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 <u>not</u> 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 when displayed mathematical material is preceded and/or followed by UEB text.

- If the displayed math and its switch indicators will fit on one braille line, that is the preferred layout.
- If the displayed math and its switches will not fit on one braille line, the opening indicator is placed at the end of the previous line of text. If the indicator will not fit on that line, it is placed on the following line in the runover position of the text. This approach can be applied to displayed material following instructions as well. When displayed material follows a transcriber's note, the opening Nemeth Code indicator must fit on the same line as the closing transcriber's note indicator. If it does not, place the switch on the same line as the displayed math.
- The Nemeth Code terminator is placed at the end of the displayed material. If the terminator will not fit on that line, it is placed on the following line in the runover position for the displayed material.

For the remainder of the course, Nemeth format summaries can be found in Appendix C. You may find the format diagrams in Appendix C helpful.

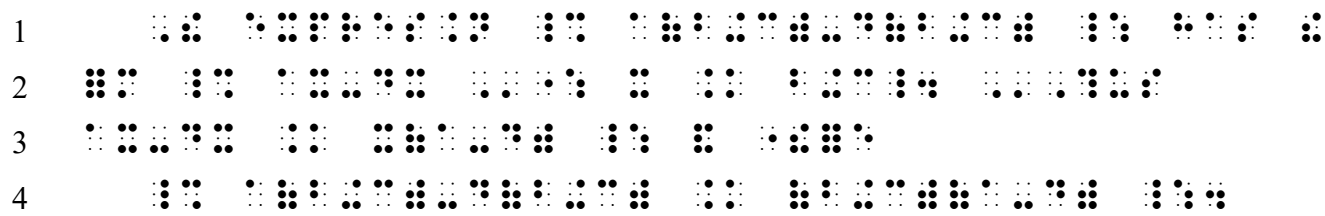
7.1.2 **Math Displayed to Unitemized Text.** Math displayed to unitemized text starts in cell 3. Runovers are in cell 5.

Notice layout patterns in the print copy to determine whether the narrative following displayed material is a continuation of the preceding text or if it is the start of a new paragraph. When the text following the displayed expression is a continuation of the same paragraph, it begins in the runover cell of that narrative, cell 1. When the text following the displayed expression starts a new paragraph, it begins in cell 3.

Example 7-1

The expression $a(b+c)-d(b+c)$ has the form $ax-dx$ where $x=b+c$. Thus $ax-dx=x(a-d)$ and therefore

$$a(b+c)-d(b+c)=(b+c)(a-d).$$



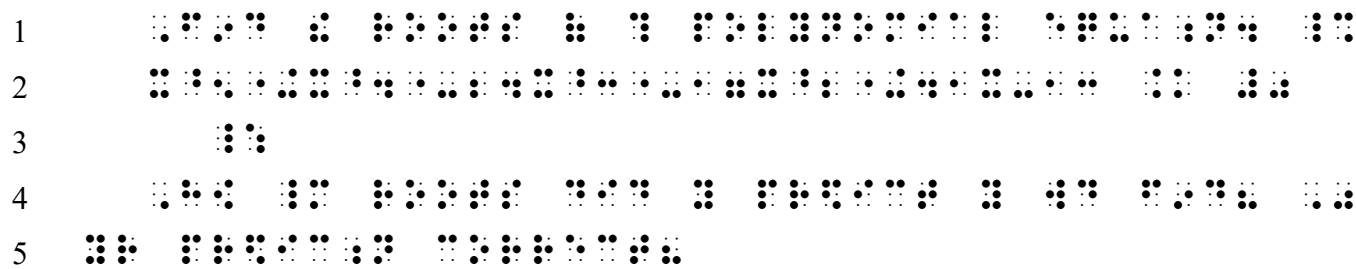
Lines 1-3: Narrative paragraph (3-1) with embedded math.
Line 4: The entire displayed expression will fit on one line with its opening switch indicator and terminator. The opening switch indicator is the first character in the display cell.

Example 7-2

Find the roots of this polynomial equation.

$$x^5+x^4-24x^3-17x^2+41x-13=0$$

How many roots did you predict you would find? Was your prediction correct?



Line 1: The narrative paragraph begins in cell 3. There is no runover. The opening Nemeth Code indicator is placed at the end of the sentence because the switch indicators do not fit on one line with the displayed math.

Lines 2-3: The displayed math begins in cell 3. The Nemeth Code terminator is placed in the runover position, cell 5. These margins apply regardless of the presence or absence of a runover in the preceding material.
Lines 4-5: New narrative paragraph (3-1).

7.1.3 **More Than One Displayed Math Item.** When more than one item is displayed, consider the following details before formatting.

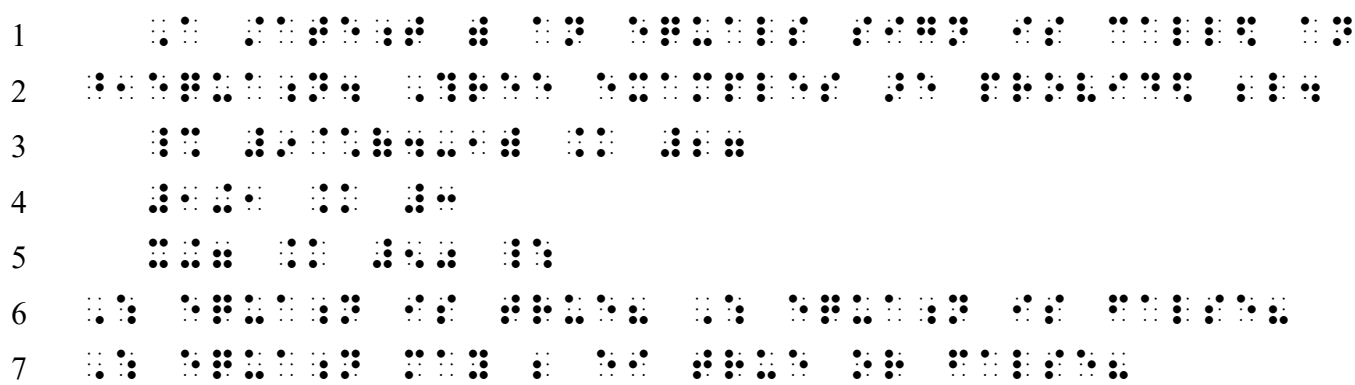
a. If each expression is printed on a new line, or if short expressions are widely spaced on one line, transcribe each expression on a new line in the initial display cell.

Example 7-3

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?



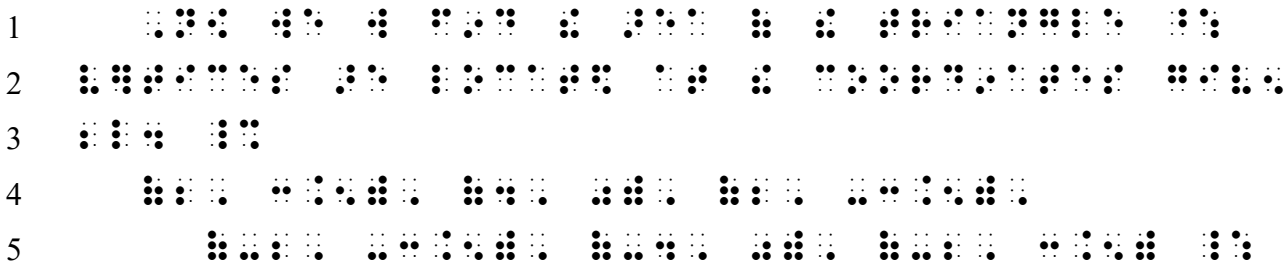
Line 3: The opening switch indicator is placed on the same line as the first displayed expression.
Lines 3-5: Although printed all on one line, each expression is transcribed on a new line.
Lines 6-7: The narrative paragraph continues in cell 1 (the runover cell to a 3-1 paragraph).

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

Example 7-4

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)



Lines 1-3: Narrative paragraph (3-1).
Line 4: Cell 3 is the starting cell for math displayed to narrative.
Line 5: Cell 5 is the runover cell for math displayed to narrative. Notice that, although (-2, will fit at the end of line 4, an enclosed list must not be divided between braille lines.

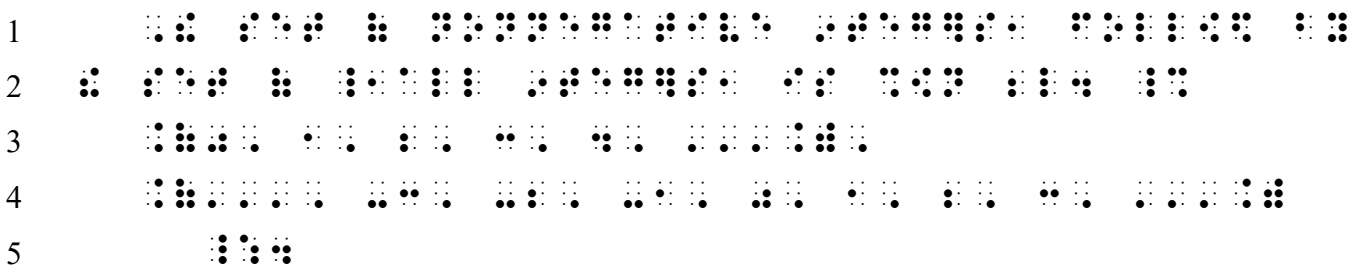
c. When sentence-structure punctuation is included in the displayed math, each expression may begin in the primary display cell if doing so more closely matches the print layout.

Example 7-5

The set of nonnegative integers, followed by the set of <u>all</u> integers, is shown below.

$\{0, 1, 2, 3, 4, \ldots\}$,

$\{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots\}$.



Lines 1-2: Narrative paragraph (3-1).
Line 3: Math displayed to unitemized text begins in cell 3.
Lines 4-5: The second displayed math item also begins in cell 3. The Nemeth Code terminator is in the runover cell, cell 5.

PRACTICE 7A

Polynomials

Solve this polynomial using basic algebra. *Hint:* First factor out "x" to make it a quadratic equation.

$$x^3 + 2x^2 - x = x(x^2 + 2x - 1)$$

Do you notice a familiar pattern?

Sequences

A sequence $a_1, a_2, a_3, \ldots, a_n$ is said to *converge* if there exists a positive number M such that, for each $h > 0$,

$$|a_n - A| < h \text{ , for all } n > M.$$

A sequence that does not converge is said to *diverge*.

Inequalities

Now we will use number lines to illustrate the following inequalities.

$-6 < -5 \qquad 0 < +6 \qquad -8 < +2 \qquad -1 > -5$

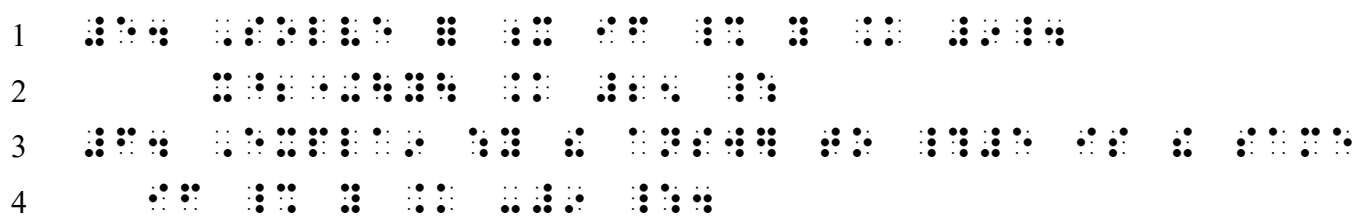
7.1.4 **Math Displayed to Itemized Text.** Math displayed to itemized text (with no subdivisions) starts in cell 5. Runovers are in cell 7.

