

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.

$$\begin{aligned} &\gg \frac{\partial f}{\partial x} \\ &\gg \partial/\partial y(\partial b/\partial x) \\ &\gg \frac{\partial h}{\partial u} = \frac{\partial f}{\partial x} \frac{\partial x}{\partial u} \end{aligned}$$

Example 13-3

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

$$\frac{\partial V}{\partial r} = \frac{2\pi r h}{3}$$

13.1.5 Empty Set (null set, void set)

The print symbol used to denote the empty set must not be mistaken for the Greek letter phi, which it resembles (φ or ϕ). When facing braces are used to denote the empty set, one space is left between the braces.

\emptyset	Empty Set (null set, void set)	\emptyset or \varnothing
	Represented by Zero or a Circle with a Slanted Bar through it	
$\{ \}$	Empty Set Represented by Facing Braces	$\{ \}$


$$\begin{aligned} &\gg A \cap \emptyset = \emptyset \\ &\gg \emptyset \subseteq A \\ &\gg S \cup \{ \} \end{aligned}$$

Example 13-4


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

$$R = \emptyset \text{ or } R = \{ \}$$

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


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


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


1 

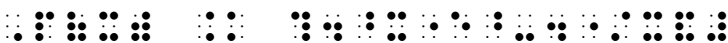
2 


3 

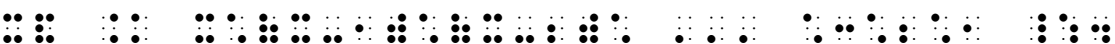
4 

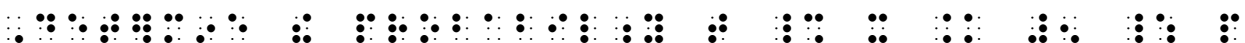
5 


6 

7 

8 

9 

10 

11 

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.

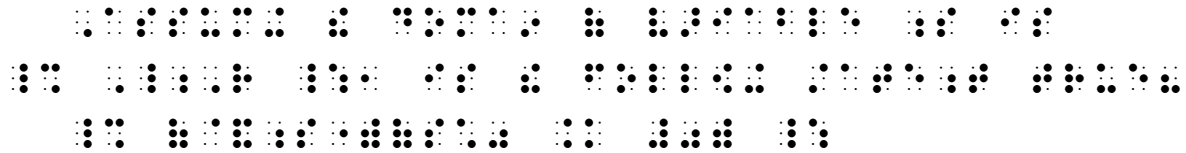
Lines 8 and 10: The narrative continues in the runover cell for paragraphs, cell 1.

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.

Example 13-8

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

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



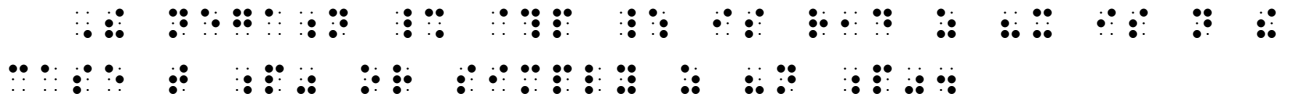
13.1.10 **Transcriber-Devised Symbols.** When a symbol is encountered that is not represented in the Nemeth Code, the transcriber may substitute another symbol as long as it is not being used with another meaning within the same subject matter. Another option is to invent a symbol for temporary use. 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 \neg 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 \neg 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_^

