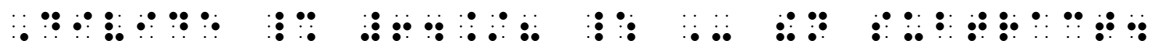


Example 3.2-3 Divide $64 \div 8$ — then subtract.



In the next example, the dash is unspaced in print. In the final example, the dash is spaced in print.
Reminder: The space after the Opening Nemeth Code Indicator does not represent a space in print.

Example 3.2-4 We continue— $8-14 = -6$



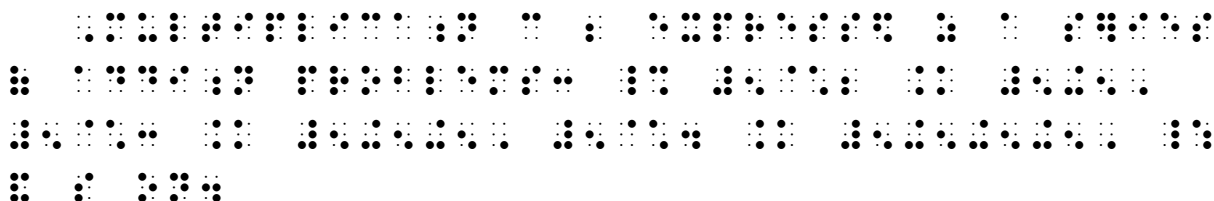
Example 3.2-5 We continue — $8-14 = -6$



3.3 Nemeth Braille Punctuation: When punctuation occurs within mathematical material, Nemeth Code punctuation is used. Even when the punctuation belongs to the sentence structure, excessive code switching is avoided by using Nemeth Code punctuation. In the example below, the Nemeth Code comma (dot 6) is used within the series even though the comma itself is not "mathematical."

Example 3.3-1 Multiplication can be expressed as a series of addition problems:

$5 \times 2 = 5 + 5$, $5 \times 3 = 5 + 5 + 5$, $5 \times 4 = 5 + 5 + 5 + 5$, and so on.



The last comma is placed inside the switch in order to continue the established pattern. It would not be wrong to place that comma after the Nemeth Code terminator as a dot 2 literary comma.

Instructions: Consider carefully where to place the code switch indicators and what kind of punctuation to use in these three sentences. Apply 3-1 Nemeth Code paragraphing.

PRACTICE 3A

72813654, when written as 72 81 36 54, is obviously divisible by 9.

Write these numbers: 3.79, 500, -123, 2,000.88, -250,794. Now add them together.

Is the answer 4.0‰, or is it 4.0%?

PUNCTUATION IN NEMETH CODE

3.4 Background: So far we have looked at mathematical punctuation that is essentially unambiguous in mathematical context: the comma, decimal, the short and long dash, and the ellipsis. These symbols are not the same as their UEB counterparts. To review:

Mathematical Punctuation of the Nemeth Code

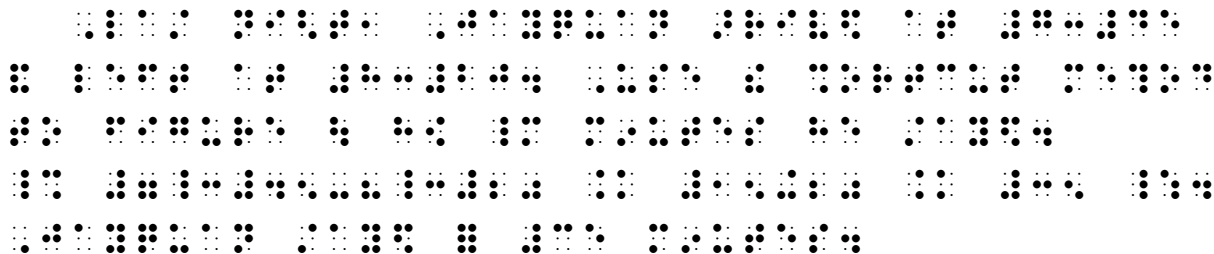
Comma	⠠⠨⠠
Decimal Point	⠠⠨⠠⠨
Dash (short)	⠠⠨⠠⠨⠠
Long Dash	⠠⠨⠠⠨⠠⠨⠠⠨⠠
Ellipsis	⠠⠨⠠⠨⠠⠨⠠

When punctuation is brailled inside the Nemeth Code switches, clarification is required because many punctuation marks are represented by the same braille dots as Nemeth numerals and symbols.