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 $y = -9$.



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 runover.
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?

$0.20 \times \$175 = \$35$ (discount)
$\$175 - \$35 = \$140$ (price)
$0.065 \times \$140 = \$9.10$ (tax)
$\$140 + \$9.10 = \$149.10$ (total cost)

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

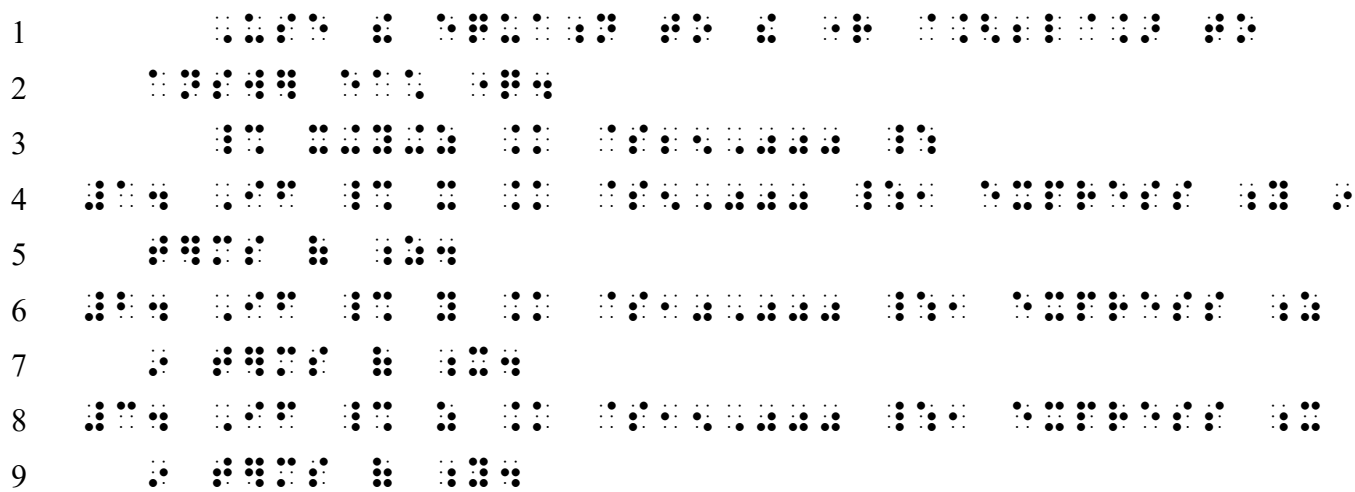
7.1.5 **Displayed Material Associated with Instructions.** Nemeth instructions begin in cell 5, with runovers in cell 3. (See Lesson 5.) If displayed mathematical material appears within or immediately following instructions, the displayed material starts in cell 5 with runovers in cell 7.

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.



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 3: The displayed math begins two cells in from the runover cell of the previous text. The two switch indicators fit on the same line as the displayed math.

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

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

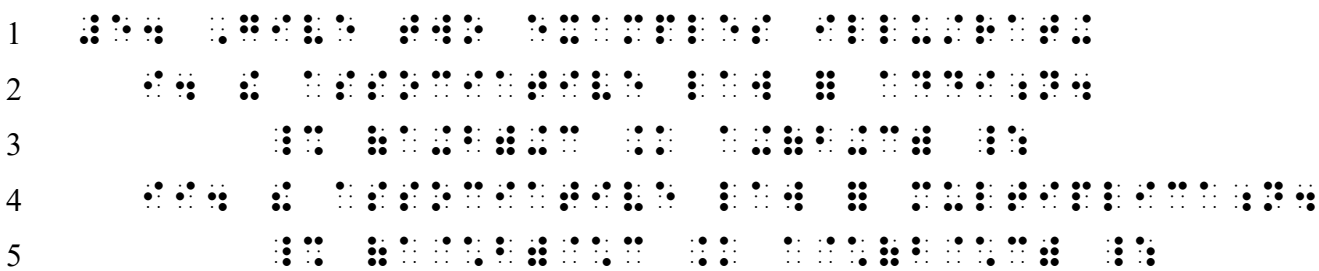
5. Give two examples illustrating

   i. the associative law for addition.

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

   ii. the associative law for multiplication.

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



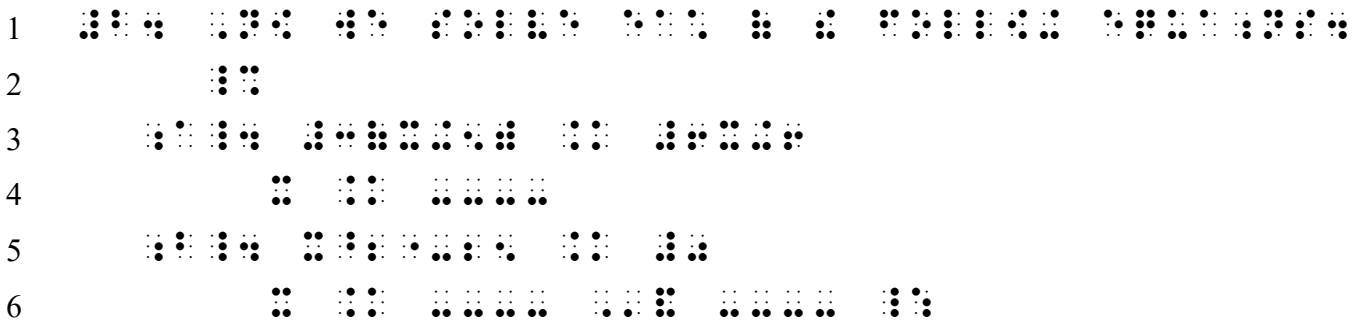
Line 1: Main item begins in cell 1.
Lines 2 and 4: Each subdivision begins in cell 3.
Lines 3 and 5: Displayed math is in cell 7, which is two cells in from the runover of subdivisions, whether or not runovers occur.

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 ___



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 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.

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)?

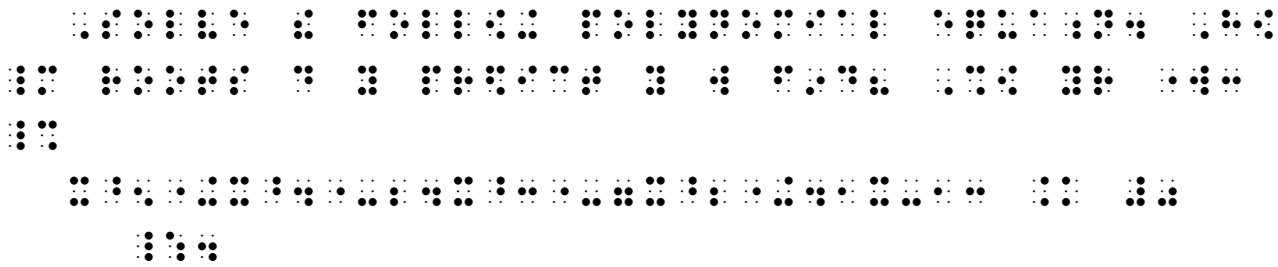
Solve for c: $14^2 + 12^2 = c^2$

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

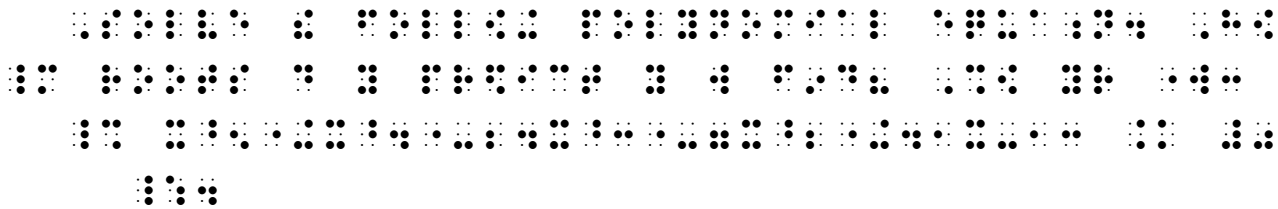
Solve the following polynomial equation. How many roots do you predict you will find? Show your work:

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



An alternate layout saves a line if the displayed expression takes up most of the line <u>and</u> 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



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.

The label may be transcribed in either UEB or Nemeth depending on context. Labels do not need to be transcribed in the same code, although the transcriber may prefer to show a sequence of labels in the same code. 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.

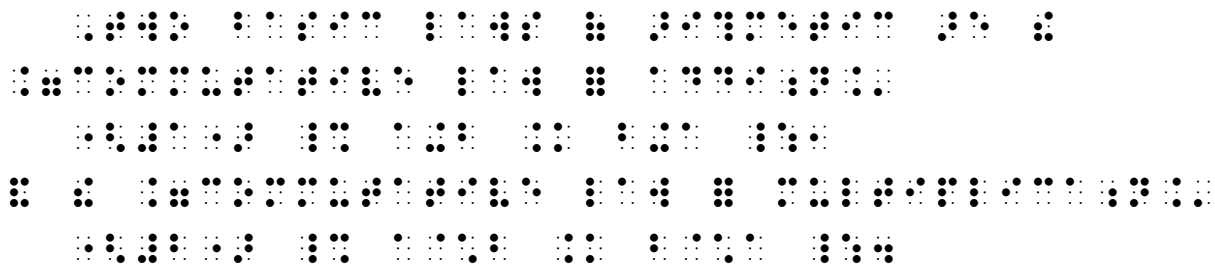
Example 7-11

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

$$a + b = b + a, \qquad (1)$$

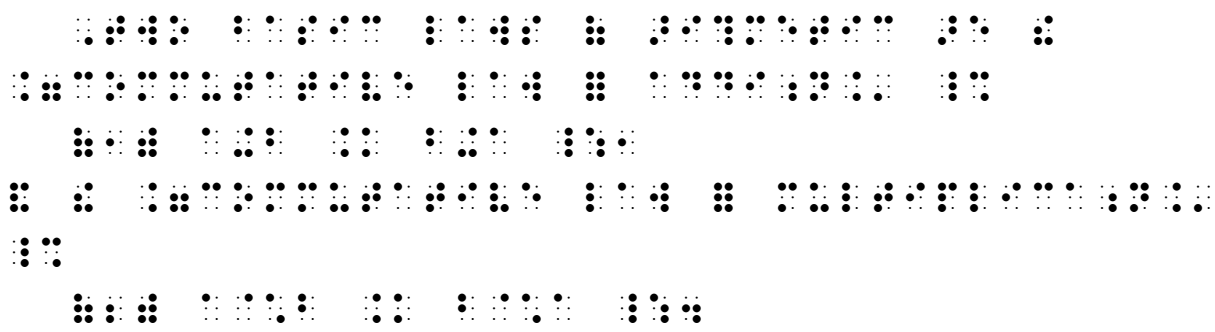
and the *commutative law for multiplication*

$$a \times b = b \times a. \qquad (2)$$



This is a narrative paragraph interrupted twice by displayed math.
Lines 1-2: The paragraph begins in cell 3 and runs over in cell 1.
Line 3: Displayed math begins in cell 3. The label (identifier) is transcribed first. The label is bold in print but the typeform is disregarded in braille. The label is transcribed in the same code as the preceding text, which is UEB in this case.
Line 4: The paragraph continues in the runover cell (cell 1).
Line 5: Same as line 3.

