

LESSON 4

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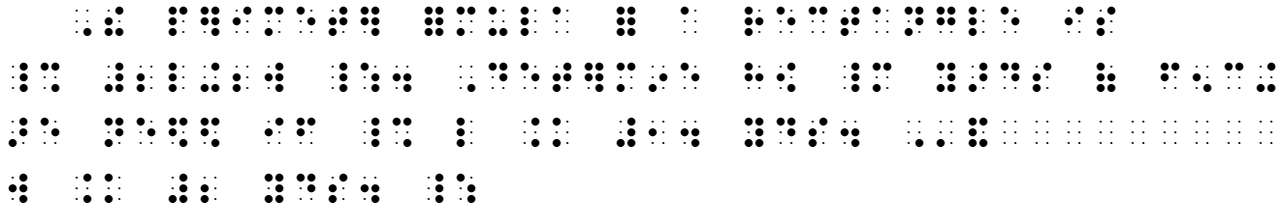
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LESSON PREVIEW

A closer look at letters used as variables. How to tell if a letter is a variable or an abbreviation. Treatment of Roman numerals. Treatment of other mathematical letter combinations as well as sequences of unspaced letters. How to handle letters used as numerals in nondecimal bases. German, Greek, Hebrew, and Russian letters used in mathematical notation. A look at mathematical constants. Rules regarding the "enclosed list". More rules about English letters and about abbreviations. Code switching considerations with headings.

Example 4-3

The perimeter formula for a rectangle is $2l + 2w$. Determine how many yards of fencing are needed if $l = 14$ yds. and $w = 2$ yds.

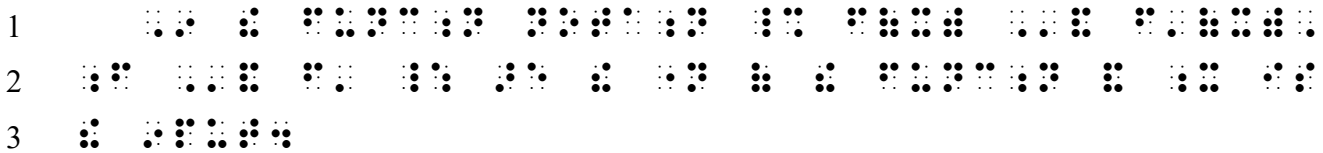


l and w are variables. Rules regarding nonuse of the English-letter indicator are followed.

- 4.1.3 **Code Switching Considerations.** As seen in Lesson 3, a freestanding unmodified mathematical letter may be transcribed in UEB or Nemeth, depending on the surrounding material. This avoids excessive code switching. Judicious use of the single-word switch indicator will provide smoother reading when a variable or other mathematical letter is part of a longer phrase.

Example 4-4

In the function notation $f(x)$ and $f'(x)$, f and f' are the name of the function and x is the input.



Line 2: "Single letter" f is transcribed inside the Nemeth switches; the single-word switch indicator is used for the word "and". Variable "x" is transcribed in UEB because the surrounding text is in UEB.

PRACTICE 4A

1. Express y in terms of x if $2x - 3y = 12$.
2. If $A = l \times l$, what is the length (l) of a side in inches if the area (A) of a square is 7.3 sq.ft.?
3. It is much easier to remember $A = lw$ (Area = length \times width) than it is to remember $B = jt$ when trying to figure out how much carpet to buy for the living room.
4. Determine the area A of trapezoid T with upper base $a = 3$ in., lower base $b = 6$ in., and height $h = 13$ in.

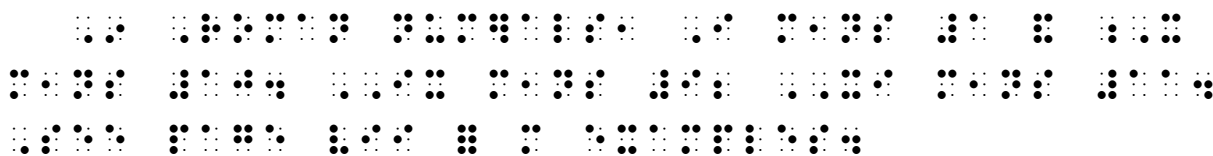
Roman Numerals

4.2 Code Switching with Roman Numerals

The rules you have learned about freestanding, unmodified mathematical numbers also apply to Roman numerals. Specifically, freestanding, unmodified Roman numerals within the narrative may be transcribed in UEB, but inside the switches they follow Nemeth rules. A Roman numeral used as an identifier may be transcribed in either code. Use context clues to decide whether or not to switch, just as you do with Arabic numerals.

Example 4-5 |

In Roman numerals, I means 1 and X means 10. IX means 9; XI means 11. See page vii for more examples.



Code switching is not required for the unmodified Roman numerals within the narrative.

