

## **LESSON 7**

- **TYPEFORM**
  - The Five Mathematical Typeform Indicators
  - Typeform of Letters
  - Typeform of Numerals
  - Boldface Mathematical Symbols
  - Other Signs of Grouping
  - Further Details Regarding Typeform of Letters and Numerals

*Format*

- **DISPLAYED FORMATS**

*Answers to Practice Material*

### **LESSON PREVIEW**

This lesson begins by defining displayed mathematical material and illustrating the format in braille. The topic of typeform in mathematical context takes up the rest of the lesson.

## ***DISPLAYED FORMATS***

### **7.1 Displayed Mathematical Material [NC 26.4]**

Up to this point in the lesson material, mathematical expressions in the examples have appeared in line with the narrative. This is referred to as an *embedded expression*. When mathematical material is set apart from the body of the text in the print copy, it is referred to as a *displayed expression*. Various layouts in the print copy are used to set the material apart, for example, skipped lines, centering or other indentation, or off to the side. In braille, margins for displayed mathematical material depend upon the margins of the surrounding text and are transcribed in one of the following formats.

- In unitemized explanatory portions of the text (3-1), displayed mathematical material begins in cell 3. Runovers begin in cell 5. **(3-5)**
- In itemized text without subdivisions (1-3), displayed mathematical material begins in cell 5. Runovers begin in cell 7. **(5-7)**
- In itemized text with subdivisions (1-5; 3-5), displayed mathematical material begins in cell 7. Runovers begin in cell 9. **(7-9)**
- Within or following instructions (5-3), displayed mathematical material begins in cell 5. Runovers begin in cell 7. **(5-7)**

Notice that in all four layouts, the first cell of the displayed material is indented two cells to the right of the runover cell of the preceding material. These margins apply regardless of the presence or absence of a runover in the preceding material. A line is not skipped above or below displayed mathematical material unless the preceding or following material requires a blank line.

**7.1.1 Placement of Code Switch Indicators.** There is not one formula that can be applied to all situations when it comes to judicious placement of code switch indicators. Use the following points as guidelines.

- a. When displayed mathematical material is preceded and followed by UEB text, the following layouts are recommended.

—Begin the displayed material with the opening Nemeth Code indicator only if the displayed math and its two switch indicators will fit on one braille line

—If the displayed math and its two switch indicators will not fit on one braille line, the opening Nemeth Code indicator is placed at the end of the previous text. The displayed material will begin with the math expression, and end with the Nemeth Code terminator. If either switch indicator will not fit on the current line, it is placed on the next line in the runover position of either the text (for the opening Nemeth Code indicator) or of the displayed material (for the Nemeth Code terminator).

- b. If Nemeth continues after the displayed expression, it is preferable to place the opening Nemeth Code indicator at the end of the line of text preceding the displayed material. See [Example 7-7](#).





- b. If separate expressions are widely spaced on one line, transcribe each expression on a new line in the initial display cell.

Example 7-4

A statement with an equals sign is called an **equation**. Three examples are provided below.

$$9 \times (4 - 1) = 27 \qquad 1 + 1 = 3 \qquad x + 7 = 50$$

Which equation is true? Which equation is false? Which equation may be either true or false?

1      ⠠⠸ ⠠⠶ ⠠⠤ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠

2      ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠

3      ⠠⠠

4      ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠

5      ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠

6      ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠

7      ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠

8      ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠ ⠠⠠⠠

*Line 3: Because there is more than one displayed math item, the opening switch indicator is placed at the end of the previous line of text. The indicator will not fit at the end of line 2, so it is placed on line 3 in the runover position of the text.*

*Lines 4-6: Although printed all on one line (widely spaced), each expression is transcribed on a new line.*

*Lines 7-8: The narrative paragraph continues in cell 1 (the runover cell to a 3-1 paragraph).*

- c. If displayed items are separated by sentence punctuation, such as commas, the displayed material may be formatted as one item with runovers. Be sure to follow "keep together" lineage rules when determining where to begin the runover line.

Example 7-5

Now we will find the area of the hexagon whose vertices are located at the coordinates given below.

$$(2, 3.5), (4, 0), (2, -3.5), (-2, -3.5), (-4, 0), (-2, 3.5)$$



## Displayed Math Using 5-7 Margins

7.1.4 **Math Displayed to Itemized Text.** Math displayed to itemized text (with no subdivisions) starts in cell 5. Runovers are in cell 7.

### Example 7-6

5. Solve for  $x$  if  $y = 9$ .

$$x^2 + |y| = 25$$

6. Explain why the answer to #5 is the same if  $y = -9$ .

1	⠠⠨⠠⠨⠠⠨	⠠⠨⠠⠨⠠⠨⠠⠨⠠⠨⠠⠨	⠠⠨	⠠⠨⠠⠨	⠠⠨⠠⠨	⠠⠨	⠠⠨⠠⠨	⠠⠨	⠠⠨⠠⠨	⠠⠨⠠⠨⠠⠨
2		⠠⠨⠠⠨⠠⠨⠠⠨⠠⠨⠠⠨	⠠⠨⠠⠨	⠠⠨⠠⠨	⠠⠨					
3	⠠⠨⠠⠨	⠠⠨⠠⠨⠠⠨⠠⠨⠠⠨	⠠⠨⠠⠨	⠠⠨	⠠⠨⠠⠨⠠⠨⠠⠨	⠠⠨⠠⠨	⠠⠨⠠⠨⠠⠨	⠠⠨⠠⠨	⠠⠨	⠠⠨⠠⠨⠠⠨
4	⠠⠨⠠⠨	⠠⠨⠠⠨	⠠⠨	⠠⠨⠠⠨	⠠⠨⠠⠨	⠠⠨⠠⠨				

*Line 1: Itemized material begins in cell 1.*

*Line 2: Displayed math begins in cell 5 even though the related text does not have a runaway.*

*Lines 3-4: Margins for itemized material (with no subdivisions) are 1-3.*

## PRACTICE 7B

1. Fred took his sister out to dinner. The total bill came to \$39. Fred's sister offered to pay the 15% tip. How much did she contribute?

$$0.15 \times \$39.00 = \$5.85$$

2. A pair of boots, originally priced at \$175, is marked down 20%. How much will the boots cost? Be sure to add 6.5% sales tax to the discounted price.

Here is how Maya found the answer. Can you explain her steps?

$$0.20 \times \$175 = \$35 \text{ (discount)}$$

$$\$175 - \$35 = \$140 \text{ (price)}$$

$$0.065 \times \$140 = \$9.10 \text{ (tax)}$$

$$\$140 + \$9.10 = \$149.10 \text{ (total cost)}$$

There is a way to solve this problem using algebra. Write an equation that combines all steps into one.

7.1.5 **Displayed Material Associated with Instructions.** Nemeth instructions begin in cell 5, with runovers in cell 3. (See Lesson 5.) If displayed mathematical material appears within or immediately following instructions, the displayed material starts in cell 5 with runovers in cell 7.

*Example 7-7*

**Use the equation to the right  
to answer each question.**

$$x + y + z = \$25,000$$

1. If  $x = \$5,000$ , express  $y$  in terms of  $z$ .
2. If  $y = \$10,000$ , express  $z$  in terms of  $x$ .
3. If  $z = \$15,000$ , express  $x$  in terms of  $y$ .

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7  
8  
9

Braille representation of the text above, including the equation and the three numbered questions. The boldface text is represented by Braille characters that are not bolded in this output.

*Lines 1-2: Margins for Nemeth instructions are 5-3. The boldface print used for instructions is a visual device and so is disregarded in braille. An embedded transcriber's note points the reader to the equation "below".*

*Line 2: The opening Nemeth Code indicator is placed at the end of the text because Nemeth continues after the displayed expression which follows. (7.1.1.b)*

*Line 3: The displayed math begins two cells in from the runover cell of the previous text.*

*Lines 4-9: Itemized problems (1-3).*



## Displayed Math Using 7-9 Margins

7.1.6 **Math Displayed to Itemized Text with Subdivisions.** Math displayed to itemized text with subdivisions starts in cell 7. Runovers are in cell 9.

