LESSON 18

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

This is the final lesson but in no way is it the end of your learning. As this book's title states, this is an INTRODUCTION to the Nemeth Braille Code. In your work you will encounter symbols and usage that will require creative and consistent application of the rules. Each new assignment will present challenges. As you research answers, your understanding of the rules and guidelines will develop.

18.1 Preparing for the Certification Exam: A certification exam for brailling Nemeth Code in UEB context is not yet available. In the meantime, topics addressed in this lesson are offered for the transcriber who is preparing materials for publication.

18.2 The Nemeth Codebook: *The Nemeth Braille Code For Mathematics and Science Notation* should become your primary source for transcribing technical materials. Subject matter from several of the lessons in this training manual may be grouped into one section in the codebook, giving new perspective and understanding of a topic or rule. Be sure you have the BANA updates for the Nemeth Code. Ask your teacher if you do not know how to obtain the updates.

To get started, read the following "use/nonuse" sections in the Nemeth Codebook. Review the rules, study the examples, and follow the cross-references.

	Use of	Non-use of	Other Considerations
Capitalization indicator	§20	§21	§22, §50
English letter indicator	§26	§27	§28, §29, §30, §51
Enlarged grouping symbol	§126	§127	
Level indicator	§80	§81	§82
Numeric indicator	§9	§11	§10, §12, §13
Punctuation indicator	§37	§38	§52
Simple fraction indicator	§62	§63	
Typeform indicator	§32, §33	§34	§35

Review situations when we do not follow print layout Here is a sampling of situations for which the Nemeth Code has specific rules regarding spacing and arrangement on the braille line. *Centering*: cancellation, ditto marks, spatially-arranged fractions. *Spacing*: abbreviations, factors in math expressions, math symbols, functions, alignment of items in spatial arrangements. *Linage*: "keep together" rules (an abbreviation and its associated numeral or letter, function abbreviations, hyphenated expressions, signs of shape), division of long math expressions, side-by-side arrangements (e.g., itemized, unitemized, displayed, spatial). *Margins:* formal proofs, instructions, itemized material, labeled mathematical statements, linked expressions, paragraphing.

Revisit rules which you find to be troublesome For example, review the various forms of fractions, the many uses of the multipurpose indicator, correct assessment of ambiguous mathematical signs, and the use of literary punctuation for words and abbreviations in mathematical context.

Back matter Familiarize yourself with Appendix B of the Nemeth Code which offers a useful index of braille symbols. Skimming the General Index is a good way to reinforce the vocabulary and terminology used in the Nemeth Braille code.

Review code switching guidelines The only time Nemeth symbols and indicators may be used is within the Nemeth Code switch indicators. Review guidelines regarding when code switching is optional and when it is required, as well as considerations concerning placement of the switch indicators in embedded material, displayed material, spatial material, and at page turns. A summary appears in **Appendix C** of this course.

18.3 Beyond the Nemeth Code: Every aspect of the Nemeth Code has been introduced in this course. Certification in this code implies that you are prepared to transcribe a textbook which contains mathematical notation. This requires knowledge of the structure of a braille textbook as well as how the Nemeth Code cooperates with textbook formatting and the rules of Unified English Braille. Format guidelines which apply to the structuring of a textbook are in the BANA publication *Braille Formats: Principles of Print-to-Braille Transcription.* The **2016** edition is applicable to UEB transcriptions. The transcriber should be thoroughly familiar with that resource as well as the other sources listed below. These documents are available online at www.brailleauthority.org. Keep up to date as newer editions or updates are posted by the Braille Authority of North America.

The dates shown are the current edition at the time of this writing.

The Rules of Unified English Braille, Second Edition 2013

Braille Formats: Principles of Print-to-Braille Transcription, 2016

The Nemeth Braille Code for Mathematics and Science Notation, 1972 Revision, 2011-2015 Updates

"Guidance for Transcription Using the Nemeth Code within UEB Contexts" (2016)

Watch for ″Application of the Formats Guidelines 2016 to Nemeth Transcriptions within UEB Contexts"

This course does not address topics regarding creating a tactile graphic. A thorough reading of the most recent edition of *Guidelines and Standards for Tactile Graphics* is recommended before undertaking a technical transcription. Mathematical and scientific diagram strategies presented in this guidebook include 2-D and 3-D drawings, clocks (analog and digital), complex geometric shapes, counting symbols, graphs (circle graphs, bar graphs, line graphs, histograms, Cartesian graphs, pictographs, pie charts, scatter plots, line or dot plots, box-and-whisker plots), measurement tools, money, nets, number lines, orthographic drawings, spinners, tessellations, thermometers, and Venn diagrams.