4.3 Capital Roman Numerals

4.3.1 **Roman Numerals Consisting of One Capital Letter.** In Nemeth context, an English-letter indicator and a single capitalization indicator are used before a Roman numeral when it follows the Nemeth definition of a "single letter" – that is, if the Roman numeral is preceded by a space or by one or more punctuation marks and followed by a space or by one or more punctuation marks. (Review Section 3.10.1 in Lesson 3.)

⠠⠠ English-letter Indicator ⠠ Single Capitalization Indicator
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There are seven Roman numerals consisting of a single letter.

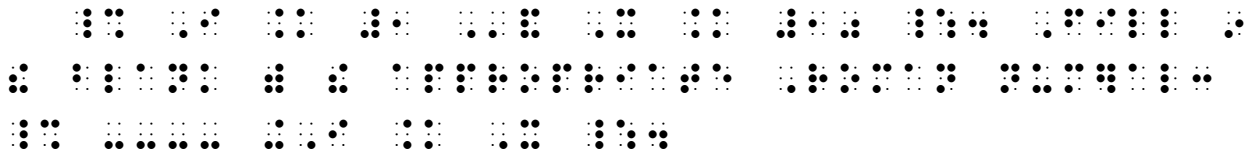
➤ I V X L C D M



Within a mathematical expression, the rules regarding the use or the nonuse of the English-letter indicator with a single-letter capital Roman numeral are the same as for any single English letter. (Lesson 3)

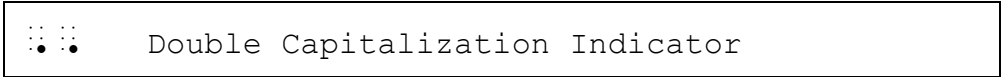
Example 4-6

I = 1 and X = 10. Fill in the blank with the appropriate Roman numeral: $___ + I = X$.

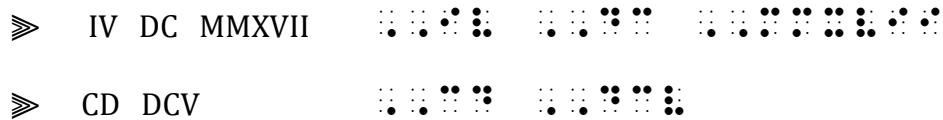


English-letter indicators are not needed, according to Nemeth rules for letters preceding or following a comparison sign. Each single-letter Roman numeral is preceded by a single capitalization indicator.

- 4.3.2 **Roman Numerals Consisting of Two or More Capital Letters.** The double capitalization indicator of the Nemeth Code is used before a Roman numeral consisting of two or more unspaced capitalized letters.



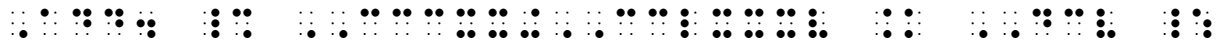
Recall that, in Nemeth, a mathematical letter sequence that corresponds to a shortform of UEB does not require an English-letter indicator because no contractions are used inside the switches. This rule also applies to Roman numerals.



Within a mathematical expression, Nemeth spacing rules are followed.

Example 4-7

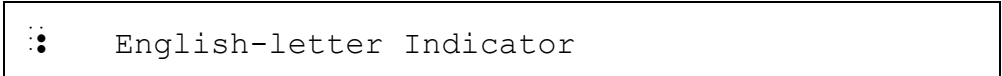
Add. CCCXX + CCLXXXV = DCV



Within the equality, the Roman numerals are unspaced from the plus sign. A space precedes and follows the equals sign. Each of these Roman numerals is preceded by a double capitalization indicator.

4.4 Lowercase Roman Numerals

In Nemeth context, an English-letter indicator is used before any lowercase Roman numeral when it follows the Nemeth definition of a "single letter" – that is, if the Roman numeral is preceded by a space or by one or more punctuation marks and followed by a space or by one or more punctuation marks.



Review: Nonuse of the English-letter Indicator

In Nemeth, the English-letter indicator is not used with a Roman numeral in the following circumstances.

- i. When a Roman numeral consists of two or more unspaced capitalized letters in regular type, no English-letter indicator is used.

➤ II III VIII XV ⠠⠠⠠⠠ ⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠

- ii. When a Roman numeral immediately precedes or follows a sign of comparison, no English-letter indicator is used.

➤ X = 10 ⠠⠠ ⠠⠠ ⠠⠠⠠⠠

➤ 1000 = M ⠠⠠⠠⠠⠠ ⠠⠠ ⠠⠠

- iii. When a Roman numeral is in an expression consisting of a sequence of unspaced mathematical symbols, no English-letter indicator is used.

➤ ix – v = iv ⠠⠠⠠⠠⠠ ⠠⠠ ⠠⠠

- iv. When a Roman numeral is entirely enclosed between grouping signs, no English-letter indicator is used.

➤ (ii) ⠠⠠⠠⠠

- v. When a Roman numeral is modified, no English-letter indicator is used.

➤ I' ⠠⠠⠠

Roman numerals starting with 5,000 include a line over the numeral in print. This notation will be discussed in Lesson 12.