Alternate transcription

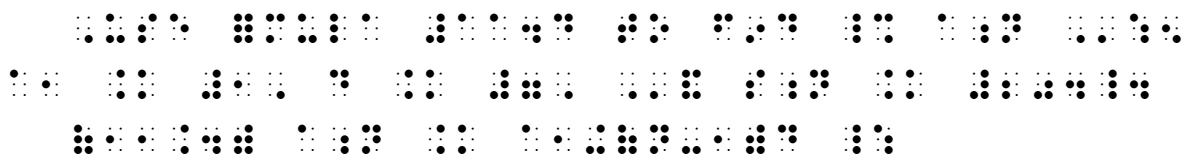


Line 2: The opening Nemeth Code indicator is placed at the end of the text.
Line 3: The label is transcribed in Nemeth.
Line 5: The opening Nemeth Code indicator will not fit at the end of the text on line 4 and so is placed in cell 1, the runover position.
Line 6: The label is transcribed in Nemeth.

Example 7-12

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

$$a_n = a_1 + (n - 1)d \qquad (11.4)$$



7.2.2 **Transcriber's Note Required.** A transcriber's note concerning the change in position of the label in the braille copy is required. Sample transcriber's note:

An identifier printed to the right of an expression is transcribed on the left.

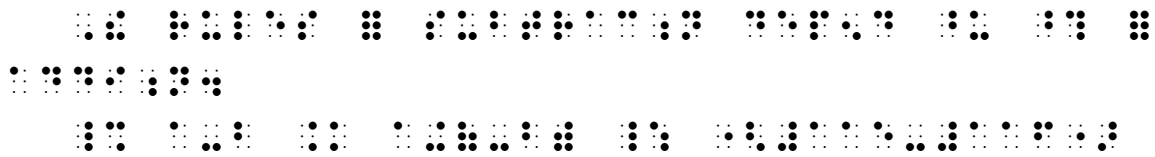
7.2.3 **Page Number Citation.** The number printed beside a displayed mathematical expression may actually be a page citation, in which case the cross reference immediately <u>follows</u> the expression, as printed. If a range of numbers is shown, you can be fairly confident that they are page numbers, especially in a review section. Look for context clues to determine if the label is a page number citation in order to place it in its proper location.

Since the location of the citation is not changed from its location in print, a transcriber's note is not needed.

Example 7-13

The rules for subtraction depend upon those for addition.

$$a - b = a + (-b) \qquad (115\text{-}116)$$



7.3 Displayed Narrative Material

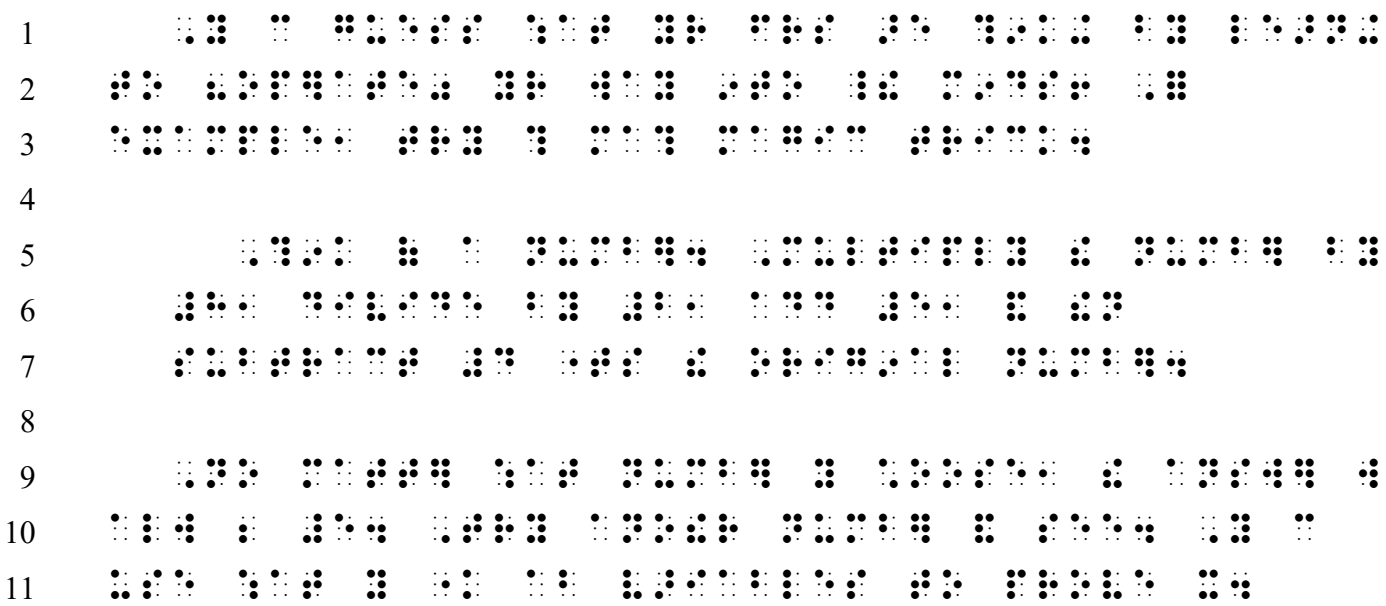
Recall that displayed narrative text follows the guidelines in *Braille Formats* with the exception that blocked paragraphs are not used throughout a technical document.

Example 7-14

You can guess what your friends are thinking by learning to "operate" your way into their minds! For example, try this math magic trick.

> **Think of a number. Multiply the number by 8, divide by 2, add 5, and then subtract 4 times the original number.**

No matter what number you choose, the answer will always be 5. Try another number and see. You can use what you know about variables to prove it.



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.

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 ($a \neq 0$).

$$ax^2 + bx + c = 0 \qquad (1)$$

This is the Pythagorean Theorem:

$$a^2 + b^2 = c^2 \qquad (2)$$

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

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.

  π 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? $19, \mathbf{28}, 37, \mathbf{44}, 51, 67, \mathbf{72}, \mathbf{80}$.

- 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 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)
ℝ	⠨⠨⠨⠨⠠⠗	(barred English capital R)
R	⠨⠨⠨⠠⠗	(boldface English capital R)
R	⠨⠨⠨⠠⠗	(italic English capital R)

R	⠰⠠⠗	(sans serif English capital R)
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)
∑	⠰⠸⠨⠠⠩⠨	(barred Greek capital Sigma)
c	⠨⠸⠆⠠	(italic German tseh, lowercase)
ℵ	⠨⠠⠠⠁⠠	(script Hebrew alef)

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.

ℍ ℹ ℚ ⅆ English letters

∑ ℽ Γ ϖ Greek letters (Sigma, gamma, Gamma, pi)

Use BOLDFACE typeform for these letters.

a B c D English letters

ρ Ψ Φ χ Greek letters (rho, Psi, Phi, chi)

Ч з г Ж Russian letters (Cheh ⠿, zeh ⠷, gheh ⠯, Zheh ⠾)

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

𝔳 𝔉 𝔶 𝔈 German letters (fao ⠷, Yaht ⠾, ypsilon ⠿, Tseh ⠽)

э Е щ Я 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.)

𝒻 𝒢 𝒽 𝒵 English letters

ז ע ג ק 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.

$\mathbb{AB}$	⠸⠁⠸⠁	(barred English A and B)
AB	⠨⠁⠨⠁	(boldface English A and B)
ab	⠨⠁⠨⠁	(boldface English a and b)
αβ	⠨⠁⠨⠁	(boldface Greek alpha and beta)
$\mathcal{AB}$	⠸⠁⠸⠁	(script English A and B)

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

βb	⠨⠁⠃	(regular Greek beta, regular English b)
B$\mathbb{B}$	⠠⠸⠁	(regular English B, barred English B)
HH	⠸⠁⠠⠓	(sans serif English H, regular English H)
p**qr**s	⠨⠠⠨⠠⠨⠠⠨⠠	(English letters: regular p, boldface q, boldface r, regular s)
x**iy**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

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

$\mathsf{y}\mathcal{y}\mathbb{y}$ **y** y

$\Sigma\boldsymbol{\Sigma}\Sigma$

$\mathbb{\pi}\pi\boldsymbol{\pi}$

Δdd**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 ℕ.

⟫ ℕ ⠨⠝⠠⠝

Example 7-15

ℚ denotes the set of rational numbers and ℝ denotes the set of real numbers.

⠨⠟ ⠨⠠⠝⠠⠝⠠⠝ ⠨⠞ ⠠⠠⠝⠠⠝⠠⠝⠠⠝ ⠠ ⠠⠠⠠ ⠠ ⠠⠠⠠⠠⠠⠠⠠
⠠⠠⠠⠠⠠⠠⠠⠠ ⠠ ⠨⠟ ⠨⠠⠝⠠⠝⠠⠝ ⠨⠞ ⠠⠠⠝⠠⠝⠠⠝⠠⠝ ⠠ ⠠⠠⠠ ⠠ ⠠⠠⠠⠠⠠⠠⠠
⠠⠠⠠⠠⠠⠠⠠⠠⠠

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, ⠸⠋⠁ and ⠸⠠⠋⠁ are German letters fao and Fao, and ⠸⠧⠁ and ⠸⠠⠧⠁ 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.

⟫ $\boldsymbol{c}^T\Sigma\boldsymbol{c}$ ⠸⠉⠔⠨⠎⠉

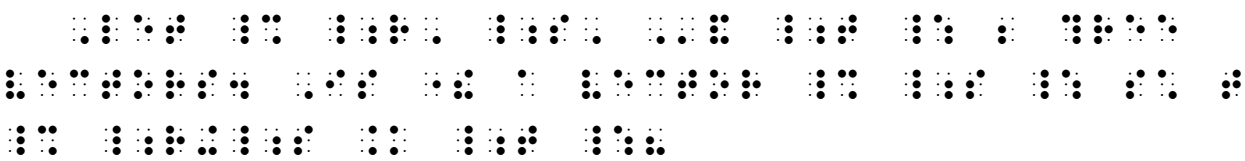
⟫ $\boldsymbol{c}_0(s) = \boldsymbol{\delta}$ ⠸⠉⠔⠣⠎⠜ ⠨⠅ ⠸⠙⠔

⟫ $\boldsymbol{J} = \Delta\boldsymbol{p} = m\Delta\boldsymbol{v}$

⠸⠚⠔⠨⠅ ⠨⠅ ⠸⠙⠔⠨⠏⠔⠨⠅ ⠨⠅ ⠸⠍⠔⠨⠙⠔⠨⠧

Example 7-16

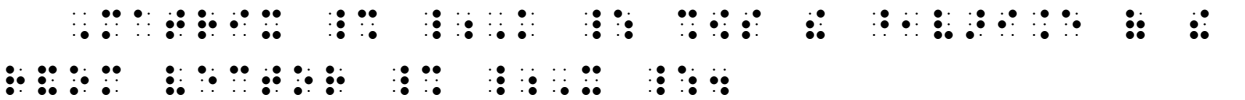
Let **r**, **s**, and **t** be three vectors. Is there a vector **s** such that **r** + **s** = **t**?



