

# LESSON 7

Read about this PROVISIONAL EDITION in the front matter to this book.  
Check the NFB website periodically for updates to this lesson.

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## TYPEFORMS

**7.1 Introduction to Typeforms:** The typeform indicators of UEB are used in the narrative text. When it is necessary to indicate emphasis or distinction inside the Nemeth Code switches, the typeform indicators of the Nemeth Code are used. The Nemeth Code has indicators and rules for applying four special typeforms to individual letters, to numerals, and to symbols, as well as indicators and rules for applying typeform to words.

### LETTERS AND NUMERALS

**7.2 Determining Significance of a Variant Typeform:** Typeform is retained in a mathematical expression only if it conveys special mathematical meaning or distinction. Variant typeform which has no mathematical significance is not shown in braille. A few typical print examples for you to consider are shown below.

- If the author has specifically distinguished between two meanings of the same letter, the distinctive typeform is significant.

*Example:*  $R$  denotes the set of rational numbers and  $\mathcal{R}$  denotes the set of real numbers.

*The second letter  $R$  must maintain its distinction in the braille transcription.*

- It is common practice to print the letters of all formulas throughout a book in italicized type. Such letters are brailled without typeform indicators.

*Examples:* The variables  $x$ ,  $y$ , and  $z$  are real numbers.  
 $\pi$  is used to determine the circumference of a circle:  $2\pi r$ .

*The italic typeform is not mathematically significant when the letters in all formulas throughout the book are printed in italics.*

- A variant typeform is often used for the sole purpose of attracting the reader's attention. This is particularly common at the lower grade levels. Such variant typeforms are not represented in the braille transcription.

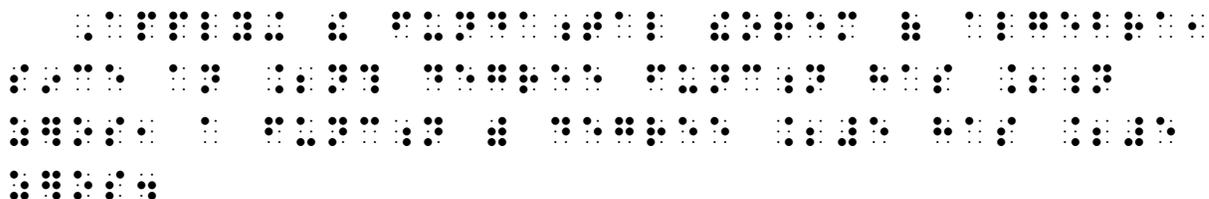
*Example:* Let **n** be the smaller number, and **13+n** be the larger number.

*The boldface is not mathematically significant—its purpose is to attract the reader's attention. No typeform indicators are used in the braille transcription.*

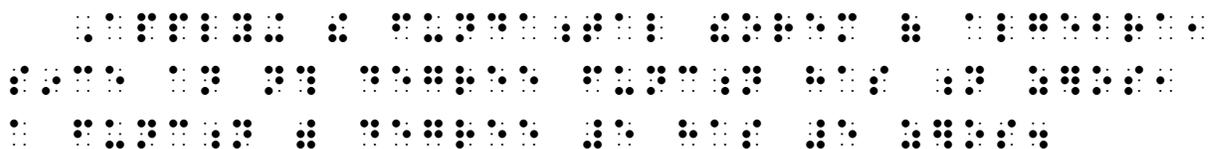
*Food For Thought:* The decision whether to retain a variant typeform can be difficult. The next example shows two italicized letters and two italicized numbers. The italics in print are the author's way of making a connection between the two *n*s and the two *5*s. The italics used in the example below is not "mathematically significant" but the transcriber must determine if the non-regular typeform is needed for "emphasis or distinction" according to UEB. Does the italic typeform aid in the understanding of the material or is it functioning simply as a visual device?

The example is brailled two ways. The first transcription retains the italics and the second does not.

