

## **LESSON 3**

- WORDS
  - Introduction to Abbreviations
  - Single-Word Switch Indicator
- LETTERS
  - Introduction to the English-Letter Indicator
  - Mathematical Letter Combinations

### *Format*

- Keep Together
- FORMAT SUMMARY #2

### *Answers to Practice Material*

## **LESSON PREVIEW**

Transcription of words in mathematical context requires a close look at punctuation, capitalization, and nonuse of contractions. Abbreviations require special treatment. A single narrative word may be transcribed within the code switches by using a single-word switch indicator. Code switching at page turns is examined. "Single letters" in Nemeth are defined, and the English-letter indicator is introduced.

# WORDS

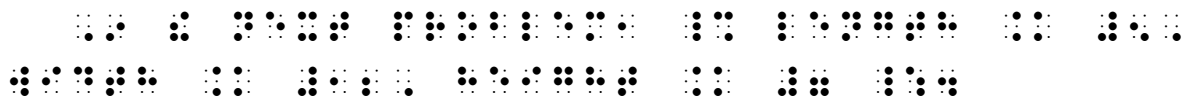
## 3.1 Words in Mathematical Context

When words are part of an equation or math expression the words are included in the technical notation—that is, the whole expression is placed inside the Nemeth switches. No contractions are used within Nemeth switches. Spacing rules of the Nemeth Code are followed.

*Exception:* Words used for math symbols such as "plus", "equals", etc., are not included in this rule. Such words are transcribed in UEB. Examples are shown later in this lesson.

### Example 3-1

In the next problem, length = 5, width = 12, height = 7.



*Inside the switches, words are transcribed without contractions.*

In the next example, words are substituted for values in a formula. The words are part of the math expression and are transcribed without contractions. The division symbol is unspaced from the words according to Nemeth rules for spacing of operation signs.

### Example 3-2

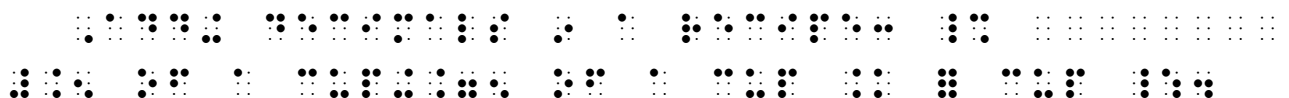
Dividend ÷ Divisor = Quotient



*As part of a math problem expressed in symbols and words, the words are included in the switch.*

### Example 3-3

Adding decimals in a recipe: .5 of a cup + .75 of a cup = ? cup.



*The operation sign (+) is unspaced; the comparison sign (=) is spaced, according to the rules of the Nemeth Code.*

3.1.1 **Capitalization.** Each fully capitalized word in mathematical context is preceded by the double capitalization indicator of the Nemeth Code. The UEB capitalized passage indicator is not used in Nemeth context.

⠠⠠ Double Capitalization Indicator

Example 3-4

TOTAL EGG COUNT = 79

⠠⠠ TOTAL ⠠⠠ EGG ⠠⠠ COUNT ⠠⠠ = ⠠⠠ 79

3.2 **Words in Narrative**

When a word in UEB narrative is associated with an expression that requires Nemeth, the word is not included inside the Nemeth switches. The word and its associated expression may fall on separate braille lines, with the line wrapping at the space between them. Note that this rule differs from an abbreviation associated with a Nemeth expression. (See 3.4.)

a. Words Labeling a Math Item

Example 3-5

Figure 4.7 shows Shape 4 and its reflection, Shape 4'.

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

Example 3-6

Chris used 25.5 cans of paint.

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

Example 3-7

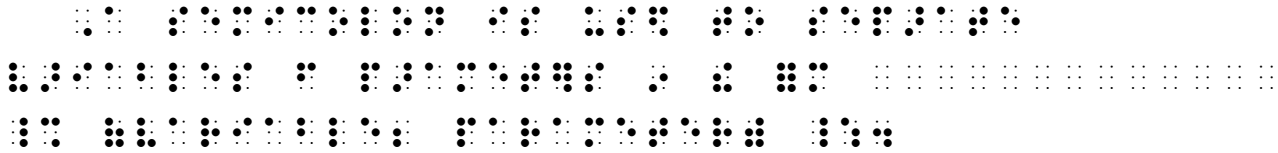
What is 5.5 percent of 72?