PRACTICE 4B

- i. Triangle ABC in Quadrant IV is reflected in Quadrant III as Triangle A'B'C'.
- ii. iv + vi = x
- iii. X = 10, L = 50, C = 100, and D = 500.
- iv. Review items v and vi.
- v. Explain why MC = 1100, but CM = 900.
- vi. Use Formulas I' and III' to prove the statement.

Nondecimal Bases

4.8 Letters Used to Represent Numerals in Nondecimal Bases

When a system of numeration is to a base larger than 10, additional digits are devised to represent digits beyond the ten Arabic numerals. One method for providing additional digits is to use letters. For example, in base 12, t or T may represent ten and e or E may represent eleven. These letters do not function as letters – they are digits and are indicated as such by use of the numeric indicator. Only uncapitalized letters are used to represent nondecimal numerals in braille, even when the letters are capitalized in print.

⤵ t or T ⠴⠠⠠⠠⠠

⤵ e or E ⠴⠠⠠⠠⠠

The rules regarding the use (or nonuse) of the numeric indicator for nondecimal digits are the same as the rules for the ten Arabic numerals 0 through 9. Numerals in nondecimal bases are mathematical symbols and are punctuated accordingly.

Transcriber’s Note Required. If the print copy uses capital letters, a transcriber’s note is required to inform the reader of a change in capitalization in the braille transcription. Sample transcriber’s note:

Letters representing nondecimal digits are capitalized in print.

A more specific transcriber’s note is used in [Example 4-13](#):

In the next paragraph, the letters which represent base 12 digits t and e are capitalized in print.

Example 4-13 |

Counting in base twelve: 0 1 2 3 4 5 6 7 8 9 T E. 13T8 and T1E5 are base 12 numerals.

1	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
2	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
3	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
4	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
5	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
6	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

4.9 Nonalphabetic Symbols Used to Represent Numerals

If a symbol other than a letter is used to represent a digit, choose a one-cell symbol to represent the special sign. The preferred method is to select a letter of the English alphabet in a similar manner as described in [Section 4.8](#). A transcriber’s note must specify the meanings assigned to these letters. If the print sign lacks a symbol in the Nemeth code, the transcriber’s note should include a drawing or a description in order to identify it.

OTHER ALPHABETS

4.10 Alphabetic Indicators

The language of mathematics uses letters from more than just the English alphabet. Specific provision is made in the Nemeth Code for the transcription of the letters of the German, Greek, Hebrew, and Russian (Cyrillic) alphabets. Each alphabet has a unique alphabetic indicator.

4.10.1 **Code Switching and Use of Letter Indicators.** Recall that switching to Nemeth to transcribe an English letter is not always required, and that the Nemeth English-letter indicator may be omitted in certain circumstances. In contrast, an alphabetic indicator is always required to identify a letter from the German, Greek, Hebrew, or Russian alphabets and a switch to Nemeth is always required for such letters even if UEB has a symbol for the letter.

4.10.2 **Capitalization and Punctuation.** When a letter from any alphabet is capitalized, the capitalization indicator (dot 6) is placed between the alphabetic indicator and the letter as illustrated in [Section 4.11](#). Letters are individually capitalized—the effect of the capitalization indicator extends only to the letter which follows it.

In a Nemeth transcription, letters from the German, Greek, Hebrew, and Russian alphabets are mathematical symbols and so are punctuated mathematically when the punctuation occurs within the Nemeth switches.

Certain letters have unique mathematical applications. If you are unsure of a letter, find an expert who can identify it. Do not guess.

4.11 The Greek Alphabet

Many letters from the Greek alphabet are used in mathematics and science. The following indicator identifies a letter as being from the Greek alphabet.

⠠ Greek-letter Indicator (standard form)

This symbol is read as the Greek-letter indicator only when immediately followed by a letter or by the capitalization indicator and a letter. Note that the order of indicators is different from UEB. Here is the (capitalized) Greek letter Delta as transcribed in Nemeth.

⠠⠠ Δ ⠠⠠⠠

The Nemeth table of Greek letters is reproduced on the next page. Take particular notice of the lowercase "ascenders" or tall lowercase letters. As in the English alphabet, not all lowercase letters are the same height. Compare the heights of alpha beta gamma delta epsilon in their lowercase forms: $\alpha \beta \gamma \delta \epsilon$.