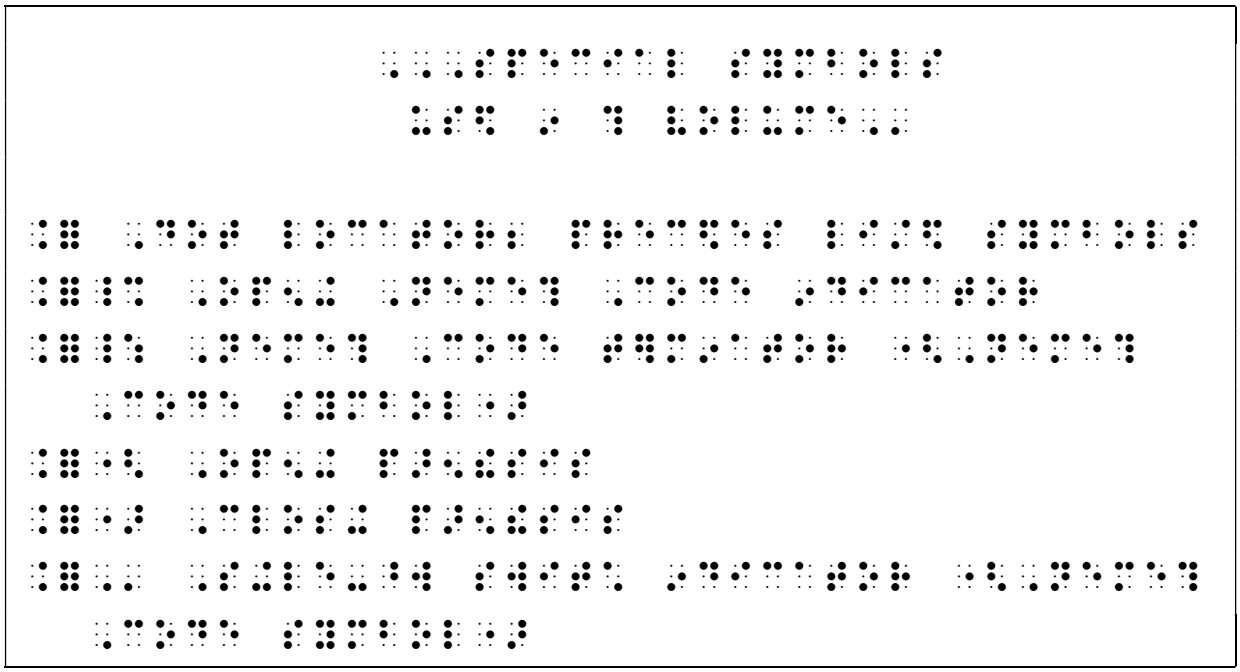
Symbols, arrangements, and structures not covered in the courses, codebooks, and other guidance documents are frequently encountered when preparing assignments. Professional development resources and online forums can provide illustrations and discussions of many topics in the fields of mathematics and science. As comprehension and understanding of the rules develops, one can find a solution to just about any transcribing challenge.

18.4 Transcriber-Generated Pages and Front Matter: Before brailling the first page of text, certain transcriber-generated and front matter pages are required. Review the guidelines for the transcriber-generated pages (title pages, special symbols page, and transcriber's notes page) in Section 2 of *Braille Formats*. You may also wish to review the lesson on "Braille Book Format" in the most recent edition of the *Instruction Manual for Braille Transcribing – UEB Edition.*

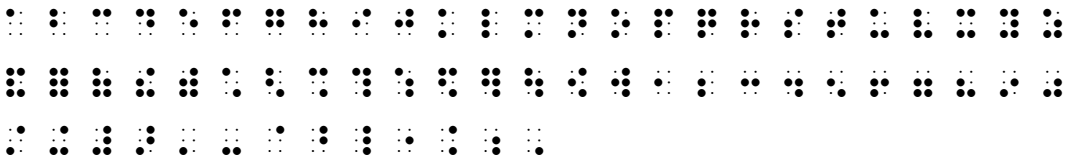
18.4.1 Special Symbols Page: The heading for this "t" page is SPECIAL SYMBOLS USED IN THIS VOLUME. Symbols from *The Rules of Unified English Braille* are to be listed as required in that rulebook. List UEB symbols that appear throughout the volume, including any that may occur on the title page. Follow the guidelines in Appendix G of *Braille Formats* to select symbols that should be included. (Disregard the UEB math symbols given in that list since UEB math symbols are not used in a Nemeth transcription.)

The code switch indicators for Nemeth Code are to be included in the list, following "braille order" as explained in Section 1.1.2 of *The Rules of Unified English Braille.* The phrase "(Nemeth Code symbol)" should follow the definition of both the Nemeth Code terminator and the single-word switch indicator. Other Nemeth Code symbols are not listed on the Special Symbols page unless they are symbols devised by the transcriber.

Here is a model, showing a few UEB symbols as well as the three Nemeth Code switch indicators. Additional symbols will be inserted into the model as needed in each braille volume.



18.4.1.a Braille Order: The "braille order" chart is reproduced here (in three rows) for your convenience. See Section 1.1.2 of *The Rules of Unified English Braille* for further details.



18.4.2 Transcriber's Notes Page: The heading for this "t" page is TRANSCRIBER'S NOTES. The purpose of this page is to identify special formats or usage found throughout a braille volume, and to cite sourcebooks. When Nemeth Code is used in a transcription, the Transcriber's Notes page should include the following note: "Mathematical content is transcribed according to *The Nemeth Braille Code for Mathematics and Science Notation, 1972 Revision,* 2007-(year of latest update) Updates including the *Guidance for Transcription Using the Nemeth Code within UEB Contexts*." You can find items that require explanation listed throughout *Braille Formats*. In addition to those requirements, the Nemeth Code identifies the following as items which require explanation either at the point in the transcription where they appear or on the Transcriber's Notes page:

- Continental usage of the comma and/or decimal point in the print copy
- Use of capitalized letters in the print copy for digits in non-decimal bases
- Use of alternative forms of Greek letters in the print copy
- Omission of vector arrows which appear in the print copy
- Description of the shapes used in print to depict calculator or computer keys
- When identifiers to displayed expression are moved to the left in the braille edition
- Changing the column format of a formal proof to an itemized list in the braille edition

---

PRACTICE 18A

Instructions: Prepare transcriber-generated pages and one front matter "contents" page according to the guidelines in Section 2 of *Braille Formats.* Do not use a running head.

Title Page: Use the following information to prepare a title page.