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 **K** shows the **variance** of the random vector **X**.



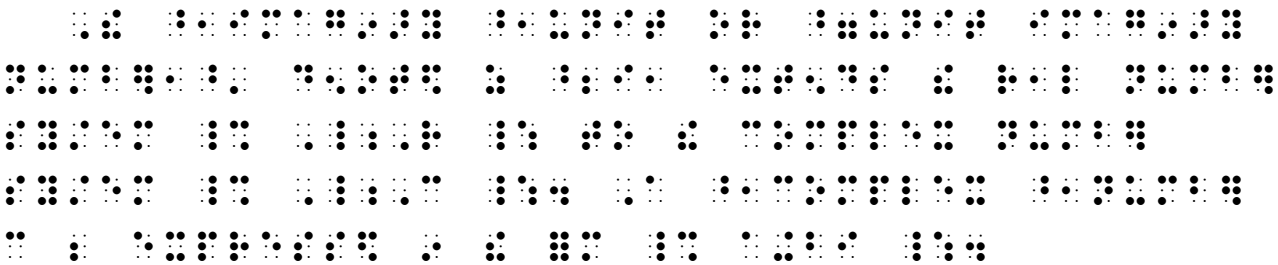
The boldfaced word in the narrative is transcribed in UEB.

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.

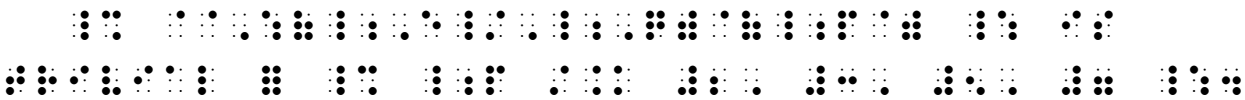
Example 7-18

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



Example 7-19

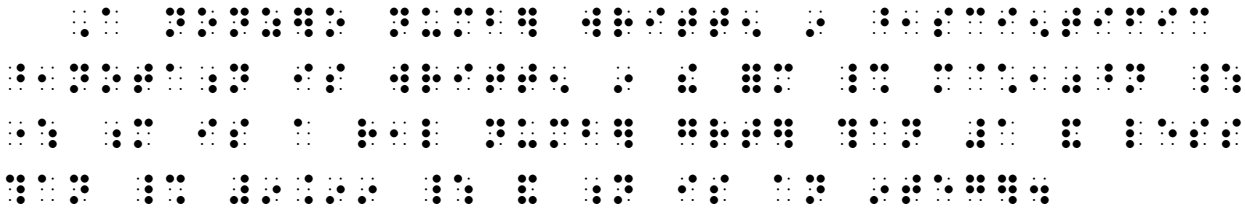
$Ш(\boldsymbol{E}/\mathbb{Q})[\boldsymbol{p}]$ is trivial for $\boldsymbol{p} \neq 2, 3, 5, 7$.



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 $\boldsymbol{m}$ is a real number greater than 1 and less than 9.99 and $\boldsymbol{n}$ is an integer.

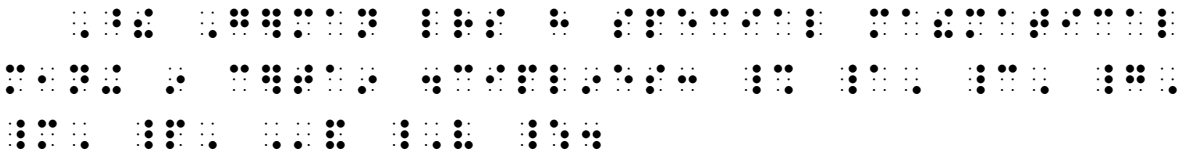


Letters m and n are not bold in the formula. The boldface used for these letters in the narrative is insignificant and so is disregarded.

d. **The German Fraktur Font.** The letters of the German "fraktur" alphabet may appear to be printed in boldface, but when <u>all</u> 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: $\mathfrak{a}$, $\mathfrak{c}$, $\mathfrak{g}$, $\mathfrak{m}$, $\mathfrak{p}$, and $\mathfrak{B}$.



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.

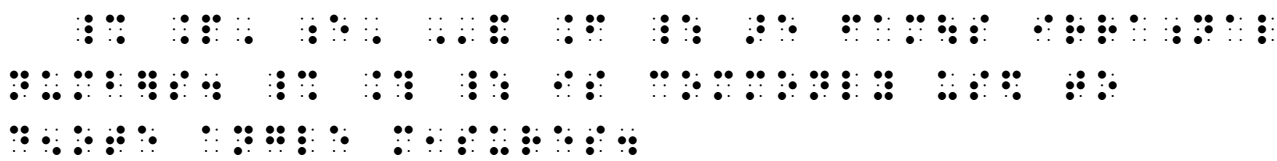
It is helpful for the transcriber to notice the typographical conventions in mathematical notation, particularly that variables are printed in italics and abbreviations are not. It is also customary to print all lowercase Greek letters in italics. Constants may be seen either upright or in italics, but

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, ⠨⠏ is the Greek letter pi, and ⠨⠏⠏ is the italicized English letter p.

Example 7-22

π, e, and ϕ are famous irrational numbers. θ 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.

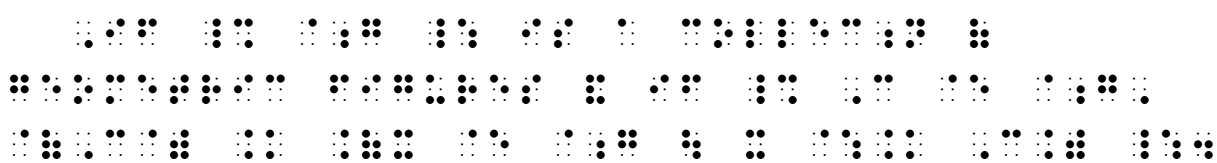
7.6.4 **Sans Serif Letters.** Sans serif letters are mainly used to differentiate computer program language from the surrounding text. Transcription of computer code is not addressed in the Nemeth code book and is beyond the scope of this course.

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 ℓ is used to denote *length*.

The letter l is printed with a script font.

b. **Partial Derivative Symbol.** The symbol for "partial derivative", ∂, 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 $\boldsymbol{k}_1$ and $\boldsymbol{k}_2$.

iv. **Two Number Sets.** $\mathbb{N}$ denotes the set of *natural numbers* – that is, the set of nonnegative integers $\{0, 1, 2, \ldots\}$. The set of <u>all</u> 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 <u>7.4.1.b.</u>) 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.

$\mathbb{4}$		(barred 4)
$\mathbf{4}$		(boldface 4)

4	⠼⠲⠲	(italic 4)
4	⠼⠲⠲	(script 4)
+**8**	⠬⠼⠦⠦	(ordinary plus, boldface 8)
–**8**	⠤⠼⠦⠦	(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.

1̸2̸3̸	⠼⠁⠃⠉	(all three numerals are barred)
123	⠼⠁⠃⠉	(all three numerals are boldface)
4*56*	⠼⠲⠲⠼⠢⠖	(boldface 4, italic 5, regular 6)
4567	⠼⠲⠲⠢⠖⠶	(boldface 4 and 5, regular 6 and 7)
12**34**	⠼⠂⠆⠼⠲⠲	(regular 1 and 2, boldface 3 and 4)
28-**571**	⠼⠢⠦⠤⠼⠖⠂	(italic 28, hyphen, boldface 571)
47-653	⠼⠲⠶⠤⠖⠢⠒	(italic 47, hyphen, regular 653)

100 + **2**00 = **3**00

⠼⠁⠃⠚ ⠬ ⠼⠃⠚⠚ ⠶ ⠼⠉⠚⠚

(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.

⟫ 5̸ ⠤⠼⠢⠴

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** ⠼⠚

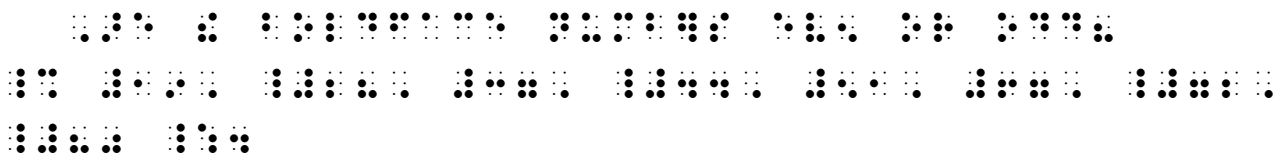
Example 7-25

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

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**.



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.

$$\cancel{4} + \mathbf{1} - \cancel{1} + \mathbf{3} - \mathbf{1} - \cancel{1} + \cancel{2} - \mathbf{1}$$

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?

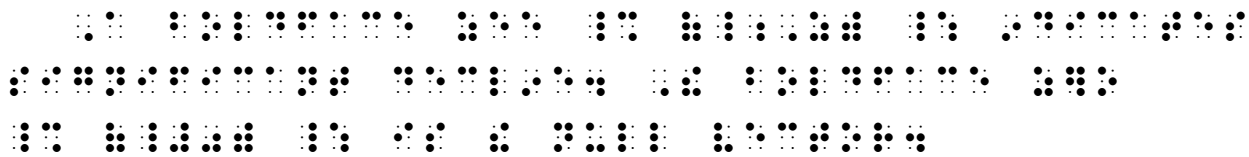
2) If the boldface number signifies a **withdrawal** from your account, can you explain why $250 + \mathbf{250} = 0$?

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.

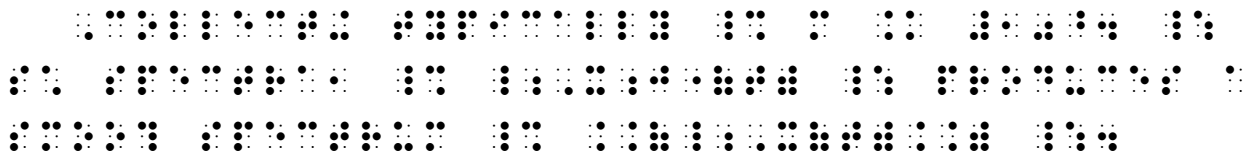
Example 7-27

A boldface zee ($\mathbf{Z}$) indicates significant decline. The boldface zero ($\mathbf{0}$) indicates the null vector.



Example 7-28

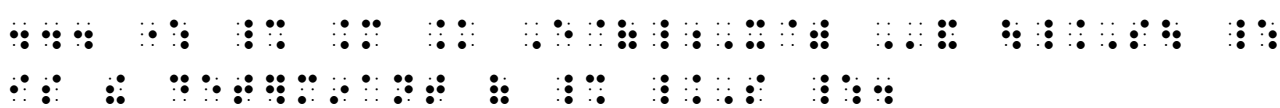
Collecting typically $m = 10^4$ such spectra, $\mathbf{X}_j(t)$ produces a smooth spectrum $\langle \mathbf{X}(t) \rangle$.



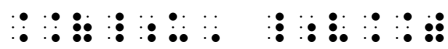
Compare the letter "t" enclosed in parentheses, which does not need an alphabetic indicator because it is in regular type, to the second letter "X" enclosed in angle brackets, which requires an English-letter indicator because it is in boldface.