Greek Alphabet Table

<u>Name of letter</u>	<u>Regular uncapitalized</u>	<u>Regular capitalized</u>	<u>Alternative form</u>
alpha	α ⠠⠠⠠	A ⠠⠠⠠	α ⠠⠠⠠
beta	β ⠠⠠⠠	B ⠠⠠⠠	β ⠠⠠⠠
gamma	γ ⠠⠠⠠	Γ ⠠⠠⠠	
delta	δ ⠠⠠⠠	Δ ⠠⠠⠠	
epsilon	ϵ ⠠⠠⠠	E ⠠⠠⠠	
zeta	ζ ⠠⠠⠠	Z ⠠⠠⠠	
eta	η ⠠⠠⠠	H ⠠⠠⠠	
theta	θ ⠠⠠⠠	Θ ⠠⠠⠠	ϑ ⠠⠠⠠
iota	ι ⠠⠠⠠	I ⠠⠠⠠	
kappa	κ ⠠⠠⠠	K ⠠⠠⠠	
lambda	λ ⠠⠠⠠	Λ ⠠⠠⠠	
mu	μ ⠠⠠⠠	M ⠠⠠⠠	
nu	ν ⠠⠠⠠	N ⠠⠠⠠	
xi	ξ ⠠⠠⠠	Ξ ⠠⠠⠠	
omicron	$ο$ ⠠⠠⠠	O ⠠⠠⠠	
pi	π ⠠⠠⠠	Π ⠠⠠⠠	
rho	ρ ⠠⠠⠠	P ⠠⠠⠠	
sigma	σ ⠠⠠⠠	Σ ⠠⠠⠠	ς ⠠⠠⠠
tau	τ ⠠⠠⠠	T ⠠⠠⠠	
upsilon	υ ⠠⠠⠠	Υ ⠠⠠⠠	
phi	ϕ ⠠⠠⠠	Φ ⠠⠠⠠	φ ⠠⠠⠠
chi	χ ⠠⠠⠠	X ⠠⠠⠠	
psi	ψ ⠠⠠⠠	Ψ ⠠⠠⠠	
omega	ω ⠠⠠⠠	Ω ⠠⠠⠠	
sampi	Ϡ ⠠⠠⠠		
stigma	Ϛ ⠠⠠⠠		
vau	Ϝ ⠠⠠⠠		
koph (qoph)	Ϙ ⠠⠠⠠		

4.11.1 **Code Switching with Greek Letters.** Even though the uncapitalized form of the Greek letters in Nemeth is identical to the uncapitalized form in UEB, you must switch to Nemeth when a Greek letter appears in a Nemeth transcription, even within the narrative. As with English letters, lowercase Greek letters are often printed in italics uniformly throughout a technical document or

4.11.3 **Alternate Form of Greek Letters.** Some lowercase Greek letters occur in variant print forms. The Greek alphabet table in the Nemeth code book shows an alternate form for five of the Greek letters (alpha, beta, theta, sigma, and phi). The following indicator is used to identify the alternate forms.

⠠⠠⠠⠠⠠⠠ Greek-letter Indicator (alternate form)

The alternative form is used in braille only when both forms—standard and alternative—appear in the same print text. If a Greek letter is represented by its alternative form *instead of its standard form throughout* the print text—that is, only one form of the letter is used throughout—the symbol for the standard form is used in braille. Include a transcriber’s note to inform the reader. Sample transcriber’s note:

The alternate form of the Greek letter theta is used in print. In braille, the standard form is used.

If a text shows an alternate form of a Greek letter that does not appear in the Nemeth Code table, determine if you should substitute the regular form or if you should use the alternate Greek-letter indicator. If the letter’s identity is not clear from context, consult an expert in the field in order to determine its designation.

PRACTICE 4D

Although the handwritten form of phi (φ) may be found in source materials, only the standard form (ϕ) is used in this book.


Another circle constant, the Greek letter tau, τ , equals 2π , or approximately 6.28.

The symbol Σ indicates summation. Δ signifies change.

In statistics, μ denotes the population mean; in engineering, μ is the coefficient of friction. In number theory, μ represents the Möbius function whereas, in particle physics, μ is the symbol for the muon.

4.13 The Hebrew Alphabet

Hebrew letters used as mathematical symbols must be transcribed in Nemeth. The following indicator is used to identify a letter as being from the Hebrew alphabet.

 Hebrew-letter Indicator

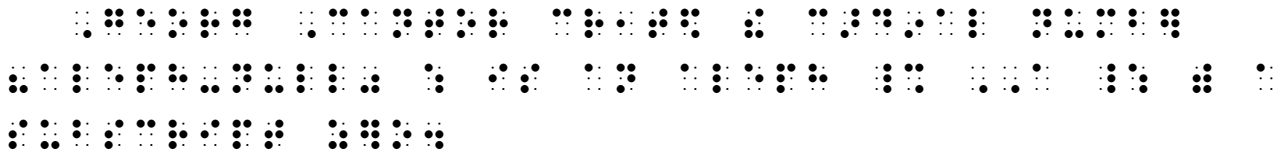
The Hebrew alphabet has no capitalized form. The letter most commonly encountered in technical material is the aleph: א The aleph is usually written with a subscript, which will be discussed in Lesson 6.

 aleph א
--

A complete list of the Hebrew letters and their braille equivalents can be found in *World Braille Usage*, which is available for download at Perkins.org.


Example 4-22

Georg Cantor created the cardinal number "aleph-null" which is an aleph א with a subscript zero.






4.14 The Russian Alphabet

Russian (Cyrillic) letters used as mathematical symbols must be transcribed in Nemeth. The following indicator is used to identify a letter as being from the Russian alphabet.