Example 7-8

5. Give two examples illustrating

i. the associative law for addition.

$$(a + b) + c = a + (b + c)$$

ii. the associative law for multiplication.

$$(a \times b) \times c = a \times (b \times c)$$

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

*Line 1: Main item begins in cell 1.  
 Lines 2 and 4: Each subdivision begins in cell 3.  
 Lines 3 and 5: Displayed math is in cell 7, which is two cells in from the runover of subdivisions, whether or not runovers occur.*

Example 7-9

2. Now we solve each of the following equations.

a.  $3(x + 5) = 6x + 6$

b.  $x^2 - 25 = 0$

x = \_\_\_\_

x = \_\_\_\_ and \_\_\_\_

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

*Lines 1-2: Main item begins in cell 1. The opening Nemeth Code indicator is placed at the end of the line of text preceding the itemized math items. Because there is no room for the switch indicator on line 1, it falls in the runover position of the current text (cell 5).*

*Lines 3 and 5: Each subdivision begins in cell 3, not side by side as printed.*

*Lines 4 and 6: Displayed math begins in cell 7, which is two cells in from the runover of subdivisions, whether or not runovers occur. (Subdivisions are 3-5.)*

*Line 6: Nemeth is terminated at the end of the displayed material.*

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### **PRACTICE 7C**

*Use the Pythagorean formula to answer the questions.*

$$a^2 + b^2 = c^2$$

3. Emma is flying a kite. The kite is 14 feet in front of her (distance  $a$ ).
- a. How high is the kite (distance  $b$ ) if she has let out 39 feet of line (distance  $c$ )?

Solve for  $b$ :  $14^2 + b^2 = 39^2$

- b. How many feet of line is let out (distance  $c$ ) if the kite is only 12 feet in the air (distance  $b$ )?

Solve for  $c$ :  $14^2 + 12^2 = c^2$

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7.1.7 **An Alternate Layout.** The next example shows a polynomial equation that will not fit on one line with both of its switch indicators. The first transcription places the opening switch in the runover position of the text, as recommended.

*Example 7-10*

Solve the following polynomial equation. How many roots do you predict you will find? Show your work:

$$x^5 + x^4 - 24x^3 - 7x^2 + 41x - 13 = 0.$$

Braille transcription of the equation above, showing an alternate layout where the opening Nemeth Code indicator is placed in the runover position of the text.

An alternate layout saves a line if the displayed expression takes up most of the line and if the Nemeth Code terminator is followed by punctuation. It is acceptable to begin the displayed math with the opening switch indicator, with the terminator and the punctuation mark on the next line.

*Alternate transcription*

Braille transcription of the equation above, showing an alternate layout where the opening Nemeth Code indicator is placed in the runover position of the text.

7.2 **Displayed Material with Labels [NC 26.4.4]**

Displayed mathematical expressions may be labeled in print with a unique number or letter printed in a location that is visually conspicuous, often in the right margin. That label is then used in place of the actual expression later in an example or in the narrative. This allows for compact presentation of a problem.

7.2.1 **Braille Layout.** When a number or letter is used to identify a displayed mathematical expression, the label (identifier) is placed at the left of the expression in braille regardless of the location of the label in the print copy. The label begins in the appropriate cell for displayed material in accordance with the margin rules presented in this lesson.

As with other itemized math items, place the opening Nemeth Code indicator at the end of the preceding text. Nonstandard typeform is disregarded. When the label is referred to in discussion, it may be transcribed in UEB or in Nemeth, as appropriate, and need not be in the same code as the original label.

Example 7-11

Two basic laws of arithmetic are the *commutative law for addition*

$$a + b = b + a, \tag{1}$$

and the *commutative law for multiplication*

$$a \times b = b \times a. \tag{2}$$

1  
2  
3  
4  
5  
6

1

Braille representation of the text above. The text is transcribed into Braille across six lines. Line 2 contains the opening Nemeth Code indicator at the end. Line 3 contains the label '(1)'. Line 5 contains the opening Nemeth Code indicator at the start of line 4. Line 6 contains the label '(2)'.

*Line 2: The opening Nemeth Code indicator is placed at the end of the text.*

*Line 3: The label (identifier) is transcribed in Nemeth.*

*Line 5: The opening Nemeth Code indicator will not fit at the end of the text on line 4 and so is placed in cell 1, the runover position.*

*Line 6: The label (identifier) is transcribed in Nemeth.*

Example 7-12

Use formula 11.4 to find  $a_n$  when  $a_1 = 1, d = 7,$  and  $s_n = 204.$

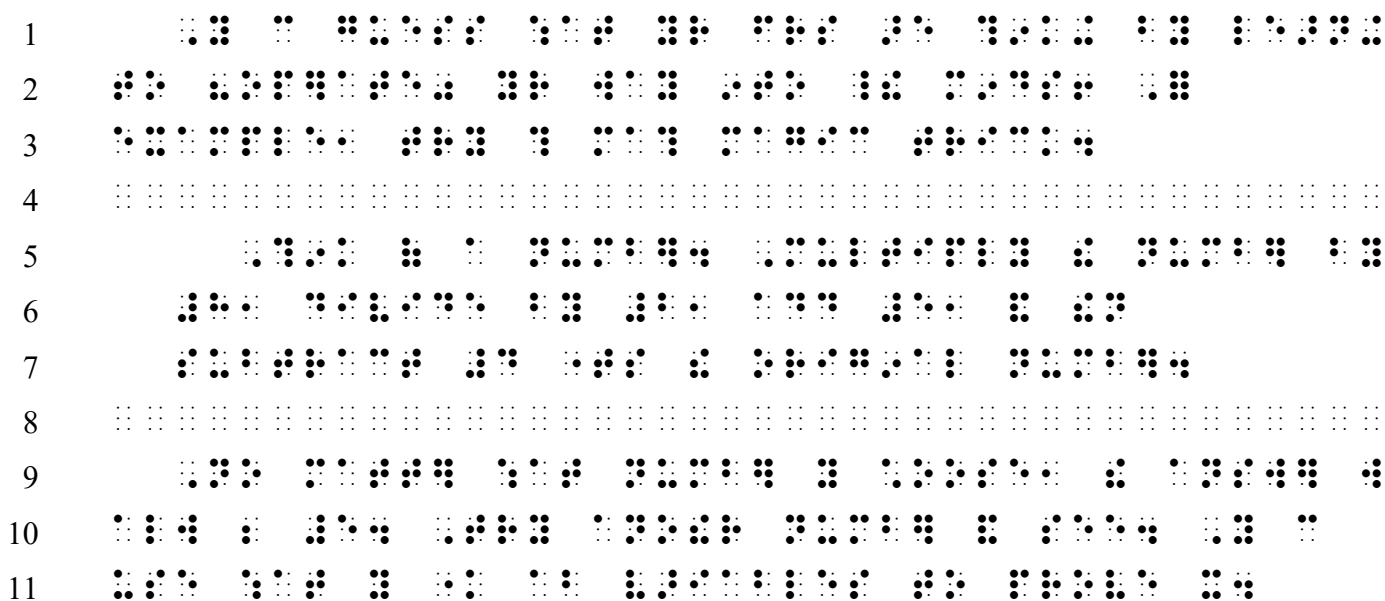
$$a_n = a_1 + (n - 1)d \tag{11.4}$$

Braille representation of the text above. The text is transcribed into Braille across three lines. The opening Nemeth Code indicator is placed at the end of the first line, and the second line starts with a runover indicator.

**7.2.2 Transcriber's Notes Page Required.** The transcriber is required to alert the reader concerning the change in position of the label in the braille copy. The note should be placed on the Transcriber's Notes page at the beginning of the volume/s in which the format change occurs.  
Sample:

Identifying numbers printed to the right of mathematical expressions are transcribed to the left.





*Lines 1, 5, and 9: According to Nemeth rules, the first line of each paragraph is indented two cells from the paragraph's left margin.*

*Lines 4 and 8: According to Braille Formats guidelines, displayed literary material is preceded and followed by a blank line.*

*Lines 5-7: According to Braille Formats guidelines, cell 3 is the adjusted left margin for this displayed material.*

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*Instructions:* Create a facsimile of a Transcriber's Notes page as follows. After the centered heading, TRANSCRIBER'S NOTES, include this required statement: "Mathematical content is transcribed according to *The Nemeth Braille Code for Mathematics and Science Notation, 2022*." The next paragraph should state: "Identifying numbers printed to the right of mathematical expressions are transcribed to the left." For the purpose of this exercise, you may begin transcribing the text after one blank line.