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



Example 3-11

A semicolon is used to separate variables from parameters in the form (variable; parameter).



*The semicolon does not require a punctuation indicator because words are punctuated in literary mode, even in mathematical context.*

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**PRACTICE 3A**

- A. If 1 pound of Swiss cheese costs \$2.50, how much does 4.8 pounds cost?
- B. JMHS's set of high-jump champions: {Terry, Leslie, Traci}
- C. The parts of a subtraction problem are named as follows: minuend – subtrahend = difference.
- D. Did you know that 98.6 degrees Fahrenheit is not necessarily "normal" body temperature for everyone?













*Only the decimal number and its associated abbreviation are transcribed in Nemeth.*

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### **PRACTICE 3B**

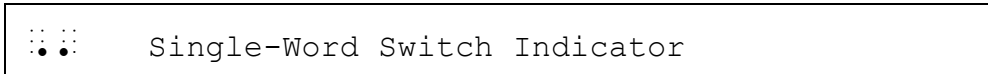
1. If 1 lb. of Gouda cheese costs \$2.96, what will you pay for 2.5 lbs.?
  2. If 2kg Gruyère costs £2,65, what is the cost of a wheel weighing 3kg?
  3. Continuing the set of ordinals, fifth = 5th, sixth = 6th, seventh = 7th, eighth = 8th.
  4. 1 kcal is equivalent to 3088.03 ft.lb.
  5. The QE2 had a top speed of 32.5 knots.
- 

**More To Come** This does not complete the discussion of abbreviations in mathematical context. Single-letter abbreviations, abbreviations that use the same letters as a shortform, and further spacing rules within mathematical expressions will be discussed in Lesson 4.

## Single-Word Switch Indicator

### 3.7 The Single-Word Switch Indicator

Words that do not provide mathematical meaning are transcribed in UEB. When a single word occurs between two math expressions, the single-word switch indicator is used to indicate that the following word is in UEB.

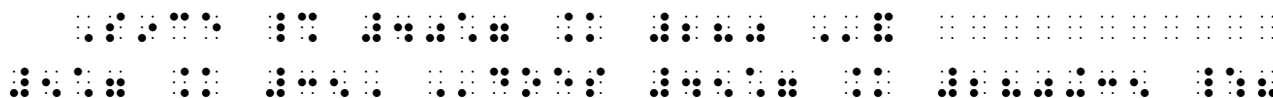


Until this symbol becomes widely recognized, we suggest that the single-word switch indicator be listed on the Special Symbols page. See the Final Lesson for details.

**3.7.1 Spacing and Contractions.** The single-word switch indicator is unspaced from the word. Contractions are used according to the rules of UEB. The switch is required on a single word even if the word contains no contractions. The effect of the single-word switch indicator is terminated by a space, and Nemeth resumes.

#### *Example 3-29*

Since  $40 \cdot 7 = 280$  and  $5 \cdot 7 = 35$ , does  $45 \cdot 7 = 280 + 35$ ?

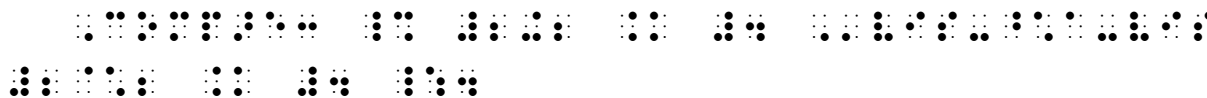


*The words are part of the sentence structure—they are not being used mathematically—and so UEB applies.*

**3.7.2 With a Hyphenated Compound Word.** The single-word switch indicator can be used with a hyphenated compound UEB word that comes between Nemeth items.

#### *Example 3-30*

Compare:  $2 + 2 = 4$  vis-à-vis  $2 \times 2 = 4$ .

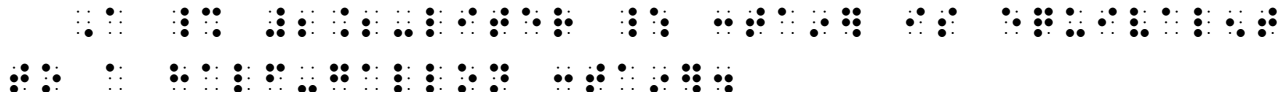


*The hyphenated compound word vis-à-vis is considered to be one word. The acute accent follows UEB rules for modified letters.*

- a. When a Nemeth item and a UEB word are part of a hyphenated expression, the entire expression is transcribed in Nemeth. The single-word switch indicator is not used.