*Example 7.2-1* Applying the fundamental theorem of algebra, since an *n*th degree function has *n* zeros, a function with degree *5* has *5* zeros.



This block shows the Braille transcription of the example text where italics are retained. The text is: "Applying the fundamental theorem of algebra, since an *n*th degree function has *n* zeros, a function with degree *5* has *5* zeros." The Braille uses the UEB italic indicator (dots 1-2-3) to format the variables *n* and *5*.



This block shows the Braille transcription of the example text where italics are removed. The text is: "Applying the fundamental theorem of algebra, since an *n*th degree function has *n* zeros, a function with degree *5* has *5* zeros." The Braille uses the UEB italic indicator (dots 1-2-3) to format the variables *n* and *5*.

Either transcription could be supported as being the correct one. The transcriber's responsibility is to apply the decision consistently throughout a document.

## ***THE FOUR MATHEMATICAL TYPEFORM INDICATORS***

**7.3 Mathematical Typeforms and Their Indicators:** Specific provision is made in the Nemeth Code for the transcription of four print typeforms: boldface, italic, script, and sanserif type. The various typeforms may be applied to the letters of the English, German, Greek, Hebrew, and Russian alphabets as well as to numerals, mathematical symbols, and words or phrases in mathematical context.

**7.4 Boldface, Italic, Script, and Sanserif Type for Letters and Numerals:** Compare characters to the surrounding text to determine whether the print style differs. If it is determined that the typeform is mathematically significant, one of the following Nemeth Code indicators is used.

<b>Boldface Typeform Indicator</b>	⠠⠠⠠
<b>Italic Typeform Indicator</b>	⠠⠠⠠
<b>Sanserif Typeform Indicator</b>	⠠⠠⠠⠠
<b>Script Typeform Indicator</b>	⠠⠠⠠

**7.5 Typeform Indicators with One Letter:** When the distinction has mathematical significance, a switch to Nemeth Code is required. A typeform indicator must always be followed by an alphabetic indicator. Here is the English letter R in these four styles.

⦿ <b>R</b>	⠠⠠⠠⠠	<i>(boldface letter R)</i>
⦿ <i>R</i>	⠠⠠⠠⠠	<i>(italic letter R)</i>
⦿ R	⠠⠠⠠⠠⠠	<i>(sanserif letter R)</i>
⦿ ℞	⠠⠠⠠⠠	<i>(script letter R)</i>

*Note:* Sanserif style is recognized by the lack of small lines or serifs at the ends of the letter parts. Only the English (Roman) alphabet has a sanserif style of type.

Review the five alphabetic indicators of the Nemeth Code in **Lessons 4 and 5**. Here are isolated examples of capitalized and uncapitalized letters in the four typeforms.

boldface English lowercase a	<b>a</b>	⠠⠠⠠
boldface English capital a	<b>A</b>	⠠⠠⠠⠠
boldface Greek lowercase alpha	<b>α</b>	⠠⠠⠠
boldface German lowercase ah	<b>ɑ</b>	⠠⠠⠠
boldface German capital ah	<b>ℒ</b>	⠠⠠⠠⠠
boldface Russian lowercase ah	<b>а</b>	⠠⠠⠠⠠
italic English lowercase a	<i>a</i>	⠠⠠⠠
italic English capital a	<i>A</i>	⠠⠠⠠⠠



**7.5.1 Recognition of Script Type in Other Alphabets:** The alphabet tables in the Nemeth codebook show the print letter for script font styles in each category: English (Roman), German, Greek, Hebrew, and Russian. Use the tables to identify such letters. Then apply the appropriate indicator when it is determined to be mathematically significant. Follow the typeform indicator with the correct alphabetic indicator. Here are some isolated examples.

script German Deh		
script Greek Psi		
script Hebrew aleph		
script Russian yah		

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*Instructions:* Braille only the forty letters, using the typeform indicated before each set: boldface\*, script, or sanserif. Do not braille the descriptions or the names—just braille four letters on each line, with one blank cell between each of the four letters.

