LESSON 13

- MISCELLANEOUS SYMBOLS
  - Unspaced Symbols
  - Spaced Symbols
  - Spacing with the Angstrom Unit and Tally Marks
- SUPERPOSED SIGNS
- AMBIGUOUS SIGNS
- MULTIPURPOSE INDICATOR
- REFERENCE SIGNS AND SYMBOLS

Answers to Practice Material

LESSON PREVIEW

Symbols not previously covered are collected in this lesson. Spacing rules differ among the symbols; the spacing rules are grouped accordingly. Signs printed one atop another are examined. Several look-alike print signs are compared. After a review of the multipurpose indicator, four more uses of this indicator are explored. Reference signs in Nemeth context are discussed.

MISCELLANEOUS SYMBOLS

[NC Rule 23]

In this lesson, symbols are grouped according to spacing rules: unspaced, spaced, and those with special rules. Within each section, the symbols are presented in alphabetical order. See Lesson 5 regarding spacing with the crosshatch symbol and the diagonal slash.

Unspaced Symbols

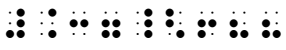
13.1 Spacing Rules for Unspaced Symbols

No space is left between the symbols listed below and any other symbol or quantity to which they apply, regardless of print spacing. However, a space must be left between these symbols and a word, an abbreviation, a sign of comparison, or other symbol which specifically requires a space before or after it.

13.1.1 Caret

The caret was first seen in Lesson 10 in the context of a long division problem. Used as a place indicator, the caret is treated as a numeric symbol.

⋙ .37∧688

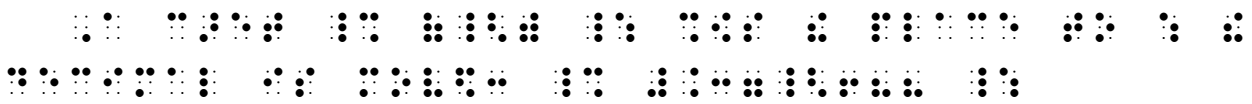


The caret was also encountered in Lesson 12, as a modifier.

⋙ **k̂**

Example 13-1

A caret (∧) shows the place to which the decimal is moved: .37∧688



a. **Use of the UEB Caret.** The caret may be transcribed more than one way within a document. The distinction is based on meaning. In mathematical context, use the Nemeth caret. In nontechnical context, use the UEB caret ⠈⠢ to indicate the insertion of literary material, or the UEB circumflex ⠘⠢ to indicate a modified letter or accent. In UEB context, follow UEB rules for spacing of the caret or circumflex symbol.

13.1.2 **Crossed Letters**

⠈⠓	Crossed h	ħ
⠈⠓⠇	Crossed lambda	ƛ
⠈⠓⠗	Crossed R	℞

⋙ $2\pi\hbar\nu = \phi e$ ⠼⠃⠰⠏⠓⠧⠀⠨⠅⠑ ⠐⠶ ⠨⠋⠢

⋙ $3\lambda\!\!\!^{-} \ldots n\lambda\!\!\!^{-}$ ⠼⠉⠨⠇ ⠄⠄⠄ ⠼⠝⠨⠇

⋙ $n = 3\mathrm{R}\!\!\!^{-}$ ⠼⠝ ⠐⠶ ⠼⠉⠨⠗

13.1.3 **Del**

⠈⠙	Del (nabla, gradient)	∇

When the inverted triangle is used as a sign of omission, it is spaced according to the rules presented in Section 11.27. In all other cases it is spaced in accordance with 13.1.

⋙ $s \nabla t + t \nabla s$ ⠎⠀⠨⠙⠀⠞⠀⠬⠀⠞⠀⠨⠙⠀⠎

⋙ $\nabla (rn)$ ⠨⠙⠀⠐⠣⠗⠝⠐⠜

Example 13-2

The symbol "∇" is called "del" as in $\mathbf{T} \cdot \nabla (r_1 + r_2) = 0$.

⠠⠞⠓⠑ ⠎⠽⠍⠃⠕⠇ ⠋⠕⠗ ⠙⠑⠇ ⠊⠎ ⠉⠁⠇⠇⠑⠙ ⠙⠑⠇ ⠊⠝ ⠞⠓⠑ ⠑⠭⠁⠍⠏⠇⠑ ⠨⠙⠀⠐⠣⠗⠁⠀⠬⠀⠗⠃⠐⠜⠀⠼⠚⠲

13.1.4 **Differentials and the Partial Derivative Symbol (Round d).** Differentials are commonly notated as d*x* and d*y*. You may also encounter d*t*, d*u*, d*v*, d*z*, etc. The letter d may be printed in regular or italic type. The italic typeform is disregarded in the braille transcription. In print, it is quite common that d*x* and d*y* are spaced within a mathematical expression. In braille, the space is omitted.

⋙ $(1 + 4xy)\mathrm{d}x\,\mathrm{d}y$ ⠐⠣⠼⠁⠬⠼⠙⠭⠽⠐⠜⠙⠭⠙⠽

The partial derivative sign is represented by the following symbol. Note that this is <u>not</u> the letter "d" in script type.

⠈⠙	Partial Derivative	∂

- $\frac{\partial f}{\partial x}$
- $\partial/\partial y(\partial b/\partial x)$
- $\frac{\partial h}{\partial u} = \frac{\partial f}{\partial x}\ \frac{\partial x}{\partial u}$

Example 13-3

Geometry The partial derivative of V with respect to r is $\frac{\partial V}{\partial r} = \frac{2\pi rh}{3}$.

13.1.5 Empty Set (null set, void set)

The print symbols ∅ and Φ used to denote the empty set must not be mistaken for the Greek uncapitalized phi (φ or ϕ) which they resemble. When facing braces are used to denote the empty set, one space is left between the braces.

	Empty Set (null set, void set) Represented by Zero with a Slanted or Vertical Bar through it	∅ or Φ
	Empty Set Represented by Facing Braces	{ }

- $A \cap \emptyset = \emptyset$
- $\emptyset \subseteq A$
- $S \cup \{\ \}$

Example 13-4

The solution set ∅ is written $R = \emptyset$ or $R = \{\ \}$.

13.1.6 **Factorial Sign**

	Factorial Sign	!

- $n!$
- ${}_5C_1 = \frac{5!}{1!4!}n!$

Example 13-5

Poisson Probability People enter a line for the *Jack Rabbit Coaster* at the rate of 4 per minute. The following formula can be used to determine the probability that x people will arrive within the next minute.

$$P(x) = \frac{4^x e^{-4}}{x!}$$

where

$$x! = x \cdot (x-1) \cdot (x-2) \cdot \ldots \cdot 3 \cdot 2 \cdot 1.$$

Determine the probability that $x = 5$ people will arrive within the next minute.

1

Line 1: The paragraph heading is formatted as a cell-5 heading. Typeform (boldface) is disregarded in a cell-5 heading.
Line 2: The paragraph begins in cell 3, following the rules of the Nemeth Code.
Lines 7 and 9: Each displayed math expression begins in cell 3.
Lines 8 and 10: The narrative continues in the runover cell for paragraphs, cell 1.
Line 9: The last sentence can be interpreted either as a continuation of the same paragraph or as a new paragraph in which case it would begin in cell 3.