 Russian-letter (Cyrillic) Indicator

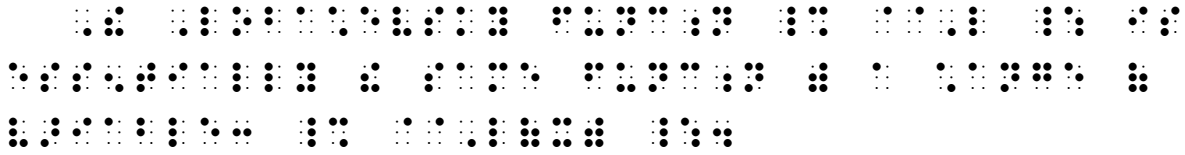
Two Cyrillic letters in common usage are Sha which is used in number theory and Ell (also the lowercase ell) which is used in hyperbolic (Lobachevskian) geometry. The Sha usually keeps company with bold and barred letters, and so will be further discussed in Lesson 7. Note the similarity between the Cyrillic letter ell and the Greek letter pi. If the letter's identity is not clear from context, consult an expert in the field in order to determine its designation.

A complete list of the Russian letters and their braille equivalents can be found in *World Braille Usage*, which is available for download at Perkins.org.

 ell π
 Ell Π
 Sha Ш

Example 4-23

The Lobachevsky function \mathcal{L} is essentially the same function with a change of variable: $\mathcal{L}(x)$.



Note: The Russian alphabet table in *World Braille Usage* shows how to transcribe the Cyrillic letters in sentence 2: dots 1, 12, 2456, 1245, 145, 15, 245, 1356, 24, and 13.

PRACTICE 4E

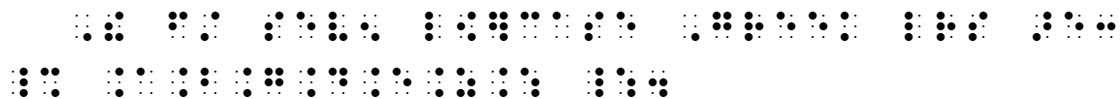
- 1) Be sure to differentiate between the Cyrillic letters "ell" Л and "Ell" Л and the Greek letters "pi" π and "Pi" Π.
- 2) The first ten uncapitalized Cyrillic letters are: ah а, beh б, veh в, gheh г, deh д, yeh е, zheh ж, zeh з, ee и, and kah к.

4.15 A Sequence of Unspaced Letters

- a. **Non-English Letters.** The effect of an alphabetic indicator extends only to the letter which follows it. Thus, in a sequence of unspaced letters from non-English-letter alphabets, the appropriate alphabetic indicator is used before each letter.

Example 4-24

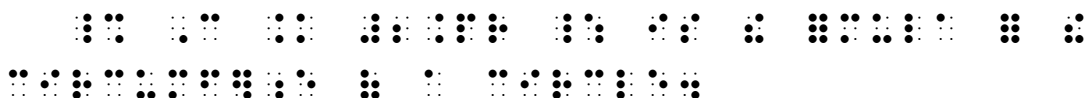
The first seven lowercase Greek letters are: $\alpha\beta\gamma\delta\epsilon\zeta\eta$.



- b. **English Letters.** An English letter in regular type which appears in an unspaced sequence of terms does not require a letter indicator. Recall that mathematical letters which are consistently *printed* in italics are transcribed in regular type.

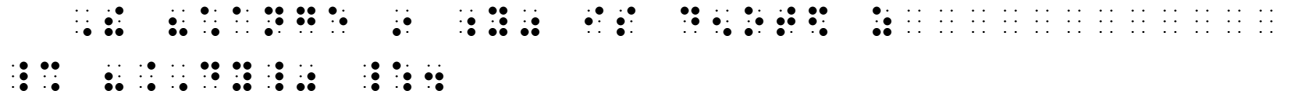
Example 4-25

$C = 2\pi r$ is the formula for the circumference of a circle.



Example 4-26

The "change in y" is denoted as "Δy".



4.15.1 **Derivatives.** The English letter combinations "dx", "dy", etc. often used in differential notation are usually spaced away from surrounding characters in print in order to enhance recognition. The space is omitted in braille unless another Nemeth rule requires a space. Print may show the letter d in italics or in regular type. Either way, the letter is not italicized in braille.

Example 4-27

$$(x + y) dx dy = \underline{\quad}$$



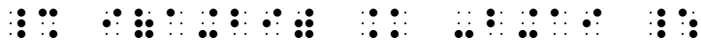
In print, there is a space before each "d".

4.16 Mathematical Constant

A mathematical constant is a special number whose value is nonvarying ("constant") and is represented by a certain alphabetic character. Two common examples are the Greek lowercase pi π and the English letter *i*. Constants are usually printed in italics uniformly throughout a document. In both UEB and Nemeth, constants are transcribed as regular type unless other circumstances require the typeface to be retained.