Book title: *ADVENTURES IN Y2K MATHEMATICS*
Book subtitle: *Math in the New Millennium*
Authors: Monica and Matías Cruz
Publisher information: Math4You Publications, Inc., Antelope Valley, CA, www.M4YPub.edu
Copyright information: © 2018 by M&M Publishers
ISBN: 9-6230-99228x
Transcriber segment: Use your name, your city, and your state
Volume Information segment: Assume this is the second volume of a three-volume transcription. The braille page designation is "t1-t3, p1, and 1-120" and the print page designation is "v and 87-a123"

Special Symbols Page: List the symbols from the title page that are required according to Appendix G of *Braille Formats*, including symbols from the "may be included" list. Also list the UEB symbols which appear in the other practice drills in this lesson. Those symbols are given below.

Grade 1 symbol indicator; Nemeth Code switch indicators; parentheses; typeform indicators for boldface passage, boldface terminator, boldface word, italic passage, italic terminator, italic word, underlined passage, and underlined terminator.

You will need to arrange the symbols in braille order as explained in Section 1.1.2 of *The Rules of Unified English Braille*.

PRACTICE 18A, cont.

Transcriber's Notes Page: In addition to the required statement citing the use of the Nemeth Code, write a description of the change made to the column format of the formal proof which appears in Practice E.

Front Matter: Include a transcription of this contents page:

18.5 Body of Text: The entire transcription follows a collaborative pattern between *Braille Formats* 2016 and formats provided for in the *Nemeth Braille Code*. When a format is specified in the Nemeth Code, those rules are applied not only to the technical material but also to the UEB material. Some examples are given below.

18.5.1 Follow Nemeth Code Formatting Rules: The following matters are governed by Nemeth Code format and apply both to the technical material and to UEB portions of text.

- Exercises with subentry levels are treated individually regarding runover margins.
- Instructions preceding itemized material begin in cell 5 and runover in cell 3.
- "Keep together" rules for hyphenated expressions and for abbreviations and a numeral or letter associated with it.
- Labeled mathematical statements—Nemeth Code rules apply regarding paragraphing, blank lines, and typeface.
- Margins applied to itemized material and their subparagraphs.
- Paragraphs begin in cell 3 and runover in cell 1. (Blocked paragraphing is not allowed.)

18.5.2 Follow Braille Formats Formatting Guidelines: Items which are not addressed in the Nemeth Code rely on *Braille Formats* for positioning. Some items governed by *Braille Formats* include:

- Blank lines
- Box lines
- Content and structure of the transcriber-generated pages and front matter
- Displayed literary text
- Exercise examples
- Headings
- Indented list format for nontechnical text
- Lists
- Margins for captions, notes, sidebars, and transcriber's notes
- Page numbering

18.5.3 Context-Dependent Formats

These formats occur only in Nemeth Code context.

- Blank lines with spatial arrangements
- Division of mathematical expressions
- Margins for displayed mathematical expressions

These items follow Nemeth Code formatting between the switches, and follow *Braille Formats* outside of the switches.

- Blank table entries to be filled in
- Keying of long entries
- Tables consisting only of numbers

Final Word Thank you for making the extra effort to learn the Nemeth braille code. We hope you have noticed your transcribing and proofreading skills improve over the course of the lessons. As you take on assignments, check the NFB website periodically for changes to this lesson material and check the BANA website for updates to the braille codes. We also encourage you to take advantage of opportunities to stay informed and connected to other transcribers. The National Braille Association (NBA) publishes a quarterly Bulletin and hosts several learning opportunities—an online forum "Ask An Expert", monthly webinars, and professional development conferences. Local groups offer similar support, for example, the California Transcribers and Educators for the Blind and Visually Impaired (CTEBVI), Visual Aid Volunteers of Florida (VAVF), and the Midwest Regional Braille Conference.

We wish you success and satisfaction providing much-needed mathematics and science materials for braille readers.

This course concludes with four practices which are characteristic of K-12 grade level topics.

Four Practices

Instructions: Use a 40-cell line and a 25-line page. Show print and braille page numbers on every page. Use the number shown in the upper right corner as the print page number. Do not use a running head. Begin numbering with braille page 1, showing the book title at the top of the page as required (see 1.8.1 in *Braille Formats).* Continue numbering the braille pages consecutively throughout the four practices. Begin each practice on a new braille page, but within each practice do not force a new braille page unless a rule supports doing so.

PRACTICE 18B

ADVENTURES IN Y2K MATHEMATICS 87

ADDING AND SUBTRACTING

53 + 36	14 + 44	33 + 21	98 + 1	2 + 2	456 + 13
4 + 84	23 + 32	71 + 1	33 − 22	150 − 40	9 − 6
826 − 16	55 − 2	77 − 27	420 + 519	95 − 62	93 + 6

ADVENTURES IN Y2K MATHEMATICS 88

COMPARING FRACTIONS

Directions: Write the correct comparison symbol (>, <, or =) in each box.

1) $\frac{1}{6} \square \frac{3}{4}$ 2) $\frac{1}{2} \square \frac{3}{6}$ 3) $\frac{2}{4} \square \frac{1}{3}$

4) $\frac{2}{5} \square \frac{2}{3}$ 5) $\frac{9}{10} \square \frac{4}{5}$ 6) $\frac{1}{6} \square \frac{2}{12}$

PRACTICE 18C

Exercise Set 18-6

1. **Home Economics** The cost of using a 60-watt light bulb is given by the function $y = 0.0036x$. The cost is in dollars, and x represents the number of hours the bulb is lit.
   a. How much does it cost to use a 60-watt light bulb 8 hours a day for a week?
   b. If the total cost of using a 60-watt bulb is $1.98, for how many hours can it be used?
2. **What's the Question?** The following set of points defines a function: $\{(3, 6), (-4, 1), (5, -5), (9, -6), (10, -2), (-2, 10)\}$. If the answer is 6, 1, –5, –6, –2, and 10, what is the question?
3. **Physics** Ohm's law can be described by the simple formula

   $$I = \frac{V}{R}$$

   where I = current (in amps, A), V = voltage (in volts, V), and R = resistance (in ohms, Ω). What equation would you use to solve for voltage?
   a. V = I/R
   b. V = IR
   c. V = R/I

ADDING, SUBTRACTING, MULTIPLYING, AND DIVIDING INTEGERS

Find the sum, product, or quotient as indicated by the signs $+, \times, \div$.