Because these letters are out of context, the alphabet and the individual letter name is given. Refer to the alphabet lists in the Nemeth codebook for the German, Hebrew, and Russian letters in order to select the correct braille character. Capital letter names are capitalized in the description. The first line in the practice is shown below to get you started.



*\*Images have been imported for many of these letters. Please disregard the uneven baseline, spacing, size variances, and dark type in the sections that are not labeled "boldface". Use the boldface typeform indicator only for the letters in the first section.*

### PRACTICE 7A

*Use BOLDFACE typeform for these ...*

**a B c D**

... English (Roman) letters (a, Bee, cee, Dee)

**v Ꞛ η €**

... German letters (fao, Yaht, ypsilon, Tseh)

**Ч э г Ж**

... Russian letters (Cheh, zeh, gheh, Zeh)

**ρ Ψ Φ χ**

... Greek letters (rho, Psi, Phi, chi)

*G g L l*

*Use SCRIPT typeform for these... [none are bold]*

... German letters (Gheh, peh, Beh, tset)

*ω λ Σ Η*

... Greek letters (omega, lambda, Sigma, Eta)

*F f H h*

... English (Roman) letters

*ז ז צ ק*

... Hebrew letters (zayin, ayin, gimel, koph)

*э Э и И*

... Russian letters: eh, Yeh, shah, Yah

*Use SANSERIF typeform for these ...*

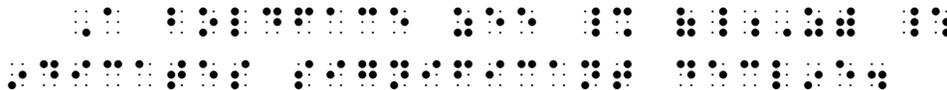
**K R h p**

... English (Roman) letters (Kay, Ar, aitch, pee)





Example 7.7-4 A boldface zee (**Z**) indicates significant decline.



An English letter in regular type would not need an alphabetic indicator when enclosed between signs of grouping.

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### PRACTICE 7B

- i. The perimeter of a rectangle is obtained by adding the measurements of the sides—two lengths and two widths—expressed as  $P = 2\ell + 2w$ . What is  $P$  if  $\ell = 5.5$  mi and  $w = 3.2$  mi?
  - ii. This expression represents Nate's sock drawer after five days of wear and laundry. Numbers in italics indicate pairs of blue socks; numbers in bold indicate pairs of red socks. How many pairs of red socks are in Nate's drawer after five days?  $4 + \mathbf{1} - 1 + \mathbf{3} - \mathbf{1} - 1 - \mathbf{1} + 2 - \mathbf{1}$
  - iii. For vectors (**a**, **b**, **c**) can it be said that  $\mathbf{a} + (\mathbf{b} + \mathbf{c}) = (\mathbf{a} + \mathbf{b}) + \mathbf{c}$ ?
-

## *Typeform Indicators with More Than One Letter or Numeral*

**7.8 More Than One Letter:** The effect of a typeform indicator extends only to the letter which immediately follows it. Thus, in a sequence of unspaced letters, a typeform indicator must be used before each letter that is not in regular type. Here are some isolated examples.

<b>AB</b>		(boldface English A and B)
<b>ab</b>		(boldface English a and b)
<b>αβ</b>		(boldface Greek alpha and beta)
<i>ab</i>		(italic English a and b)
<i>AB</i>		(script English A and B)
<i>AbCd</i>		(italic English A, boldface b, italic C, script d)
p <b>q</b> r <b>s</b>		(regular English p, boldface q and r, regular s)
x <b>i</b> y <b>j</b>		(regular English x, boldface i, regular y, boldface j)
α <b>a</b>		(regular Greek alpha, boldface English a)
H <b>H</b>		(sanserif English H, regular English H)

*Example 7.8-1* Is there a vector **s** such that **r+s = t**?