Example 3-31

A 2.2-liter container is equivalent to a half-gallon container.




*The first hyphenated expression contains a decimal number and so a switch to Nemeth is required. The word "liter" is included within the switches and is transcribed without contractions.*

- 3.7.3 **With Typeform.** The single-word switch indicator can be used with a word associated with a UEB typeform word indicator.

Example 3-32

Can  $2 + 3 \times 4$  be both  $(2 + 3) \times 4$  and  $2 + (3 \times 4)$ ?



*The single-word switch indicator is used on the underlined word and.*

- 3.7.4 **With Lower Wordsigns.** A lower wordsign may be used with a single-word switch indicator without violating the lower sign rule.

Example 3-33

Let  $2 + 3 \times 4$  be  $2 + (3 \times 4)$ .



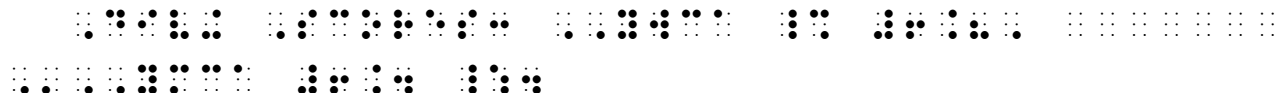
*The single-word switch indicator is used on the lower wordsign for be.*

- 3.7.5 **With a Heading.** The single-word switch indicator can be used with a one-word heading that comes between Nemeth material.

- 3.7.6 **With Abbreviations.** A single-word switch may be used for an abbreviation. But remember, an abbreviation of measurement associated with a Nemeth number is part of the Nemeth expression.

Example 3-34

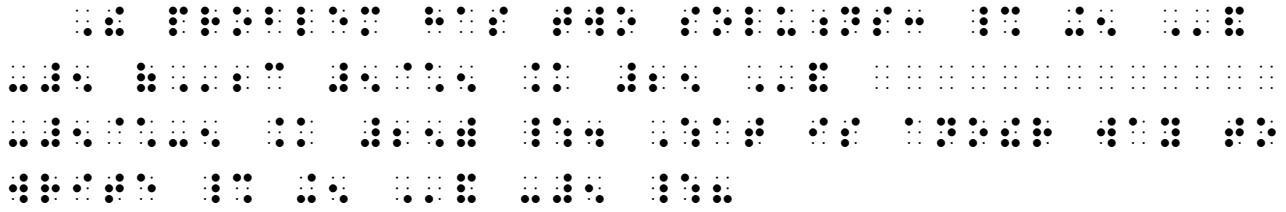
Diving Scores: YWCA 6.8, YMCA 6.4.





Example 3-38

The problem has two solutions: +5 and -5 (because  $5 \times 5 = 25$  and  $-5 \times -5 = 25$ ).  
What is another way to write +5 and -5?

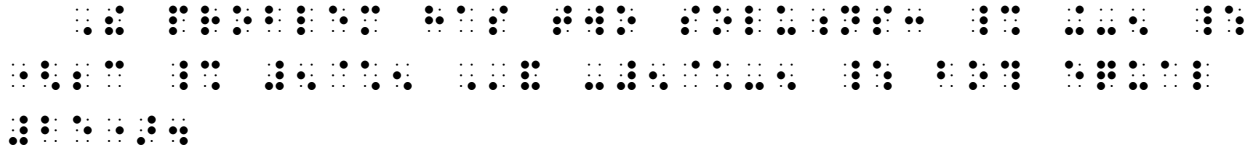


*The opening and closing parentheses are in Nemeth. The single-word switch indicator immediately follows the opening parenthesis.*

Example 3-39

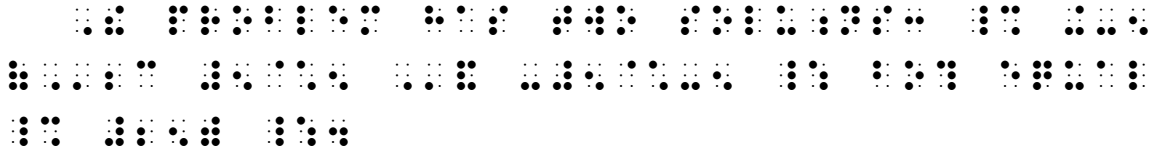
The problem has two solutions:  $\pm 5$  (because  $5 \times 5$  and  $-5 \times -5$  both equal 25).

