

LESSON 16

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LESSON PREVIEW

The remaining lessons take a look at a variety of formatting topics. In this lesson, spatially arranged fractions are studied, a braille format for instructional commentary is given, and layouts for stem-and-leaf plots are introduced.

SPATIAL ARRANGEMENTS OF FRACTIONS

[NC 13.10]


Fractions are usually transcribed linearly, as discussed in Lesson 8. However, certain situations suggest or require a spatial arrangement.

Review the terminology used for the parts of a fraction.

$$\begin{array}{l} 3 \quad \textit{numerator} \\ \hline 4 \quad \textit{fraction line} \\ \quad \quad \textit{denominator} \end{array}$$

16.1 Spatial Fraction Line

The spatial fraction line is comprised of a series of dots 25. An opening fraction indicator (1456) marks the beginning of the fraction line; a closing fraction indicator (3456) signals the end.



Spatial Fraction Line with opening and closing fraction indicators (varying length)

In a spatially arranged fraction the numerator is placed above the spatial fraction line and the denominator is placed below it. The fraction line is comprised of the same number of cells as the widest item above (numerator) or below (denominator), with the fraction indicators placed one cell beyond the width on either end, as illustrated in the next section.

Note: Code switch indicators are absent in many of the isolated examples in this lesson.

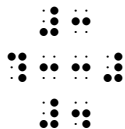
16.2 Numerator and Denominator

The numerator is centered above the fraction line; the denominator is centered below the fraction line. If exact centering is not possible, the item is moved to the left one cell. Since fractions do not contain material aligned for computation, the numeric indicator is used in the numerator and/or denominator according to the rules of the Nemeth Code. For the same reason, the English-letter indicator is used where necessary in the numerator and/or denominator.

Example 16-1

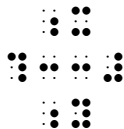
(a)

$$\frac{3}{4}$$



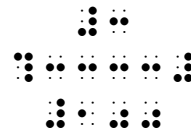
(b)

$$\frac{x}{y}$$



(c)

$$\frac{3}{100}$$



(d)

$$\frac{25}{100}$$

(e)

$$\frac{5x}{3}$$

16.3 Placement of Identifiers with Spatially Arranged Fractions

An identifier, if present, is placed on the same braille line as the fraction line. One blank space is left between the last symbol in the identifier and the symbol furthest left in the overall arrangement.

Example 16-2

5. $\frac{(9x) \div 3}{(3x+15) \div 3}$

6. $\frac{3xy+9x^2}{3x}$

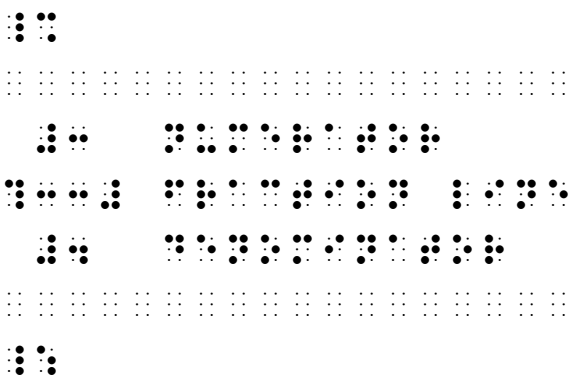
Recall from Lesson 9 that three blank cells come between the rightmost symbol of an arrangement and the next identifier.

Situations Requiring Spatial Presentation of Simple Fractions

16.4 Fractions Arranged Spatially for Illustration

When the parts of a simple fraction are labeled, use a spatial arrangement. The labels are uncontracted because they are within the code switches.




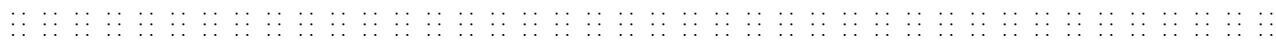


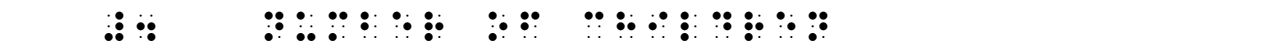
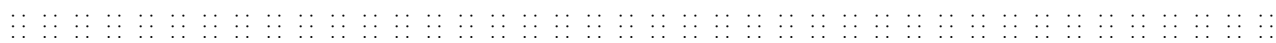

Example 16-3

$\frac{3}{4}$	<i>numerator</i> <i>fraction line</i> <i>denominator</i>	
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Example 16-4

Four children share a dozen cookies equally. Expressed as a fraction, how many cookies does each child receive?

$$\frac{12}{4} \quad \begin{array}{l} \text{number of cookies} \\ \text{number of children} \end{array}$$

1	
2	
3	
4	
5	
6	
7	
8	
9	

PRACTICE 16A

1. Shandra invited seven friends to a pizza party. Two pizzas were ordered. Each pizza had eight slices. Which fraction shows how many slices of pizza each child can have if they share equally?

- a. $\frac{2}{8}$ number of pizzas
 number of children
- b. $\frac{8}{8}$ number of slices
 number of children
- c. $\frac{16}{8}$ number of slices
 number of children

16.5 Cancellation with Replacement Values [NC 12.1]

Recall that a spatial arrangement is required when numbers, letters, or abbreviations are canceled in print and replacement values are shown. *Reminder:* The print copy may show any type of stroke to indicate cancellation.

⋮	Opening Cancellation Indicator
⋮⋮	Closing Cancellation Indicator

When cancellation occurs within a fraction, replacement items are placed above canceled items in the numerator and below canceled items in the denominator. Each replacement item is centered with respect to the canceled term. If exact centering is not possible, the term is moved to the left one cell.

Example 16-5

$\frac{1}{25}$	1	⋮⋮
$\frac{25}{50}$	2	⋮⋮⋮⋮
$\frac{25}{50}$	3	⋮⋮⋮⋮⋮⋮
$\frac{25}{50}$	4	⋮⋮⋮⋮
$\frac{25}{50}$	5	⋮⋮

Line 1: Replacement "1" is centered above the canceled number. A numeric indicator is required.