### PRACTICE 7D

This is the quadratic equation, where  $x$  is the variable and  $a$ ,  $b$ , and  $c$  are constants ( $a \neq 0$ ).

$$ax^2 + bx + c = 0 \tag{1}$$

This is the Pythagorean Theorem:

$$a^2 + b^2 = c^2 \tag{2}$$

Which equation, (1) or (2), is used to find the length of the sides of a right triangle?

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# ***TYPEFORM***

## **[NC Rule 7]**

In this lesson, we look at typeform as it applies to letters, numbers, and mathematical symbols. Typeform applied to words in mathematical context will be addressed in Lesson 11.

### **7.4 General Guidelines Regarding Typeform**

When the typeform of a letter or number has mathematical significance, a typeform indicator of the Nemeth Code is used. This rule applies regardless of the existence of a similar typeform indicator in UEB.

When such a letter or number is referred to within narrative, a switch to Nemeth is required in order to show the letter or number associated with its appropriate Nemeth typeform indicator. Note that UEB typeform indicators are not used inside the switches and that Nemeth typeform indicators are not used outside the switches.

**7.4.1 Determining Significance of a Variant Typeform.** The decision whether to retain a variant typeform can be difficult. The transcriber needs to determine if the typeform has mathematical meaning (i.e., for "distinction"), if the typeform is for instructional purposes (i.e., for "emphasis"), or whether the typeform does not add any information or is merely decorative. The general rule of thumb is that, when technical material is printed in nonregular type that has no mathematical or instructional significance, the variant typeform is disregarded in the transcription.

#### **a. Typeform Showing Distinction**

- **Significant**: Various fonts often have fixed meanings in particular areas of mathematics and science. Such letters, numbers, and symbols must retain their significant typeform in the braille transcription, and must be transcribed following Nemeth Code rules.

*Examples:*      $\mathbb{R}$  signifies the set of real numbers.  
                      The null vector is denoted with a boldface  $\mathbf{0}$  .  
                       $\mathcal{S}$  represents a system's action in physics.

- **Insignificant**: It is standard print practice to show math variables using an italic font throughout a publication. This use of italics is not mathematically significant and so is not retained in the braille transcription.

*Examples:*     The variables  $x$ ,  $y$ , and  $z$  are real numbers.  
                       $\pi$  is used to determine the circumference of a circle:  $2\pi r$  .

#### **b. Typeform Showing Emphasis**

- **Significant**: An author may use a variant typeform to focus on a teaching point or topic. Such letters or numbers may lose their meaning if their significant typeform is not retained in the braille transcription. If the typeform is mentioned in the narrative, it should either be retained or explained in a transcriber's note.

*Example:* Are the boldface numbers even or odd? 19, **28**, 37, **44**, 51, 67, **72**, **80**.

- **Insignificant:** A variant typeform is often used for the sole purpose of attracting the reader's attention. This is particularly common at the lower grade levels. Such variant typeforms are disregarded in the braille transcription.

*Examples:* Let  $x$  be the smaller number, and  $9 + x$  be the larger number.

A function with degree 5 has 5 zeros.

## 7.5 The Five Mathematical Typeform Indicators

Specific provision is made in the Nemeth Code for the transcription of five print typeforms: barred, boldface, italic, sans serif, and script. (In other publications, the barred font may be called blackboard bold or double struck.) The various typeforms may be applied to the letters of the English, German, Greek, Hebrew, and Russian alphabets as well as to numerals and mathematical symbols. (Note that underlining is not a typeform in the Nemeth Code.)

⠠⠠⠠⠠	Barred Type
⠠⠠⠠	Boldface Type
⠠⠠⠠	Italic Type
⠠⠠⠠⠠	San Serif Type
⠠⠠⠠	Script Type

## 7.6 Typeform of Letters

Certain specific mathematical letters are identifiable by their variant typeform. Common examples include the letter  $\mathbb{R}$  for "the set of real numbers" and boldfaced letters that represent vectors. In this lesson, after practicing the application of the rules regarding typeform of letters, only the variant letters in common practice will be studied.

Typeform applied to a mathematical letter is considered to be a modification. A switch to Nemeth is required when such a letter appears in the narrative, even if UEB has a typeform indicator for the font. A Nemeth typeform indicator applied to a letter must always be followed by an alphabetic indicator.

- a. **Typeform Indicators with One Letter.** Here is the capital English letter R in regular type, followed by the same letter in each of the five Nemeth typeforms.

R	⠠⠠⠠⠠	(regular English capital R)
$\mathbb{R}$	⠠⠠⠠⠠⠠⠠	(barred English capital R)
<b>R</b>	⠠⠠⠠⠠	(boldface English capital R)
<i>R</i>	⠠⠠⠠⠠	(italic English capital R)



R     ⠠⠠⠠⠠⠠⠠     (sans serif English capital R)

℞     ⠠⠠⠠⠠⠠⠠     (script English capital R)

*Notes: Sans serif typeform is recognized by the lack of small lines or serifs at the ends of the letter parts. Only the English alphabet has a sans serif style of type. Script typeform looks like cursive handwriting. Publishers have different styles for this font.*

Here are isolated examples of capital and lowercase letters from the other four alphabets, in various typeforms. The first indicator names the typeform; the second indicator names the alphabet; a capital letter then shows a capitalization indicator; and, finally, the letter is identified. You may wish to review the five alphabetic indicators of the Nemeth Code in Lessons 3 and 4.

α     ⠠⠠⠠     (boldface Greek alpha, lowercase)

Ш     ⠠⠠⠠⠠⠠⠠     (boldface Russian capital Sha)

Σ     ⠠⠠⠠⠠⠠⠠     (barred Greek capital Sigma)

c     ⠠⠠⠠     (italic German tseh, lowercase)

ℓ     ⠠⠠⠠⠠⠠⠠     (script Hebrew alef)

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This Practice is an exercise in applying the rules regarding order of indicators: typeform, alphabet, and capitalization. Since these letters are out of context, the alphabet and the individual letter name is given. The braille character of the lowercase German, Hebrew, and Russian letters are provided. Note that capital letter names are capitalized in the description.

*Instructions:* Transcribe only the 44 letters, using the typeform indicated before each set: boldface, barred, script, or sans serif. Do not transcribe the directions or the names—just transcribe four letters on each line, with one blank cell between each of the letters. The first line in the practice is shown below to get you started.

⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠

### PRACTICE 7E

Use BARRED typeform for these English and Greek letters.

⠠⠠	<i>i</i>	⠠⠠	<i>Q</i>	<i>d</i>	English letters
⠠⠠	⠠⠠	⠠⠠	⠠⠠	⠠⠠	Greek letters (Sigma, gamma, Gamma, pi)

Use BOLDFACE typeform for these letters.

<b>a</b>	<b>B</b>	<b>c</b>	<b>D</b>	English letters
<b>ρ</b>	<b>Ψ</b>	<b>Φ</b>	<b>χ</b>	Greek letters (rho, Psi, Phi, chi)
<b>Ч</b>	<b>з</b>	<b>г</b>	<b>Ж</b>	Russian letters (Cheh ⠠⠠, zeh ⠠⠠, gheh ⠠⠠, Zheh ⠠⠠)

Use ITALIC typeform for these letters.  
(Disregard the dark typeface. None are bold.)

<i>v</i>	<i>ƒ</i>	<i>ŋ</i>	<i>Ɔ</i>	German letters (fao ⠠⠠, Yaht ⠠⠠, ypsilon ⠠⠠, Tseh ⠠⠠)
<i>э</i>	<i>E</i>	<i>щ</i>	<i>Я</i>	Russian letters (eh ⠠⠠, Yeh ⠠⠠, sha ⠠⠠, Yah ⠠⠠)

Use SANS SERIF typeform for these English letters.

K R h p

Use SCRIPT typeform for these letters.  
(Disregard the dark typeface. None are bold.)