Transcription A.



*The closing parenthesis is in UEB. The opening parenthesis must also be in UEB. Because a single-word switch indicator cannot be used immediately before an opening parenthesis, Nemeth is terminated and then reopened after the word.*

Transcription B.



*By transcribing the numeral 25 and the closing parenthesis in Nemeth, the opening parenthesis is now done in Nemeth, similar to Example 3-38.*

3.7.9 **The Word "of"**. The word "of" requires a closer look. Within a narrative sentence, it is a word like any other word and may require a single-word switch indicator. However, when "of" is part of an equation, it is transcribed in Nemeth, uncontracted, without any code switching. Compare the treatment of the word "of" in these examples.





*Example 3-45*

Use + and/or ×, as necessary.



**3.8 More About Switch Indicators at Braille Page Turns**

Now that you have had more experience with switch indicators, we will consider more layout issues that occur at braille page turns. Observe the following "keep together" rules as they relate to mathematical expressions within the narrative text.

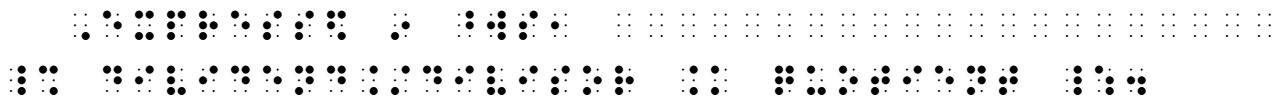
- A mathematical expression that will fit entirely on the braille line must not be divided between lines.
- If the math expression is preceded by the opening Nemeth Code indicator and followed by the Nemeth Code terminator, and if there is room on the line for both switch indicators and the expression, keep them all on the same line.
- If there is not room on the line for both switch indicators and the math expression, one of the switches will fall on a different line.
- If neither switch indicator will fit on the same line as the math expression, priority is given to keeping the math expression intact, placing each switch indicator on another line. The opening Nemeth Code indicator will be the last item on the preceding line; the Nemeth Code terminator will be the first item on the following line.
- If a math expression is preceded by the opening Nemeth Code indicator and followed by the Nemeth Code terminator and it falls at a braille page turn, place each switch indicator on the same braille page as the mathematical material to which it applies. An opening Nemeth Code indicator should not be the last item at the bottom of a braille page; a Nemeth Code terminator should not be the first item at the top of a braille page.
- If a page number on line 25 or line 1 does not allow the entire expression to fit on the line, the expression is brought down to the next line that has enough usable cells.

Different layouts are illustrated in the next four examples.

**3.8.1 Layout #1.** The first example shows a math expression that will fit on one braille line along with the code switch indicators and the ending punctuation.

*Example 3-46*

Expressed in words, dividend ÷ divisor = quotient.









**3.9 New Print Page**

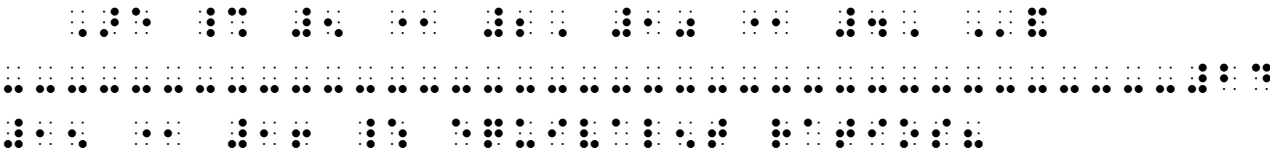
The page change indicator and page number are constructed in the same way in either code. The code in place before the page change indicator remains in effect following the page change indicator. Placement of code switch indicators is not affected by the presence of a page change indicator.

*Example 3-50*

Are 5 : 2, 10 : 4, and

[print page turn, page 24]

15 : 16 equivalent ratios?



*Nemeth remains in effect through the page change indicator.*

**LETTERS**

**3.10 Single English Letters in Narrative**

The language of mathematics uses single letters as mathematical characters. Special provision is made for a single English letter that has mathematical meaning when it appears within UEB narrative.