13.1.7 **Infinity**

⠠⠿	Infinity	∞

⋙ $a-(+\infty)=-\infty$ ⠁⠤⠷⠬⠠⠿⠾ ⠨⠅ ⠤⠠⠿

⋙ $n\to\infty$ ⠝ ⠫⠕ ⠠⠿

⋙ 1^{∞} ⠼⠂⠘⠠⠿

⋙ $\sum_{n=-\infty}^{\infty} f(n)$ ⠐⠨⠠⠎⠩⠝ ⠨⠅ ⠤⠠⠿⠣⠠⠿⠻⠋⠷⠝⠾

Example 13-6

Interval	Inequality
(a, +∞)	x > a
[a, +∞)	x > a
(−∞, a)	x < a
(−∞, a]	x < a

⠠⠔⠞⠻⠧⠁⠇ ⠠⠔⠑⠟⠥⠁⠇⠰⠽
⠐⠒⠒⠒⠒⠒⠒⠒⠒ ⠐⠒⠒⠒⠒⠒⠒⠒⠒
⠸⠩
⠷⠁⠠ ⠬⠠⠿⠾ ⠭ ⠨⠂ ⠁
⠈⠷⠁⠠ ⠬⠠⠿⠾ ⠭ ⠨⠂⠱ ⠁
⠷⠤⠠⠿⠠ ⠁⠾ ⠭ ⠐⠅ ⠁
⠷⠤⠠⠿⠠ ⠁⠈⠾ ⠭ ⠐⠅⠱ ⠁
⠸⠱

13.1.8 **Integrals**

⠔	Single Integral	$\int$
⠔⠔	Double Integral	$\iint$
⠔⠔⠔	Triple Integral	$\iiint$

⋙ $\int(\mathrm{d}u + \mathrm{d}v) = \int \mathrm{d}u + \int \mathrm{d}v$

⠔⠔⠒⠔⠔⠒⠔⠔ ⠔⠔ ⠔⠒⠔⠔⠒⠔

⋙ $V = \iiint \mathrm{d}x\,\mathrm{d}y\,\mathrm{d}y$ ⠔⠔ ⠔⠔ ⠔⠔⠔⠒⠔⠔⠒⠔⠔

Reminder: There are no spaces before or after the terms of the expression (dx and dy) even though they are spaced in print.

a. **Superscripts and Subscripts.** Superscripts and subscripts are printed just to the right of the integral symbol. Because the integral symbol is printed at a slant, the superscript and subscript do not exactly align, but they are considered to be simultaneous.The subscript is transcribed first. A subscript indicator is required for numeric subscripts.

⋙ $\int_1^3 \frac{\mathrm{d}x}{x^2-2x+5}$ ⠔⠔⠒⠔⠒⠔⠒⠒⠔⠒⠔⠒⠒⠔⠒⠔⠔⠒⠔⠔⠒⠔

⋙ $\int_1^2 \int_0^{x-1} y\,\mathrm{d}y\,\mathrm{d}x$ ⠔⠔⠒⠔⠒⠔⠒⠔⠒⠔⠒⠒⠔⠒⠔⠒⠒⠔⠒⠒

b. **Modifiers.** Symbols printed directly above and/or directly below the integral symbol are transcribed according to the five-step rule for the transcription of modified expressions.

⋙ $\int_0^{\infty} f(x)\,\mathrm{d}x$ ⠔⠒⠔⠒⠔⠒⠔⠒⠒⠔⠒⠔⠒⠔⠒⠔

The single integral sign is modified directly below with the numeral zero and directly above with an infinity symbol.

⋙ $\iint_Q f(x,y)\,\mathrm{d}y\,\mathrm{d}x$ ⠔⠒⠔⠒⠔⠒⠒⠔⠒⠔⠒⠒⠔ ⠔⠔⠒⠔⠒⠔⠒⠔

The double integral sign is modified directly below with the letter "Q".

c. **Upper and Lower Integral Signs.** A horizontal bar directly over or under the integral sign is not a modifier—the bar is an essential part of the symbol. The symbols for the upper and lower integral signs are transcribed as follows.

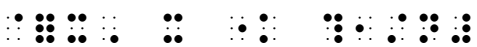
⠸⠌	Upper Integral	$\overline{\int}$
⠸⠬	Lower Integral	$\underline{\int}$

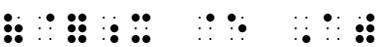
⋙ $\overline{\int}_a^b f(x)\,dx = 0$ 

⋙ $\underline{\int}_a^b f(x)\,dx = 0$ 

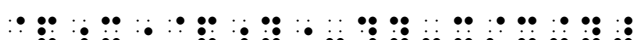
13.1.9 **Quantifiers**

	Existential Quantifier	
⠸⠢	There Exists, for Some	∃
⠸⠢⠳	There Exists Uniquely for Exactly One	∃| or ∃!
	Universal Quantifier	
⠸⠄	For All, For Each, For Every	∀

⋙ $\exists x,\ x < \frac{1}{n}$ 

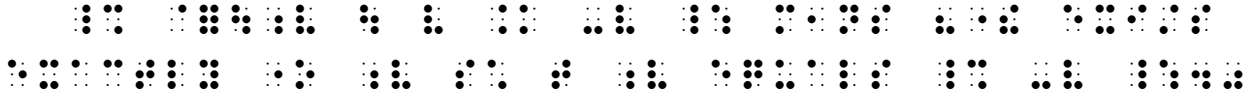
⋙ $(\exists_x \in A)$ 

⋙ $(\forall_x)$ 

⋙ $\forall_x \forall_y - \frac{y-x}{x+y}$ 

Example 13-7

$\exists | v \mid v = -v$ means "there exists exactly one v such that v equals $-v$."

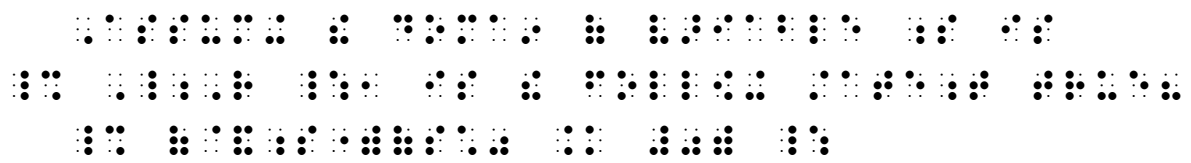


The first vertical bar is part of the Existential Quantifier symbol, and is unspaced. The second vertical bar is a sign of comparison meaning"such that" (understood from the narrative) and is spaced accordingly. Review Section 5.6.16.

Example 13-8

Assuming the domain of variable s is $\mathbb{R}$, is the following statement true?

$$(\forall_s)(s \cdot 0 = 0)$$



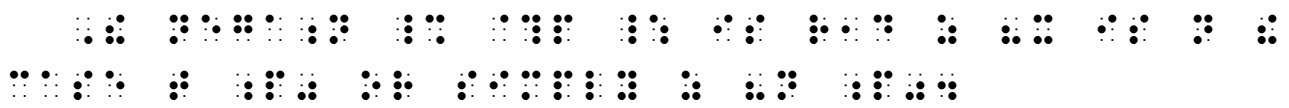
13.1.10 **Transcriber-Devised Symbols.** When a symbol is encountered that is not represented in the Nemeth Code, the transcriber may substitute another symbol as long as it is not being used with another meaning within the same subject matter. Another option is to invent a symbol for temporary use. A transcriber-devised symbol should be constructed in keeping with usage and according to the general rules of the Nemeth Code. In either case, the symbol must be explained in a transcriber's note.

a. **"Not-p".** One example of a symbol that is not represented in the Nemeth Code is the negation sign ¬ which is commonly used in the topic of logic. Since this particular print sign is not listed in the Nemeth Code, the transcriber must devise one. A little research reveals that UEB has a braille symbol for this print sign. Although UEB symbols cannot be used inside the Nemeth switches, it can be used here as a transcriber-devised Nemeth symbol. Checking Appendix B of the Nemeth Code, we find that this dot configuration has no other meaning in Nemeth. Sample transcriber's note:

> The symbol represents the negation symbol, which is printed as a small horizontal bar with a down-pointing end.