<i>f</i>	<i>G</i>	<i>h</i>	<i>Z</i>	English letters
<i>ז</i>	<i>ע</i>	<i>ג</i>	<i>ק</i>	Hebrew letters (zayin ⠠⠠, ayin ⠠⠠, gimel ⠠⠠, qof ⠠⠠)

- b. **Typeform Indicators with More Than One Letter.** The effect of a typeform indicator extends only to the letter which immediately follows it. Thus, in a sequence of unspaced letters, a typeform indicator must be used before each letter that is not in regular type. Here are some isolated examples.

$\mathbb{A}\mathbb{B}$	⋮ ⋮ ⋮ ⋮ ⋮ ⋮ ⋮ ⋮ ⋮ ⋮	(barred English A and B)
<b>AB</b>	⋮ ⋮ ⋮ ⋮ ⋮ ⋮ ⋮ ⋮	(boldface English A and B)
<b>ab</b>	⋮ ⋮ ⋮ ⋮ ⋮	(boldface English a and b)
<b>αβ</b>	⋮ ⋮ ⋮ ⋮ ⋮	(boldface Greek alpha and beta)
<i>AB</i>	⋮ ⋮ ⋮ ⋮ ⋮ ⋮ ⋮ ⋮	(script English A and B)

In a sequence of unspaced letters, an English letter in regular type does not need an alphabetic indicator.

$\beta b$	⋮ ⋮ ⋮	(regular Greek beta, regular English b)
$\mathbb{B}\mathbb{B}$	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	(regular English B, barred English B)
$\text{H}\text{H}$	⋮ ⋮ ⋮ ⋮ ⋮ ⋮	(sans serif English H, regular English H)
$p\mathbf{q}rs$	⋮ ⋮ ⋮ ⋮ ⋮ ⋮ ⋮	(English letters: regular p, boldface q, boldface r, regular s)
$x\mathbf{i}y\mathbf{j}$	⋮ ⋮ ⋮ ⋮ ⋮ ⋮ ⋮	(English letters: regular x, boldface i, regular y, boldface j)

*Instructions:* Practice applying typeform to English and Greek unspaced letter groupings. No italics are used in this list. Only English letters are showing a sans serif and a script typeform.

### PRACTICE 7F

$\mathbb{M}\mathbb{M}\mathcal{M}\mathbb{M}$

$\gamma\psi\Upsilon\Upsilon$

$\Sigma\Sigma\Sigma$

$\text{III}\pi\pi$

$\Delta\text{d}\text{d}\mathbf{D}\lambda\mathcal{N}$

7.6.1 **Barred Letters.** Certain important constructs are sometimes represented by barred letters. Frequently, a barred capital letter may be used to denote the number sets. For example, some authors denote the set of natural numbers by  $\mathbb{N}$ .

$$\gg \mathbb{N} \quad \dots \dots \dots \dots \dots$$

Example 7-15

$\mathbb{Q}$  denotes the set of rational numbers and  $\mathbb{R}$  denotes the set of real numbers.

$\dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots$   
 $\dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots$   
 $\dots \dots \dots \dots \dots \dots$

*The barred typeform has mathematical significance and so is retained.*

Note that a publication may represent these number sets using script rather than barred typeform. 7.6.5 discusses the script typeform indicator.

7.6.2 **Boldface Letters.** Boldface is used to distinguish certain specialized mathematical letters. The text may use bold italics or simply bold. The italic typeform is disregarded, but the bold must be preserved. (See 7.6.3 regarding italics.) Within narrative, a boldface mathematical letter requires a switch to Nemeth. The UEB boldface symbol indicator is not used when the letter has mathematical significance.

Recall that the German letter indicator is dots 456. For 456 to mean "boldface", it must be followed immediately by an alphabetic indicator. Thus,  $\dots \dots$  and  $\dots \dots \dots$  are German letters fao and Fao, and  $\dots \dots \dots$  and  $\dots \dots \dots \dots$  are boldface English letters v and V.

a. **Boldface Letters of Significance—Vectors and Matrices.** Bold lowercase letters are often used to identify vectors. Bold capital letters usually represent matrices. Bold letters may also be found in certain topics in engineering and physics.

$$\gg c^T \Sigma c \quad \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots$$
  
$$\gg c_0(s) = \delta \quad \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots$$
  
$$\gg J = \Delta \mathbf{p} = m \Delta \mathbf{v}$$
  
 $\dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots$

*Example 7-16*

Let  $\mathbf{r}$ ,  $\mathbf{s}$ , and  $\mathbf{t}$  be three vectors. Is there a vector  $\mathbf{s}$  such that  $\mathbf{r} + \mathbf{s} = \mathbf{t}$ ?

$\mathbf{r} + \mathbf{s} = \mathbf{t}$

*A switch to Nemeth is required within narrative for the boldface mathematical letters. An English-letter indicator is required following each typeform indicator.*

*Example 7-17*

Matrix  $\mathbf{K}$  shows the **variance** of the random vector  $\mathbf{X}$ .

$\mathbf{K}$

*The boldfaced word in the narrative is transcribed in UEB.*

- b. **Context Clues.** The boldfaced words in the next example indicate to the reader that they are defined in a glossary. But what about the boldfaced letter "i"? Search the surrounding text to determine whether the letter "i" retains the bold typeform within a mathematical expression. If it does, the boldface is mathematical and a switch to Nemeth Code is required. However, you can see in the expression  $a + bi$  that the imaginary unit is not printed in bold. Therefore, the bold font does not have mathematical significance. Checking the glossary, you find that "i" is a glossary entry, so the bold is retained for that reason but is transcribed in UEB, using the UEB boldface symbol indicator. The italic typeform is disregarded in both cases. (See 7.6.3 regarding italics.)

The Sha from the Cyrillic alphabet often keeps company with bold and barred letters, as seen in the second example.

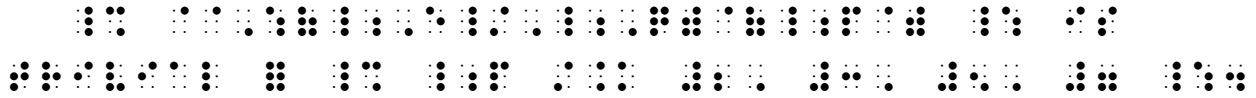
*Example 7-18*

The **imaginary unit** or **unit imaginary number**, denoted as  $i$ , extends the real number system  $\mathbb{R}$  to the complex number system  $\mathbb{C}$ . A **complex number** can be expressed in the form  $a + bi$ .

$a + bi$

*Example 7-19*

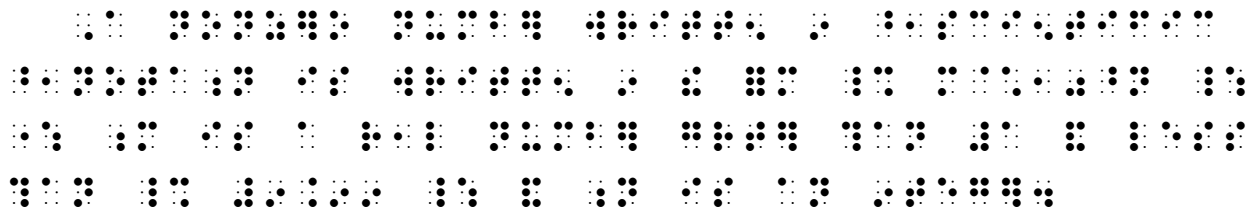
$\text{III}(\mathbf{E}/\mathbb{Q})[\mathbf{p}]$  is trivial for  $\mathbf{p} \neq 2, 3, 5, 7$ .



- c. **Visual Significance Only.** Boldface type of a mathematical letter used only to draw visual attention is disregarded.

*Example 7-20*

A nonzero number written in **scientific notation** is written in the form  $m \times 10^n$  where  $m$  is a real number greater than 1 and less than 9.99 and  $n$  is an integer.