The rules are similar to those you have learned about freestanding, unmodified numbers within narrative: when an English letter is freestanding and is unmodified, it may be transcribed in UEB. As with numbers, an unmodified English letter that touches literary punctuation is considered to be freestanding. In a hyphenated term such as "x-axis", the letter is considered to be unmodified. An English letter with an ordinal or with a plural ending is considered to be unmodified. Roman numerals are also included in this definition and will be studied in Lesson 4.

*Example 3-51*

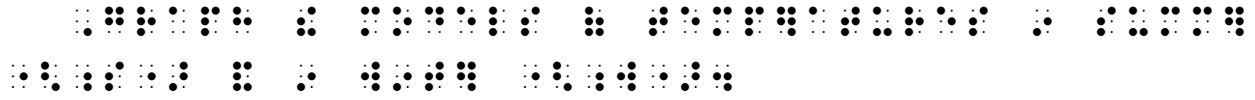
In this equation, b must be greater than a.



*The unmodified letter a, transcribed in UEB, is touching punctuation.*

Example 3-52

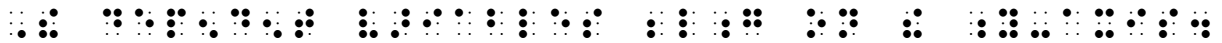
Graph the models of temperatures in summer (s) and in winter (w).



*The unmodified letters s and w, transcribed in UEB, are touching punctuation.*

Example 3-53

The dependent variables belong on the y-axis.



*The letter y is unmodified. The hyphenated term is transcribed in UEB.*

Example 3-54

Find the nth term of the arithmetic sequence.



*The letter n is unmodified. The ordinal is transcribed in UEB.*

**3.11 Single English Letters in Nemeth Code**

When an English letter that has mathematical meaning appears in technical context—that is, between Nemeth switches—it is transcribed according to the rules of the Nemeth Code. Before presenting the rules, it is helpful to understand how the Nemeth Code defines a "single letter".

3.11.1 **Nemeth Definition of "Single Letter"**. Throughout this course, when referring to the Nemeth Code's definition of a single letter, the term "single letter" is in quotation marks. To be defined as a "single letter" in Nemeth, several criteria must be met.

- i. A "single letter" must be from the English alphabet, transcribed in regular type, and unmodified as defined in Section [3.10](#).

These are "single letters"                    p D z R

These are not "single letters"             π D  $\bar{z}$  ℝ

*The first letter is not from the English alphabet, the second and fourth letters are not in regular type, the third letter is modified with a bar over it.*

- ii. Furthermore, in the print copy the letter must be both preceded by a space or by one or more punctuation marks and followed by a space or by one or more punctuation marks.\*

These are "single letters"                    "y" x, "w S"

*Each letter is preceded and followed by punctuation or by a space.*

These are not "single letters" -x "wS" y+z

*The x, z, and S are not preceded by a space or by punctuation (-x is "negative x"); the y and the w are not followed by a space or by punctuation.*

- iii. Whether the leading punctuation mark is preceded by a space or not is irrelevant; whether the following punctuation mark is followed by a space or not is irrelevant.

These are "single letters"                    "x"+"y"

*Each letter is both preceded and followed by punctuation.*

- iv. If the space shown in print is not shown in braille, the letter is no longer a "single letter."

These are not "single letters" r + s

*Although each letter is preceded and followed by a space in print, in braille the plus sign is unspaced from the letters.*

- v. And finally, to be defined as a "single letter" the letter must not be an abbreviation nor can it be a word ("a", "A", "I", or "O").

These are not "single letters" I need 4.5 m of fabric.


*I is a word; m is an abbreviation for meters.*

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\*Nemeth grouping symbols, such as parentheses, are not considered to be punctuation marks. Rules for letters touching grouping symbols will be discussed in Lesson 4.

## *Introduction to the English-Letter Indicator*

The term "English-letter indicator" clearly describes the function of this indicator—that is, the following letter (singular) is from the English alphabet.


 English-Letter Indicator

It is important to note that the English-letter indicator does not function in the same way as the UEB grade 1 symbol indicator. Several rules are in place regarding situations where the English-letter indicator is or is not used.

### 3.12 Use of the English-Letter Indicator with a "Single Letter"

Even though contractions are not used in Nemeth, a single letter from the English alphabet used in mathematical context may require an English-letter indicator for clarity. Except as noted in 3.13, an English-letter indicator is required when a letter is a "single letter" as defined in 3.11.1.