*Each letter is individually boldfaced; an ELI is required following each typeform indicator.*

*Example 7.8-2* In **Pv = 0**, **v** is a vector and **0** is the null vector.

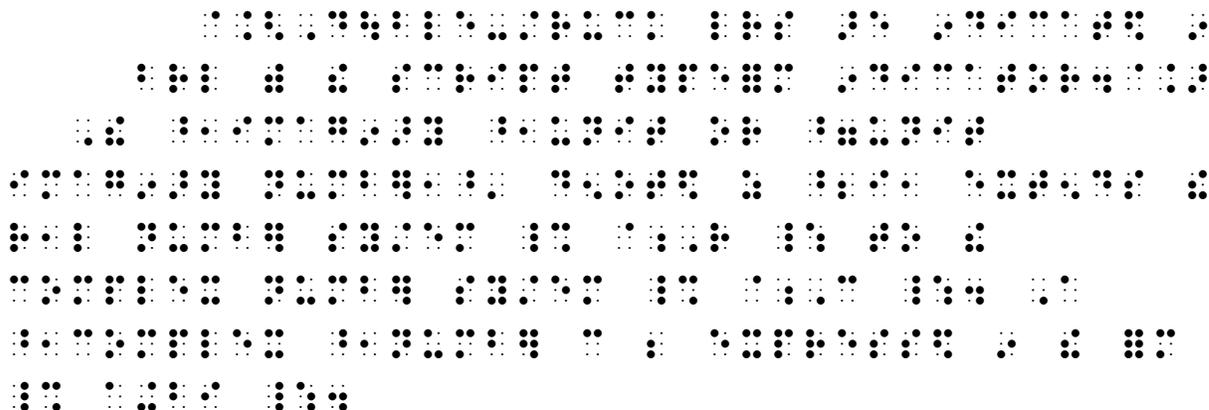
*In Pv, the letter P does not require an ELI because it is in regular type and is not followed by a space or a punctuation mark. The boldface letter v requires an ELI because an alphabetic indicator must follow a typeform indicator.*

**7.9 More Than One Numeral:** The effect of a typeform indicator with numerals extends until there is a change in type. Thus, when numerals contain digits in more than one typeform, the appropriate typeform indicator and the numeric indicator must be used before each change in type. When the change is to regular type, only the numeric indicator is used. Here are some isolated examples.





Example 7.12-1 The **imaginary unit** or **unit imaginary number**, denoted as  $i$ , extends the real number system  $\mathbb{R}$  to the complex number system  $\mathbb{C}$ . A **complex number** can be expressed in the form  $a + bi$ .




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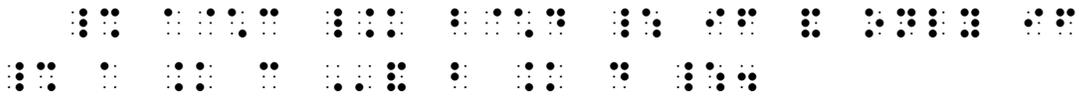
*Instructions:* Begin this practice with a transcriber's note explaining your treatment of the double-struck letters.

### PRACTICE 7C

1. The 1-D coordinate system is denoted by  $\mathbb{R}$ .
  2. If the boldface number signifies a withdrawal from your account, can you explain why  $250 + \mathbf{250} = 0$ ?
  3.  $c(\mathbf{a}, \mathbf{b}) = (c\mathbf{a}, \mathbf{b})$  as well as  $(\mathbf{a}, c\mathbf{b})$ .  $\mathbf{a}$  and  $\mathbf{b}$  are **vectors**. Define  $\mathbf{ab}$ .
  4. **Two Number Sets:**  $\mathbb{N}$  denotes the set of *natural numbers* – that is, the set of nonnegative integers  $\{0, 1, 2, \dots\}$ . The set of all integers is denoted by  $\mathbb{Z}$ .
-



Example 7.13-3  $a \times c = b \times d$  if and only if  $a = c$  and  $b = d$ .