<u>Literary Punctuation Mark</u>		<u>Could be misread in Nemeth Code as a ...</u>
Semicolon	;	⠠⠨⠠ <i>(numeral 2)</i>
Colon	:	⠠⠨⠠⠨ <i>(numeral 3)</i>
Period	.	⠠⠨⠠⠨⠠ <i>(numeral 4)</i>
Exclamation Point	!	⠠⠨⠠⠨⠠ <i>(numeral 6)</i>
Question Mark	?	⠠⠨⠠⠨⠠ <i>(numeral 8)</i>
Quotation Marks	" "	⠠⠨⠠⠨⠠⠨⠠ <i>(numerals 8 and 0)</i>
Apostrophe	'	⠠⠨⠠⠨⠠ <i>(prime sign)</i>

The BANA Nemeth Code Technical Committee is discussing details regarding the treatment of "single" quotation marks in Nemeth context.

PROVISIONAL SOLUTION

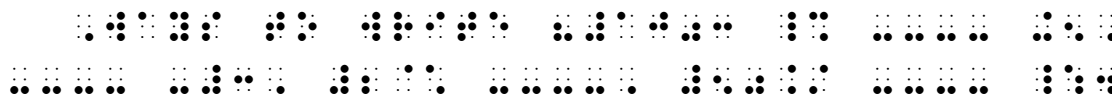


3.6 Punctuation with Omission Signs: When a sign of omission represents omitted mathematical content the appropriate omission symbol of the Nemeth Code is brailled and it is punctuated mathematically. The punctuation is unspaced from the omission symbol. (There is one exception noted after the examples.)

- $2 \times \dots,$ \dots \dots
- $2 \times \underline{\quad}.$ \dots \dots \dots
- $2 \times ?;$ \dots \dots

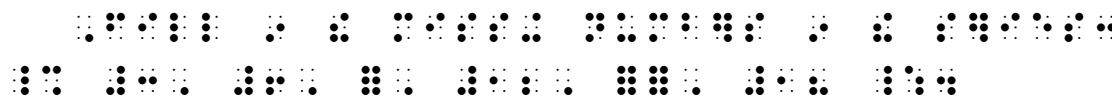
Take another look at this example from **Lesson 2**. Notice the use of the mathematical comma with the long dash.

Example 3.6-1 Ways to write "10": ___ + 5, ___ - 3, 2 × ___, 50 ÷ ___.



Reminders from Lesson 2: The long dash and the ellipsis are spaced away from the multiplication symbol even though operation signs are usually unspaced.

Example 3.6-2 Fill in the missing numbers in the series: 3, 6, ?, 12, ??, 18.



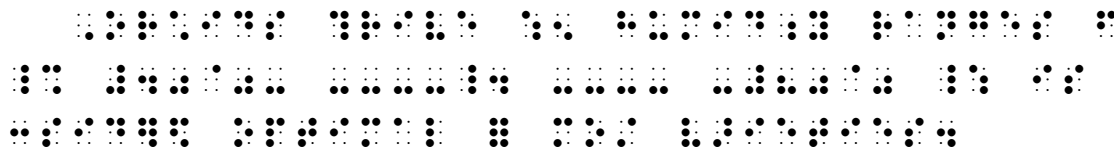
Switch Decision: The general omission symbol is a Nemeth Code symbol. The use of that symbol supports the decision to use Nemeth Code to braille the entire series even though the numerals do not necessarily require a switch.

Reminder: The general omission symbol is spaced according to rules of the item it represents (in this case, a numeral). The same number of omission symbols shown in print should be used in braille.