1) $-6 + -5 =$ ____
2) $-2 \times -1 =$ ____
3) $35 \div -5 =$ ____
4) $5 + -19 =$ ____
5) $-24 \div 4 =$ ____
6) $-132 \div -11 =$ ____
7) $9 \times 9 \times -5 =$ ____

PRACTICE 18D

Instructions: Format the italicized text as Nemeth Code instructions.

UNIT 6 REVIEW

Fill in the correct answers.

1. If $7n = 0$, then $n =$ ____.
2. Replace the ☐ with a numeral to make a true sentence: $(4 + 8) + ☐ = 4 + (8 + 3)$.
3. $\left(\frac{1}{3} + \frac{5}{6}\right) - \frac{5}{12} = ?$
4. $5 \times 5 \times 5 = 5^{?}$

Study the equivalencies.

5. To find the mixed-number name for $\frac{154}{9}$, divide 9 into 154.

$$\begin{array}{r} 17\text{ R}1 \\ 9\overline{)\,154} \\ \underline{9} \\ 64 \\ \underline{63} \\ 1 \end{array}$$

$$\frac{154}{9} = 17\frac{1}{7}$$

6. Multiply $4\frac{2}{3}$ by $\frac{3}{14}$. $4\frac{2}{3} = \frac{12+2}{3} = \frac{14}{3}$. $\frac{14}{3} \times \frac{3}{14} = 1$!

PRACTICE 18D, cont.

Review set notation, Roman numerals, and miscellaneous topics.

7. If R = {a, b, c, d} and S = {a, c, e, g, h}, then the intersection of sets R and S is {a, c}.
8. Only the following pairs of symbols may occur out of the natural order: I before V or X, X before L or C, C before D or M. For example, XL = L–X = 50–10 = 40.
9. Use the distributive property to multiply 14 by 3.

$$\begin{aligned} 3 \cdot 14 &= 3\,(10 + 4) \\ &= 3 \cdot 10 + 3 \cdot 4 \\ &= 30 + 12 = 42 \end{aligned}$$

10. "$24_{(\text{five})}$" is read "two four, base five."
11. A gain of 5 yd followed by a loss of 2 yd gives a total gain of 3 yd. Expressed mathematically, $(^{+}5) + (^{-}2) = {}^{+}3$.

Explain the relationships.

12. $\overline{AB}$ is congruent to $\overline{DE}$.
13. $\overline{RS} \approx \overline{EF}$; $\overline{RS} \neq \overline{LK}$.
14. $\overrightarrow{DA} \cup \overrightarrow{DB} = \overleftrightarrow{AB}$
15. $\frac{7}{\cancel{12}\,6} \times \frac{\overset{11}{\cancel{22}}}{5} = \frac{77}{30}$

Simplify each radical expression.

16. $\sqrt[4]{x} \cdot \sqrt{x}$ 17. $\sqrt[5]{\sqrt[3]{a^2}}$ 18. $\frac{\sqrt{36x}}{\sqrt[3]{8x^2}}$

PRACTICE 18E

THEOREM The sum of the angles in a triangle is 180 degrees.

Given: $\triangle$ABC

Prove: $\angle a + \angle b + \angle c = 180°$

STATEMENT	REASON
1. Let BD be a line through B parallel to AC.	1. Parallel postulate.
2. $\angle a = \angle d$.	2. Corresponding angles are equal.
3. $\angle b = \angle b$.	3. Identity.
4. $\angle c = \angle e$.	4. Alternate-interior angles are equal.
5. $\angle a + \angle b + \angle c = \angle d + \angle b + \angle e$.	5. Sum of equal quantities are equal.
6. $\angle d + \angle b + \angle c = 180°$.	6. A straight angle equals 180°.
7. $\therefore \angle a + \angle b + \angle c = 180°$.	7. Quantities equal to the same quantity are equal to each other. ∎

Use $\pi/12 = \pi/3 - \pi/4$ and the identity for the tangent of a difference to solve $\mathbf{tan}\left(\frac{\pi}{12}\right)$.