**7.13.3 Grouping Signs in Boldface Type:** When square brackets or vertical bars are printed in mathematically-significant boldface, ⠠ is used before the grouping symbol.

<b>Boldface Opening Bracket</b>	[	⠠⠠⠠
<b>Boldface Closing Bracket</b>	]	⠠⠠⠠
<b>Boldface Vertical Bar</b>		⠠⠠
<b>Boldface Double Vertical Bar</b>		⠠⠠⠠⠠

Double boldface vertical bars are usually read as "the norm of."



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



*Instructions:* Practice brailleing the isolated symbols according to Nemeth Code. Follow the print format of a 3-column list. After the centered heading, place the opening Nemeth Code indicator in cell 1 on line 3. Begin the list on the next line (lines 4-6). Follow the list with the Nemeth Code terminator in cell 1 (line 7). Braille the two itemized sentences starting on line 9.

**PRACTICE 7D**

=	+ -	- +
+	+ -	- +
-	+ -	- +

A. Find the greatest integer function where  $[z]$  is the greatest integer  $\geq z$ .

B. ... where  $\| \|$  is the norm of  $Y$ , written  $\|Y\|$ .





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*Instructions:* Braille the following compound expressions in Nemeth Code, applying the typeforms shown.

## PRACTICE 7E

***x***-axis

35-ft

DC-10

**Bismuth-210**

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### *Typeform Summary*

The typeform indicators presented in this lesson apply to letters, numerals, certain math symbols, and compound expressions. Indicators are provided for letters printed in boldface, italics, sanserif, and script. Boldface and italic indicators can be applied to numerals or to either or both components of a compound expression. The boldface indicator can be applied only to certain specific math symbols.

Typeform indicators for words and phrases in mathematical context will be discussed in a later lesson.

**Food for Thought** You may have noticed that the italic typeform indicator is the same symbol as the decimal point, the Greek letter indicator, as well as the first cell in several math symbols; and that the boldface indicator is the same symbol as the punctuation indicator, the German letter indicator, and the first cell in several symbols and indicators. The dots' functions are determined in context.

## ***UNSPACED NUMBER/LETTER COMBINATIONS***

**7.16 Number/Letter Combinations Without Hyphens:** Letters that occur in unspaced number/letter combinations are not considered to be abbreviations in the Nemeth Code. If a letter/number combination appears in mathematical context, each capital letter is preceded by the single capitalization indicator. Letter/number combinations are punctuated mathematically if the punctuation falls inside the Nemeth Code switches.

➤ 4WD      ⠠⠠⠠⠠⠠⠠⠠⠠

➤ 1074FE      ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

If a number follows a letter, a multipurpose indicator (dot 5) precedes the number. A numeric indicator is not used.

➤ MP3      ⠠⠠⠠⠠⠠⠠⠠⠠

➤ WD40      ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

*Compare:* Note that the presence of a hyphen turns WD40 into a compound expression and a numeric indicator is used.