Line 2: A numeric indicator is not required because the numeral is not preceded by a space.

Line 3: The fraction line is as long as the widest item in the fraction. In this case, both numerator and denominator have a 4-cell item.

Line 4: A numeric indicator is not required because the numeral is not preceded by a space.

Line 5: Replacement "2" is centered below the canceled number. A numeric indicator is required.

Example 16-6

$$\begin{array}{c}
 \text{⠠⠠⠠⠠} \\
 \text{⠠⠠⠠⠠⠠⠠} \\
 \text{⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠} \\
 \text{⠠⠠⠠⠠⠠⠠} \\
 \text{⠠⠠}
 \end{array}
 \frac{\overset{1}{\cancel{25}}}{\underset{2}{\cancel{50}}} = \frac{1}{2}$$

Note that the second fraction ("one-half") is transcribed as a linear fraction because it doesn't contain cancellation. The equals sign and the linear fraction are placed on the same line as the spatial fraction line.

- 16.5.1 **Alignment Considerations with Cancellation.** Vertical alignment of place value is not a consideration in spatially arranged fractions when the material is not aligned for computation. Replacement items are centered above or below their canceled item. Placement of the replacement item is relative to the width of the canceled item, without respect to place value. Note the location of the replacement items in [Example 16-7](#).

Example 16-7

$$\begin{array}{c}
 \text{⠠⠠⠠} \\
 \text{⠠⠠⠠⠠⠠⠠⠠} \\
 \text{⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠} \\
 \text{⠠⠠⠠⠠⠠⠠} \\
 \text{⠠⠠}
 \end{array}
 \frac{\overset{7}{\cancel{1449}}}{\underset{1}{\cancel{207}}} = 7$$

- a. **Alignment of Indicators.** When the canceled number and its replacement contain the same number of digits, the numeric indicator and the opening cancellation indicator will align.

Example 16-8

$\frac{1}{\cancel{6}} = \frac{1}{6}$	1	⠠⠠
	2	⠠⠠⠠
	3	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
	4	⠠⠠⠠⠠
	5	⠠⠠

- Line 1: Replacement "1" is centered above the canceled number on line 2. In this case, the numeric indicator lies directly above the opening cancellation indicator below it.*
- Line 2: Canceled "6" is centered above the fraction line. Exact centering is not possible so it is moved left one cell.*
- Line 3: The fraction line is as long as the widest item in the fraction (the denominator).*
- Line 4: Canceled "36" is centered below the fraction line.*
- Line 5: Replacement "6" is centered below the canceled number above it.*

16.5.2 Stacked Cancellation. More than one level of cancellation may be encountered.

Example 16-9

1. $\frac{15 \times 5280}{60 \times 60}$		⠠⠠⠠
$\frac{1}{15} \times \frac{22}{88} = \frac{1}{60} \times \frac{1}{60}$		⠠⠠⠠⠠⠠
		⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
		⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
		⠠⠠⠠⠠
		⠠⠠

PRACTICE 16B

Simplify using cross canceling. Then multiply the numerators and multiply the denominators.

$$1. \quad \frac{\cancel{3}^1}{\cancel{15}_3} \times \frac{\cancel{5}^1}{\cancel{6}_2} = \frac{1}{6}$$

$$2. \quad \cancel{2}^1 \times \frac{8}{\cancel{2}_1} = \frac{1 \times 8}{1} = 8$$

16.5.3 Cancellation and Level Indicators. Care must be taken to place the opening cancellation indicator and its paired closing cancellation indicator on the same level.

$$\gg \quad \cancel{b^x} \quad \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot$$

Both the base and its superscript are canceled with one stroke. A baseline indicator places the cancellation terminator on the same level as the paired opening cancellation indicator.

$$\gg \quad b^{\cancel{x}} \quad \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot$$

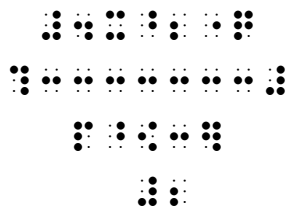
Only the superscript is canceled. The opening and closing cancellation indicators are at the superscript level.

Example 16-10 |

$$\frac{\cancel{a}^a}{\cancel{a}_1} = a \quad \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \quad \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \quad \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \quad \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \quad \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot$$

The denominator is centered under the fraction line.

Example 16-11

$$\frac{4x^2q}{p^{\cancel{2}^2}}$$


The replacement numeral "2" is placed below the canceled superscript in the denominator, even though it is printed beside the canceled superscript.

PRACTICE 16C

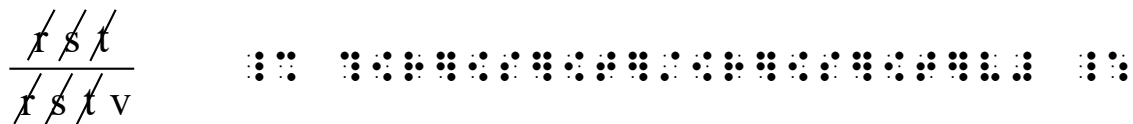
$$1. \frac{2b+a}{b} \div \frac{4b^2-a^2}{b^2} = \frac{\cancel{(2b+a)}^1}{\cancel{b}_1} \cdot \frac{\cancel{b^2}^b}{\cancel{(2b+a)}_1(2b-a)} = \frac{b}{2b-a}$$

16.6 Cancellation Without Replacement Values [NC 12.1]

Material containing cancellation with no replacement may be transcribed linearly.