Example 7-29

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

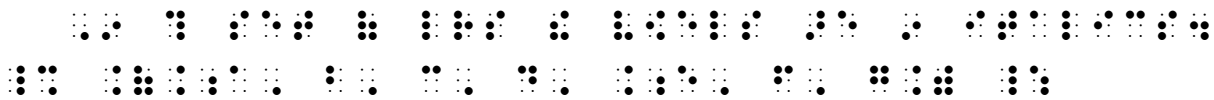


7.8.1 **Nonregular Typeform in an Enclosed List.** Recall that English letters in an enclosed list do not use an English-letter indicator. (See Lesson 4.) When letters or numerals in an enclosed list are printed in nonregular typeform and the variant typeform is retained, each typeform indicator is followed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

- $\langle \mathbf{u}, \mathbf{v} \rangle$ 
- $(\mathbf{0}, \mathbf{0})$

Example 7-30

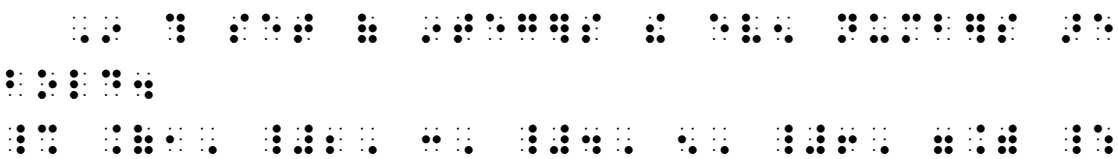
In this set of letters the vowels are in italics. {a, b, c, d, *e*, f, g}



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. $\{1, \mathbf{2}, 3, \mathbf{4}, 5, \mathbf{6}, 7\}$



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

PRACTICE 7I

(1) For vectors $(\mathbf{a}, \mathbf{b}, \mathbf{c})$, 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 $(\mathbf{a}, c\mathbf{b})$. $\mathbf{a}$ and $\mathbf{b}$ are **vectors**. Define $\mathbf{ab}$.

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	**+**
⠸⠤	Boldface Minus	**−**
⠸⠖⠐⠸⠤	Bold Plus Followed by Bold Minus	**+−**
⠸⠖⠐⠤	Bold Plus Followed by Regular Minus	**+**−
⠖⠐⠸⠤	Regular Plus Followed by Bold Minus	+**−**
⠸⠤⠐⠸⠖	Bold Minus Followed by Bold Plus	**−+**
⠸⠤⠐⠖	Bold Minus Followed by Regular Plus	**−**+
⠤⠐⠸⠖	Regular Minus Followed by Bold Plus	−**+**

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	**=**

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."

⩾ **||**f**||**

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

⩾ **[**x**]**

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.

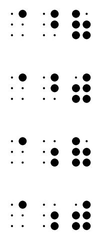
7.10.1 **Barred Brackets and Barred Braces.** Use the symbols in the box below when barred brackets or barred braces are encountered. Notice that the barred grouping symbols are formed by inserting dots 456 before the second cell of the normal grouping symbol.

⠸⠷	Left Barred Bracket	⟦
⠸⠾	Right Barred Bracket	⟧
⠸⠷	Left Barred Brace	⦃
⠸⠾	Right Barred Brace	⦄

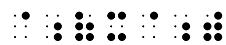
⟫ $[\![x]\!]$ ⠸⠷⠭⠸⠾

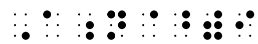
⟫ $\{\!\{abc\}\!\}$ ⠸⠷⠁⠃⠉⠸⠾

7.10.2 **Half Brackets.** Use the symbols in the box below when half brackets are encountered. Notice that these symbols are formed by inserting dots 45 (upper) or dots 56 (lower) before the second cell of the normal bracket symbols.



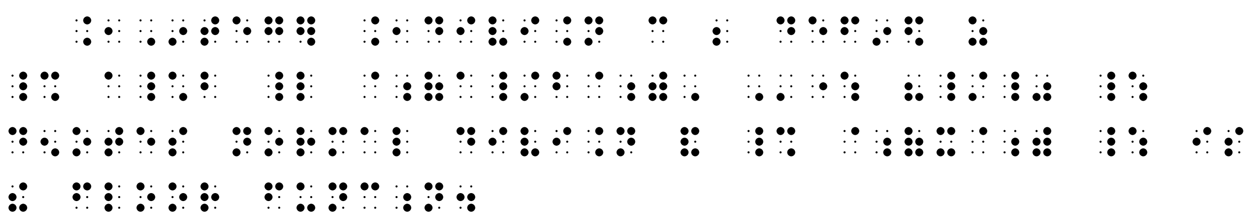
Upper Left Half Bracket	⌈ or ⌜
Upper Right Half Bracket	⌉ or ⌝
Lower Left Half Bracket	⌊ or ⌞
Lower Right Half Bracket	⌋ or ⌟

⋙ $\llcorner x \lrcorner$ or $\lfloor x \rfloor$ 

⋙ $A_{n\urcorner i}$ 

Example 7-34

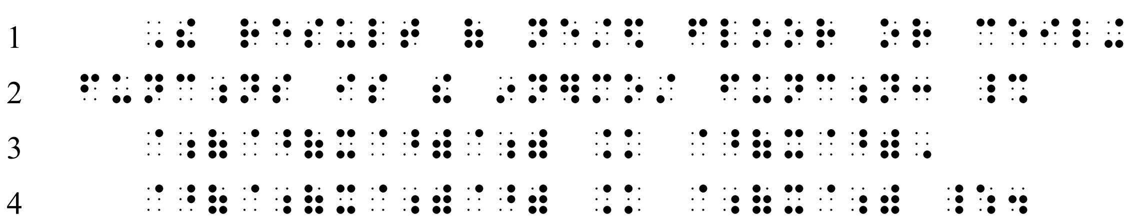
Integer division can be defined as $a \backslash b \equiv \lfloor a/b \rfloor$, where "/" denotes normal division and $\lfloor x \rfloor$ is the floor function.



Example 7-35

The result of nested floor or ceiling functions is the innermost function:

$$\lfloor \lceil x \rceil \rfloor = \lceil x \rceil,$$
$$\lceil \lfloor x \rfloor \rceil = \lfloor x \rfloor.$$



Lines 1-2: Narrative paragraph (3-1).
Line 3: Math displayed to unitemized text begins in cell 3.
Line 4: The second displayed item begins in cell 3, matching the print layout. See 7.1.3.c.

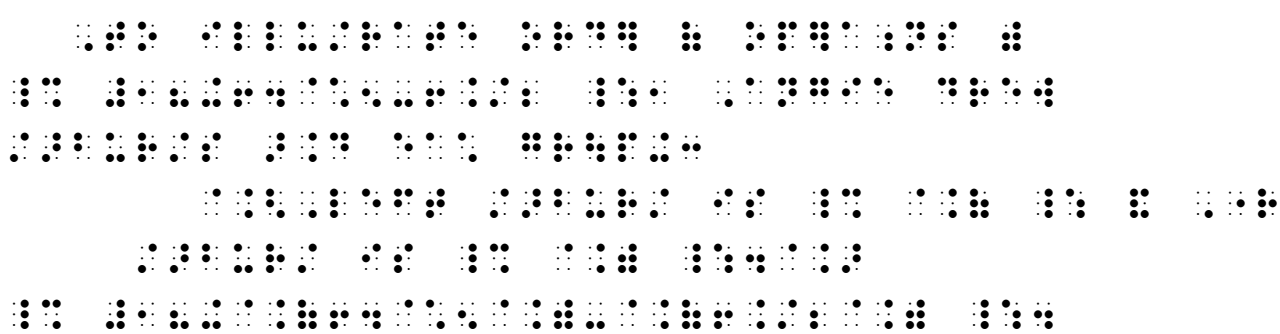
7.10.3 **Transcriber-Devised Grouping Symbols.** If a mathematical sign of grouping is not represented in the Nemeth Code, the transcriber devises one, using two or more braille symbols whose last cell is dots 12356 for the left symbol and whose last cell is dots 23456 for the right symbol. The transcriber-devised symbol must be identified in a transcriber's note or listed on the Special Symbols page at the beginning of the volume according to the guidelines given in *Braille Formats*.

Sample transcriber's note:

Left starbust is ⠐⠐⠶ and right starbust is ⠐⠐⠷.

Example 7-36

To illustrate order of operations with $18 + 64 \times 5 - 6 \div 2$, Angie drew starbursts around each grouping: 18 + ⠐⠐⠶64×5⠐⠐⠷ − ⠐⠐⠶6÷2⠐⠐⠷



PRACTICE 7K

1) Describe how the functions $f(x) = 3 + [\![x]\!]$ and $g(x) = 3 - [\![-x]\!]$ differ.

2) $\lfloor x \rfloor = m$ if and only if $m \leq x < m + 1$; $\lceil x \rceil = n$ if and only if $n - 1 < x \leq n$.

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.)

⫸ $\boldsymbol{i}_1$ ⠨⠊⠂⠁ (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)* ⠼⠉⠊

⫸ $3\boldsymbol{i}$ *(Spoken: three bold i)* ⠼⠉⠨⠊

⫸ 3_i *(three, subscript i)* ⠼⠉⠌⠊

⫸ $3_{\boldsymbol{i}}$ *(three, subscript bold i)* ⠼⠉⠌⠨⠊

⫸ $\delta_{\boldsymbol{ij}}$ *(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 printout: Colored type appears in the next example. Some numbers are blue and some are red.

Example 7-37

This expression represents pairs of socks in Nate's sock drawer: 4+1−1+3−1−1+2−1.
... How many pairs of red socks are in Nate's drawer today?

The UEB underlined word indicator is used in the narrative text.

7.11.4 **Termination of a UEB Typeform Passage.** UEB typeform is terminated by the opening Nemeth indicator. An explicit UEB typeform terminator is not needed. If the nonregular typeform continues after the termination of the mathematical portion, a UEB typeform indicator must be re-entered.

Example 7-38

The null vector 0 is also called the *isotropic vector*.

A UEB boldface terminator is not needed after the bold paragraph heading because it is immediately followed by an opening Nemeth Code indicator. Typeform is retained for the numeral zero because it is mathematically significant—the bold typeform identifies it as the null vector.

Example 7-39

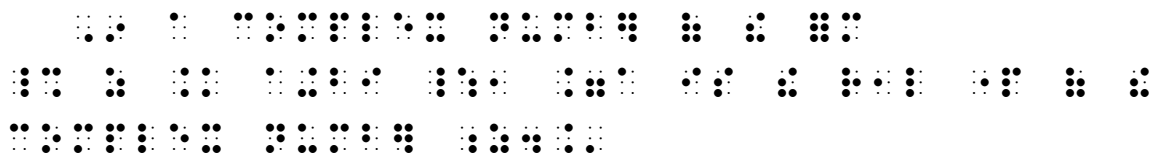
In *three-dimensional Euclidean space*, ***R*** *vectors* are identified with triples of scalar components.

The UEB italics are terminated by the opening Nemeth indicator. Boldface is retained for the letter R because it is mathematically significant—the bold typeform identifies it as a vector. However, the italic typeform is disregarded,

according to normal practice for italicized letters.UEB italics are reapplied on the word "vectors".