3.6.1 SPACING EXCEPTION—The Hyphen: Although no space is left between an ellipsis and a related punctuation mark or between a long dash and a related punctuation mark, if the punctuation mark is a hyphen then a space is required.

- $40\% - \underline{\quad}$ \dots \dots \dots
- $\dots - 9.3$ \dots \dots \dots

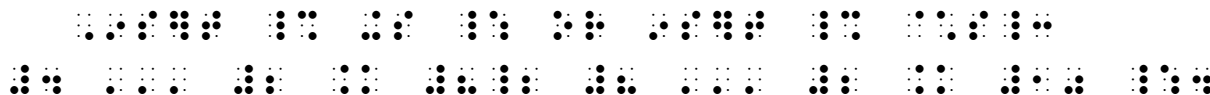
Example 3.6-3 Orchids thrive when humidity ranges from 40% - ____ -80% is considered optimal for most varieties.



3.7 Punctuation and Spacing of Plural or Possessive Endings: When "s" or apostrophe-s is attached to a mathematical expression it becomes part of that expression. This means that—in mathematical context—the "s" is punctuated mathematically.

➤ ×s: 

Example 3.7-1 Insert +s or insert ×s: $4 \dots 2 = 8$; $8 \dots 2 = 10$.

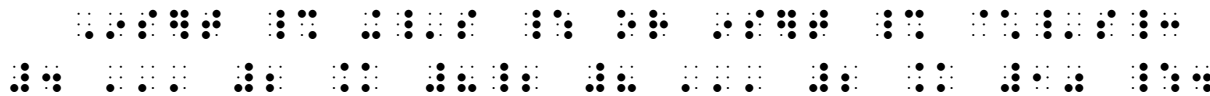


Reminder: A Nemeth Code format rule states that a mathematical expression must not be divided between braille lines if it will fit on one line within current margins. The expression "4 ... 2 = 8" must not be divided and so it begins on line 2.

A punctuation indicator is required before the apostrophe in a possessive ending "apostrophe-s". Even so, a punctuation indicator is still required before a punctuation mark that immediately follows the "s". Compare this similar example to the previous one.

➤ ×'s: 


Example 3.7-2 Insert +'s or insert ×'s: $4 \dots 2 = 8$; $8 \dots 2 = 10$.



A punctuation indicator is needed both before the apostrophe and before the colon in ×'s:

The ending is unspaced from the symbol even if the symbol normally requires a space.

➤ =s 

➤ ='s 

INTRODUCTION TO SIGNS OF GROUPING

3.9 Definition: In mathematical context, symbols such as parentheses, braces, and brackets are not considered to be punctuation; they are classified as *signs of grouping*. Here are some grouping signs commonly encountered in technical material.

Opening Parenthesis	(
Closing Parenthesis)	
Opening Brace	{	
Closing Brace	}	
Opening Bracket	[
Closing Bracket]	
Opening Angle Bracket	<	
Closing Angle Bracket	>	
Vertical Bar		
Double Vertical Bar		

More signs of grouping will be presented in later lessons.

3.10 Signs of Grouping with Numerals: The numeric indicator is not used before a numeral or before a decimal point that immediately follows an opening grouping sign.

➤ (3)(.5)

Example 3.10-1 "Three times point five" can be written this way: (3)(.5).

The numeric indicator is not used after a minus sign that immediately follows an opening grouping sign.

➤ |-8|

Example 3.10-2 |-8| is spoken "the absolute value of negative eight."

Lacking an opening grouping sign, the numeric indicator is required when the numeral is preceded by a space or begins a braille line. Compare:

$$\gg 1) \quad \begin{matrix} \cdot\cdot & \cdot\cdot & \cdot\cdot \\ \cdot\cdot & \cdot\cdot & \cdot\cdot \end{matrix}$$

$$\gg (1) \quad \begin{matrix} \cdot\cdot & \cdot\cdot & \cdot\cdot \\ \cdot\cdot & \cdot\cdot & \cdot\cdot \end{matrix}$$