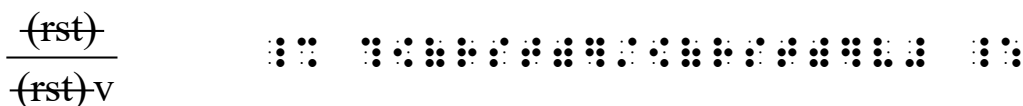
16.6.1 **Linear Presentation of Simple Fractions with Canceled Items.** When replacement items are not given for canceled material in the numerator and denominator, a linear fraction may be transcribed. The cancellation indicators must exactly represent what is canceled in print.

Example 16-12

$$\frac{\cancel{r} \cancel{s} \cancel{t}}{\cancel{r} \cancel{s} \cancel{t} v}$$


Each letter "r" "s" and "t" is printed with a slash through it.

Example 16-13

$$\frac{(\cancel{rst})}{(\cancel{rst})v}$$


Each letter combination "rst" as well as the parentheses are printed with a line through them.

Example 16-14

Use factorization and cross cancellation to simplify $\frac{x^2-5x+6}{-x+2}$.

$$\begin{aligned} \frac{x^2-5x+6}{-x+2} &= \frac{(x-2)(x-3)}{-(x-2)} \\ &= \frac{\cancel{(x-2)}(x-3)}{-(\cancel{x-2})} \\ &= -x+3 \end{aligned}$$

- 1
- 2
- 3
- 4
- 5
- 6

16.6.2 **Canceled Abbreviations.** When canceled abbreviations show no replacements, linear transcription may be applied. The abbreviation is unspaced from the cancellation indicators. As a whole, however, the abbreviation must follow the spacing rules for abbreviations (Lesson 3). If a space is required, the space comes before and/or after the related indicator or indicators.

- $\cancel{\text{in}}$ ⠠⠠⠠⠠⠠
- $\cancel{\text{in}}^3$ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
- 7888 $\cancel{\text{in}}^3 + n$ ⠠⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠

A space precedes the opening cancellation indicator. A space follows the closing cancellation, before the plus sign.

- $\frac{1 \text{ ft}^3}{1728 \cancel{\text{in}}^3}$
- ⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

A space precedes the opening cancellation indicator because the abbreviation must be spaced away from its value. There is no space between the closing cancellation indicator and the closing fraction indicator.

HYPERCOMPLEX FRACTIONS

[NC 13.7 and 13.8]

16.7 Definition and Recognition

"Hypercomplex fraction" is a term used only in the Nemeth Code—it is unlikely that you will encounter this phrase in a math book. First, we will review the definition of a complex fraction.

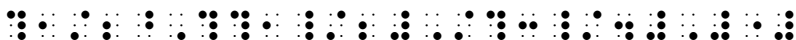
Recall from Lesson 8 that a *complex* fraction is one whose numerator and/or denominator are, or contain, one or more simple fractions or mixed numbers. In other words, a complex fraction is a fraction within a fraction.

➤ $\frac{\frac{1}{2}}{5}$ This is a complex fraction.



If a simple fraction contains a complex fraction at the superscript or subscript level, it is still a simple fraction. In this sample, the numerator is "1" and the denominator is "2 raised to the (one-half over three-fourths) power."

➤ $\frac{1}{2^{\frac{1}{2}}_{\frac{3}{4}}}$ This is a simple fraction.



The complex fraction is at the superscript level.

A hypercomplex fraction is one whose numerator or denominator, or both, contain at least one complex fraction. Here is a print sample of a hypercomplex fraction. The denominator is "10" and the numerator contains the complex fraction shown above, "one-half over five."

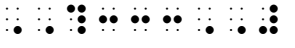
➤ $\frac{\frac{1}{2}}{5_{10}}$ This is a hypercomplex fraction.

The numerator contains a complex fraction.

16.8 Transcription of Hypercomplex Fractions




Although a linear transcription is possible, using a linear arrangement for the numerator and a linear arrangement for the denominator within a spatial arrangement overall gives a clearer representation of the hypercomplex fraction.

16.8.1 Hypercomplex Fraction Indicators. Opening and closing hypercomplex fraction indicators mark the beginning and end of a spatial hypercomplex fraction line.

	Spatial Hypercomplex Fraction Line with opening and closing fraction indicators (varying length)
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Here is the transcription of the hypercomplex fraction shown on the previous page. The complex fraction in the numerator is transcribed as a linear arrangement within the overall spatial arrangement.

Example 16-16

$\frac{1}{2}$	
$\frac{5}{10}$	
	

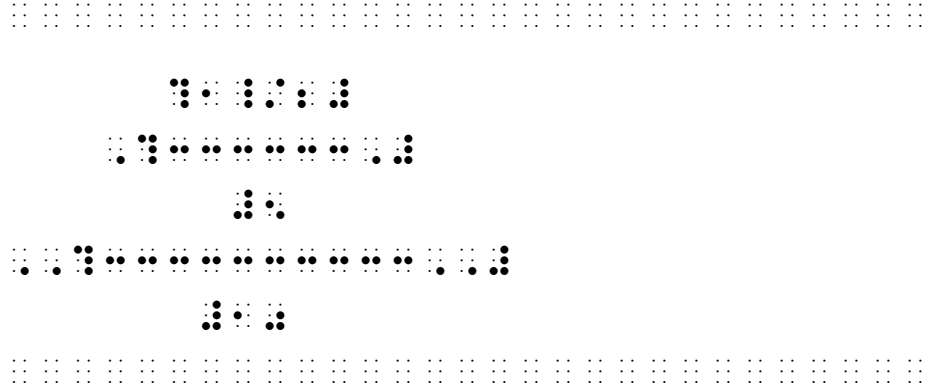
Terms of the fraction are centered above and below their fraction lines.

If the numerator and denominator are too long to fit on one line, follow the rules regarding division of mathematical expressions between braille lines. (Lesson 15) [Example 16-17](#) shows an expression which will fit in 40 cells as first transcribed, but if it is displayed, division of the denominator is necessary.