Example 7-40

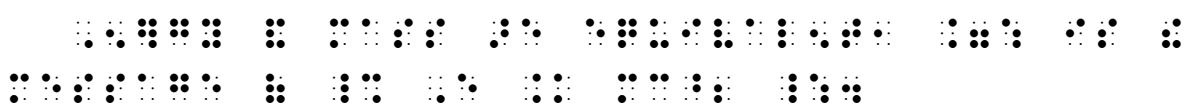
In a complex number of the form $z = a + bi$, a *is the real part of the complex number* z.



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* $E = mc^2$.

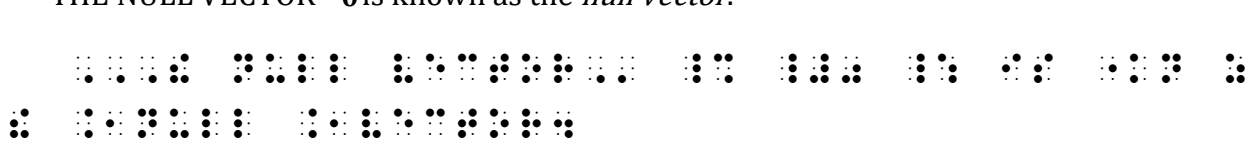


The UEB italics are terminated by the opening Nemeth indicator. Italics are disregarded for the math equation, according to normal practice.

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* $r_{k+1} = r_{n+1}$.

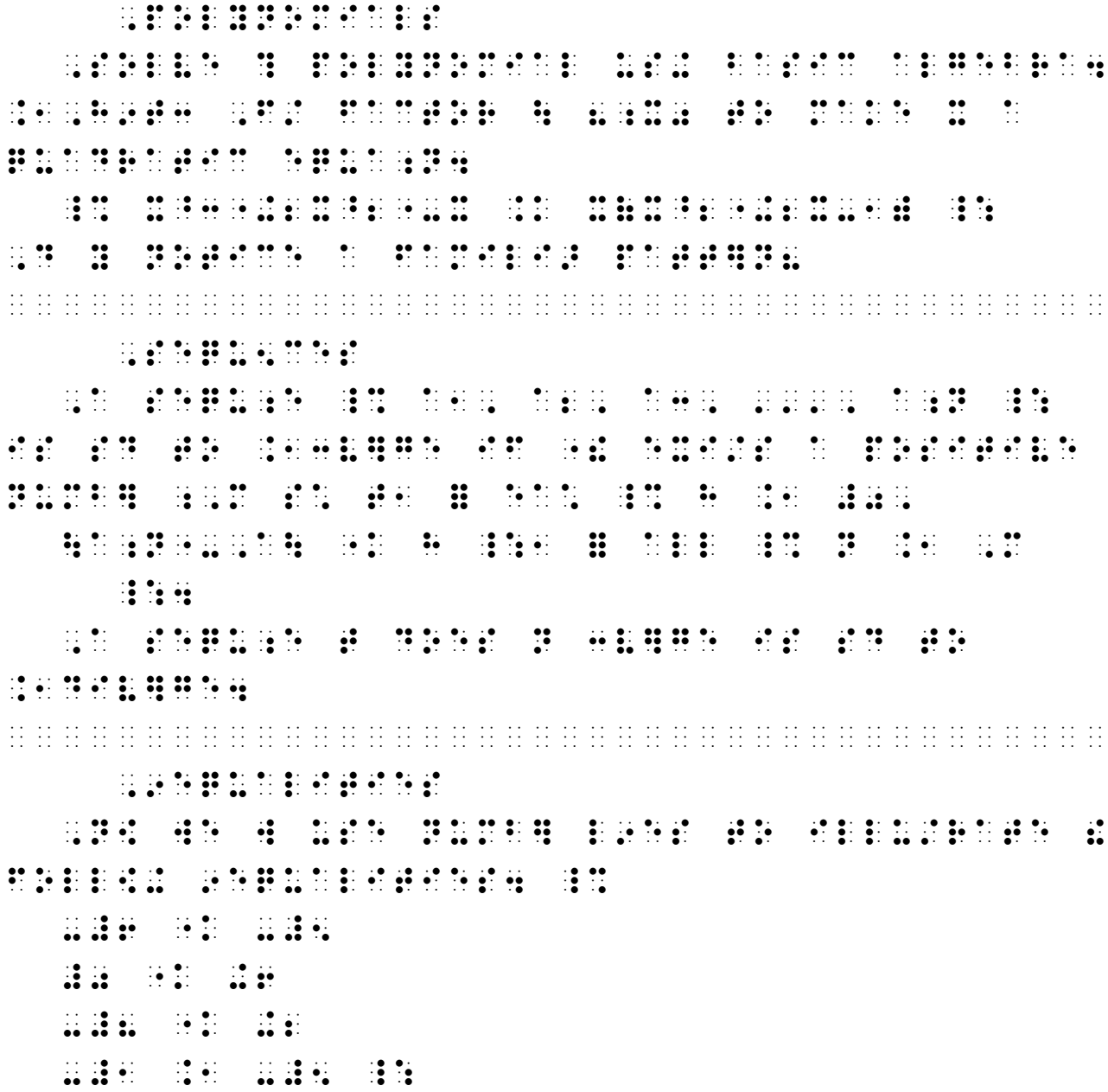
For further practice, see Appendix A—Reading Practice.

EXERCISE 7

Prepare Exercise 7 for your grader.

ANSWERS TO PRACTICE MATERIAL

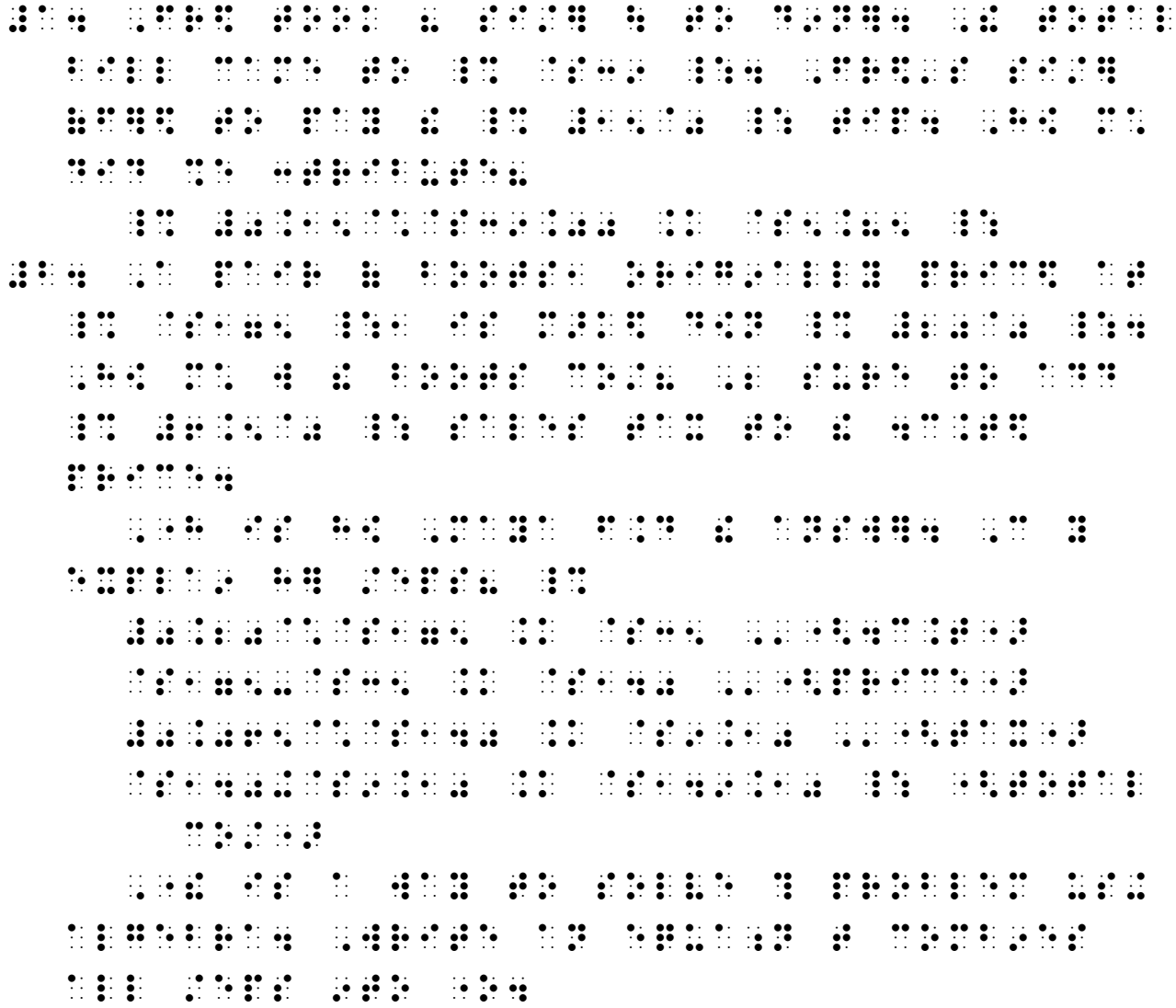
PRACTICE 7A



NARRATIVE FORMAT (3-1)
Line 5: Math displayed to (3-1) narrative begins in cell 3. This displayed expression has no runover.
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.
(The commentary continues on the next page.)

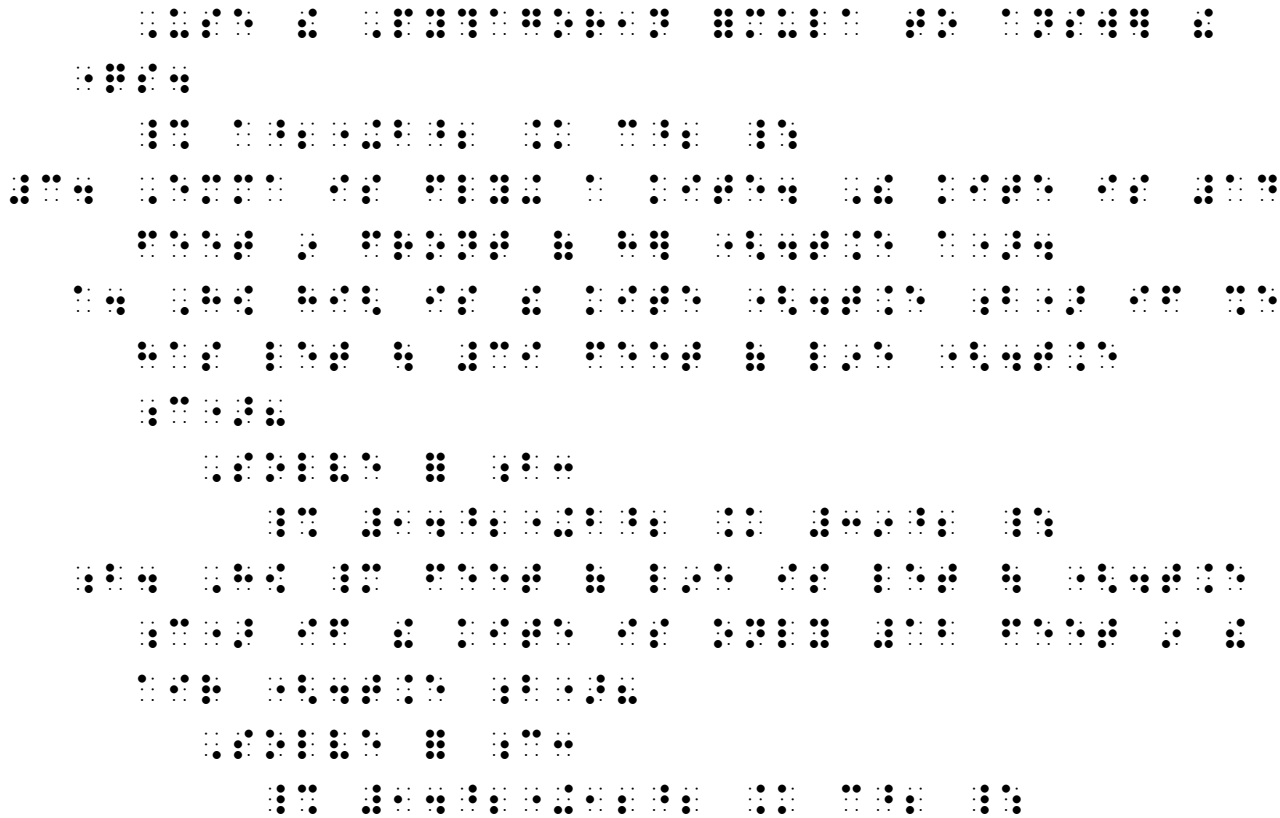
Line 13: The Nemeth Code terminator does not fit on the previous line. It is placed in the runover cell of the displayed expression, cell 5.
Lines 14-15: A new narrative paragraph (3-1).
Lines 20-23: Each displayed expression begins in cell 3. Note that, in print, the four expressions are printed widely spaced on one line.