3.12.1 **Capitalization of "Single Letters"**. To indicate a single capitalized letter, the capitalization indicator is placed between the English-letter indicator and the letter. The effect of the capitalization indicator extends only to the letter which follows it.

 Capitalization Indicator

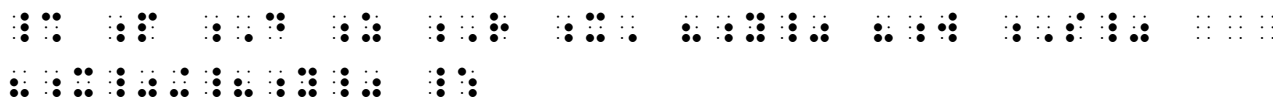
➤ D     

3.12.2 **Punctuation of "Single Letters"**. A "single letter" is punctuated mathematically if the letter and the punctuation fall within the Nemeth switch indicators.

The examples from 3.11.1 are illustrated below, assuming mathematical context. Note the placement of the capitalization indicator as well as the use of mathematical punctuation.

#### Example 3-55

p D z R x, "y" "w S" "x"+"y"



*Instructions:* Demonstrate use of the English-letter indicator and proper punctuation mode in this series of single letters. Transcribe entirely in Nemeth, using [Example 3-55](#) as a model.

### **PRACTICE 3D**

c, C; r, R; "l", "L"; "i, j, k"; "l"×"w"×"h".









### 3.14 Letters as Identifiers

Letters used as identifiers are constructed according to the rules of the code which is in effect at the time—UEB or Nemeth. Compare:

Print	UEB	Nemeth
a.	⠠⠁	⠠⠠⠁
B.	⠠⠠⠠⠠⠠⠠⠠⠠	⠠⠠⠠⠠⠠⠠⠠⠠
(a)	⠠⠠⠠⠠⠠⠠⠠⠠	⠠⠠⠠⠠
(B)	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	⠠⠠⠠⠠⠠⠠
c)	⠠⠠⠠⠠⠠⠠	⠠⠠⠠⠠

*Instructions:* Demonstrate the use and the nonuse of the English-letter indicator for "single letters" by transcribing this practice entirely in Nemeth. Place the opening Nemeth Code indicator in cell 1 on the first line. Begin item (a) on the next line. Place the Nemeth Code terminator at the end of the last item, on the same line.

#### PRACTICE 3E

- (a)  $r = \text{rate}$
- (b)  $"r" = \text{rate}$
- (c)  $x, y, z < 100$
- (d)  $n\text{¢} = \$4.95$
- (e)  $x > "3"$
- (f)  $a + b$
- (g)  $|y| = |-y|$
- (h)  $|x + y| = |x| + |y|$
- (i)  $P(\text{red and blue})$

***Mathematical Letter Combinations***

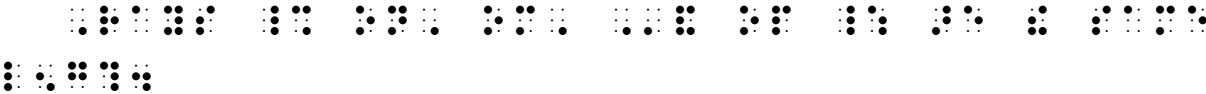
These rules apply to letter combinations which have mathematical meaning. A nonmathematical series of letters, as in a serial number, license plate, or postal code, is transcribed in UEB. (See 3.6.)

**3.15 Mathematical Letter Sequence**

The option to remain in UEB to transcribe a mathematical letter applies only to a single freestanding English letter. A mathematical letter sequence must be transcribed in Nemeth and must be punctuated mathematically if the punctuation falls within the Nemeth switch indicators. When a letter sequence is part of a hyphenated expression, the entire expression is transcribed in Nemeth.

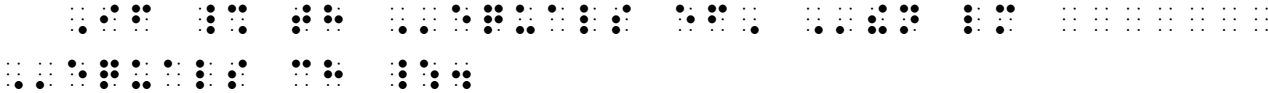
Example 3-65

Rays on, om, and op are the same length.