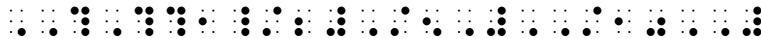
Example 16-18

$$\frac{\frac{1}{2}}{\frac{5}{10}}$$

(entirely spatial)



(entirely linear)



16.9 Higher Orders of Complexity

Hypercomplex fractions of higher order may be transcribed in the manner described in [Section 16.8](#) with dot 6 added the appropriate number of times before the fraction indicators and the matching fraction lines. No examples are shown.

Instructions: Transcribe this hypercomplex fraction using the combined method—that is, transcribe each complex fraction as a linear arrangement within the overall spatial arrangement. Numerators and denominators can be determined by noting the length of each fraction line in print.

PRACTICE 16E

1. Solve for r in terms of s .

$$\frac{\frac{r^2 - 4s^2}{s^2}}{\frac{r + 2s}{\frac{s}{4r - 2s^2}}}$$

$$\frac{3s}{\frac{2s^2 - 3r}{4r}}$$

CONTINUED FRACTIONS

[NC 13.9]

16.10 Definition and Recognition

In essence, a continued fraction is a fraction within a fraction. Each denominator is the sum of a whole number and a fraction. The digit in the denominator of one fraction becomes the digit in the numerator of the next fraction. You may find them in the study of irrational numbers such as pi and certain square roots.

The continued fraction shown below can be described as follows. The fraction begins with $1 - \frac{7}{3}$. The first denominator is $3 + \frac{3}{2}$. The next denominator is $2 + \frac{2}{2}$. The final denominator is $2 - \frac{2}{3}$.

$$n = 1 - \frac{7}{3 + \frac{3}{2 + \frac{2}{2 - \frac{2}{3}}}}$$

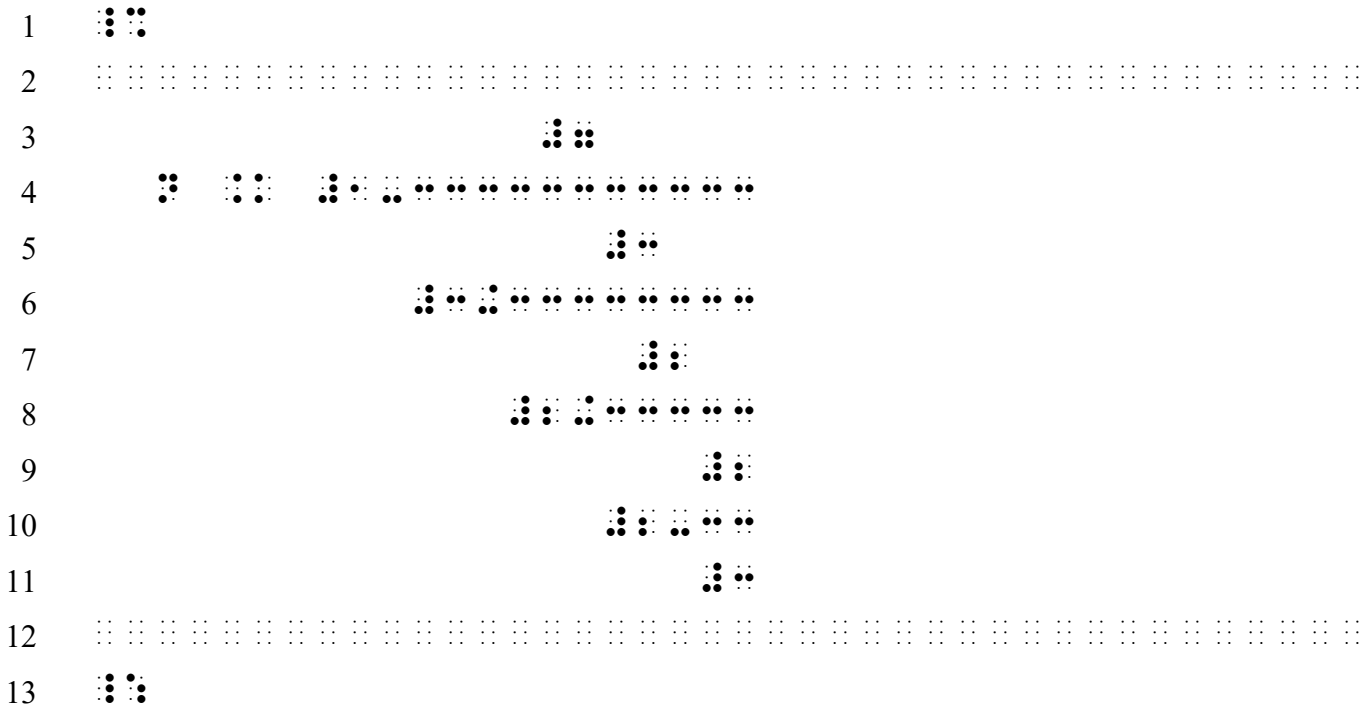
16.10.1 **Transcription Rules.** A continued fraction is transcribed as a spatial arrangement. The layout mimics the print arrangement. Each fraction line begins in the cell after the plus or minus sign (unspaced). Opening and closing fraction indicators are not used. All fraction lines end in the same cell, aligned with the rightmost symbol in the arrangement.

Each new denominator's whole number is aligned directly below the first cell of the separation line above it. Its numerator is centered with respect to the fraction line below it. If that number cannot be exactly centered, it is placed one cell to the left of center.

The rules will make sense when you study [Example 16-19](#) which is the transcription of the continued fraction shown in [Section 16.10](#), above.

Example 16-19

$$n = 1 - \frac{7}{3 + \frac{3}{2 + \frac{2}{2 - \frac{2}{3}}}}$$



Line 1: The opening Nemeth Code indicator is transcribed on the line preceding the required blank line.

Line 3: The numerator is centered over the fraction line below it.