PRACTICE 7B



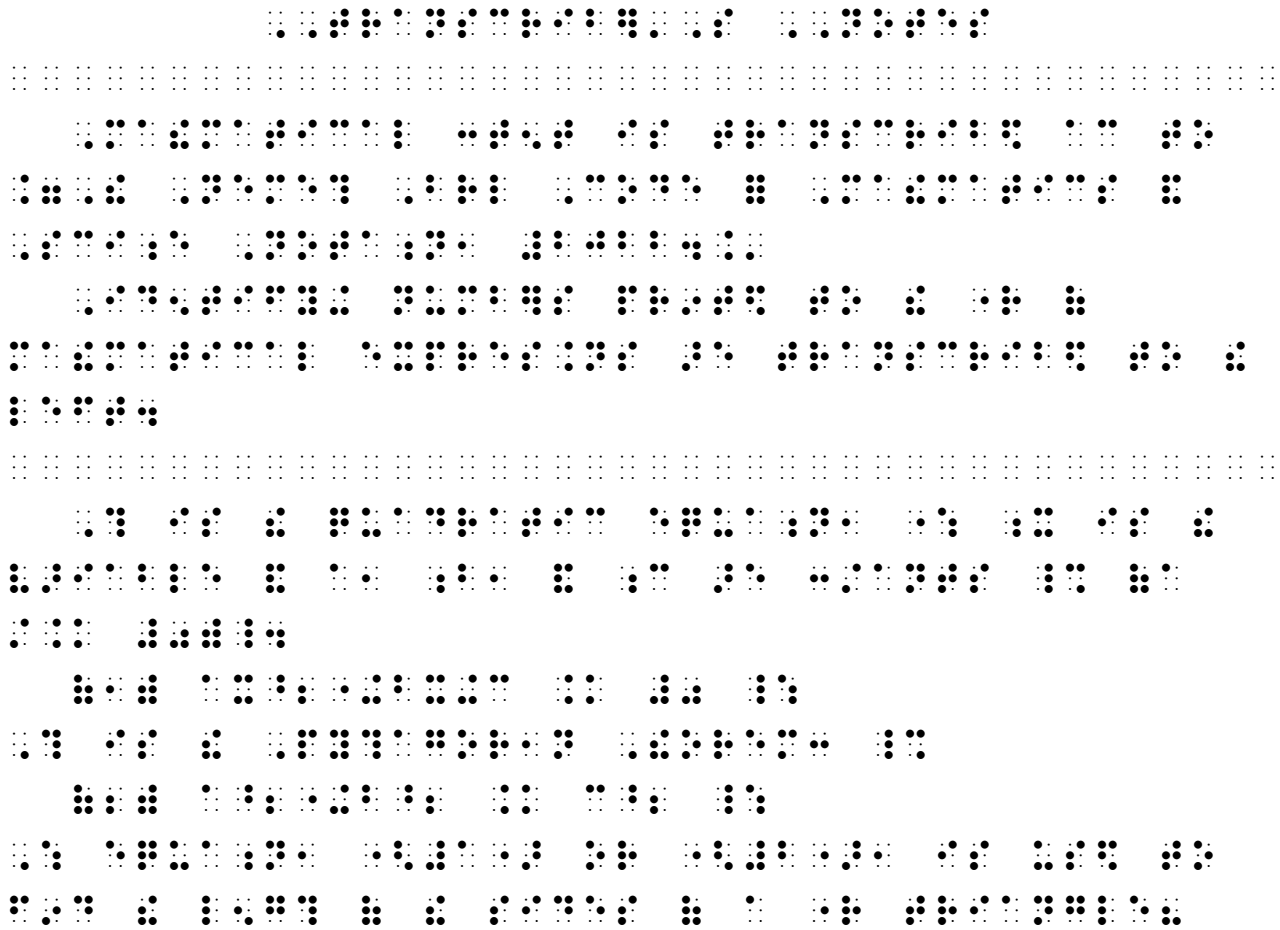
ITEMIZED FORMAT (1-3)
Line 5: Math displayed to (1-3) itemized material begins in cell 5. This displayed expression has no runover.
Lines 11-12: The subparagraph begins in cell 5, with runovers in cell 3.
Lines 13-17: Each displayed step begins in cell 5. The last step has a runover, in cell 7.
Lines 18-20: A new subparagraph begins in cell 5, with runovers in cell 3.

PRACTICE 7C



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



Lines 10-12: Narrative paragraph begins in cell 3 with runovers in cell 1.
Line 13: The displayed math expression begins with its label in cell 3. The label is in Nemeth because the preceding material is in Nemeth.
Line 14: The paragraph continues in cell 1. This transcription shows the opening Nemeth Code indicator at the end of this line in order to transcribe the following label in Nemeth. The decision to show both labels in the same code is not a requirement.
Line 15: The displayed math expression begins with its label 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