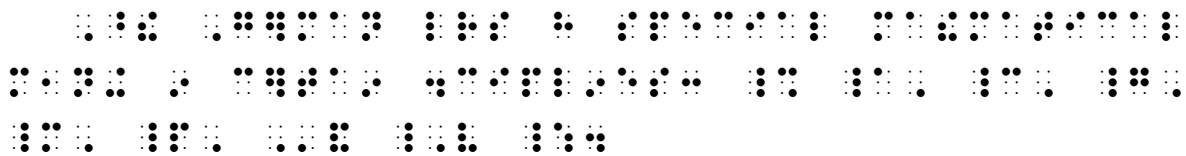


*Letters m and n are not bold in the formula. The boldface used for these letters in the narrative is insignificant and so is disregarded.*

- d. **The German Fraktur Font.** The letters of the German "fraktur" alphabet may appear to be printed in boldface, but when all German letters in the document are dark, the bold typeform is disregarded in the transcription.

*Example 7-21*

These German letters have special mathematical meaning in certain disciplines: **α**, **c**, **g**, **m**, **p**, and **B**.



*The German letters are printed in a dark font. They are not bold.*

- 7.6.3 **Italic Letters.** In the braille transcription, italics are disregarded when mathematical letters are printed in italics consistently throughout the document. If a letter is italicized for other reasons, the transcriber must decide whether the typeface is significant. If the italic typeface is retained, an English-letter indicator is required.

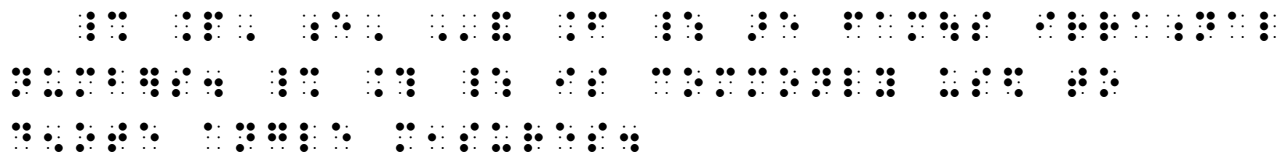
It is helpful for the transcriber to notice the typographical conventions in mathematical notation, particularly that variables are printed in italics and abbreviations are not. It is also customary to print all lowercase Greek letters in italics. Constants may be seen either upright or in italics, but

will be printed in a consistent manner throughout a publication. Sometimes, variables in the superscript or subscript position will be printed in regular (upright) type for clarity. Unless a specific, unique meaning is assigned to an italicized letter, it can be concluded that italics are not a mathematically significant typeface. The distinction between variables and abbreviations is not an issue in braille because Nemeth spacing rules adequately differentiate between them.

Recall that the Greek letter indicator is dots (46). For (46) to mean "italics", it must be followed immediately by an alphabetic indicator. Thus,  $\pi$  is the Greek letter pi, and  $\pi$  is the italicized English letter p.

Example 7-22

$\pi$ ,  $e$ , and  $\phi$  are famous irrational numbers.  $\theta$  is commonly used to denote angle measures.



*Greek letters pi, phi, and theta, as well as English letter e, are printed in italics. These letters are not italicized in braille, according to the general guidelines regarding italicized mathematical letters.*

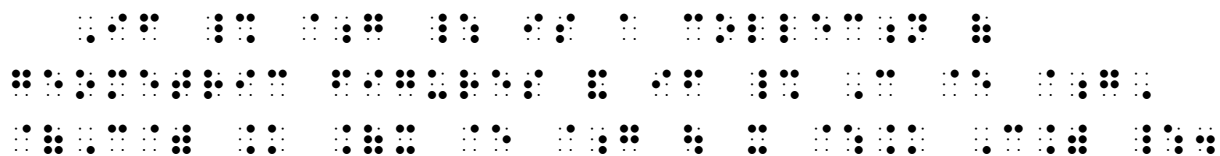
7.6.4 **Sans Serif Letters.** Sans serif letters are mainly used to differentiate computer program language from the surrounding text. Transcription of computer code is not addressed in the Nemeth code book and is beyond the scope of this course.

7.6.5 **Script Letters.** When a script letter is assigned specific mathematical significance, the typeform is retained in the braille transcription. Although there is a script typeform indicator in UEB, a mathematically significant script letter in narrative requires a switch to Nemeth Code.

*Examples:*  $\mathcal{S}$  represents a system's action in physics.  
Let  $\mathcal{T}$  be a topological space.

Example 7-23

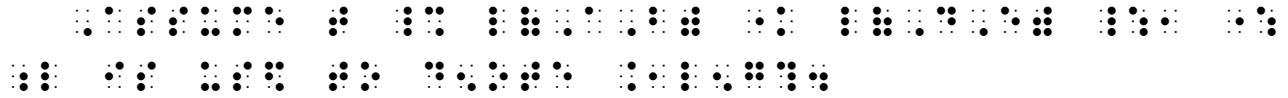
If  $\mathcal{G}$  is a collection of geometric figures and if  $C \in \mathcal{G}$ ,  $[C] = \{x \in \mathcal{G} \mid x \cong C\}$ .



a. **Script Letter "ell".** Print publishers often use the script form of the lowercase English letter "ell" simply to differentiate it visually from the numeral 1 (one). Since the letter and the numeral cannot be confused in braille, there is no reason to retain the script typeform.

*Example 7-24*

Assume that  $\ell(AB) < \ell(DE)$ , where  $\ell$  is used to denote *length*.



*The letter l is printed with a script font.*

- b. **Partial Derivative Symbol.** The symbol for "partial derivative",  $\partial$ , is its own symbol. This is not a script letter d. This symbol will be discussed in Lesson 13.

**PRACTICE 7G**

- i. The perimeter of a rectangle is obtained by adding the measurements of the sides—two lengths and two widths—expressed as

$$P = 2\ell + 2w.$$

What is  $P$  if  $\ell = 5.5$  mi and  $w = 3.2$  mi ?

- ii. The 1-D coordinate system is denoted by  $\mathcal{R}$ . The 2-D coordinate system is often denoted by  $\mathcal{R}^2$ . A general  $n$ -dimensional coordinate system can be denoted by  $\mathcal{R}^n$ .
- iii. Use  $\alpha_1, \beta_1, \gamma_1$  and  $\alpha_2, \beta_2, \gamma_2$  to denote the direction vectors  $\mathbf{k}_1$  and  $\mathbf{k}_2$ .
- iv. **Two Number Sets.**  $\mathbb{N}$  denotes the set of *natural numbers* — that is, the set of nonnegative integers  $\{0, 1, 2, \dots\}$ . The set of all integers is denoted by  $\mathbb{Z}$ .

**7.7 Typeform of Numerals**

Typeform applied to a number is considered a modification if the typeform is mathematically significant or is considered to be printed in a variant typeform for instructional purposes. (See 7.4.1.b.) A switch to Nemeth is required when such a number appears in the narrative.

- 7.7.1 **Typeform Indicators with One Numeral.** The appropriate Nemeth typeform indicator is used when it is determined that the nonregular type is mathematically significant. A numeric indicator is required between a typeform indicator and a numeral. Here are isolated examples of a numeral in various typeforms.

4      ⠠⠠⠠⠠      (barred 4)

4      ⠠⠠⠠      (boldface 4)



<i>4</i>		(italic 4)
<i>4</i>		(script 4)
<b>+</b>		(ordinary plus, boldface 8)
<b>-</b>		(ordinary minus, boldface 8)

7.7.2 **Typeform Indicators with More Than One Numeral.** The effect of a typeform indicator with numerals extends until there is a change in type. Thus, when numerals contain digits in more than one typeform, the appropriate typeform indicator and the numeric indicator must be used before each change in type. When the change is to regular type, only the numeric indicator is used. Here are some isolated examples.

<b>123</b>		(all three numerals are barred)
<b>123</b>		(all three numerals are boldface)
<i>456</i>		(boldface 4, italic 5, regular 6)
<b>4567</b>		(boldface 4 and 5, regular 6 and 7)
1234		(regular 1 and 2, boldface 3 and 4)
<i>28-571</i>		(italic 28, hyphen, boldface 571)
<i>47-653</i>		(italic 47, hyphen, regular 653)
100 + 200 = 300		(boldface 1, 2, and 3; all zeros in regular type)

7.7.3 **Barred Numerals.** The use of this typeform with numerals tends to be an author's choice for clarity, rather than using regular boldface. The transcription follows print.