➤ WD-40      ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠









Example 7.18-4

5. Does the method of creating whole-number x-terms work with decimals? Consider this example.

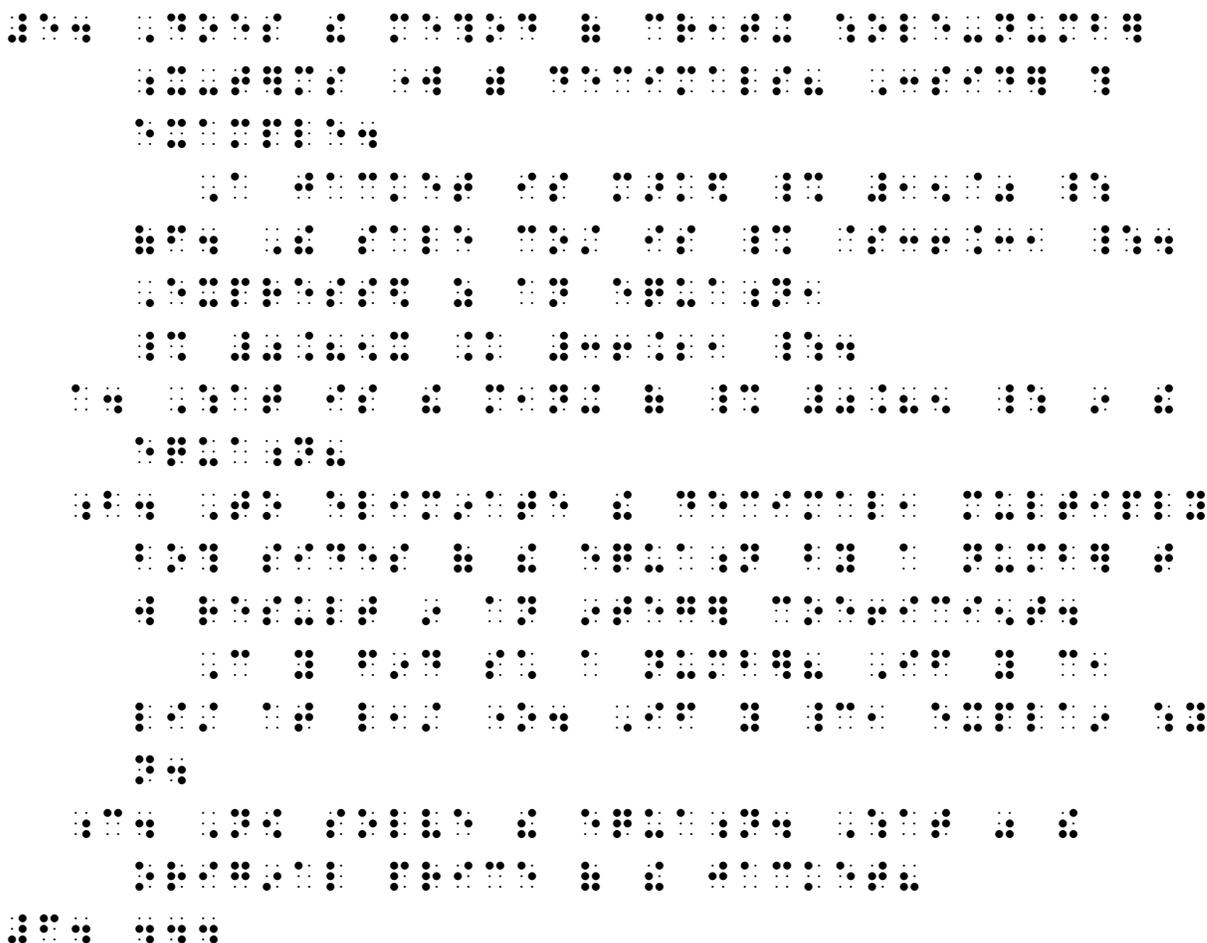
A jacket is marked 15% off. The sale cost is \$36.31. Expressed as an equation,  $0.85x = 36.21$ .

- a. What is the meaning of 0.85 in the equation?  
b. To eliminate the decimal, multiply both sides of the equation by a number that will result in an integer coefficient.

Can you find such a number? If you can, list at least one. If you cannot, explain why not.

- c. Now solve the equation. What was the original price of the jacket?

6. ...





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**PRACTICE 7G**

23. Simplify and solve each equation below for  $x$ . Show your work and check your answer.
- a.  $24 = 3x + 3$                       b.  $2(x - 6) = x - 14$   
 c.  $6 + 2.5x = 21$                       d.  $2(x + 4.5) = 32$
- 

**7.18.3 Tabular Form:** When itemized material is arranged in tabular form so that items are numbered at the margin and subdivisions are aligned beneath lettered column headings, the material should be transcribed in one of the following ways, depending upon whether all of the columns can be accommodated across the braille page.