Example 13-9

The negation $\neg p$ is read as "it is not the case that p" or simply as "not p".



PRACTICE 13A

Unspaced Miscellaneous Symbols

$1.2_{\wedge}$

$(v > \phi\hbar)$

ℝ: 24 grams

$\|\nabla \mathrm{f}(a)\|$

$\frac{\partial P}{\partial x} + \frac{\partial Q}{\partial y}$

$\{\ \} \cap \{\ \}$

$\binom{n}{r} = \frac{n!}{(n-r)!\,r!}$

$-\infty < x < \infty$

$f'(x) = 0$ or ∞

$\int_a^b f(x)\,\mathrm{d}x = F(x)\Big]_a^b$

$\int\limits_{x=a}^{x=b} f(t)\,\mathrm{d}t$

$(\exists x)(\exists y)[x + y = 85]$

∃|x

$\forall_x \in A$

13.2 Spacing Rules for Spaced Symbols

A space is left *before and after* the symbols listed below. However, no space is left between these symbols and a mark which applies to them such as a sign of grouping, a braille indicator, or a punctuation mark.

13.2.1 "At" Sign in Mathematical Context

⋙ (@) ⠈⠁⠈⠣

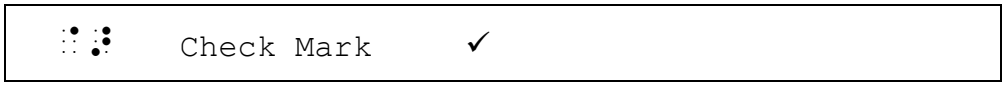
Example 13-10

15 pencils @45¢ = $6.75.

⠼⠁⠑ ⠏⠑⠝⠉⠊⠇⠎ ⠈⠁⠼⠙⠑ ⠈⠉ ⠼⠋⠛⠂⠑⠛

In the print copy there is no space following the "at" symbol. In braille, this symbol is spaced. Switching Decision: The problem is not "45¢ = $6.75" therefore "15 pencils @" is part of the problem and is transcribed in Nemeth.

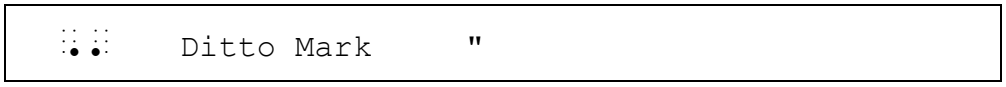
13.2.2 **Check Mark.** The following symbol may be used within Nemeth context. A space is left before and after a single check mark. A sequence of two or more check marks is written unspaced, but the combination as a whole is preceded and followed by a space.



⋙ ✓ 1 + 2 = 3 ⠈⠩ ⠼⠁⠐⠖⠼⠃⠀⠶⠀⠼⠉ ⠈⠩ ⠼⠃⠒

⋙ ✓✓ 2 + 2 = 4 ⠈⠩⠈⠩ ⠼⠃⠐⠖⠼⠃⠀⠶⠀⠼⠙ ⠈⠩ ⠼⠃⠒

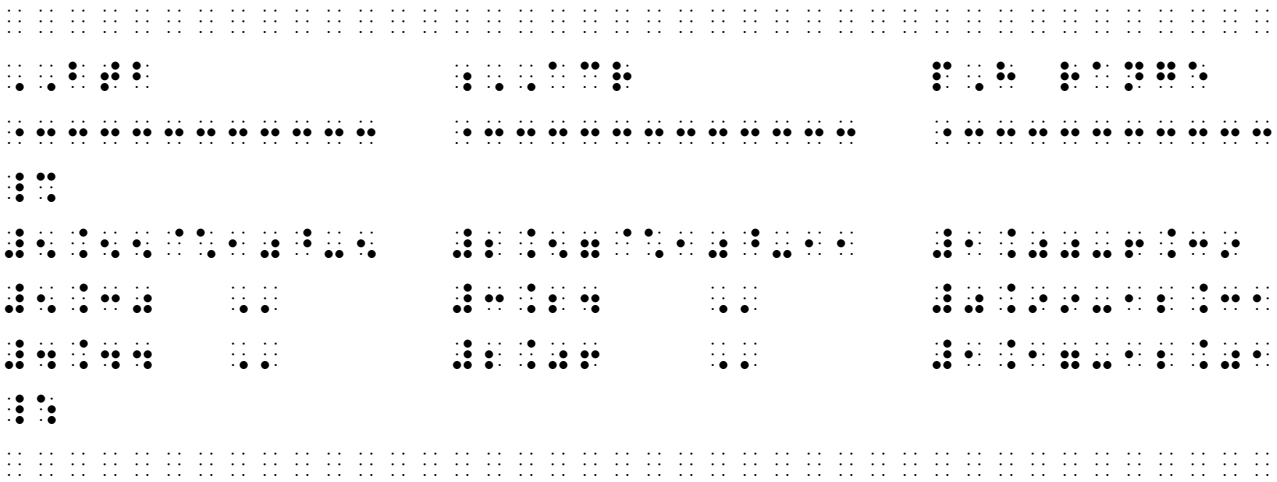
13.2.3 **Ditto Mark.** A ditto mark is centered beneath the material it duplicates. It is separated from any expression which precedes or follows it by at least one space. In Nemeth, the ditto mark shown below is used. For clarity, guide dots are not inserted in the row entries which end with a ditto mark.



In UEB context, the UEB ditto mark is used, but Nemeth formatting is applied, centering the ditto under the word or item it duplicates.

Example 13-11

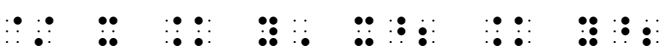
BTB	ACR	pH range
5.55×10^{-5}	2.57×10^{-11}	1.00-6.39
5.30 "	3.24 "	0.99-12.31
4.44 "	2.06 "	1.17-12.01



13.2.4 **Since (because)**

⠸⠸	Since (because) ∵

⋙ ∵ $x = y, x^2 = y^2$



⋙ (∵) RS = RT 

No space is left between the symbol and the grouping signs which apply to it.

13.2.5 **Therefore**

Therefore		
⠨⠄	Normal	∴
⠸⠨⠄	Negated (it does not follow that)	/∴

⋙ ∴ CM ⊥ AB ⠨⠄ ⠨⠒⠨⠒ ⠶⠶ ⠨⠂⠨⠂

⋙ /∴ R = S ⠸⠨⠄ ⠨⠖ ⠨⠒ ⠨⠒

Example 13-12

∴ the solution set is {±3}.

⠶⠒ ⠨⠂ ⠨⠆ ⠠ ⠠⠨⠂⠨⠒⠨⠒ ⠠⠨⠂⠶ ⠠⠨⠂ ⠨⠒ ⠨⠁⠨⠒⠨⠒⠨⠶ ⠨⠂⠨⠂

PRACTICE 13B

Spaced Miscellaneous Symbols

1. Su bought 25 boxes of tissue for her classroom. Priced @99¢, can she pay with only one $20 bill?

   $25 \times \$.99 = \$24.75$

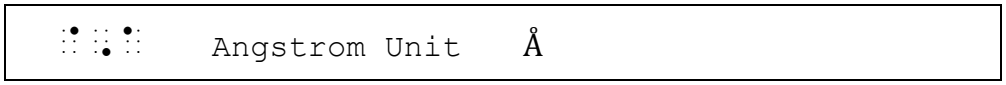
   ✓ $\$24.75 > \$20$

   Answer: No. Su needs more than $20 to buy the tissues.

