

## LESSON 4

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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.



















## ***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.

$\text{⠠}$ Greek-letter Indicator (standard form)
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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.

$\text{⠠⠠}$      $\Delta$      $\text{⠠⠠⠠⠠}$

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	$\alpha$ ⠠⠠⠠	A ⠠⠠⠠⠠	$\alpha$ ⠠⠠⠠⠠
beta	$\beta$ ⠠⠠⠠	B ⠠⠠⠠⠠	$\beta$ ⠠⠠⠠⠠
gamma	$\gamma$ ⠠⠠⠠⠠	Γ ⠠⠠⠠⠠⠠	
delta	$\delta$ ⠠⠠⠠⠠	Δ ⠠⠠⠠⠠⠠	
epsilon	$\epsilon$ ⠠⠠⠠⠠	E ⠠⠠⠠⠠⠠	
zeta	$\zeta$ ⠠⠠⠠⠠	Z ⠠⠠⠠⠠⠠	
eta	$\eta$ ⠠⠠⠠⠠	H ⠠⠠⠠⠠⠠	
theta	$\theta$ ⠠⠠⠠⠠	Θ ⠠⠠⠠⠠⠠	$\vartheta$ ⠠⠠⠠⠠⠠
iota	$\iota$ ⠠⠠⠠⠠	I ⠠⠠⠠⠠⠠	
kappa	$\kappa$ ⠠⠠⠠⠠	K ⠠⠠⠠⠠⠠	
lambda	$\lambda$ ⠠⠠⠠⠠	Λ ⠠⠠⠠⠠⠠	
mu	$\mu$ ⠠⠠⠠⠠	M ⠠⠠⠠⠠⠠	
nu	$\nu$ ⠠⠠⠠⠠	N ⠠⠠⠠⠠⠠	
xi	$\xi$ ⠠⠠⠠⠠	Ξ ⠠⠠⠠⠠⠠	
omicron	$\omicron$ ⠠⠠⠠⠠	O ⠠⠠⠠⠠⠠	
pi	$\pi$ ⠠⠠⠠⠠	Π ⠠⠠⠠⠠⠠	
rho	$\rho$ ⠠⠠⠠⠠	P ⠠⠠⠠⠠⠠	
sigma	$\sigma$ ⠠⠠⠠⠠	Σ ⠠⠠⠠⠠⠠	$\varsigma$ ⠠⠠⠠⠠⠠
tau	$\tau$ ⠠⠠⠠⠠	T ⠠⠠⠠⠠⠠	
upsilon	$\upsilon$ ⠠⠠⠠⠠	Υ ⠠⠠⠠⠠⠠	
phi	$\phi$ ⠠⠠⠠⠠	Φ ⠠⠠⠠⠠⠠	$\varphi$ ⠠⠠⠠⠠⠠
chi	$\chi$ ⠠⠠⠠⠠	X ⠠⠠⠠⠠⠠	
psi	$\psi$ ⠠⠠⠠⠠	Ψ ⠠⠠⠠⠠⠠	
omega	$\omega$ ⠠⠠⠠⠠	Ω ⠠⠠⠠⠠⠠	
sampi	Ϝ ⠠⠠⠠⠠		
stigma	Ϛ ⠠⠠⠠⠠		
vau	Ϝ ⠠⠠⠠⠠		
koph (qoph)	Ϟ ⠠⠠⠠⠠		

























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**PRACTICE 4G**

*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.

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.  $\{1, 2, \text{and } 3\}$
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**PRACTICE 4I**

*Instructions:* Review the "keep together" format rule for abbreviations and a preceding or following numeral to which it applies, (Lesson 3). In item G, assume that the letters of ARPA are pronounced individually.

- A. 1 m = 100 cm
- B. 3 yrs = 365 × 3 days
- C. Draw three triangles using the given side lengths. Then compare their angles.  
(1) 1.5 cm, 5 cm, and 4.5 cm; (2) 4.5 cm, 5 cm, and 7.5 cm; (3) 1.5 cm, 4.5 cm, and 7 cm.
- D. 1 square mile converted to acres: 1 sq mi = 640 ac
- E. 5 in + 25 in = 30 in
- F. **Two Types of Tons.** Compare the long ton with the short ton: 1 l. t. = 2240 lb.; 1 sh. t. = 2000 lb.
- G. Fill in the missing information in the Customer Lifetime Value (CLV) Formula using Average revenue per account (ARPA). CLV = \_\_\_ × ARPA
- H. Specific heat is expressed in J/kg·K.

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*For further practice, see Addendum I—Reading Practice.*

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Submit Exercise 4 to your instructor.
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