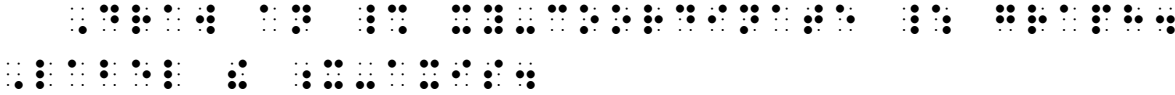
Example 3-66

If th equals ef, then lm equals ch.



Example 3-67

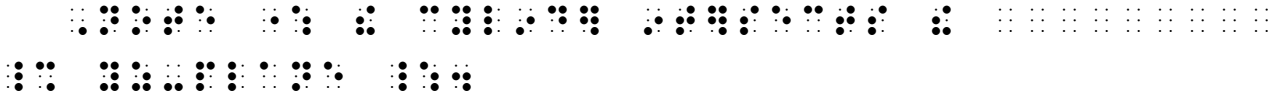
Draw an xy-coordinate graph. Label the x-axis.



*The first hyphenated expression is transcribed in Nemeth, including the word. No contractions are used. The second hyphenated expression is transcribed in UEB because it contains a "single letter".*

Example 3-68

Note where the cylinder intersects the yz-plane.







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*Instructions:* Explain your decisions regarding use and nonuse of the English-letter indicator.

### PRACTICE 3F

- (A) Prove: If  $a < b$  and  $c < 0$ , then  $ac > bc$ . Verify your proof by determining  $ac$  and  $bc$  when  $a = 5$ ,  $b = 7$ , and  $c = -4$ .
- (B)  $j = 1, 2, \dots, n$
- (C) 40% of  $N = 120$
- (D) 40% of "N" = 120
- (E) If "rcv = rjc" does "v" = "j"?

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### FORMAT SUMMARY #2

Here is a summary of the Nemeth formats encountered in Lessons 2 and 3.

Side-by-Side Itemized Material When itemized material is arranged side by side across the page in print, the braille format is changed so that all identifiers start in cell 1. (Different rules apply to subitems and to spatial material, which will be studied later.)

Keep Together—Hyphenated Expressions A hyphenated expression containing one or more mathematical components must not be divided between braille lines.

Keep Together—Mathematical Expression If a page number on line 25 or line 1 does not allow the entire mathematical expression to fit on the line, the expression must be brought down to the next line that has enough usable cells. If the expression will fit on one line but the code switch indicators will not, one or both of the indicators can be placed on a different line.

Keep Together—Abbreviation An abbreviation and a preceding or following numeral to which it applies must not be divided between braille lines.

*For further practice, see Appendix A—Reading Practice.*

### EXERCISE 3

Prepare Exercise 3 for your grader



ANSWERS TO PRACTICE MATERIAL

PRACTICE 3A

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11

*Lines 2-3: A number and a related word (4.8 pounds) do not have to fall together on the same line.*


*Line 5: Words are punctuated with the dot 2 comma, even in mathematical context.*


*Line 8: Following Nemeth spacing rules, the operation sign is unspaced from the words minuend and subtrahend. Words are transcribed without contractions in Nemeth.*








PRACTICE 3F


1 

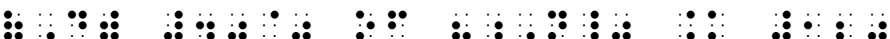
2 


3 


4 

5 

6 

7 

8 

9 

*Lines 1, 2, and 4: Single letters that fall before and after signs of comparison need no English-letter indicator.*

*Line 3: Two-letter mathematical expressions must be transcribed in Nemeth.*

*Line 5: Nemeth continues and so the identifier is transcribed in Nemeth. No English-letter indicator is needed when a single letter is enclosed between grouping signs. Letter j is followed by a comparison sign—no English-letter indicator. Letter n is preceded and followed by a space—English-letter indicator required.*

*Line 6: Letter N is followed by a sign of comparison—no English-letter indicator.*

*Line 7: Letter N is preceded and followed by punctuation—English-letter indicator required even though equals sign follows.*

*Line 8: Nemeth continues, so the identifier is transcribed in Nemeth. The word If uses single-word switch indicator.*

*Line 9: Because letters v and j are each preceded and followed by punctuation, an English-letter indicator is required despite the proximity of the equals sign.*