3.11 Punctuation with Grouping Symbols: Grouping symbols of the Nemeth Code are mathematical symbols and therefore must be punctuated mathematically inside of the switch indicators. Thus, except for the mathematical comma, hyphen, and dash, a punctuation indicator must be used before a punctuation mark following a sign of grouping.

$$\gg \{-5\}, (0), [+5]. \quad \begin{matrix} \cdot\cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \\ \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \end{matrix}$$

$$\gg ("20\%"), \quad \begin{matrix} \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \\ \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \end{matrix}$$

Example 3.11-1 What fractions do these percentages represent? ("20%"), ("25%"), ("50%")

$$\begin{matrix} \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \\ \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \\ \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \end{matrix}$$

Reminder: A numeric indicator is required when a numeral immediately follows an opening quotation mark.

3.12 Nested Grouping Symbols: When two or more grouping signs follow one another the outer set may be printed using a taller size in order to visually distinguish the nested groupings. The braille transcription does not differentiate between the sizes—regular grouping symbols are brailled.

Example 3.12-1 ((4 + 7) - (7 + 4))

$$\begin{matrix} \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \\ \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \end{matrix}$$

In print, the first and last parentheses are taller than the others.

Note that this does not apply to the vertical bar since the double vertical bar is a distinct mathematical symbol. Nested vertical bars are discussed in a later lesson.

Example 3.14-2 (\$1.01 is the correct answer.)

1.01

However, do not switch out of Nemeth Code merely for the sake of a punctuation mark. The practice of avoiding excessive code switching takes precedence over symmetrical pairing of punctuation marks.

Example 3.14-3 Al shouted, "The answer is 99¢!" (\$1.01 is the correct answer.)

Al shouted, "The answer is 99¢!"

If you ask yourself, "Does the punctuation apply only to the math expression, or does it apply to the whole phrase (not just the math)?" and "Is Nemeth Code in effect both before and after the punctuation?" the best transcription interpretation will usually be clear.

Spacing with Signs of Grouping

3.15 Spacing Inside of the Grouping Signs: Unless other rules apply, no space is left between an opening or a closing sign of grouping and the material which it encloses.

➤ [-4]

➤ (12¢)

This includes symbols which usually require spacing—no space is left between a dash, an ellipsis, a sign of comparison, or any other symbol and its sign of grouping.

➤ ||...||

➤ (<, =, >)

Example 3.15-1 Circle the correct comparison sign: $14 \div 7$ (<, =, >) $14 - 7$

$14 \div 7$ (<, =, >) $14 - 7$

3.15.1 SPECIAL CASE—When a space is printed between an opening and a closing sign of grouping and that blank space does not represent an omission, the space between the grouping signs is included in the braille transcription.

Example 3.15-2 Angle brackets < > denote a sequence.

< 1 2 3 >

Context will help you determine whether the print sign is an angle bracket or a "less than" or a "greater than" symbol.

3.16 Spacing Outside of the Grouping Signs: The spacing before and after an enclosed expression is subject to the spacing rules for the signs which precede or follow the enclosure.

Example 3.16-1 Perform the multiplication before the addition: $(4 \times 30) + (4 \times 2) = 128$

$$(4 \times 30) + (4 \times 2) = 128$$

Operation signs are unspaced; comparison signs are spaced.

Example 3.16-2 Complete the missing values in the range (0.1) ... (0.9)

$$(0.1) \dots (0.9)$$

The ellipsis is spaced.

No space is left between an enclosed expression and a numeral when these items are part of the same expression unless other spacing rules apply. These items often appear to be spaced in print.

Example 3.16-3 Does $5(9 + 7) = (5 \cdot 9) + 7$?

$$5(9 + 7) = (5 \cdot 9) + 7$$

No space is left between an enclosed expression and another sign of grouping when these items are part of the same expression unless other spacing rules apply. These items often appear to be spaced in print.

Example 3.16-4 Multiply, then add: $[(3)(-1)] + [(1)(-3)]$

$$[(3)(-1)] + [(1)(-3)]$$

Instructions: Format each line in print as a 3-1 paragraph in braille.

PRACTICE 3C

Is $3(-2.5) + (-4)$ the same as $3(-2.5 + (-4))$?