2. ∵ $8x + 3y = 15$, substituting 0 for x gives $8(0) + 3y = 15$, or $3y = 15$. ∴ $y = 5$.

13.3 Angstrom Unit

The angstrom unit is a mathematical symbol, but it is spaced according to the rules of abbreviations. A switch to Nemeth is required for this symbol.

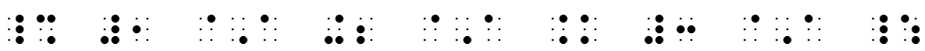


⋙ 1Å

a. A space is left before and after the angstrom unit even when it is preceded or followed by a sign of operation.

Example 13-13

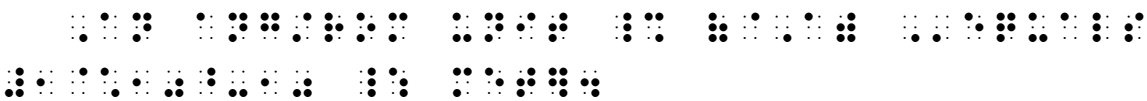
$1Å + 2Å = 3Å$



b. A space is not left between the angstrom unit and a sign of grouping, a horizontal or diagonal fraction line, a braille indicator, or a punctuation mark which applies to it.

Example 13-14

An angstrom unit $(Å)$ equals 1×10^{-10} meter.



The angstrom unit is unspaced from the opening and closing parentheses.

Example 13-15

$(\lambda > 7{,}000Å)$

A space precedes the angstrom unit, but it is unspaced from the closing parenthesis.

Example 13-16

$$\frac{(2)(2\text{Å})}{4\times10^{6}\text{Å}}$$

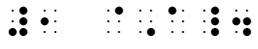
A space precedes each angstrom unit, but the first angstrom unit is unspaced from the closing parenthesis and the second angstrom unit is unspaced from the closing fraction indicator.

Example 13-17

$(500-1000)\text{Å}$

The closing parenthesis does not apply to the angstrom unit, therefore the symbol is preceded by a space.

c. Although the Angstrom unit is spaced like an abbreviation, it is a mathematical symbol and therefore must be punctuated mathematically when the punctuation falls within the Nemeth switches.

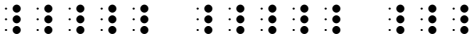
⋙ 1Å. 

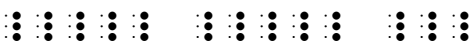
The angstrom unit is unspaced from the punctuation which follows it. (Assume Nemeth continues after this period.)

13.4 Tally Mark

Tally Mark	|

a. **Grouping.** If tally marks are grouped in print they are similarly grouped in braille, with one blank cell between groupings. When a group of tally marks is crossed through, the cross tally is treated as an additional (456) tally mark which is added to its group. Tally marks belonging to the same grouping should not be divided between braille lines.

⋙ ||||| ||||| ||| 

⋙  

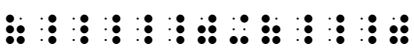
In the print copy, each group of five tally marks appears a long diagonal stroke superposed on four vertical strokes.

b. **Spacing.** One space is left before and after a group of tally marks even when the group is preceded or followed by a sign of operation.

⋙ ||| + ||| = ||||||

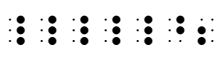
No space is left between a group of tallies and a sign of grouping or a braille indicator applying to it.

⋙ (|||||) + (|||)



⋙ (||| + |||)

⋙ $\not|||^{2}$



When the combination of symbols cannot be accommodated on one braille line, transition to another braille line may take the place of a required space.

c. **Punctuation.** No space is left between a group of tallies and a punctuation mark applying to it. When a tally mark is followed by punctuation requiring the punctuation indicator, a multipurpose indicator (dot 5) is placed between the tally mark and the punctuation indicator to avoid misreading the identical symbols. In the next illustration, assume more Nemeth material follows the period.

⋙ $\not|||$, $\not|||$.

PRACTICE 13C

I. Tally marks ||||||| equal the number 11_{six}. What numeral does ||||||||| equal in base six?

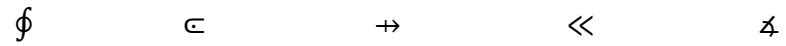
II. Does |||+||| = $\not|||$ | ?

III. 5550Å = 555nm or 0.555 micron. (nm is a millimicron.)

SUPERPOSED SIGNS

13.5 Definition and Analysis

Superposed signs are signs which are printed one upon another so that one sign extends beyond the boundary of the other. Contrast this with "shapes with interior modification" presented in Lesson 11, where one symbol is printed inside the boundaries of the other. Here are some examples of superposed signs.



In order to transcribe a superposed sign, the basic sign and the superposed sign need to be determined because the basic sign is transcribed first. The following order of preference is used as a guide. A symbol lower on the list is regarded as being superposed upon a symbol higher on the list.

Integral sign
Signs of operation
Horizontal and vertical bars
Signs of shape
Signs of comparison
Signs not listed above

Here is an analysis the first three print examples shown above.

 The basic sign is an integral sign; the superposed sign is a sign of shape (circle).

 The basic sign is a sign of operation (dot); the superposed sign is a sign of comparison (inclusion).

 The basic sign is a vertical bar; the superposed sign is a sign of comparison (arrow).

If two signs belong to the same category, the superposition may be represented in either order, provided the same order is followed consistently throughout the transcription. Here is an analysis the last two print examples shown above.

 Both signs belong to the same category – signs of comparison (nested "less than" signs).

 Both signs belong to the same category – signs of shape (an angle and an arc).

13.6 Transcription of Superposed Signs

The components of a superposed sign are unspaced and are transcribed in the following order:

The symbol for the basic sign is written first.
The superposition indicator is written next.
The symbol for the superposed sign is written third.
The termination indicator is written last.

⠸	Superposition Indicator
⠿	Termination Indicator

13.6.1 **Integral Modified by Superposition.** The most common integrals with superposed symbols are listed below. Unlisted integrals modified by superposition are transcribed in accordance with the rules for superposed signs. Spacing and punctuation follow the same rules as for unmodified integral signs (see 13.1.8).

⠫⠸⠒⠿	Integral with superposed circle	∮
⠫⠸⠔⠿	Integral with superposed infinity	⨌
⠫⠸⠒⠗⠿	Integral with superposed rectangle	⨏
⠫⠸⠒⠎⠿	Integral with superposed square	⨏

⋙ $\oint \frac{\mathrm{d}q}{T} < 0$ ⠫⠸⠒⠙⠟⠌⠞⠻⠐⠣⠟⠀⠀⠠⠚⠀⠀⠐⠜⠀⠀⠴

⋙ $\oint P\,\mathrm{d}x + Q\,\mathrm{d}y$ ⠫⠸⠒⠠⠏⠙⠭⠬⠠⠟⠙⠽

⋙ $\oint f(x,y)\,\mathrm{d}y$ ⠫⠸⠔⠋⠣⠭⠂⠽⠜⠙⠽

13.6.2 **Signs of Operation Modified by Superposition.** The most common symbols use the multiplication dot as the basic symbol. Three examples are shown below. (Note that these are <u>symbols</u> modified by superposition, they are not shapes with interior modification. See Lesson 11.) Unlisted signs of operation modified by superposition are transcribed in accordance with the rules for superposed signs.