5

7.7.4 **Boldface Numerals**

- a. **Boldface Numeral of Significance—The Null Vector.** The boldface zero is defined as the "null vector" and therefore the typeform has mathematical significance. A switch to Nemeth Code is required, even in literary context.

0

Example 7-25

In  $P\mathbf{v} = \mathbf{0}$ ,  $\mathbf{v}$  is a vector and  $\mathbf{0}$  is the null vector.

Braille representation of the text above, with boldface numerals 0 and 10.

b. Otherwise, bold numerals may simply indicate distinction, as in the next example.

Example 7-26

Are the boldface numbers even or odd? 19, 28, 37, 44, 51, 67, 72, 80.

Braille representation of the text above, with boldface numerals 28, 44, 72, and 80.

7.7.5 Typeform Indicators with Numeral/Symbol Combinations. Rules regarding significant typeform applied to a numeral/symbol combination such as 49% or \$5 will be discussed in Lesson 11.

PRACTICE 7H

1) The following math sentence represents pairs of socks in Nate's sock drawer. Barred numbers indicate pairs of blue socks; bold numbers indicate pairs of red socks.

4 + 1 - 1 + 3 - 1 - 1 + 2 - 1

Clean socks added from the wash are after a plus sign "+". Socks which Nate wore and put into the laundry hamper are after a minus sign "-". How many pairs of red socks are in Nate's drawer today?

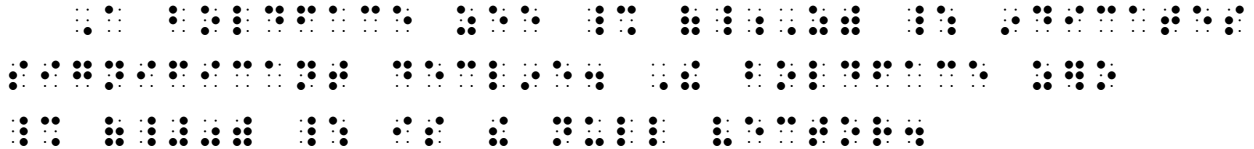
2) If the boldface number signifies a withdrawal from your account, can you explain why 250 + 250 = 0?

## 7.8 Nonregular Typeform in Contact with a Grouping Symbol

Because a letter or numeral in nonregular type must include a numeric or alphabetic indicator, rules regarding such letters or numerals when in contact with grouping signs are different from rules regarding letters or numerals in regular type. A numeric or alphabetic indicator is required for numbers or letters in nonregular type when touching or enclosed between grouping symbols.

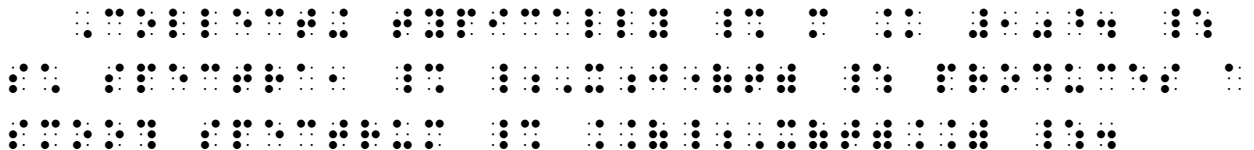
### Example 7-27

A boldface zee (**Z**) indicates significant decline. The boldface zero (**0**) indicates the null vector.



### Example 7-28

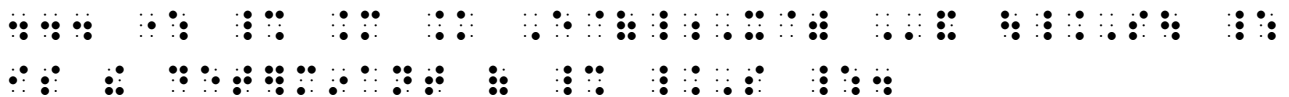
Collecting typically  $m = 10^4$  such spectra,  $\mathbf{X}_j(t)$  produces a smooth spectrum  $\langle \mathbf{X}(t) \rangle$ .



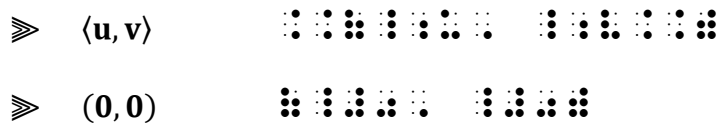
*Compare the letter "t" enclosed in parentheses, which does not need an alphabetic indicator because it is in regular type, to the second letter "X" enclosed in angle brackets, which requires an English-letter indicator because it is in boldface.*

### Example 7-29

... where  $\mu = E[\mathbf{X}]$  and  $|\Sigma|$  is the determinant of  $\Sigma$ .

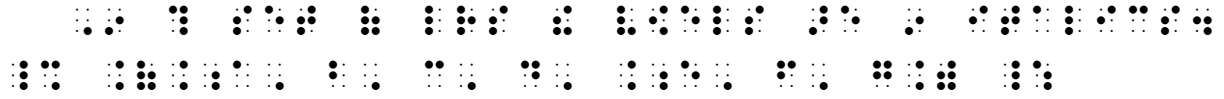


7.8.1 **Nonregular Typeform in an Enclosed List.** Recall that English letters in an enclosed list do not use an English-letter indicator. (See Lesson 4.) When letters or numerals in an enclosed list are printed in nonregular typeform and the variant typeform is retained, each typeform indicator is followed by an appropriate letter indicator or numeric indicator.



Example 7-30

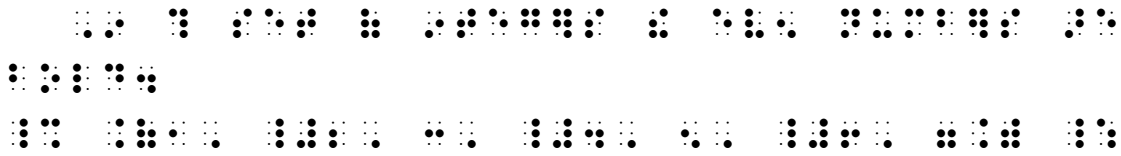
In this set of letters the vowels are in italics. {a, b, c, d, e, f, g}



*In an enclosed list, English letters in regular type do not require an English-letter indicator.*

Example 7-31

In this set of integers the even numbers are bold. {1, 2, 3, 4, 5, 6, 7}



*In an enclosed list, numerals in regular type do not require a numeric indicator.*

**PRACTICE 7I**

- (1) For vectors **(a, b, c)**, can it be said that  $\mathbf{a} + (\mathbf{b} + \mathbf{c}) = (\mathbf{a} + \mathbf{b}) + \mathbf{c}$ ?
- (2)  $c(\mathbf{a}, \mathbf{b}) = (c\mathbf{a}, \mathbf{b})$  as well as  $(\mathbf{a}, c\mathbf{b})$ . **a** and **b** are vectors. Define **ab**.

## 7.9 Boldface Mathematical Symbols [NC 7.5]

Dots 456 can be applied only to certain specific math symbols. Each symbol consists of dots 456 followed by the appropriate symbol. (456) is considered to be an actual part of the symbol and must not be considered to be a boldface typeform indicator. As such, do not use dots 456 with any sign other than those shown in this section.

7.9.1 **Signs of Operation in Boldface Type.** The signs of operation listed below are to be used to show boldface type only when the distinction between the regular and the boldface forms of the same sign has mathematical significance. The surrounding text should be examined to determine if this is the case.