Use a number line to illustrate this addition problem: $[-4 - (-1)] + [-1 - (-3)]$.

$$7 + (-3) + (-4) = ?$$

$$8 + |(-2) + (-3)| = ?$$

$$|2(-7.5)| + 3.2(2) = ?$$

The **multiplicative identify** [sic] property is illustrated: $(83)(1) = 83$.

A pair of braces "{ }" indicates a set.

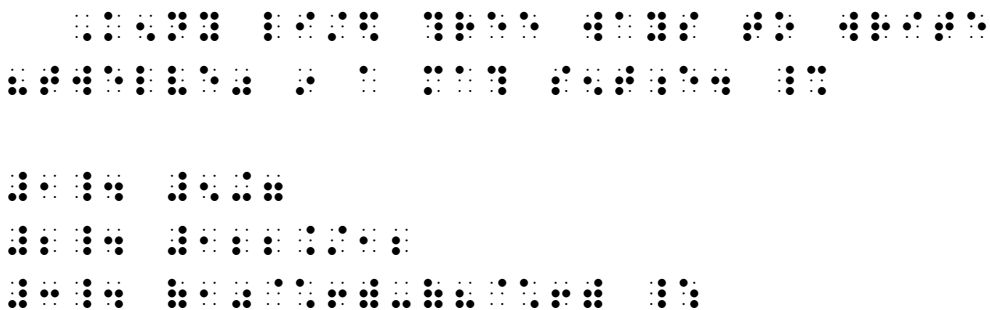
What is the meaning of the symbol "||" in "The answer is ||3.1||"?

IDENTIFIERS, cont.

3.17 Code Switching and Identifiers—Maintaining Alignment: In itemized sections, the identifiers should each begin in the same cell. You have learned one format for itemized text: 1-3. In that layout, each identifier should begin in cell 1. By placing the opening Nemeth Code indicator at the end of the line of text that precedes a list of numbered items you can ensure that all identifiers begin in the same cell.

Example 3.17-1 Kenny listed three ways to write "twelve" in a math sentence.

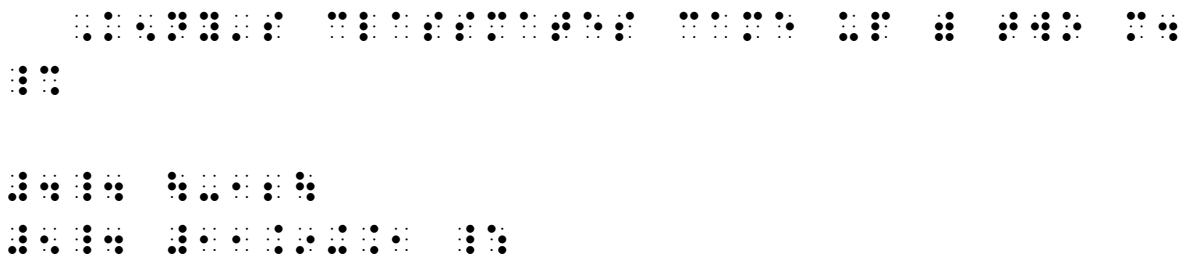
1. $5+7$
2. $144 \div 12$
3. $(10 \times 6) - (8 \times 6)$



If there is no room for the opening Nemeth Code indicator at the end of the line that precedes the identified material, place it on the next line in the appropriate runover cell. The code switch indicator does not take the place of the blank line that must precede the itemized material.

Example 3.17-2 Kenny's classmates came up with two more.