**7.18.3.a When to Retain Column Format:** If all the columns can be accommodated across the braille page, the print columnar arrangement is followed. Each problem number begins in cell 1. The letter identifying each column is aligned with the first cell of the related column. A blank line is left above and below the lettered column headings. Two blank cells separate the columns.

*Example 7.18-7*

	a	b	c
1.	16 + 9	17 + 4	14 + 23
2.	46 + 15	87 + 12	95 + 54
3.	157 + 452	134 + 63	485 + 12

⠠⠠

⠠⠠

⠠⠠

⠠⠠

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⠠⠠

The BANA Nemeth Code Technical Committee is discussing placement of the switch indicators in the tabular example, above.

**7.18.3.b When Not To Retain Column Format:** If all the columns cannot be accommodated across the braille page, each subdivision in each problem must be lettered individually, and the format in 7.18 must be followed.

*Example 7.18-8*

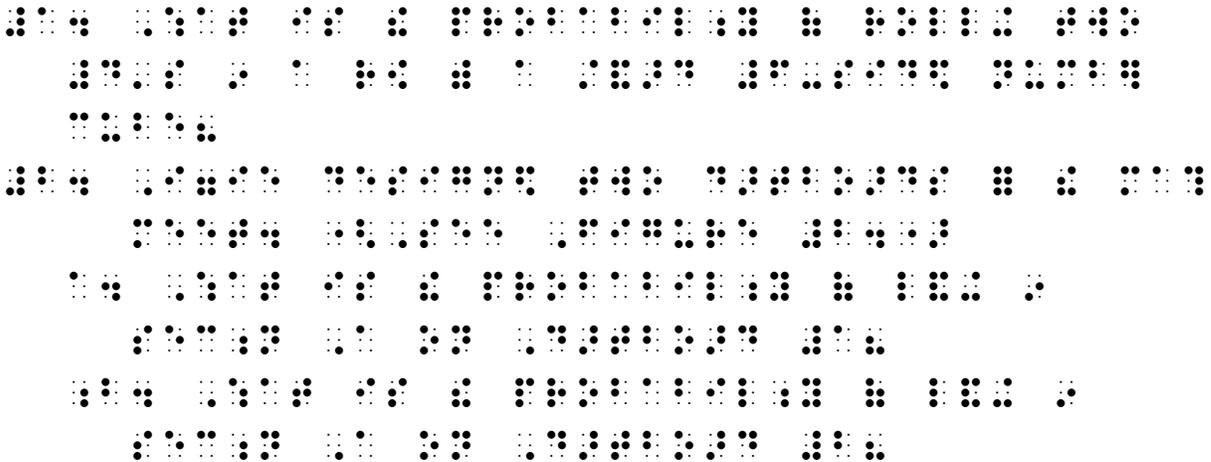
	a	b	c	d
1.	16 + 9	17 + 4	14 + 23	37 + 18
2.	46 + 15	87 + 12	95 + 54	101 + 43
3.	157 + 452	134 + 63	485 + 12	935 + 298

Braille representation of the table above, showing individual lettering for subdivisions in each problem.

**7.19 Margins for Exercise Sets:** Runover margins for itemized material are determined individually for each question. That is, a problem with no subentries will be (1-3); the next problem may have subentries and so will be (1-5; 3-5), etc.

*Example 7.19-1*

1. What is the probability of rolling two 4's in a row with a standard 6-sided number cube?
2. Iggie designed two dartboards for the math meet. (See Figure 2.)
  - a. What is the probability of landing in section A on Dartboard 1?
  - b. What is the probability of landing in section A on Dartboard 2?



*For the remainder of the course, Nemeth Code format summaries can be found in **Appendix C**.*

*For further practice, see Appendix A—Reading Practice.*