Line 4: The length of this fraction line extends to the rightmost character in the arrangement, which is on lines 9 and 11.

Line 5: This numerator "3" is centered over the fraction line below it. Likewise for the numerators on lines 7 and 9.

Line 6: The numeric indicator is directly aligned with the first cell of the fraction line two lines above. Likewise for lines 8 and 10.

Line 13: The Nemeth Code terminator is in cell 1 on the line following the required blank line.

PRACTICE 16F

The square root of 3 can be expressed as a continued fraction.

$$\sqrt{3} = 1 + \frac{1}{3 + \frac{1}{3 + \frac{1}{3 + \dots}}}$$

INSTRUCTIONAL COMMENTARY

[NC 4.8.9 and 26.4.5]

16.11 Format for Instructional Commentary

When instructional commentary appears alternated with math problems, place the comment on the line following the related expression, blocked 4 cells to the right of the runover position for the expression. Explain this format in a transcriber's note. Sample transcriber's note:

Comments printed beside related math problems are placed on the line following the expression, blocked four cells to the right of the runover position of the expression.

When switching into or out of Nemeth before a change of margins, place the switch indicators after the last item of the line rather than at the beginning of the next line. This maintains clarity in the indented margin pattern. The single-word switch indicator is used, as needed.

Comments are often printed in a different color or typeface. (In the examples in this section, instructional commentary is printed in italics.) The variant typeform is disregarded in the braille transcription.

Notice in the examples how the comments are clearly set off by indentation.

Example 16-20

If y varies inversely as x , and $y = 3$ when $x = 4$, find y when $x = 18$.

$$\frac{x_1}{y_2} = \frac{x_2}{y_1} \quad \textit{Given.}$$

$$\frac{4}{y_2} = \frac{18}{3} \quad \textit{Substitute the known values.}$$

$$18y_2 = 12 \quad \textit{Now cross multiply.}$$

$$y_2 = \frac{12}{18} \textit{ or } \frac{2}{3} \quad \textit{Divide each side by 18 and simplify.}$$

The value of y when $x = 18$ is $\frac{2}{3}$.

1 $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

2 $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

3 $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

4 $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

5 $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

6 $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

7 $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

8 $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

9 $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

10 $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

11 $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

12 $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

13 $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

14 $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

*Lines 1-3: The narrative begins in cell 3, with runovers in cell 1.
 Lines 2-3: This phrase can also be transcribed as follows:*

$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

*Lines 4, 6, 8, 10: Each displayed math expression begins in cell 3.
 Line 5: The comment begins in cell 9, which is four cells to the right of the runover cell of the displayed material even though there is no runover present. A single-word switch is used for this comment. The italic typeform is disregarded.
 Lines 6, 8, 10: A Nemeth Code terminator ends each line, preparing the reader for the following comment.
 Lines 7, 9, 11: Each comment begins in cell 9.
 Line 12: The runover is blocked (cell 9).
 Lines 7 and 9: The opening Nemeth Code indicator is placed at the end of the line of text preceding the Nemeth material to assure that all of the displayed math expressions begin in the same cell.
 Lines 13-14: The narrative begins in cell 3, with its runover in cell 1. No blank line is needed.*

16.11.1 Alignment of Equals Signs. If the print copy aligns equals signs of separate displayed equations, the layout is disregarded in the braille transcription. This assures that each step begins in the same cell, as [Example 16-21](#) illustrates. On the other hand, if the print layout meets the definition of a nested list expression, braille format for nested list expressions is applied. (Lesson 8) [Example 16-22](#) illustrates that layout.

Lines 6, 11, 14: Each comment begins in cell 13, which is four cells to the right of the runover position of the previous line, even if no runover is present.

Lines 7-8, 12, 15: Runovers to comments are blocked (cell 13, in this case).

Lines 9-10: Because the canceled numbers do not have replacements, the fraction is transcribed linearly.

Instructions: Transcribe this as one paragraph with four lines of displayed material between the two sentences.

PRACTICE 16G

What percent of 48 is 54?

$$n \cdot 48 = 54$$

Write an equation.

$$\frac{48n}{48} = \frac{54}{48}$$

Divide each side by 48.

$$n = 1.125$$

Simplify.

$$= 112.5\%$$

Change the decimal to a percent.

Answer: 54 is 112.5% of 48.

STEM-AND-LEAF PLOTS

16.12 Recognition

A stem-and-leaf plot is a method of showing data distribution in columns and rows. A vertical line partitions the information into data on the left, called the stem, and data on the right, called the leaf. Stem and leaf data may consist of numbers, letters, and/or blank entries and may be spaced or unspaced in the print copy. Stem data are right justified to the vertical line; leaf data are left justified to the vertical line. The columns may include a heading. Here is a sample.

Stem	Leaf
10	0 4
9	3 4 5 7 8 9
8	0 2 2 9
7	5 8 9
6	3

A distinctive feature of a stem-and-leaf plot is the vertical line separating the stems from the leaves.

16.13 The Table

A stem-and-leaf plot is transcribed in Nemeth notation using the guidelines for tables outlined in *Braille Formats*. The entire table is transcribed in Nemeth, including the column headings (if present), even if the numbers or letters are unmodified. Column headings begin in cell 1 and no contractions are used. Column separation lines follow on the next line below the headings, covering the same number of cells as the widest data entry in each column. Column headings are not transcribed if they do not appear in print.

The vertical line between the stem column and the leaf column is transcribed as dots 456, preceded and followed by one blank cell. This symbol is transcribed in every row, including between column headings and between column separation lines.

<code>⠠⠨⠠</code> Vertical Line (preceded and followed by a space)

The following Nemeth rules apply to [Example 16-23](#).

- The numeric indicator is omitted in the body of the plot.
- Spaces are not inserted between single-digit entries.
- The data are justified to the vertical line as shown in print.

The following Nemeth rules apply to [Example 16-24](#).