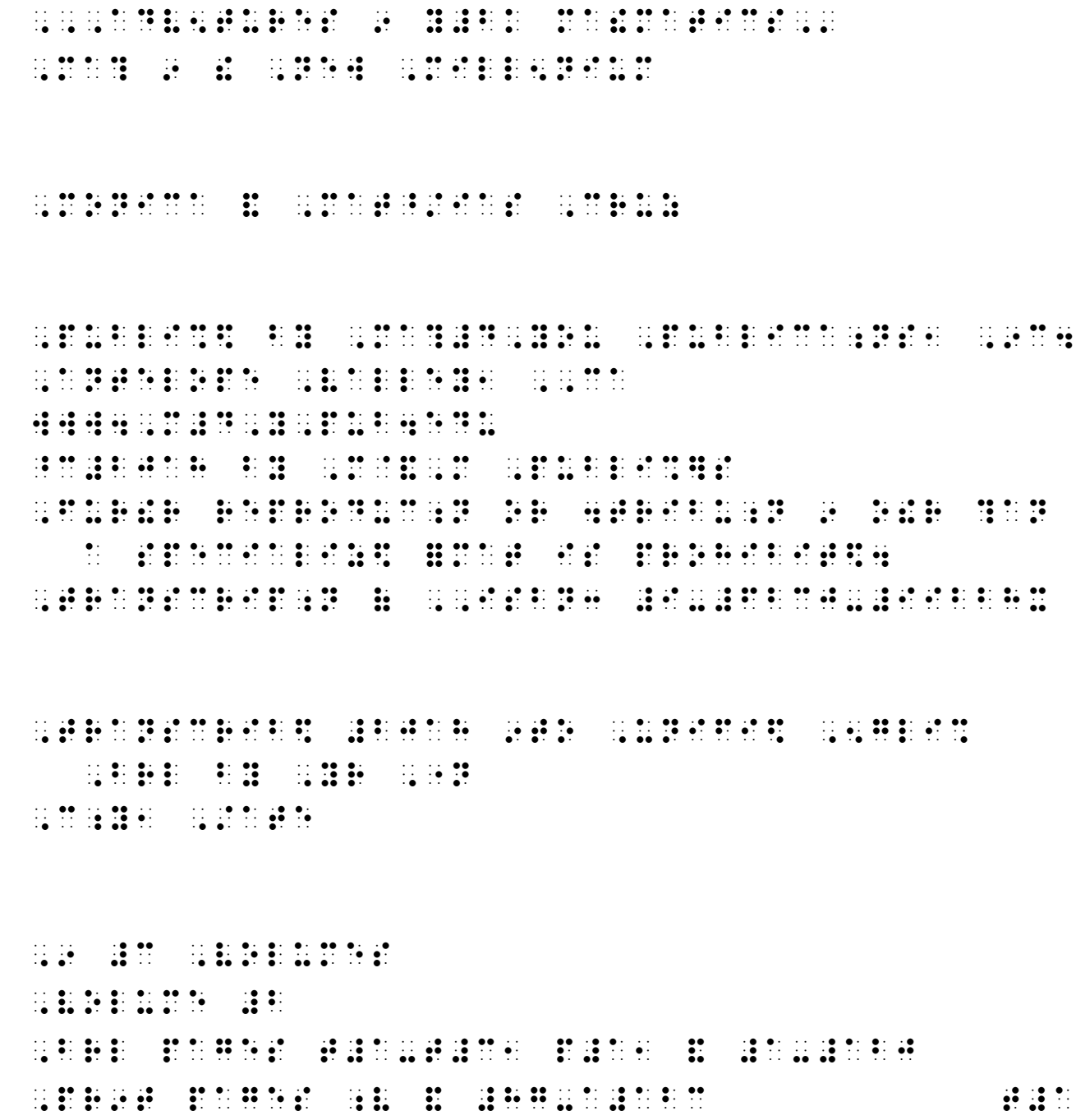
$$\tan\left(\frac{\pi}{12}\right) = \tan\left(\frac{\pi}{3} - \frac{\pi}{4}\right) = \frac{\tan\frac{\pi}{3} - \tan\frac{\pi}{4}}{1 + \tan\frac{\pi}{3}\tan\frac{\pi}{4}} = \frac{\sqrt{3}-1}{1+\sqrt{3}\cdot 1} = \frac{(\sqrt{3}-1)(\sqrt{3}-1)}{(\sqrt{3}+1)(\sqrt{3}-1)} =$$
$$\frac{3-2\sqrt{3}+1}{2} = \frac{4-2\sqrt{3}}{2} = 2 - \sqrt{3}$$

The answer is $\tan\left(\frac{\pi}{12}\right) = 2 - \sqrt{3}$.