⋮⋮	Boldface Plus	<b>+</b>
⋮⋮	Boldface Minus	<b>-</b>
⋮⋮ ⋮⋮	Bold Plus Followed by Bold Minus	<b>+ -</b>
⋮⋮ ⋮	Bold Plus Followed by Regular Minus	<b>+ -</b>
⋮ ⋮⋮	Regular Plus Followed by Bold Minus	<b>+ -</b>
⋮⋮ ⋮⋮	Bold Minus Followed by Bold Plus	<b>- +</b>
⋮⋮ ⋮	Bold Minus Followed by Regular Plus	<b>- +</b>
⋮ ⋮⋮	Regular Minus Followed by Bold Plus	<b>- +</b>

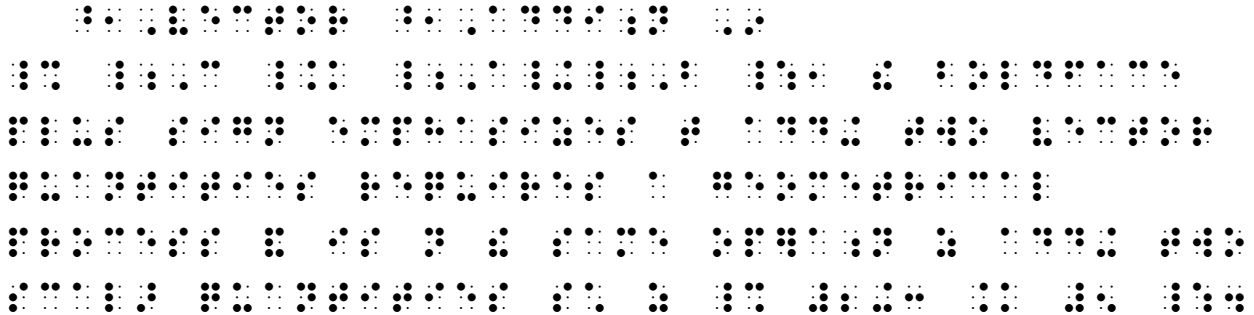
7.9.2 **Equals Sign in Boldface Type.** When it is necessary to show that an equals sign is printed in boldface type, dots 456 are placed before the equals symbol. Boldface equals signs are used only when the distinction between the regular and boldface forms of the same sign has mathematical significance. The surrounding text should be examined to determine if this is the case.

⋮⋮⋮	Boldface Equals	<b>=</b>
-----	-----------------	----------

Boldface signs are used in vector equations to emphasize the distinction between vector and scalar mathematical operations, as the following examples illustrate.

Example 7-32

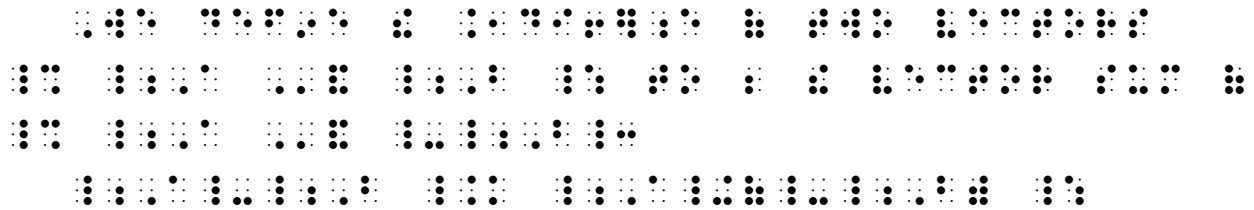
**Vector Addition** In  $C = A + B$ , the boldface plus sign emphasizes that adding two vector quantities requires a geometrical process and is not the same operation as adding two scalar quantities such as  $2 + 3 = 5$ .



Example 7-33

We define the *difference* of two vectors **A** and **B** to be the vector sum of **A** and **-B**:

$$A - B = A + (-B)$$



7.9.3 **Grouping Signs in Boldface Type.** When brackets or vertical bars are printed in mathematically significant boldface, dots 456 are placed before the grouping symbol.

⠠⠠⠠	Boldface Left Bracket	[
⠠⠠⠠	Boldface Right Bracket	]
⠠⠠	Boldface Vertical Bar	
⠠⠠⠠⠠	Boldface Double Vertical Bar	

Double boldface vertical bars are usually read as "the norm of."



Boldface brackets are often used to designate the "integer function".



---

*Instructions:* Follow the print format of a 3-column list. Place the opening Nemeth Code indicator in cell 1. After one blank line, begin the first row in cell 1. After the third row, another blank line must precede the Nemeth Code terminator, which is also placed in cell 1. Sentence A will then begin on the next line.

**PRACTICE 7J**

=	+ -	- +
+	+ -	- +
-	+ -	- +

- A. In older texts, the greatest integer function may be notated with a bold bracket: **[x]**.
  - B. **||Y||** means "the norm of Y".
- 

**7.10 Barred Grouping Symbols and Other Signs of Grouping [NC Rule 19]**

While we are on the topic of barred typeform, this is a good time to introduce the rest of the grouping signs for which the Nemeth Code has devised symbols, since four of them are barred.

7.10.1 **Barred Brackets and Barred Braces.** Use the symbols in the box below when barred brackets or barred braces are encountered. Notice that the barred grouping symbols are formed by inserting dots 456 before the second cell of the normal grouping symbol.

⠠⠠⠠⠠⠠	Left Barred Bracket	⠠⠠
⠠⠠⠠⠠⠠	Right Barred Bracket	⠠⠠
⠠⠠⠠⠠⠠	Left Barred Brace	⠠⠠
⠠⠠⠠⠠⠠	Right Barred Brace	⠠⠠

➤ **[x]**      ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

➤ **{abc}**      ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠







**7.11 Further Details Regarding Typeform of Letters and Numerals**

7.11.1 **Typeform with Subscripts.** Regarding the special subscript rule where the subscript indicator is not used for a numeral that is a right subscript to a letter, the letter may be in any typeform. (Review 6.11 in Lesson 6.)

➤  $i_1$     ⠠⠠⠠⠠⠠    (Bold English letter i, subscript one)

7.11.2 **Typeform with Unspaced Mathematical Expressions.** Recall that an English-letter indicator is not used in an unspaced mathematical expression. (See 3.12.3 in Lesson 3.) The rule applies only to an English letter in regular type, or an italicized letter when the italics are disregarded in braille. If an English letter is printed in a mathematically significant typeform, an alphabetic indicator is always required.

Compare these transcriptions of the letter "i" in regular type and bold type.

- $3i$     (*Spoken: three i*)    ⠠⠠⠠⠠⠠
- $3\mathbf{i}$     (*Spoken: three bold i*)    ⠠⠠⠠⠠⠠⠠⠠⠠
- $3_i$     (*three, subscript i*)    ⠠⠠⠠⠠⠠⠠⠠
- $3_{\mathbf{i}}$     (*three, subscript bold i*)    ⠠⠠⠠⠠⠠⠠⠠⠠⠠
- $\delta_{ij}$     (*delta, subscripts bold i and bold j*)    ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

7.11.3 **Underlining and Other Typeforms.** There is no underline indicator in the Nemeth Code. Underlining of letters, numbers, and mathematical symbols will be discussed in Lesson 12.

Typeforms for which there are no provisions in the Nemeth Code may use one of the five typeform indicators that is not used elsewhere in the document. A transcriber's note should explain the substitution.

Sample transcriber's note:

⠠⠠⠠ indicates red numbers. ⠠⠠⠠⠠⠠ indicates blue numbers.

Here is Nate's sock drawer again, substituting the script and sans serif typeform indicators for the colored type.

*Note to students reading from a monochrome printout: Colored type appears in the next example. Some numbers are blue and some are red. The word "red" is also red.*



Example 7-39

In *three-dimensional Euclidean space*, **R** vectors are identified with triples of scalar components.

1     *three-dimensional Euclidean space*, **R** vectors are identified with triples of scalar components.  
 2     **R** vectors are identified with triples of scalar components.  
 3     *three-dimensional Euclidean space*, **R** vectors are identified with triples of scalar components.

Line 2: The UEB italics are terminated by the opening Nemeth indicator. UEB typeform is reapplied on the italicized word "vectors".

Line 2: The bold typeform is retained for the letter R because it is mathematically significant—the boldface identifies it as a vector. The italic typeform for the letter R is disregarded, according to normal practice for italicized letters.

Example 7-40

In a complex number of the form  $z = a + bi$ , *a* is the real part of the complex number *z*.

*In a complex number of the form z = a + bi, a is the real part of the complex number z.*

*Italics are disregarded for the math equation, according to normal practice. The UEB italic passage indicator and terminator are used for the italicized phrase.*

Example 7-41

Energy and mass are equivalent, *which is the message of*  $E = mc^2$ .