Example 4-28

$$i(a + bi) = -b + ai$$



Example 4-29

$$C = 2\pi r + \pi\Delta r$$



Linage and judicious placement of code switches is the challenge in this practice. After transcribing each sentence, write down your reasons for switching where you did. Then compare your decisions to the answer key and commentary at the end of the lesson.

PRACTICE 4F

1. Variables a and b are inversely related.
2. There exists a constant N such that no bit of Ω after the N th can be proven to be 1 or 0.
3. Randall replied, " $12 - n, 11 - n, 10 - n \dots$ which is correct?"
4. " $12 - n, 11 - n, 10 - n, \dots$ "
5. Which is correct: " $4x + 3y$," " $3x + 4y$," or " $4x + 4y$ "?
6. What is the remainder when 101 is divided by 3? ($101 \div 3$)
7. The result is $(ax + by)(cx + dy)$, where all components are real.
8. Δx means "the change in x " and Δy means "the change in y ". When x increases by Δx , y increases by Δy as expressed in the equation $y = \Delta y = f(x + \Delta x)$.
9. ($4x + 3y$ is the denominator.)

ENCLOSED LISTS

4.17 Special Case—Definition of an "Enclosed List"

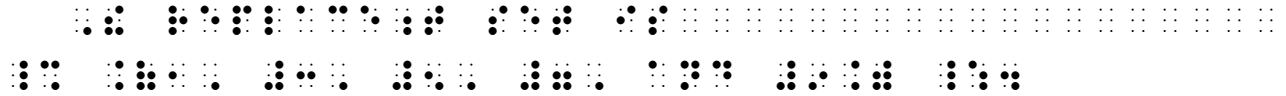
Special provision is made for the transcription of a sequence of mathematical items enclosed within grouping signs. All of the following must be true in order to apply this rule.

- i. The sequence must begin and end with a sign of grouping. The grouping signs do not have to be of the same kind.
- ii. The list must have at least two items and the items must be separated by commas.
- iii. An item of the list may be any sign used for omission – for example, an ellipsis or a long dash.
- iv. The list cannot contain any punctuation mark other than the separating commas. (The omission ellipsis or long dash are not considered to be punctuation.)
- v. The list cannot contain any words, abbreviations, ordinal endings, or plural endings. (An exception applies when a word is an element in set notation. See [Section 4.17.3.b.](#))
- vi. The list cannot contain a sign of comparison.

When a word (or words) appearing within set notation is not one of the elements of the set, it is still transcribed in Nemeth, but the grouped expression is no longer considered to be an "enclosed list". The word is transcribed without contractions and without the use of the single-word switch indicator.

Example 4-46

The replacement set is {1, 3, 5, 7, and 9}.



This set does not meet the requirements of an "enclosed list" because it contains a word that is not an element of the set. Numeric indicators are required before each number that is preceded by a space.

Instructions: First determine if each item is or is not an enclosed list. Write YES if the item is an enclosed list and NO if it is not. Then transcribe the YES items in Nemeth.

PRACTICE 4G

1. $\{a, b, c, d\}$
2. $(-1, -2, -3)$
3. $(h\text{ ft}, k\text{ in})$
4. (ab, cd, ef)
5. $1, i, -1, -i$
6. $(1, i, 2, ii)$
7. $(1\text{st}, 2\text{nd}, 3\text{rd})$
8. (A, A', B, B', C)
9. $\{__, .13, .15, .17, __\}$
10. $(1 + h, 2 + k, 0)$
11. $(x = 1, 2, \dots, 10)$
12. $(a, b]$
13. $(1\ 2\ 3)$
14. $[0, 1]$
15. $(u, v; x, y)$
16. $\{(Denver, 19), (Utah, 27), (Minnesota, 24), (San Antonio, 28)\}$
17. (a, b, \dots)
18. $(x + 1, x + 2, ?, ?, x + 5)$
19. $\langle -1, 0 \rangle$
20. $(2, 4, 6, __, 10)$
21. $(0, a, 1, b, 2)$
22. $\{1's, 2's, 3's\}$
23. $\{1, 2, \text{and } 3\}$

MORE ABOUT ENGLISH LETTERS

4.18 An English Letter Touching Only One Grouping Symbol

In Lesson 3, you learned that the English-letter indicator is not needed when a "single letter" is enclosed between mathematical grouping symbols.

(c) compare to "c"

However, when a "single letter" is in direct contact with only one grouping sign and the letter is not an item in an enclosed list as defined in [Section 4.17](#), rules regarding the English-letter indicator are applied as though the grouping sign was not present.

Example 4-47

$(k = 1, 2, \dots, n)$.

Without the left parenthesis, the letter k would not need an English-letter indicator because it is followed by an equals sign. Without the right parenthesis, the letter n would need an English-letter indicator because it is preceded by a space and followed by punctuation.

Example 4-48

Consider the set $\{m \text{ and } n\}$.