⠒⠸⠐⠒⠿	Dot between bars of equals sign	≒
⠒⠸⠣⠐⠜⠿	Dot within inclusion sign	⊡
⠒⠸⠜⠐⠣⠿	Dot within reverse inclusion sign	⊐

⋙ $\pi \fallingdotseq 3.14$ ⠏⠨⠅⠀⠒⠸⠐⠒⠿⠀⠼⠉⠂⠁⠙

13.6.3 **Horizontal and Vertical Bars Modified by Superposition.** The most common symbols are shown below. Unlisted bars modified by superposition are transcribed in accordance with the rules for superposed signs.

⠸⠢⠸⠔⠢⠸	Horizontal Bar through inclusion sign	⫅̸
⠸⠢⠸⠔⠢⠸	Horizontal Bar through reverse inclusion sign	⫆̸
⠸⠢⠸⠒⠒⠔⠸	Vertical Bar through shaft of right-pointing arrow	↛
⠸⠢⠸⠔⠒⠒⠸	Vertical Bar through shaft of left-pointing arrow	↚

⩾ ⊖ ⠸⠢⠸⠢⠸

"Horizontal bar" is higher on the list than a sign of shape (the circle).

13.6.4 **Signs of Shape Modified by Superposition**

⩾ ⧊ ⠸⠸⠢⠸⠢⠸

"Triangle" is a sign of shape, which is higher on the list than "perpendicular to," which is a sign of comparison.

When both signs are signs of shape, the superposition may be represented in either order, provided the same order is followed consistently throughout the transcription.

⩾ ∡ ⠸⠸⠢⠸⠢⠸ ⠸⠸ ⠸⠢⠢⠸⠸⠸

This arc shape extends beyond the boundary of the angle shape, making this a shape modified by superposition. Compare this symbol to the "angle with interior arc" (Lesson 11) which has a different braille form.

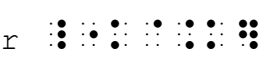
When the print copy uses an "angle with interior arc" symbol throughout the text to simply mean "angle", the two-cell angle symbol may be used: ⠸⠸. A transcriber's note is required to inform the reader of the substitution. Sample note on the Transcriber's Notes page: "In print, the angle shape image includes an interior arc."

Signs of shape modified by superposition are spaced and punctuated as other signs of shape. (See Lesson 11).

13.6.5 **Two Signs of Comparison Modified by Superposition.** When both signs are signs of comparison, the superposition may be represented in either order, provided the same order is followed consistently throughout the transcription. Spacing and punctuation follow the same rules as for any other sign of comparison.

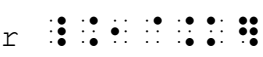
Equals Sign Through Inclusion Sign

⥼

or 

Equals Sign Through Reverse Inclusion Sign

⥽

or 

Nested Greater Than Signs
(means "is large compared with")

 with straight sides ≫

 with curved sides ⪢

Nested Less Than Signs
(means "is small compared with")

 with straight sides ≪

 with curved sides ⪡

13.6.6 **Negated Symbols and Tally Marks.** Negated symbols are not transcribed as superposed signs. As seen in Lessons 5 and 11, as well as in Section 13.2.5, negated symbols simply include dots 34 in their construction. Also, the print method of showing a group of five tally marks as a long diagonal stroke superposed on four vertical strokes does not follow the Nemeth rules for superposed signs, as shown in Section 13.4 above.

Instructions: See Lesson 11 to review shapes with interior modification, and Lessons 5, 11, and 13 regarding negated symbols.

PRACTICE 13D

Superposed Signs	Interior Modification	Negated Relations
$\oint$	⊙	/∴
Ψ	⊡	≠
⊖	⊖	∦
∡C	⊾	≰
$5 \ll y$		∉
R ⊃→ s	⑬	≢
Q ⇸ R	✪	∤

13.7 Context

Certain fonts can make it difficult to differentiate between print symbols for letters o, O, and the numeral "zero", or letters l, i, I, and the numeral "one". Additionally, certain print signs look similar to other print signs. The braille symbols may be altogether different. Transcribing the wrong symbol will give the reader false information. In order to assure your transcription is correct, search the surrounding context to determine the meaning of the sign. Magnification may help you identify it. If you are unsure, seek help from someone knowledgeable in the math or science topic who can correctly identify the print sign. Some examples are shown below.

ϕ Greek letter phi  or ⌽ null set 

or ∅ canceled numeral zero 

or 𝟎 zero in certain fonts

or ⌽ horizontal bar with superposed circle

or θ Greek letter theta 

α Greek letter alpha or ∝ "varies as" 

or English letter "a"

ε Greek letter epsilon or Ɛ "membership"

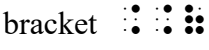
ν Greek letter nu  or ν English letter "vee"

Δ Greek letter Delta  or △ triangle shape 

or ⩓ logical product with underbar

< "less than" or ⟨ opening angle bracket

or < left-pointing caret 

> "greater than"  or ⟩ closing angle bracket 

or > right-pointing caret 

|| two vertical bars  or || "is parallel to" 

or ⫴ two separate vertical bar symbols

^ mathematical caret  or ⋀ logical product 

or ^ literary (UEB) caret or circumflex

√ radical sign or ✓ checkmark

¬ Is it a right-pointing arrow with lower-only, straight arrowhead
or a long-division structure? or the logic "negation" symbol?

13.7.1 **Vertical Bar and Colon.** The symbols that give transcribers the most trouble due to their ambiguity are the vertical bar and the colon. The vertical bar can be a grouping sign, an operation sign, a comparison sign, or an “end of proof” symbol. The colon can be a ratio symbol or a punctuation mark. You need to recognize the meaning of the sign in order to transcribe the proper symbol.

⠸ Vertical bar used as a sign of grouping, or as a sign of operation meaning "is a factor of", or as a sign of comparison meaning "such that" or "given"

⠒⠒ Colon used as a ratio symbol

⠒ Colon used in digital time, or meaning "is to", or meaning "such that", or used in mapping notation, or used as sentence punctuation. Preceded by a punctuation indicator when unspaced.

⠰⠸⠸⠸⠒⠸ Boldface vertical bar as an “end of proof” icon.

13.7.2 **Spacing.** Some signs use the same braille symbol but have different spacing rules depending on their meaning. You can't depend upon the print copy to show the spacing according to Nemeth rules so you need to recognize the meaning of the sign in order to apply proper spacing. Generally speaking, signs of comparison are spaced; signs of operation are unspaced; punctuation marks are followed by a space but not preceded by a space; signs of grouping are preceded by a space (opening) or followed by a space (closing).

| Is the vertical bar a grouping sign, an operation sign, or a comparison sign?

~ Is the tilde an operation sign ("not") or is it a comparison sign ("is related to" or "is similar to")?

' Is this an apostrophe or single quotation mark (a punctuation mark) or is it a math symbol (prime sign)?

/ Is the slash mathematical (meaning "per", "over", or "divided by") or is it a UEB solidus?

: Are the two vertical dots a ratio symbol (a sign of comparison) or are they a punctuation mark?

13.7.3 **Capital Greek Letters.** Some capital Greek letters are indistinguishable from English letters. Unless the text identifies the letter as Greek, you can safely assume it is an English letter.

13.7.4 **Chemical Notation.** Some signs have yet another meaning in chemical notation. For example, the following symbols can be certain types of chemical bonds.

= || ≡ — | / \ · : ::

Details can be found in *Chemical Notation Using the Nemeth Braille Code*.

MULTIPURPOSE INDICATOR

⠨ Multipurpose Indicator

13.8 Review

In addition to being a baseline indicator, dot 5 assumes several other functions in the Nemeth Code. Dot 5 is called the *multipurpose indicator* in the following situations which have been discussed previously.