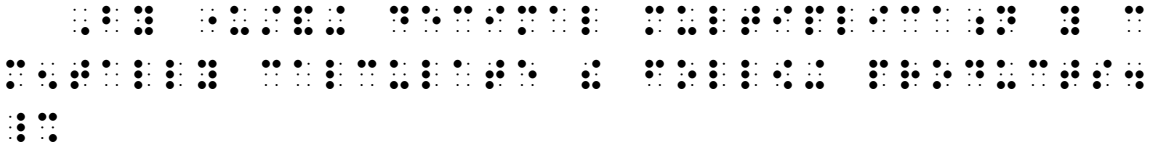
4. $|-12|$
5. $11.9 + .1$

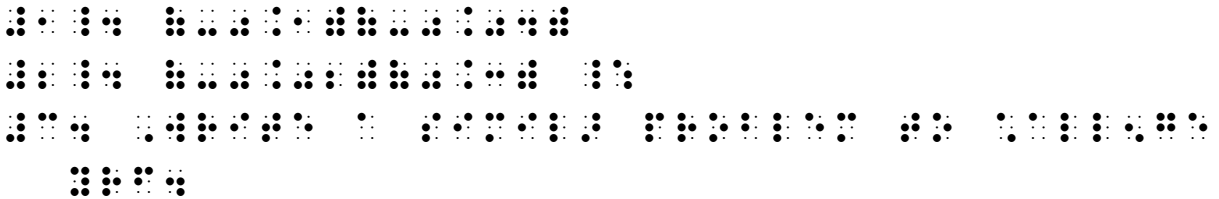


3.18 Context Decisions and Code Switching: Even though an identifier is not part of the math, there is no need to switch out of Nemeth Code simply to braille an identifier. Notice in the two examples above that all of the itemized expressions are in Nemeth Code as well as their identifiers. If code switching is required within the itemized portion, identifiers are transcribed according to the rules for the code in use at the time regarding upper-cell or lower-cell numerals, use of indicators, and construction of related punctuation or grouping symbols. All identifiers in a section do not need to be transcribed in the same code.

Example 3.18-1 By understanding decimal multiplication you can mentally calculate the following products.

1. $(-0.1)(-0.04)$
2. $(-0.02)(0.3)$
3. Write a similar problem to challenge yourself.

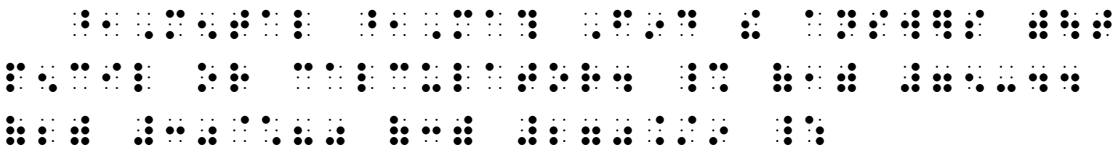




The identifiers can be brailled in either code. Note how the switch indicators are placed where they are least intrusive to the flow of text and do not interfere with the alignment of the first cell of the identifiers.

Embedded identifiers may be brailled in Nemeth Code to avoid excess code switching.

Example 3.18-2 **Mental Math** Find the answers without pencil or calculator. (1) $75-44$ (2) 30×80
(3) $270 \div 9$



PRACTICE 3D

- 1) The box is 2'4'' in height.
 - 2) 5' is the same as 60''
 - 3) $12' + 15'' = 13'3''$
-

FORMAT

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

Example 3.19-1 The following problem uses a (1.5-to-1; 2.5-to-1; 3.5-to-1) high torque right-angle gearbox.

Because Nemeth Code format rules are applied throughout a technical transcription, this rule also applies in UEB text when a numeral and a word are connected by a hyphen.

Example 3.19-2 Estimate how many seconds are in a 24-hour day.

3.20 Margins for Itemized Material with No Subdivisions—Side-by-Side Layout: When the print copy arranges itemized material side-by-side across the page and there are no subdivisions, the braille format is changed so that all identifiers start in cell 1.

Example 3.20-1

Homework for Monday

- | | | |
|-------------------|--------------------|----------------|
| 1. 30×90 | 2. 71×300 | 3. $90 \div 2$ |
| 4. $382 + 802$ | 5. $568 - 392$ | 6. $147 - 26$ |

Line 1: Note that the opening Nemeth Code indicator is placed at the end of the cell-5 heading. A discussion about code switches and headings occurs in a later lesson.

For further practice, see Appendix A—Reading Practice.

ANSWERS TO PRACTICE MATERIAL

1. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.

1. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.

1. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.

1. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.