Set notation is mathematical and so a switch to Nemeth is required. Without the left brace, the letter m would need an English-letter indicator because it is preceded and followed by a space. Without the right brace, the letter n would need an English-letter indicator because it is preceded by a space and followed by punctuation.

Example 4-49

If two events are mutually exclusive we write $P(A \text{ AND } B) = 0$ where $P(A \text{ AND } B)$ means "the probability of A and B occurring at the same time".

1

 2

 3

 4

Line 2: Without the left parenthesis, the letter A would not need an English-letter indicator because it immediately follows the letter P . Without the right parenthesis, the letter B would not need an English-letter indicator because it is followed by a comparison sign.

Line 3: Without the left parenthesis, the letter A would not need an English-letter indicator because it immediately follows the letter P. Without the right parenthesis, the letter B would need an English-letter indicator because it is preceded and followed by a space.
 Line 4: Letters A and B follow the rules of UEB in the narrative.

- a. **Roman Numerals.** The same rule applies to a Roman numeral that is in direct contact with only an opening or closing grouping sign. The English-letter indicator is used or is not used as though the grouping sign was absent. The following three samples illustrate Roman numerals used as identifiers, assuming uninterrupted mathematical context.

➤ i) ⠠⠠⠠⠠⠠
 ➤ iv) ⠠⠠⠠⠠⠠⠠⠠
 ➤ v) ⠠⠠⠠⠠

- b. **Modified Grouping Sign.** If the grouping sign includes a prime or other modifying symbol, the English-letter indicator is not used with the single English letter that touches the grouping symbol.

➤ t]' ⠠⠠⠠⠠⠠⠠

Example 4-50

t]' and v] have unique meaning.

⠠⠠⠠ ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠ ⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠

4.19 English Letters with Plural, Possessive, or Ordinal Endings

When a "single letter" has a plural, possessive, or ordinal ending, in mathematical context the English-letter indicator rules of the Nemeth Code are applied as though such endings were not present. The following samples illustrate proper use of the English-letter indicator, assuming mathematical context. Note that the expressions are punctuated mathematically. The presence of a plural, possessive, or ordinal ending does not change the fact that the punctuation mode is mathematical.

- a. Plural

➤ ps, qs, rs ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠

Think: p, q, r – English-letter indicator is required.

➤ Xs, Ys, Zs ⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠

Think: X, Y, Z – English-letter indicator is required.

b. Possessive

Reminder: To prevent dot 3 from being read as a prime sign, a punctuation indicator is inserted before an apostrophe.

➤ $p's, q's, r's$ ⠠⠏⠛⠎⠠⠒⠛⠎⠠⠓⠛⠎

Think: p, q, r – English-letter indicator is required.

➤ $X's, Y's, Z's$ ⠠⠭⠛⠎⠠⠶⠛⠎⠠⠵⠛⠎

Think: X, Y, Z – English-letter indicator is required.

c. Ordinal

➤ $n\text{th}, 2n\text{th}$ ⠠⠒⠎⠞⠠⠓⠞⠞

Think: n – English-letter indicator is required; 2n – English-letter indicator is not required.

d. Letter Combinations

Reminder: Mathematical letter combinations require a switch to Nemeth, but no English-letter indicator is needed. Capital letters are individually capitalized.

➤ ABs and GHs ⠠⠁⠃⠎⠠⠒⠞⠞⠠⠒⠞⠞

➤ $AB's$ and $GH's$ ⠠⠁⠃⠛⠎⠠⠒⠞⠛⠎⠠⠒⠞⠛⠎

➤ $ab's$ and $gh's$ ⠠⠁⠃⠛⠎⠠⠒⠞⠛⠎

➤ $ab\text{th}$ and $jk\text{th}$ ⠠⠁⠃⠞⠠⠒⠞⠞

Instructions: Stay in Nemeth to transcribe items C) and E).

PRACTICE 4H

A) Find all ABs , CDs , and EFs ; draw $XYZs$.

B) Find all $AB's$, $CD's$, and $EF's$; draw $XYZ's$.

C) (1st, 2nd, ... nth, ... 49th)

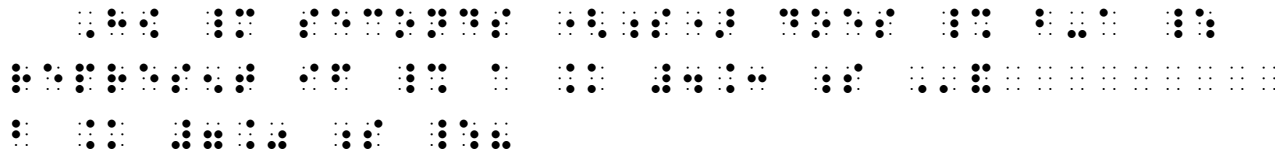
D) Does $|a| \times |b| = |ab|$?

E) If Q , then $\{[NOT-P] OR P\}$.

In [Example 4-60](#) the letter s is an abbreviation (printed in normal typeface), and letters *a* and *b* are variables (printed in italics). Review [Section 4.1.2](#), "Abbreviation or Variable?"