- A multipurpose indicator is used between two unspaced signs to indicate that they are printed horizontally.
  - — side-by-side plus and minus signs. See Section 5.2.
  - — side-by-side tildes. See Section 5.4.9.b.
  - — side-by-side signs of comparison. See Section 5.9.
  - — a number printed on the baseline to the right of a letter. See Section 6.11.1.c.
  - — consecutive superscripts and subscripts. See Section 6.16.
  - — side-by-side arrows. See Section 9.12.
  - — side-by-side modifiers within a sign of shape. See Section 11.17.
- A multipurpose indicator is used between a regular polygon representing a sign of operation and a numeral immediately following it. See Section 11.29.
- A multipurpose indicator begins a modified expression. See Section 12.2.
- A multipurpose indicator is placed between a tally mark and a following punctuation indicator to avoid misreading the similar symbols. See Section 13.4.c.

13.9 Additional Uses of the Multipurpose Indicator

13.9.1 **Letter Followed by a Decimal Point and a Numeral.** When a letter on the baseline of writing is immediately followed by a decimal point and a numeral, a multipurpose indicator is placed between the letter and the decimal point to show that the decimal point and numeral are not subscripts to the letter.

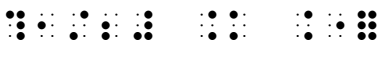
⋙ x.4 ⠨⠭⠨⠲⠼⠙

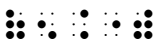
13.9.2 **Numeric Subscript Followed by a Numeral.** A multipurpose indicator is used after a numeric subscript if the subscript is followed by a numeral on the baseline of writing.

⋙ $x_7 10$ ⠨⠭⠰⠨⠂⠼⠁⠚

13.9.3 **Decimal Point Followed by a Nonnumeric Character.** A multipurpose indicator is used after a decimal point if the symbol following the decimal point is something other than a numeral. When a decimal point is followed by a comma or the punctuation indicator, a multipurpose indicator is not needed.

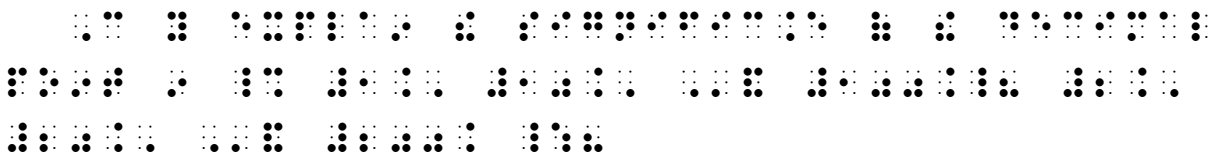
⋙ $0.a_1a_2a_3 \ldots a_n$ 

⋙ $\frac{1}{2} = .\underline{?}$ 

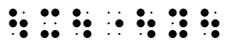
⋙ (5.) 

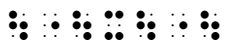
Example 13-18

Can you explain the significance of the decimal point in 1., 10., and 100.? 2., 20., and 200.?



13.9.4 **Side-by-Side Vertical Bars.** A multipurpose indicator is used between two unspaced vertical bars when the first bar is a closing sign of grouping and the second bar is an opening sign of grouping. Similarly, a multipurpose indicator is used between two vertical bars which are nested grouping symbols (one bar is shorter and/or thicker than the other). Examine the surrounding material to be sure the sign is indeed two distinct vertical bars, not a double vertical bar symbol or a parallel sign.

⋙ $|x||y|$ 

⋙ $\big||x|\big|$ 

This example shows only one outer closing bar.

⋙ $|x|\big|_{x=0}$ 

13.10 Reference Signs and Symbols

Reference signs are used in both literary and technical context. Within UEB context, UEB symbols are transcribed. Within Nemeth context, the Nemeth symbols shown below are transcribed.

13.10.1 **Asterisk, Daggers, Star, and Icons.** We have seen these symbols being used elsewhere, in other contexts. The asterisk and the daggers were introduced in Lesson 5 as operation signs; the star was introduced in Lesson 11 as a sign of shape. When these signs are used as reference markers within Nemeth context, the familiar symbols are transcribed.

When a reference sign occurs for which no provision exists in the Nemeth Code such as pictures and icons, the transcriber devises a suitable symbol with an explanatory transcriber's note or a listing in the Special Symbols list. Icons were discussed in Lesson 11.

⠔⠡	Asterisk	*
⠔⠹	Single Dagger	†
⠔⠹⠹	Double Dagger	‡
⠸⠡	Star	☆

13.10.2 **Numerals or Letters.** When reference to a footnote is denoted by a number or a letter, the general reference indicator is used. The number or letter immediately follows the indicator. A numeric indicator or English-letter indicator is required.

⠔⠹	General Reference Indicator

13.10.3 **Layout and Spacing.** Reference signs are often printed in the superscript position, unspaced from the referenced item. In braille, the superscript position is ignored and the reference symbol is spaced away from the word, letter, or number to which it applies. If there is a punctuation mark associated with a reference symbol, no space is left between them. Follow print as to the left-to-right order of reference sign, item being referenced, and punctuation.

Assume that Nemeth continues following each of the examples, below.

Reference sign is printed before the item

⋙ *6.3 ⠔⠡ ⠡⠼⠒⠉

⋙ †2.6 ⠔⠹ ⠡⠆⠒⠃

Reference sign is printed after the item

⋙ 6.3* ⠡⠼⠒⠉ ⠔⠡

⫸ 2.6†

⫸ $4,265[d]

With punctuation (follow print order)

⫸ 18%‡.

⫸ 18%.‡

⫸ 1.4709×10^8 km[1],

Example 13-19

... distance of 1.4709×10^8 km[1], what is the average distance?

13.10.4 **The Note.** Follow *Braille Formats* for the placement and layout used for the note. The note begins with the same reference indicator used at the point of reference. There may be a mixture of UEB and Nemeth reference symbols in the notes section, depending on the symbol used at the point of reference. The note separation line may be used in either Nemeth Code or UEB, without switching.

Using the models shown above where the reference symbol in the text is transcribed in Nemeth, the next two examples demonstrate the transcription of the note itself. The first transcription of each example shows a page ending in UEB; the second transcription of each example shows a page ending in Nemeth.

Example 13-20

[d] From budget: ($1,715+$1,870+$680) = $4,265

(a) UEB text ...

(b) Nemeth ...

⠐⠒⠒⠒⠒⠒⠒

⠈⠻⠰⠙ ⠸⠱ ⠠⠋ ⠃⠥⠙⠛⠑⠞⠒ ⠸⠩

⠷⠈⠎⠂⠠⠶⠂⠢⠬⠈⠎⠂⠠⠦⠶⠴⠬⠈⠎⠒⠦⠴⠾ ⠨⠅ ⠈⠎⠲⠠⠆⠖⠢ ⠸⠱

⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠼⠿⠿

Example 13-21

[1]Note: Earth's orbit is elliptical, not circular.

(a) UEB text ...

⠐⠒⠒⠒⠒⠒⠒

⠸⠩ ⠈⠻⠼⠂ ⠸⠱ ⠠⠝⠕⠞⠑⠒ ⠠⠑⠜⠹⠄⠎ ⠕⠗⠃⠊⠞ ⠊⠎

⠑⠇⠇⠊⠏⠞⠊⠉⠁⠇⠂ ⠝ ⠉⠊⠗⠉⠥⠇⠜⠲

⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠼⠿⠿

(b) Nemeth ...

