅ ⠼⠆⠴⠈⠉

⠈⠎⠲⠨⠦⠔⠬⠢⠨⠢⠈⠴ ⠨⠅ ⠈⠎⠢⠨⠂⠖

⠼⠒⠖⠈⠴⠴⠈⠡⠂⠴⠴ ⠨⠅ ⠼⠒⠨⠖

⠼⠢⠄⠦⠄⠄ ⠨⠅ ⠼⠖⠦⠄⠄

⠈⠎⠂ ⠨⠅ ⠈⠇⠴⠨⠖⠒⠒⠲⠢⠖

EXERCISE 1

Exercise 1 will be available when this course is finished being written and is no longer "Provisional".

Proceed to Lesson 2.