*Energy and mass are equivalent, which is the message of E = mc^2.*

*The UEB italics are terminated by the opening Nemeth indicator. Italics are disregarded for the math equation, according to normal practice.*

a. **Capitalization.** Capitalization is not a typeform and must be explicitly terminated.

Example 7-42

THE NULL VECTOR  $\mathbf{0}$  is known as the *null vector*.



*A capitals terminator is required at the end of this paragraph heading.*

**PRACTICE 7L**

Assume that the first pair to be repeated is  $(r_k, r_{k+1})$  for  $k \geq 0$ . In the sequence of pairs, there is a later pair  $(r_n, r_{n+1})$  equal to  $(r_k, r_{k+1})$  with  $m^2 + 1 \geq n + 1 > k + 1$ . But, *since the pairs are equal*,  $r_k = r_n$  and  $r_{k+1} = r_{n+1}$ .

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

**EXERCISE 7**

Prepare Exercise 7 for your grader.



# ANSWERS TO PRACTICE MATERIAL

## PRACTICE 7A

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### *NARRATIVE FORMAT (3-1)*

*Line 5: Math displayed to (3-1) narrative begins in cell 3. Both switches fit on this line.*

*Line 6: The (3-1) paragraph continues in cell 1.*

*Line 12: Math displayed to (3-1) narrative begins in cell 3. Nemeth Code is already in effect.*

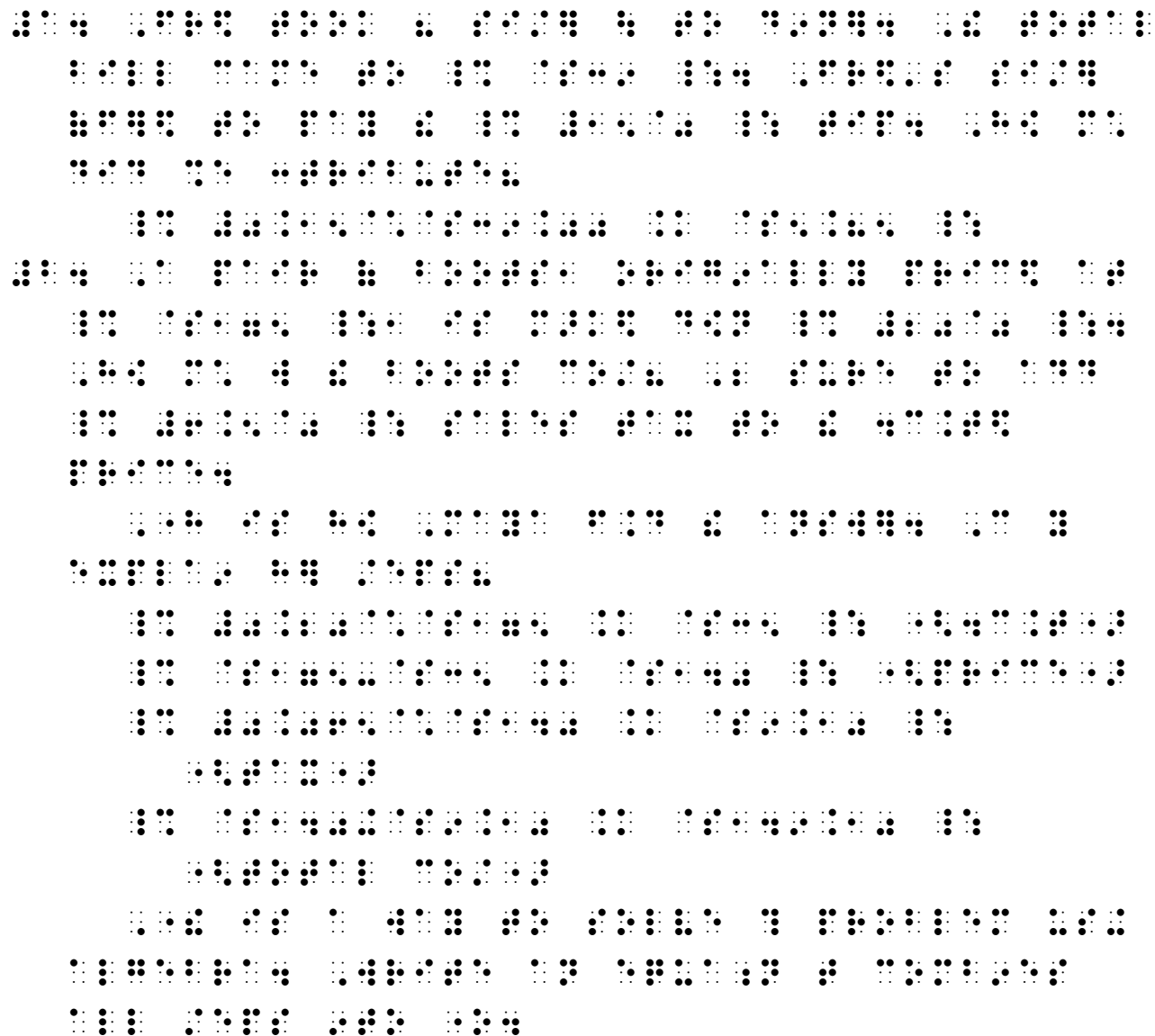
*Line 13: Within the displayed material, code switches appear on the same line.*

*Lines 14-15: A new narrative paragraph (3-1).*

*Lines 20-23: Each displayed expression begins in cell 3. Note that, in print, the four expressions are printed widely spaced on one line.*

## PRACTICE 7B

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### *ITEMIZED FORMAT (1-3)*

*Line 5: Math displayed to (1-3) itemized material begins in cell 5. This displayed expression has no runover.*

*Lines 11-12: The subparagraph begins in cell 5, with runovers in cell 3.*

*Lines 13-18: Each displayed step begins in cell 5. Runovers begin in cell 7.*

*Lines 13-16: Recall from 3.6.7 (Lesson 3) that a single-word switch indicator cannot be placed immediately before an opening parenthesis. Nemeth must be terminated before transcribing each word that is enclosed in parentheses.*

*Lines 19-21: A new subparagraph begins in cell 5, with runovers in cell 3.*



## PRACTICE 7C

1		$\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}$
2		$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$
3		$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$
4		$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$
5		$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$
6		$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$
7		$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$
8		$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$
9		$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$
10		$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$
11		$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$
12		$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$
13		$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$
14		$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$
15		$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

*INSTRUCTIONS (5-3) and ITEMIZED FORMAT WITH SUBENTRIES (1-5; 3-5)*

*Lines 1-2: Instructions (5-3). The italic typeform is disregarded.*

*Line 3: Math displayed to instructions begins in cell 5. This expression has no runovers.*

*Lines 4-5: The item identifier begins in cell 1. Runovers are in cell 5 because this item has subentries.*

*Lines 6-8: The subdivision identifier begins in cell 3. Runovers are in cell 5.*

*Lines 9-10: Math displayed to a subentry begins in cell 7 with runovers in cell 9. The math and its code switches fit on one line (line 10).*

*Lines 11-13: A new subdivision identifier begins in cell 3. Runovers are in cell 5.*

*Lines 14-15: Math displayed to a subentry begins in cell 7 with runovers in cell 9. The math and its code switches fit on one line (line 15).*

## PRACTICE 7D

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*Lines 10-12: Narrative paragraph begins in cell 3 with runovers in cell 1.*

*Line 13: The displayed math expression begins with its label (identifier) in cell 3.*

*Line 14: The paragraph continues in cell 1. The opening Nemeth Code indicator is placed at the end of this line, following switching guidelines for text preceding itemized Nemeth material.*

*Line 15: The displayed math expression begins with its label (identifier) in cell 3.*

*Lines 16-17: The paragraph continues in cell 1. The equation labels are transcribed in UEB because the context is UEB—they do not need to match the code in which the labels are first shown.*

## PRACTICE 7E

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- 11
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## PRACTICE 7F

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- 6
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PRACTICE 7L

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Braille transcription of the text passage:

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*Line 7: Recall from Lesson 3 that the single-word switch indicator can be used with a word associated with a UEB typeform word indicator.*