⠐⠒⠒⠒⠒⠒⠒

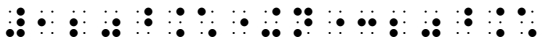
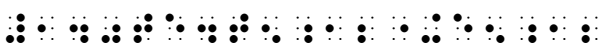
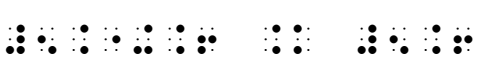
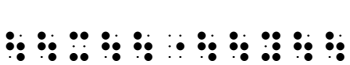
⠈⠻⠼⠂ ⠸⠱ ⠠⠝⠕⠞⠑⠒ ⠠⠑⠜⠹⠄⠎ ⠕⠗⠃⠊⠞ ⠊⠎

⠑⠇⠇⠊⠏⠞⠊⠉⠁⠇⠂ ⠝ ⠉⠊⠗⠉⠥⠇⠜⠲

⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠤⠼⠿⠿

Instructions: Explain the function of the multipurpose indicator in each example. Then transcribe the text after the last example. Assume that the equation is the last item on the print page, before the footnote.

PRACTICE 13E

1. x3, R10 
2. $120° + n320°$ 
3. $C = \pi 2r$ 
4. $\omega 2 = \omega \neq 2\omega$ 
5. $140\text{te}4\text{t}5_{12} + \text{e}5_{12}$ 
6. $\frac{\text{A}_0}{2} = \text{A}_0 2^{-0.05\text{T}}$ 
7. $x_2 = n_1 5^{-1} - 1 n_2 5^{-1}$ 
8. $0.\alpha_1\alpha_2\alpha_3 \ldots \alpha_n$ 
9. .% 
10. $4\% = .\_\_\_\_$ 
11. $5. + .6 = 5.6$ 
12. $\|x\|\|y\|$ 
13. $\| |x| \|$

Finding an Equation for a Sinusoidal Graph

Figure 47 can be viewed as the graph of a sine function with amplitude $A = 5$*, where $T = 4$.

_____

* The equation could also be viewed as a cosine function with a horizontal shift.

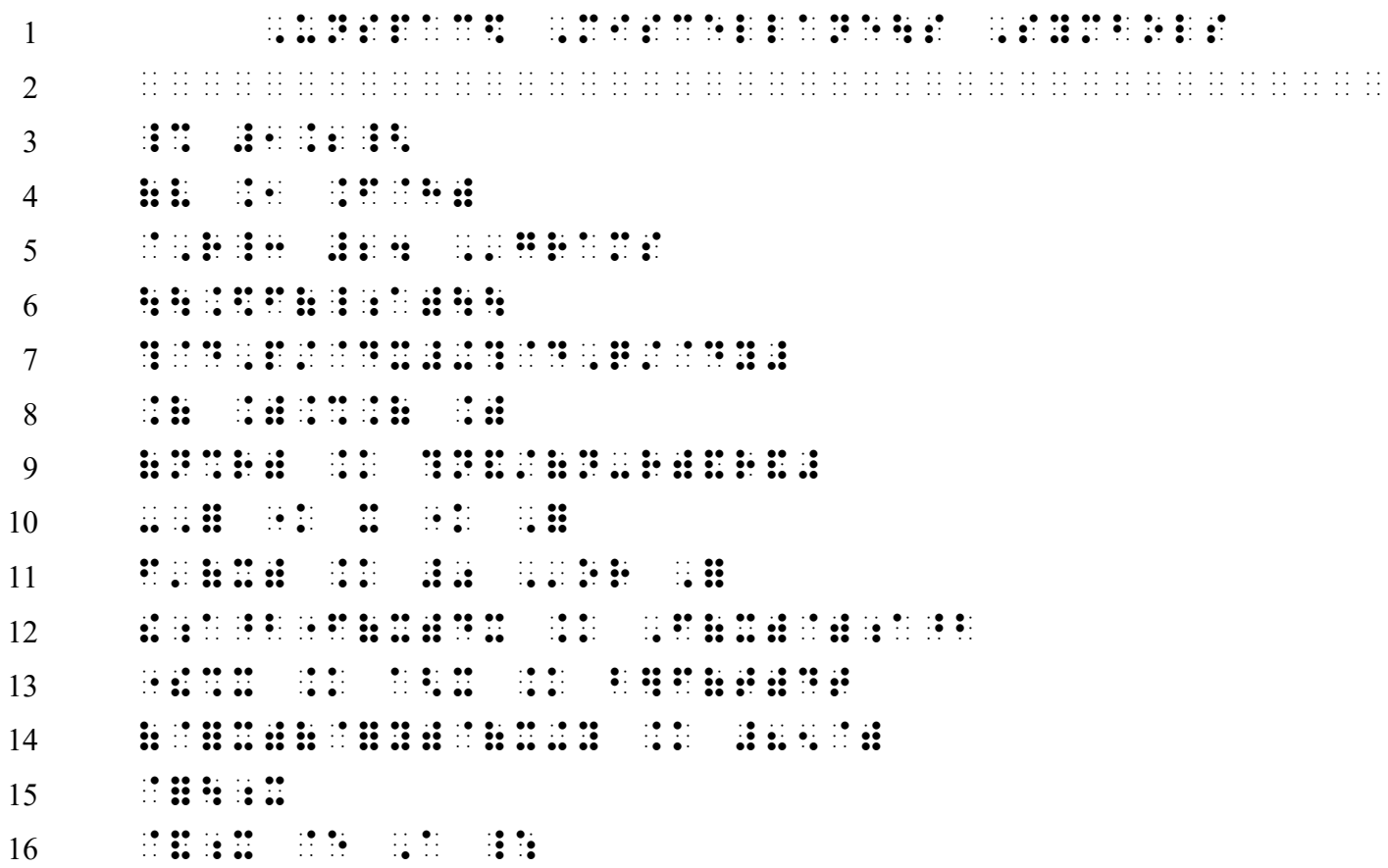
For further practice, see Appendix A—Reading Practice.

EXERCISE 13

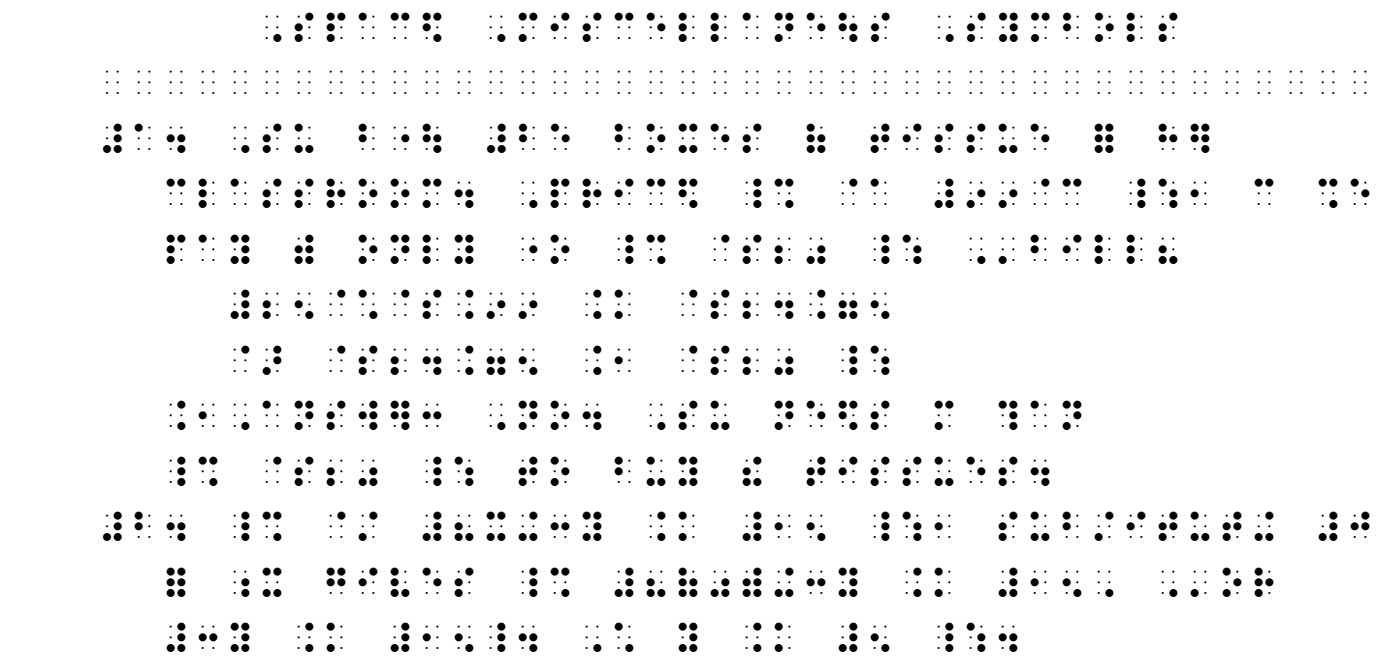
Prepare Exercise 13 for your grader.