Example 4-60

How many seconds (*s*) does $b - a$ represent if $a = 4.3$ s and $b = 7.0$ s?



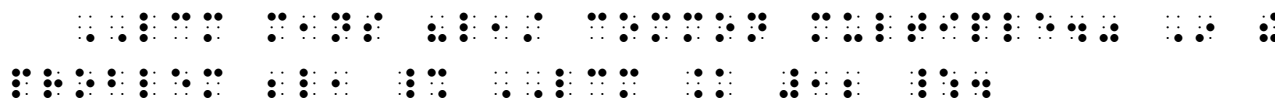
The single-letter abbreviation requires an English-letter indicator; the variables do not because they are either touching a sign of operation or next to a sign of comparison.

4.24 Fully Capitalized Abbreviations – Acronyms and Initialisms

In Nemeth, an abbreviation consisting of more than one capital letter is capitalized as a unit using the double capitalization indicator of the Nemeth Code. Nemeth rules for spacing and punctuation of acronyms and initialisms follow the same rules as those for abbreviations.

Example 4-61

LCM means "least common multiple." In the problem below, $LCM = 12$.

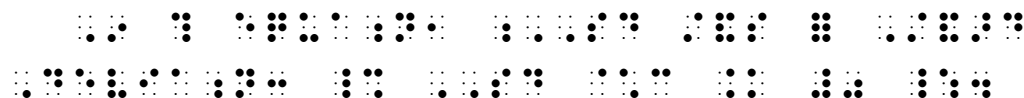


On line 2, the three-letter abbreviation (initialism) is part of the math.

4.24.1 **UEB vs. Nemeth Code.** In literary mode, apply UEB rules regarding use of the grade 1 indicator with abbreviations. In Nemeth mode, apply Nemeth rules regarding use of the English-letter indicator with abbreviations. In both modes, the lineage rules of Nemeth are followed.

Example 4-62

In this equation, SD stands for Standard Deviation: $SD \times c = 0$.




*In UEB, SD needs a grade 1 indicator in order not to be read as "SAID". In Nemeth, an English-letter indicator is not needed for the two-letter abbreviation because contractions are not allowed inside the switches. The abbreviations (*SD*) is spaced away from the operation sign; the variable (*c*) is not.*

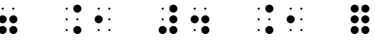
Example 4-64


Problem Set A

(a) $7 > 4 > -?-$

(b) $|-6| _ 6$ (Use =, >, or <)

1 

2 

3 

4

Line 1: The opening Nemeth Code indicator fits on the line with the cell-5 heading.


Line 2: The first identifier is transcribed in Nemeth.

Example 4-65

Problem Set A [CC 7.11.d]


(a) $7 > 4 > -?-$

(b) $|-6| _ 6$ (Use =, >, or <)

1 

2

3

4 

5

Line 1: The cell-5 heading takes 38 cells. There is no room for the opening switch.

Line 2: The opening Nemeth Code indicator is in the runover cell of the heading (cell 5).

Line 3: The first identifier is transcribed in Nemeth.

4.26 Transcriber’s Notes

Transcriber’s note indicators are UEB symbols and therefore must be transcribed outside of the Nemeth switches. When the note itself contains mathematical material, code switching occurs within the note. Nemeth must be terminated before the closing transcriber’s note indicator is transcribed. If mathematical material follows the transcriber’s note, the opening Nemeth Code indicator may be placed following the closing transcriber’s note indicator only if it fits on the same line. If it does not fit, follow established directives regarding placement of the opening switch.

For further practice, see Addendum 1—Reading Practice.

Submit Exercise 4 to your instructor.

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Practice 4F, continued

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7. The function of the parentheses is to group the factors, specifying multiplication. Grouping symbols that are part of the mathematical expression must be transcribed as Nemeth symbols.

⠠⠠⠠⠠ ⠠⠠ ⠠⠠⠠⠠⠠⠠ ⠠⠠ ⠠⠠⠠⠠⠠ ⠠⠠ ⠠⠠⠠⠠⠠⠠⠠ ⠠ ⠠⠠⠠⠠ ⠠⠠

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8. Variables x and y that are not associated with the Greek letter or within the equation are transcribed in UEB.

⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠ ⠠⠠ ⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

9. The paired grouping symbols (parentheses) must be transcribed in the same code—in this case, UEB.

PRACTICE 4G

Code switch indicators are omitted from the illustrations in this Practice.

1. YES ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠ ⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠
2. YES ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠
3. NO (this list includes abbreviations)
4. YES ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠
5. NO (this sequence does not begin and end with a sign of grouping)
6. YES ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠ ⠠⠠⠠⠠
7. NO (this list contains ordinals)
8. YES ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠
9. YES ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
10. YES ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠

PRACTICE 4I

1 ⠠⠠

2 ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

3 ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

4 ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

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6 ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

7 ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

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21 ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

Line 7: The embedded identifier (3) fits on this line. See [Section 4.27](#).