1 ⠳⠢ ⠠⠳⠳⠠⠢ ⠠⠳⠳⠂ ⠠⠳⠳⠠⠆ ⠠⠳⠳⠢

2 ⠠⠳⠳⠠⠂ ⠠⠳⠳⠆ ⠠⠳⠳⠠⠆ ⠠⠳⠳⠆

3 ⠳⠳⠢ ⠳⠳⠠⠳ ⠳⠳⠢ ⠳⠳⠠⠢

4 ⠳⠳⠳ ⠳⠳⠠⠆ ⠳⠳⠠⠢ ⠳⠳⠆

5 ⠳⠳⠳⠠⠆ ⠳⠳⠳⠠⠆ ⠳⠳⠳⠠⠆ ⠳⠳⠳⠠⠆

6 ⠳⠳⠳ ⠳⠳⠠⠢ ⠳⠳⠆ ⠳⠳⠠⠢

7 ⠳⠳⠳⠂ ⠳⠳⠳⠠⠂ ⠳⠳⠳⠠⠆ ⠳⠳⠳⠠⠆

8 ⠠⠳⠳⠠⠳ ⠠⠳⠳⠠⠆ ⠠⠳⠳⠆ ⠠⠳⠳⠆

9 ⠳⠢ ⠳⠠⠆ ⠳⠳ ⠳⠠⠳

10 ⠳⠠⠳ ⠳⠠⠆ ⠳⠠⠆ ⠳⠠⠆ ⠳⠢

PRACTICE 7F

1 ⠳⠢ ⠳⠳⠠⠳⠢⠳⠳⠠⠳⠢⠳⠳⠠⠳⠢⠳⠳⠠⠳⠢⠳⠳⠠⠳⠢

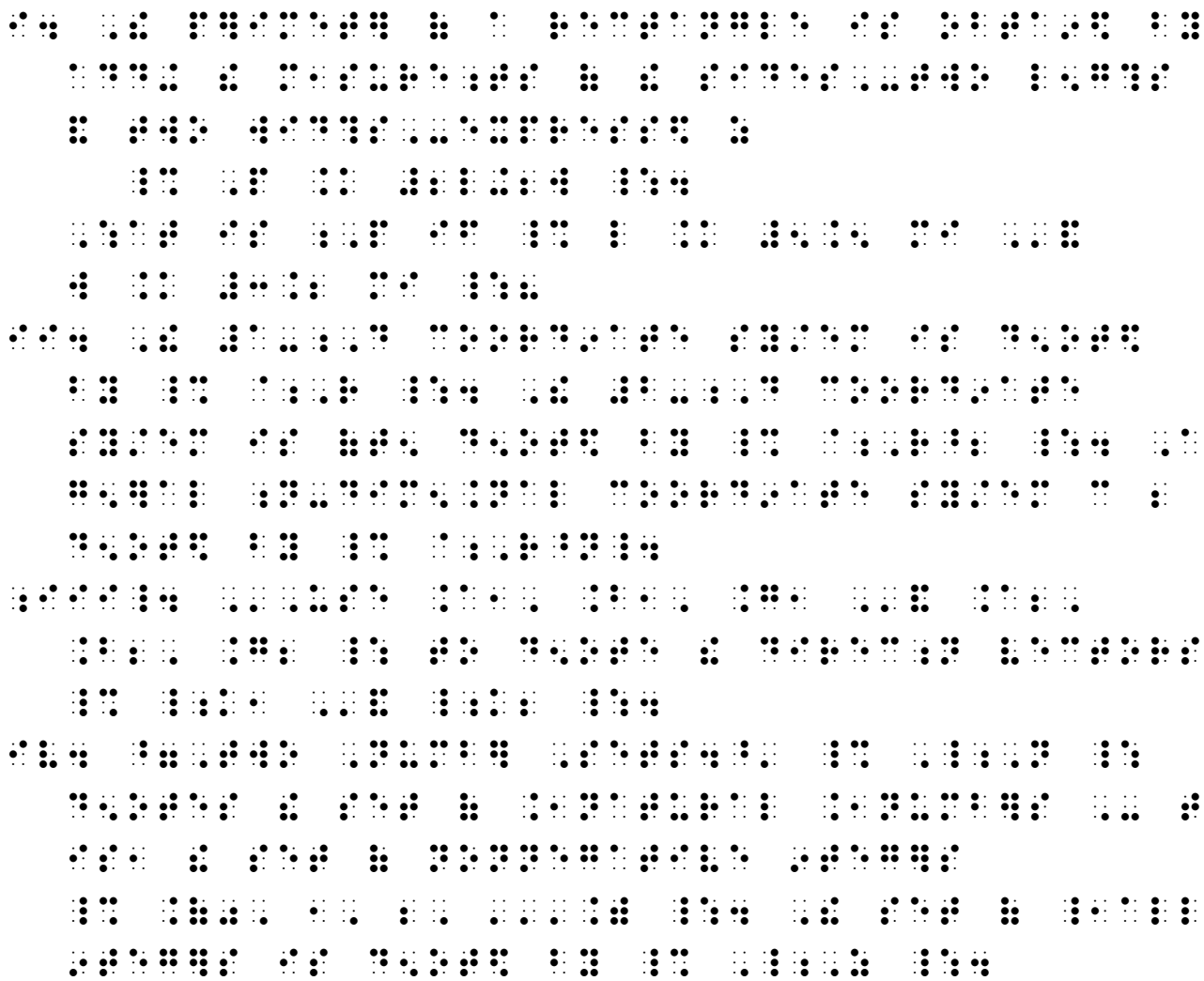
2 ⠠⠳⠳⠠⠆⠳⠠⠆⠳⠳⠠⠆⠳⠳⠠⠆

3 ⠠⠳⠳⠠⠂⠳⠳⠠⠂⠳⠳⠠⠂

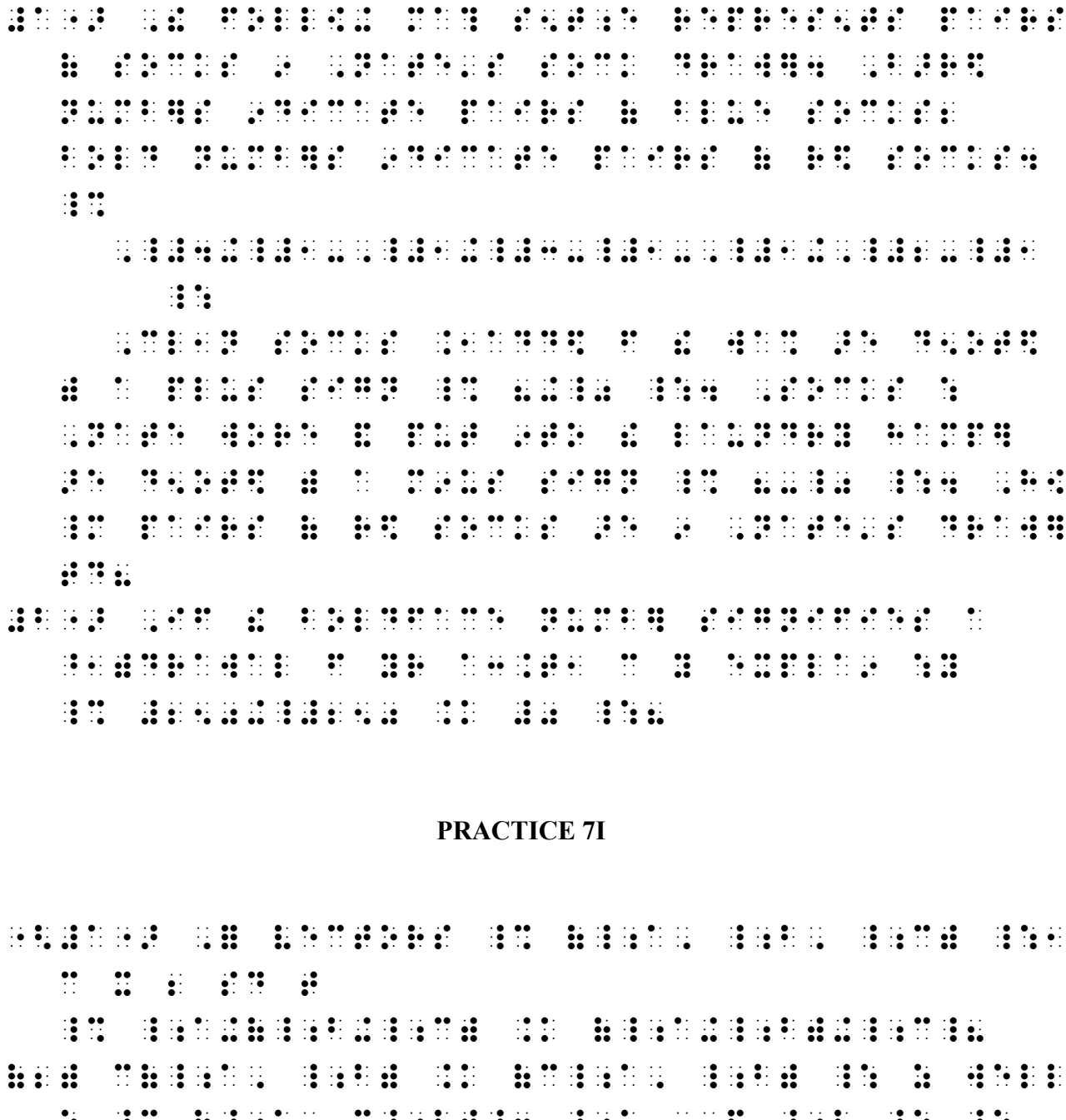
4 ⠠⠳⠳⠠⠆⠳⠠⠆⠳⠳⠠⠆

5 ⠳⠆⠢⠳⠠⠆⠳⠳⠠⠢⠳⠳⠠⠢⠳⠳⠠⠆ ⠳⠢

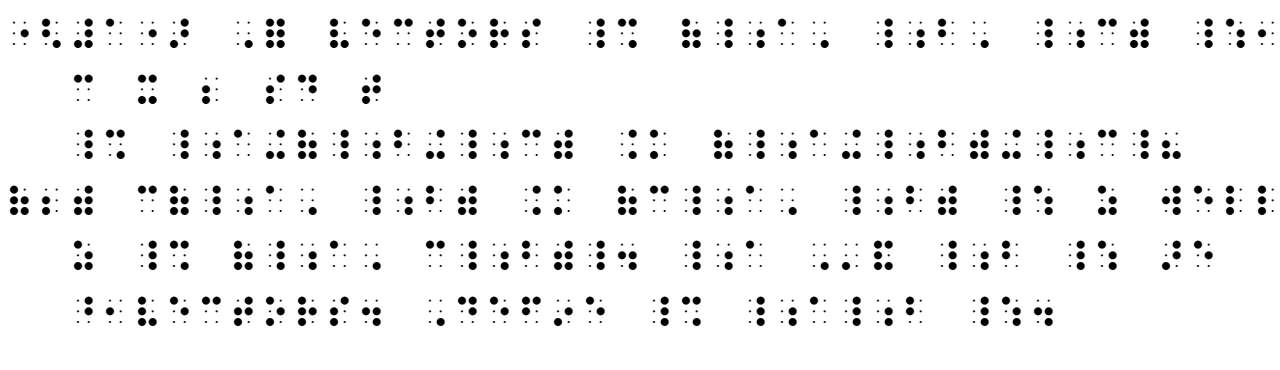
PRACTICE 7G



PRACTICE 7H



PRACTICE 7I



PRACTICE 7J

```
⠸⠩
⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀
⠸⠨⠅    ⠸⠬⠐⠸⠤    ⠸⠤⠐⠸⠬
⠸⠬     ⠸⠬⠐⠤     ⠸⠤⠐⠬
⠸⠤     ⠬⠐⠸⠤     ⠤⠐⠸⠬
⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀
⠸⠱
⠠⠁⠲ ⠠⠔ ⠕⠇⠙⠻ ⠞⠑⠭⠞⠎⠂ ⠮ ⠛⠗⠞⠑⠌ ⠔⠞⠑⠛⠻ ⠋⠥⠝⠉⠰⠝
  ⠍⠁⠽ ⠆ ⠝⠕⠞⠁⠞⠫ ⠾ ⠁ ⠃⠕⠇⠙ ⠃⠗⠁⠉⠅⠑⠞⠒
  ⠸⠩ ⠸⠈⠷⠭⠸⠈⠾⠸⠲
⠰⠠⠃⠸⠲ ⠸⠳⠸⠳⠠⠽⠸⠳⠸⠳ ⠸⠱ ⠍⠂⠝⠎ ⠦⠮ ⠝⠕⠗⠍ ⠷ ⠰⠠⠽⠴⠲
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PRACTICE 7K

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⠼⠁⠐⠜ ⠠⠙⠑⠎⠉⠗⠊⠃⠑ ⠓⠪ ⠮ ⠋⠥⠝⠉⠰⠝⠎
  ⠸⠩ ⠋⠷⠭⠾ ⠨⠅ ⠼⠒⠬⠈⠸⠷⠭⠈⠸⠾ ⠠⠄⠯
  ⠛⠷⠭⠾ ⠨⠅ ⠼⠒⠤⠈⠸⠷⠤⠭⠈⠸⠾ ⠠⠄⠙⠊⠖⠻⠲
⠼⠆⠾ ⠈⠰⠷⠭⠈⠰⠾ ⠨⠅ ⠍ ⠸⠱ ⠊⠋ ⠯ ⠕⠝⠇⠽ ⠊⠋
  ⠸⠩ ⠍ ⠐⠅⠱ ⠭ ⠐⠅ ⠍⠬⠂⠸⠆ ⠈⠘⠷⠭⠈⠘⠾ ⠨⠅ ⠝ ⠸⠱ ⠊⠋
  ⠯ ⠕⠝⠇⠽ ⠊⠋ ⠸⠩ ⠝⠤⠂ ⠐⠅ ⠭ ⠐⠅⠱ ⠝ ⠸⠱⠲
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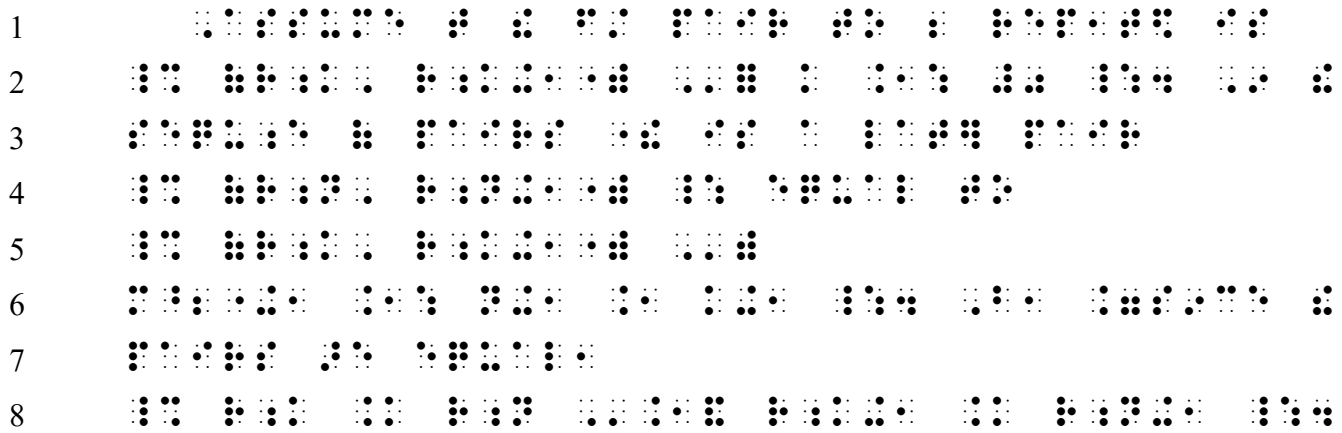
PRACTICE 7L



Line 8: Recall from Lesson 3 that the single-word switch indicator can be used with a word associated with a UEB typeform word indicator.