ANSWERS TO PRACTICE MATERIAL

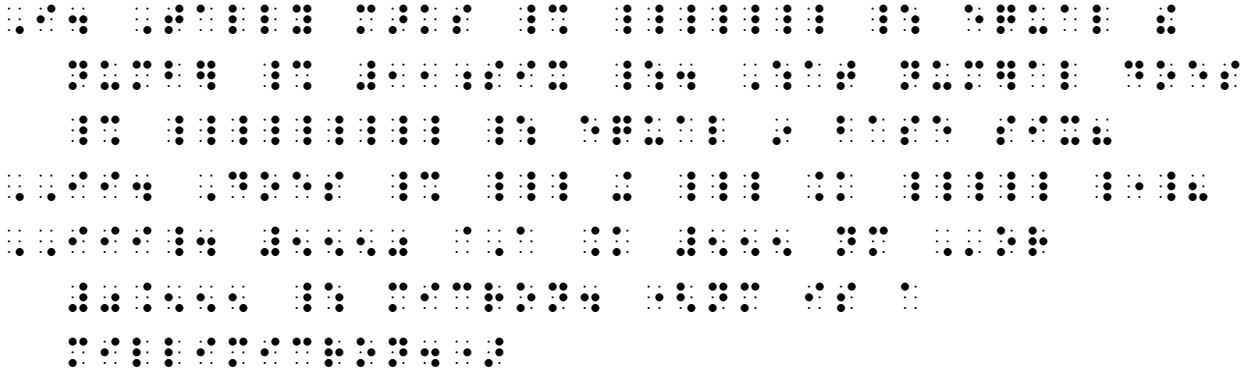
PRACTICE 13A



PRACTICE 13B

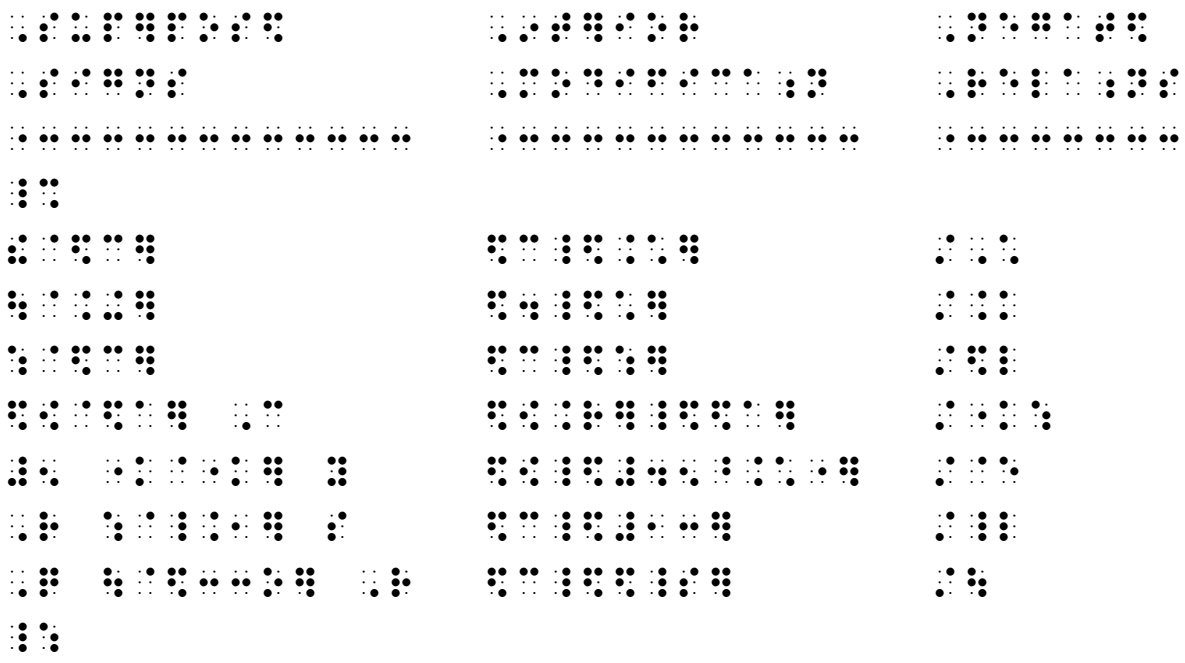


PRACTICE 13C



Switch decision: The word "micron" is transcribed in UEB even though it is associated with a Nemeth number.

PRACTICE 13D



Guide dots are not used because the items are not related across the rows.

PRACTICE 13E

1. A multipurpose indicator is used when a letter is followed by a numeral and they are both on the baseline of writing.

2. The first dot 5 is a baseline indicator because the plus sign is on the baseline and it follows a raised hollow dot. The second dot 5 is a multipurpose indicator which is needed to show that the numeral "3" is not a subscript to the letter "n".

3. The same rule applies to letters in any alphabet – a multipurpose indicator is needed to show that the numeral "2" is not a subscript to the Greek letter pi.

4. Same as #3 regarding Greek letter omega followed by numeral "2" in "ω2". Note that a multipurpose indicator is not needed for a letter following a numeral, as in " 2ω".

5. A baseline indicator precedes the plus sign, following the subscript "12". (The multipurpose indicator is not used following the "t" and "e" because they represent numerals in base 12.)

6. A multipurpose indicator is needed after the second numeric subscript "0" because the subscript is followed by a numeral on the baseline of writing ("2").

7. The function of the first and third dot 5 is the same as item 6. The second dot 5 is a baseline indicator which is needed for the minus sign following a superscript.

8. A multipurpose indicator is needed after the decimal point because the next symbol is not a numeral—it is the Greek letter "alpha".

9. A multipurpose indicator is needed after the decimal point because the next symbol is not a numeral—it is a percent sign.

10. A multipurpose indicator is needed after the decimal point because the next symbol is not a numeral—it is a long dash.

11. A multipurpose indicator is needed after the decimal point because the next symbol is not a numeral—it is a plus sign.

12. A multipurpose indicator is used between two unspaced vertical bar symbols (in this case, each is a "double vertical bar" symbol) when the first is a closing sign of grouping, and the second bar is an opening sign of grouping.

13. A multipurpose indicator is used between vertical bars which are nested grouping symbols.