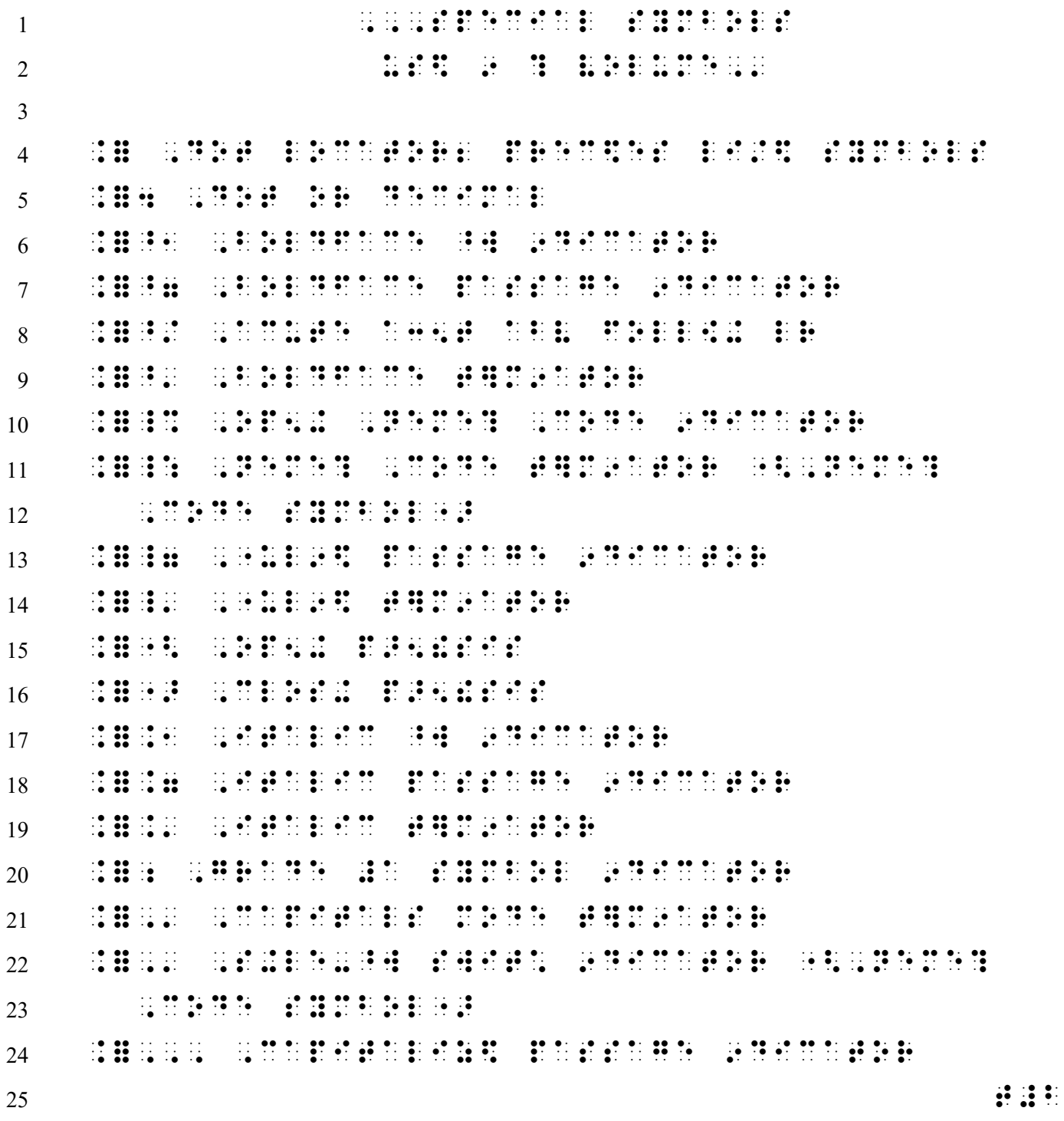
ANSWERS TO PRACTICE MATERIAL

PRACTICE 18A

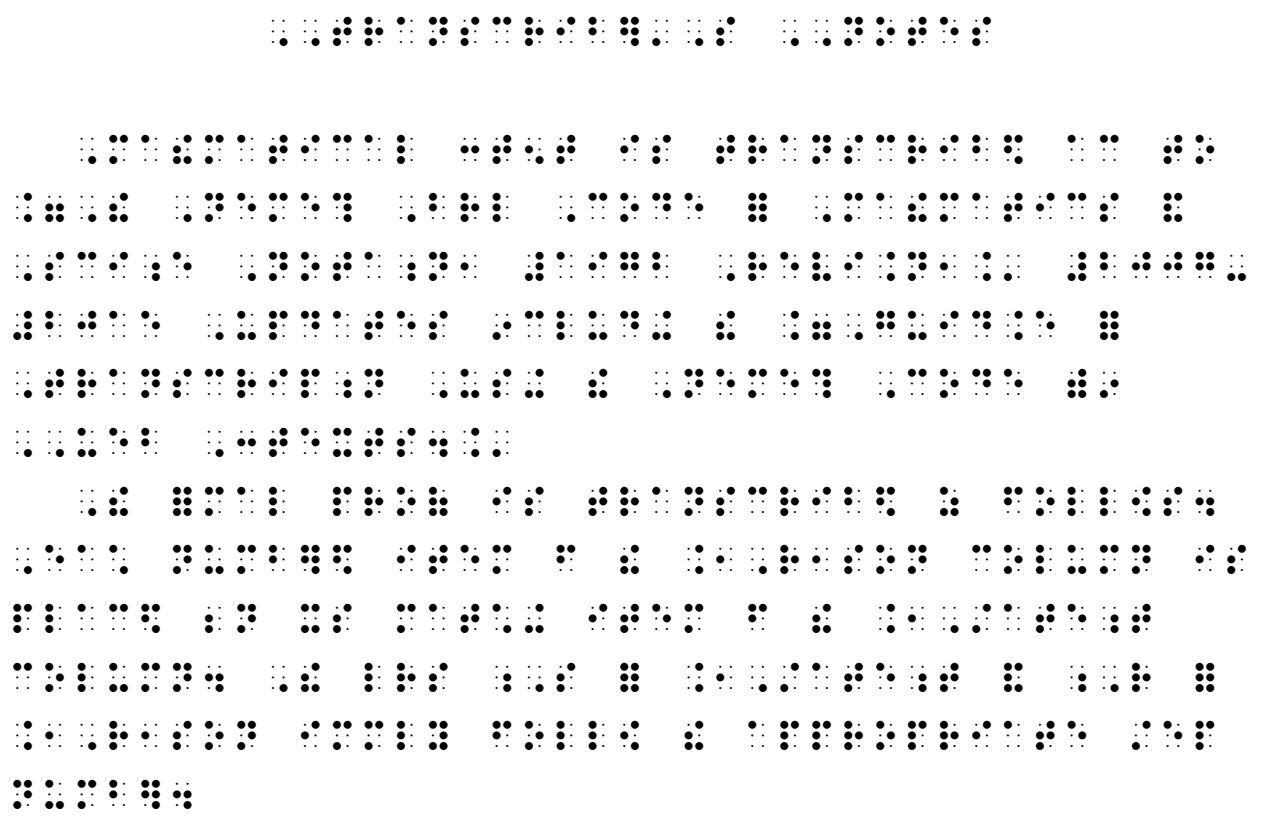
Title Page



PRACTICE 18A, cont.
Special Symbols Page

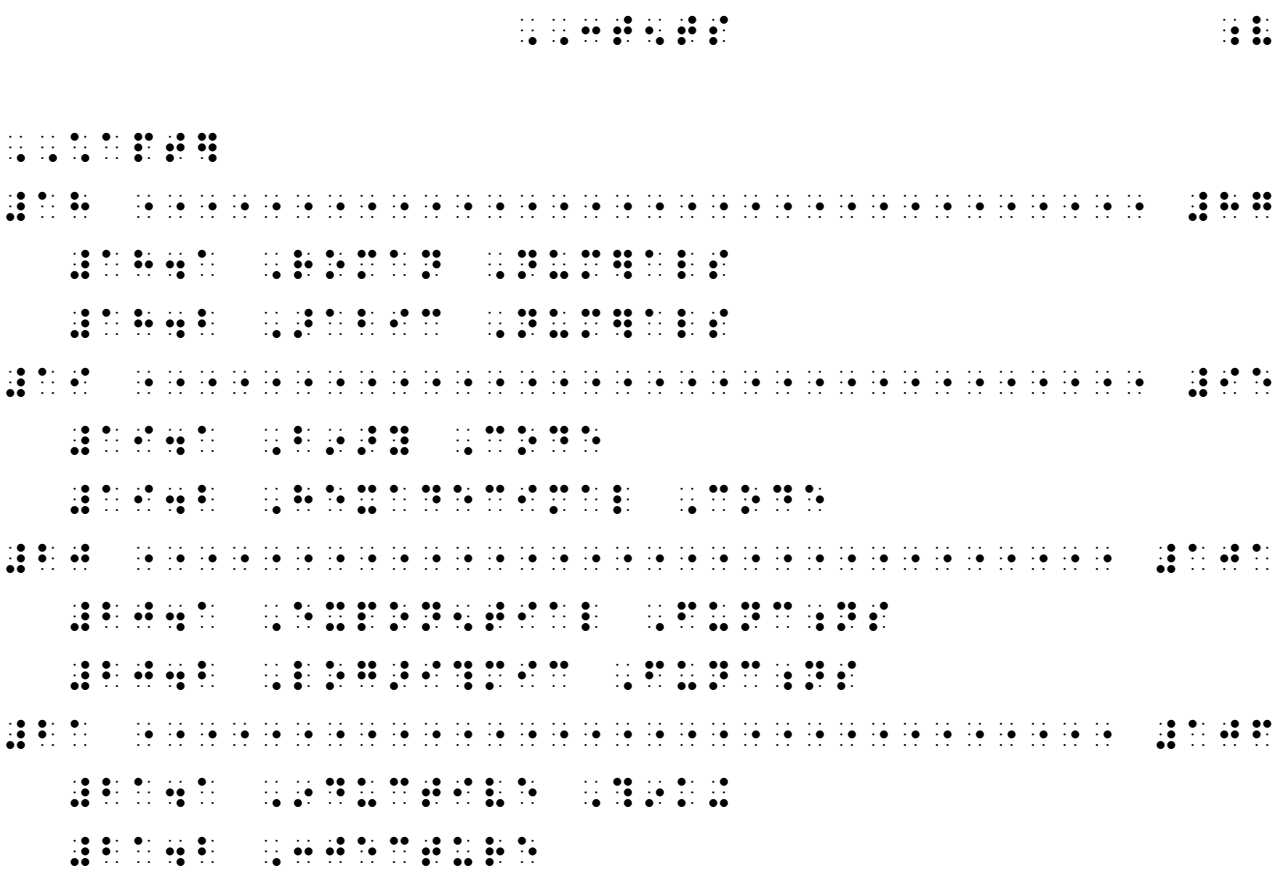


In addition to the symbols from Practices B-E, these symbols appear on the title page: dot in web address (line 4), acute accent (line 8), capitals mode terminator (line 17), and capitalized passage indicator (line 18). Note that the ampersand and copyright symbol need not be listed.



(line 25)