- The key is transcribed first, beginning in cell 1.
- The numeric indicator is omitted in the body of the plot.
- Spaces are not inserted between single-digit entries.

Example 16-24

Stem	Leaf
10	0 4
9	3 4 5 7 8 9
8	0 2 2 9
7	5 8 9
6	3

10 | 0 = 100

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

16.14.1 **Runovers in the Key.** If the key requires a runover line, the runover begins in cell 3. When there are words in the key, they may be transcribed in UEB, switching to Nemeth for the portion that reflects the stem and leaf.

The key in the [Example 16-25](#) includes a descriptive label ("Key:"). The label is transcribed only if it appears in print. If the key is set off by shading or in a box, box lines are not transcribed.

Example 16-25

Key: 2 2 represents 2,150,000 to 2,249,999 copies sold.

Braille representation of the key text above.

16.15 Data Consisting of More Than One Character; Punctuation Between Entries

Example 16-26 shows leaf entries with a decimal point and more than one digit. It also shows commas between leaf entries. The key is printed within the body of the table. The following rules are applied:

- The key is transcribed first.
- The numeric indicator is omitted in the body of the plot.
- Data consisting of groups of two or more digits requires one blank cell between entries.
- Punctuation printed between units of data is omitted in the transcription.

Example 16-26

Stem	Leaf
5	8.3
6	4.3, 5.1, 5.5, 6.7, 7.0, 8.7, 9.3
7	0.0, 2.8, 3.2, 5.8, 7.4

5 | 8.3 = 58.3

Braille representation of the stem-and-leaf plot above.

16.16 Alphabetic Data

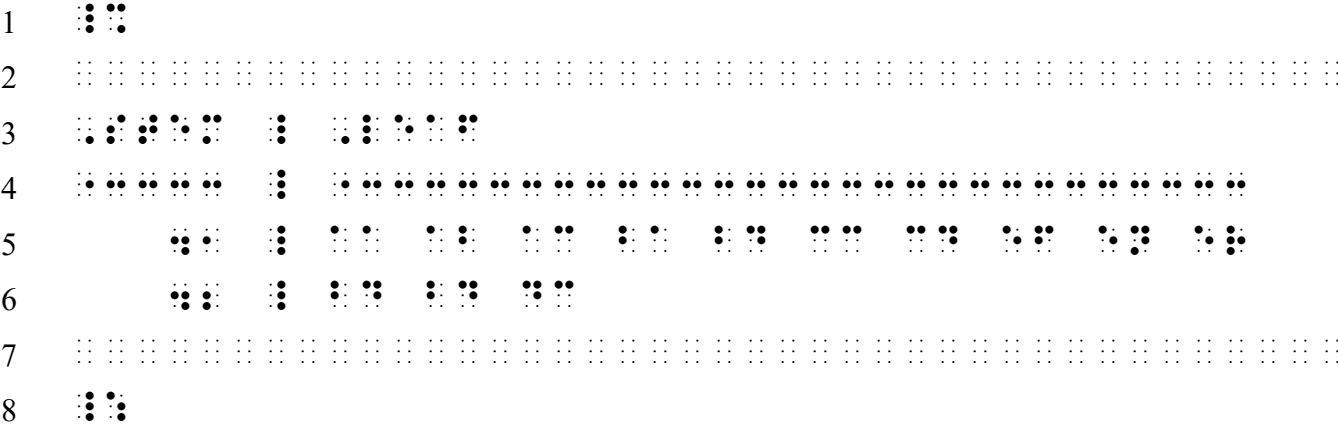
For alphabetic data, the following rules apply.

- The English-letter indicator is omitted in the body of the plot.
- Spaces are not inserted between single-letter data entries.
- Data consisting of groups of two or more letters requires one blank cell between entries.

The leaves in [Example 16-27](#) consist of pairs of lowercase letters. There is no key.

Example 16-27

Stem	Leaf
41	aa ab ac ba bd cc cd ef en er
42	bd bd dc



Lines 5 and 6: *Reminder: The numeric indicator is omitted in the body of the plot (Stem column).*

16.16.1 **Alphabetic Key.** In an alphabetic key, the English-letter indicator is not used for the portion of the key that replicates an entry in the plot. The value assigned to the key is transcribed using the English-letter indicator as required by the Nemeth Code.

➤ c | d = cd ⠠⠉ ⠠⠽ ⠠⠿ ⠠⠚ ⠠⠾

16.17 Blank Entries

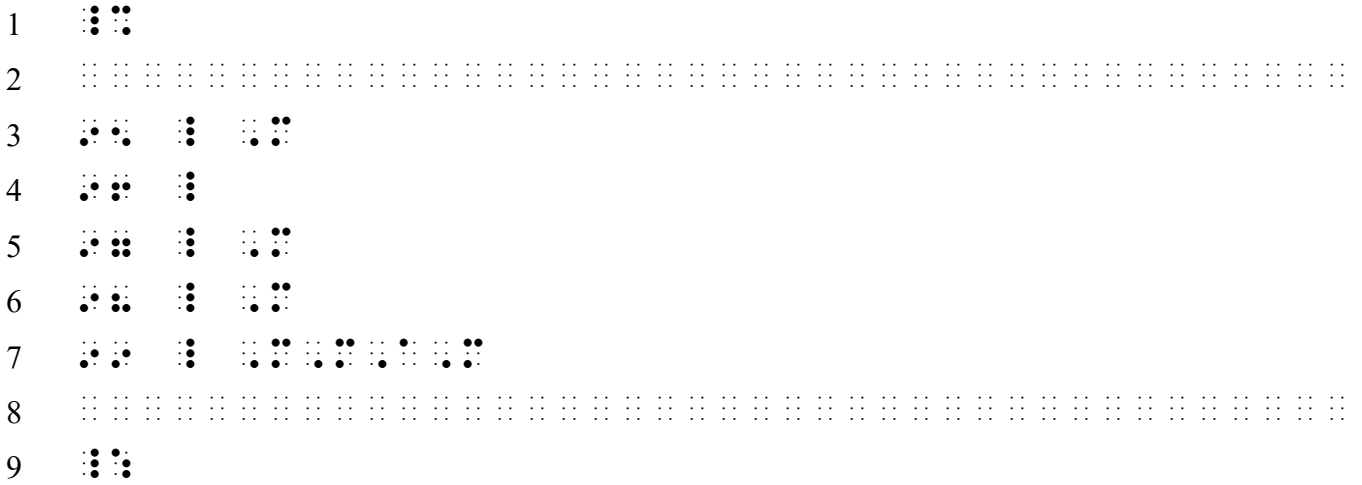
A blank entry in a stem-and-leaf plot is shown as blank space in braille. Do not transcribe a general omission symbol. Do not fill the width of the column with dot 5s.