$(v > \phi \hbar)$

R: 24 grams

$\|\nabla f(a)\|$

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

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

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

$-\infty < x < \infty$

$f'(x) = 0$ or ∞

$\int_a^b f(x) dx = F(x) \Big|_a^b$

$\int_{x=a}^{x=b} f(t) dt$

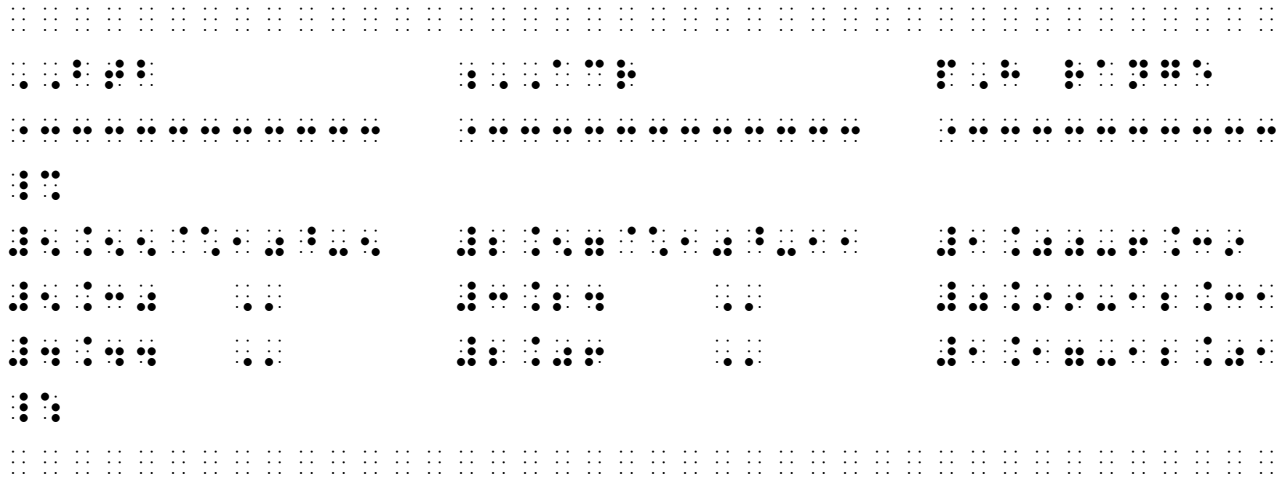
$(\exists x)(\exists y)[x + y = 85]$

$\exists |x$

$\forall_x \in A$

Example 13-11

<u>BTB</u>	<u>ACR</u>	<u>pH range</u>
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) ⠠⠨

⠠⠨ $\because x = y, x^2 = y^2$

⠠⠨ ⠠⠨ ⠠⠨ ⠠⠨ ⠠⠨ ⠠⠨ ⠠⠨

⠠⠨ (⠠⠨) 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?

$$25 \times \$0.99 = \$24.75$$

$$\checkmark \$24.75 > \$20$$

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 $3y = 15$. ∴ $y = 5$.

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.

\oint \subset \Rightarrow \ll \sphericalangle

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.

- \oint The basic sign is an integral sign; the superposed sign is a sign of shape (circle).
- \subset The basic sign is a sign of operation (dot); the superposed sign is a sign of comparison (inclusion).
- \Rightarrow 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.

- \ll Both signs belong to the same category – signs of comparison (nested "less than" signs).
- \sphericalangle Both signs belong to the same category – signs of shape (an angle and an arc).

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).

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

PRACTICE 13D

<u>Superposed Signs</u>	<u>Interior Modification</u>	<u>Negated Relations</u>
ϕ	\odot	\therefore
ψ	\square	\neq
\ominus	\ominus	\nparallel
$\angle C$	\sphericalangle	\nless
$5 \ll y$	$\sphericalangle_{45^\circ}$	\notin
$R \ni s$	$\textcircled{13}$	\neq
$Q \leftrightarrow R$	\star	\dagger

AMBIGUOUS SIGNS

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 φ Greek letter phi	\dots	or	\emptyset \varnothing null set	\dots	
			$\cancel{0}$ canceled numeral zero	\dots	
			0 zero in certain fonts	\dots	
			Φ horizontal bar with superposed circle	\dots	
			θ Greek letter theta	\dots	
α Greek letter alpha	\dots	or	\propto "varies as"	\dots	
			English letter "a"	\dots	
ε Greek letter epsilon	\dots	or	ε "membership"	\dots	
ν Greek letter nu	\dots	or	ν English letter "vee"	\dots	
Δ Greek letter Delta	\dots	or	\triangle triangle shape	\dots	
			$\underline{\Delta}$ logical product with underbar	\dots	
$<$ "less than"	\dots	or	\langle opening angle bracket	\dots	
			$<$ left-pointing caret	\dots	
$>$ "greater than"	\dots	or	\rangle closing angle bracket	\dots	
			$>$ right-pointing caret	\dots	
\parallel two vertical bars	\dots	or	\parallel "is parallel to"	\dots	
			\parallel two separate vertical bar symbols	\dots	
\wedge mathematical caret	\dots	or	\wedge logical product	\dots	
			$\hat{\ }$ literary (UEB) caret	\dots	or circumflex
$\sqrt{\ }$ radical sign	\dots	or	\checkmark checkmark	\dots	
\neg	Is it a right-pointing arrow with lower-only, straight arrowhead \dots				
	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

$\cdot\cdot$ 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 $\cdot\cdot$ $\cdot\cdot$ $\cdot\cdot$ $\cdot\cdot$

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 $\cdot\cdot$ $\cdot\cdot$ $\cdot\cdot$ $\cdot\cdot$ $\cdot\cdot$

REFERENCE SIGNS AND SYMBOLS

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 Other Symbols.** 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.

⠠⠠⠠⠠	Asterisk	*
⠠⠠⠠	Single Dagger	†
⠠⠠⠠⠠⠠	Double Dagger	‡
⠠⠠⠠	Star	☆

When a reference sign occurs for which no provision exists in the Nemeth Code, the transcriber devises a suitable symbol. The symbol must be identified in a transcriber's note or listed on the Special Symbols page, as appropriate.

- 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* ⠠⠠⠠⠠⠠ ⠠⠠⠠

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. x^3, R_{10}
2. $120^\circ + n320^\circ$
3. $C = \pi 2r$
4. $\omega 2 = \omega \neq 2\omega$
5. $140te4t5_{12} + e5_{12}$
6. $\frac{A_0}{2} = A_0 2^{-0.05T}$
7. $x_2 = n_1 5^{-1} - 1n_2 5^{-1}$
8. $0. \alpha_1 \alpha_2 \alpha_3 \dots \alpha_n$
9. $.\%$
10. $4\% = .\underline{\hspace{1cm}}$
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.

PRACTICE 13D

1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

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 " ω^2 ". 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").