The following rules apply to [Example 16-28](#).

- The numeric indicator and the English-letter indicator are omitted in the body of the plot.
- Spaces are not inserted between single-letter data entries.
- Capital letters are capitalized individually.

Example 16-28

95	M
96	
97	M
98	M
99	M M A M

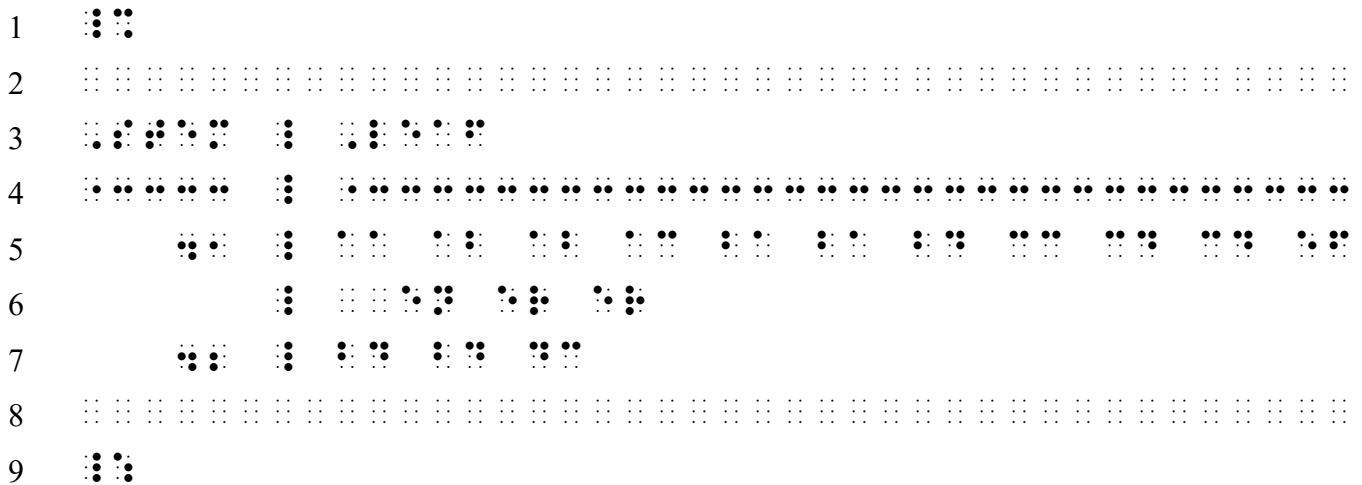


*This plot has no key and no column headings—none are added in braille.
 Line 4: The blank space in the second row indicates a blank entry in the leaf column.
 Line 7: Single letters are unspaced and are capitalized individually.*

16.18.2 **Braille Runovers.** If leaf data will not fit on one line in the braille transcription, indent the runover line two cells to the right after using as much of the braille line as possible. Do not repeat the stem row heading. [Example 16-30](#) illustrates, expanding the data shown in row one of [Example 16-27](#).

Example 16-30

Stem	Leaf
41	aa ab ab ac ba ba bd cc cd cd ef en er er
42	bd bd dc



Lines 3-7: The vertical line is transcribed on every line in the table.

16.19 Back-To-Back Plot

A back-to-back stem-and-leaf plot is used when two sets of data are being compared. There are three columns. The stem is the middle column. Data is read from the stem outward, which means that data in the left leaf is read from right to left. There will be two keys. Here are the rules as they apply to [Example 16-31](#).

- *The Keys:* The left column's key is transcribed first, followed on the next line by the right column's key.
- *The Columns:* Column separation lines are transcribed below only the lines that contain column headings.
- *The Runovers:* Right leaf data are read from left to right; runovers to the right leaf data column are shifted two cells to the right. Left leaf data are read from right to left; runovers to the left leaf data column are shifted two cells to the left.

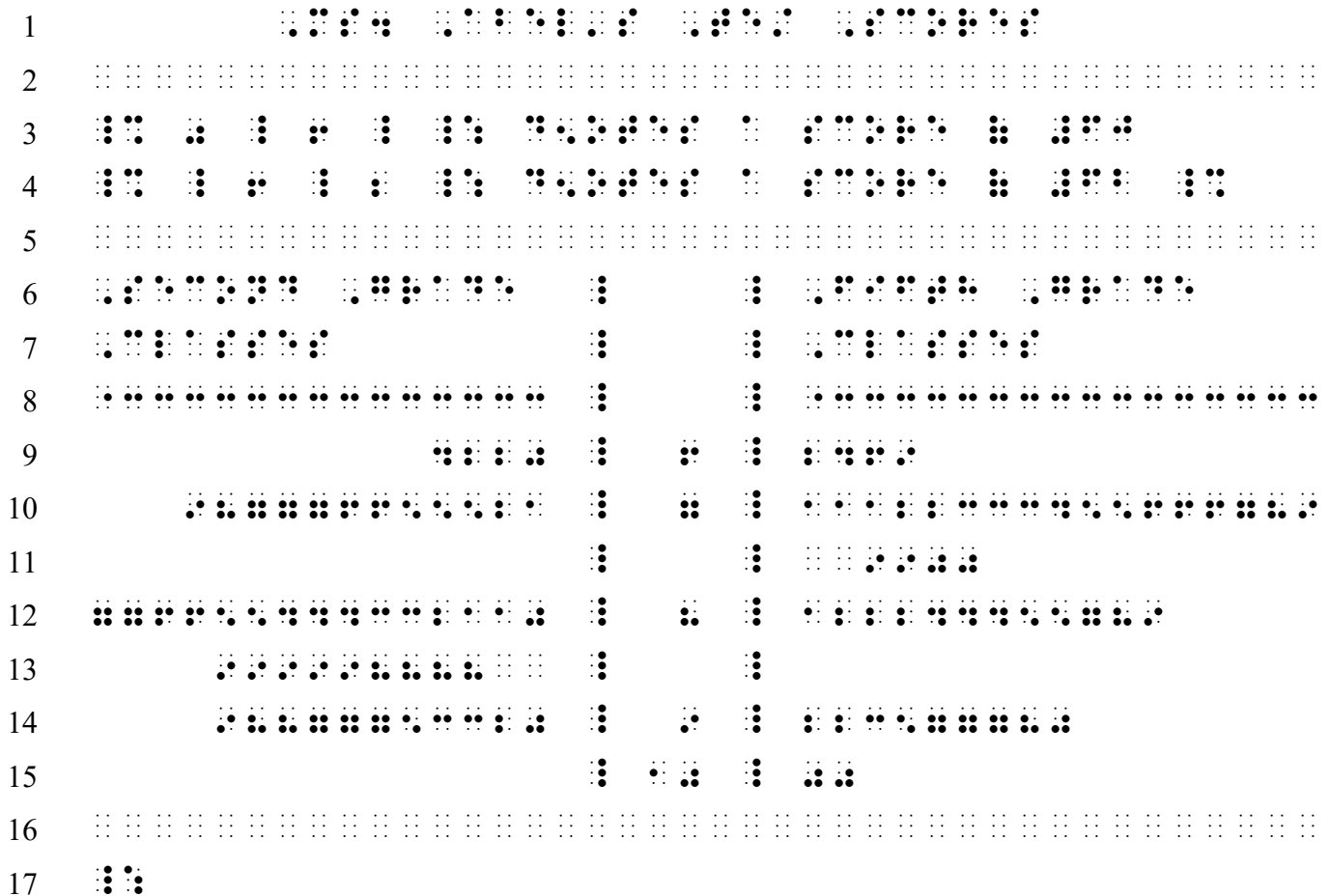
Example 16-31

Ms. Abel's Test Scores

Second Grade Classes	Fifth Grade Classes
4220	6 2469
987776655521	7 111223334556667899900
999998888776655444332110	8 122244455789
98877753320	9 223577780
	10 00

0 | 6 | denotes a score of 60

| 6 | 2 denotes a score of 62



- Line 3: Key to left column. *Italic typeform is disregarded.*
- Line 4: Key to right column. *Italic typeform is disregarded.*
- Line 5: A blank line precedes the plot.
- Lines 6-7: Column headings are uncontracted in a stem-and-leaf plot. These column headings require two lines. Runovers to column headings are blocked.
- Line 8: The stem column (middle column) has no heading, so no column separation line is transcribed.
- Line 11: Reading left to right, runovers to the right leaf data column are shifted two cells to the right.

Line 13: Reading right to left, runovers to the left leaf data column are shifted two cells to the left.

Line 15: The blank left-leaf entry in the last row is a blank space in braille.

Line 16: The blank line is required following the table.

Line 17: The Nemeth Code terminator is alone on this line, outside of the table arrangement.

PRACTICE 16H

A pet store owner constructed the following stem-and-leaf plot showing the number of guinea pigs at each of her seventeen stores.

Stem	Leaf
0	7 8
1	
2	0 6 8 8 8
3	0 2 6 6 7 8
4	1 2 6 6
5	

Key: 2 | 0 represents 20 guinea pigs

How many stores have fewer than 36 guinea pigs?

For further practice, see Addendum 1—Reading Practice.

Submit Exercise 16 to your instructor.


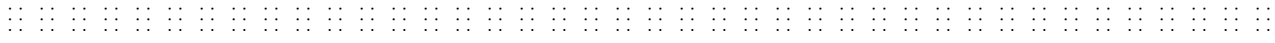



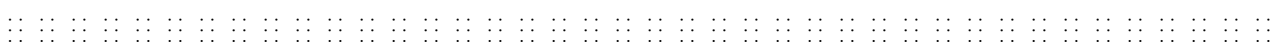

BLANK PAGE

PRACTICE 16B


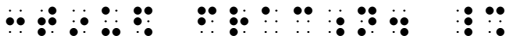
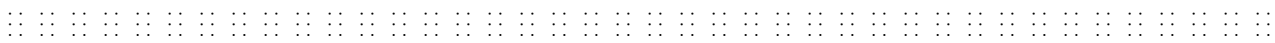







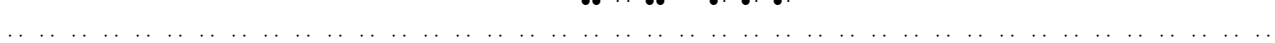
1	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
2	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
3	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
4	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
5	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
6	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
7	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
8	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
9	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
10	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
11	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
12	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
13	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
14	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
15	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
16	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

Lines 1-3: Nemeth "Instructions" format is applied. Margins are 5-3 and the bold typeform is disregarded.
 Line 4: A blank line must precede the spatial material which follows.

PRACTICE 16E

- 1 
- 2 
- 3 
- 4 
- 5 
- 6 
- 7 

PRACTICE 16F

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