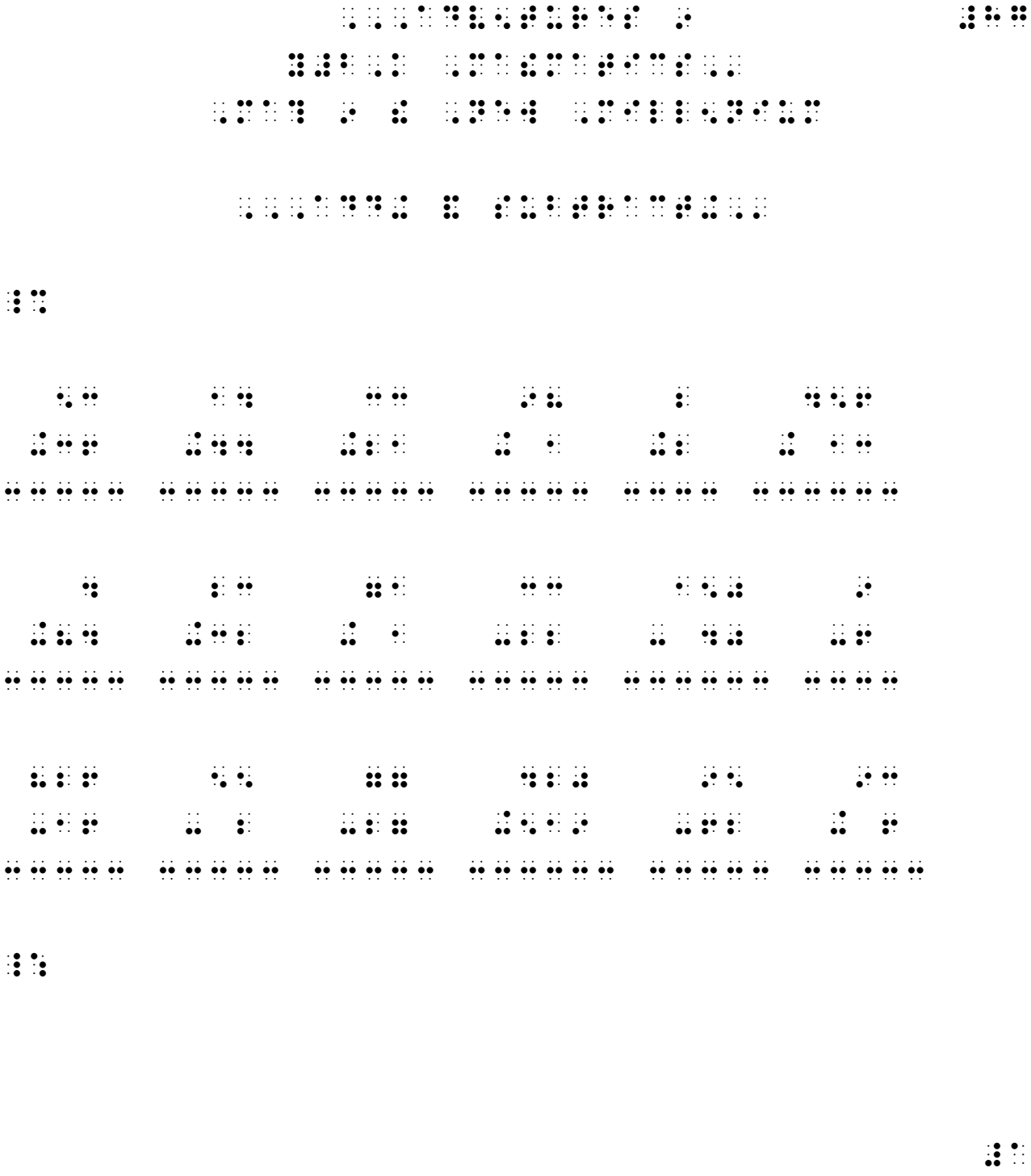
PRACTICE 18A, cont.
Contents Page



(line 25)

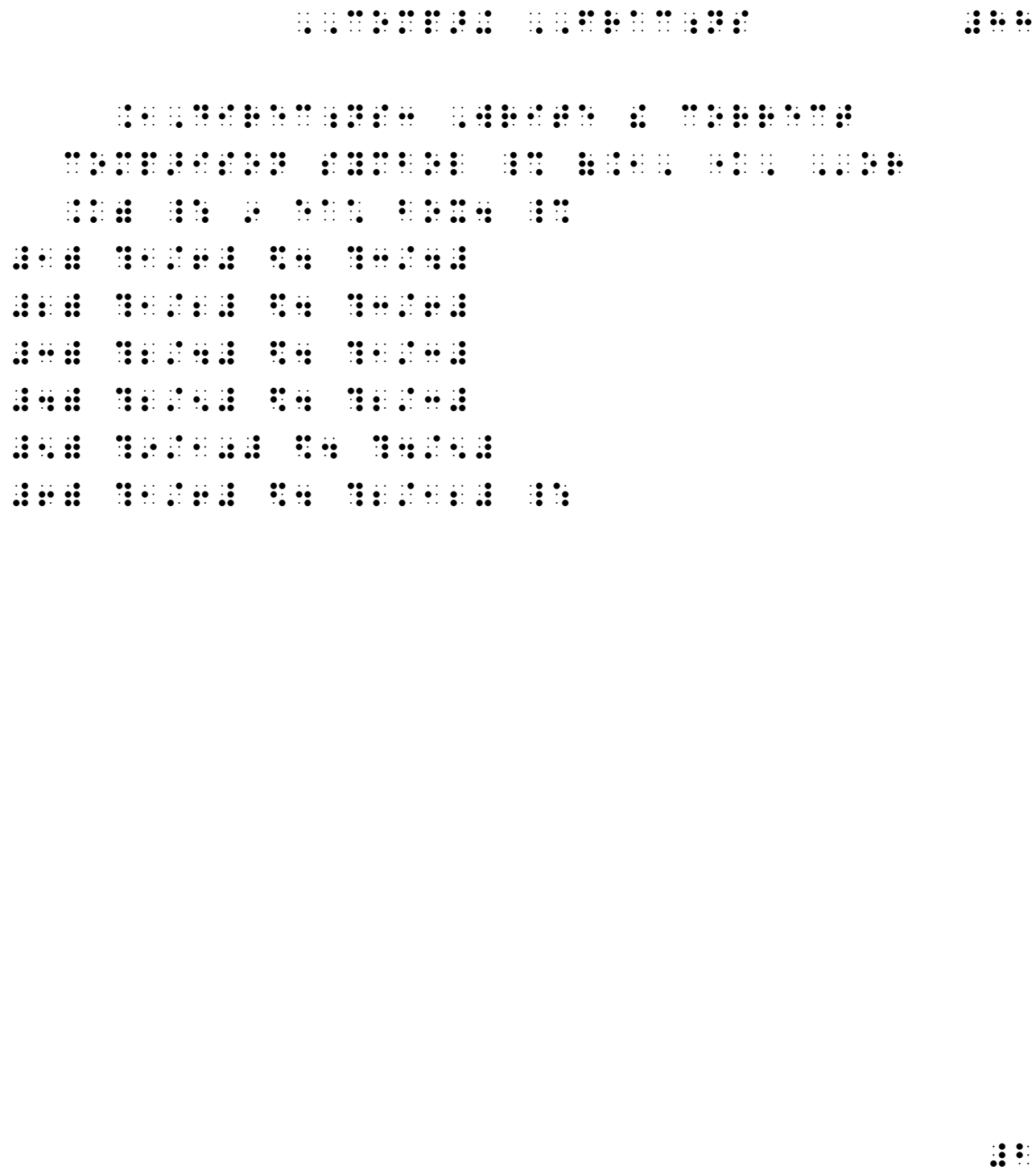
Line 1: Instructions for this page say to assume this is the second volume of a transcription. Implied page numbers i-iv are brailled in Volume 1 only. See Braille Formats *2.7.1 for details.*

PRACTICE 18B



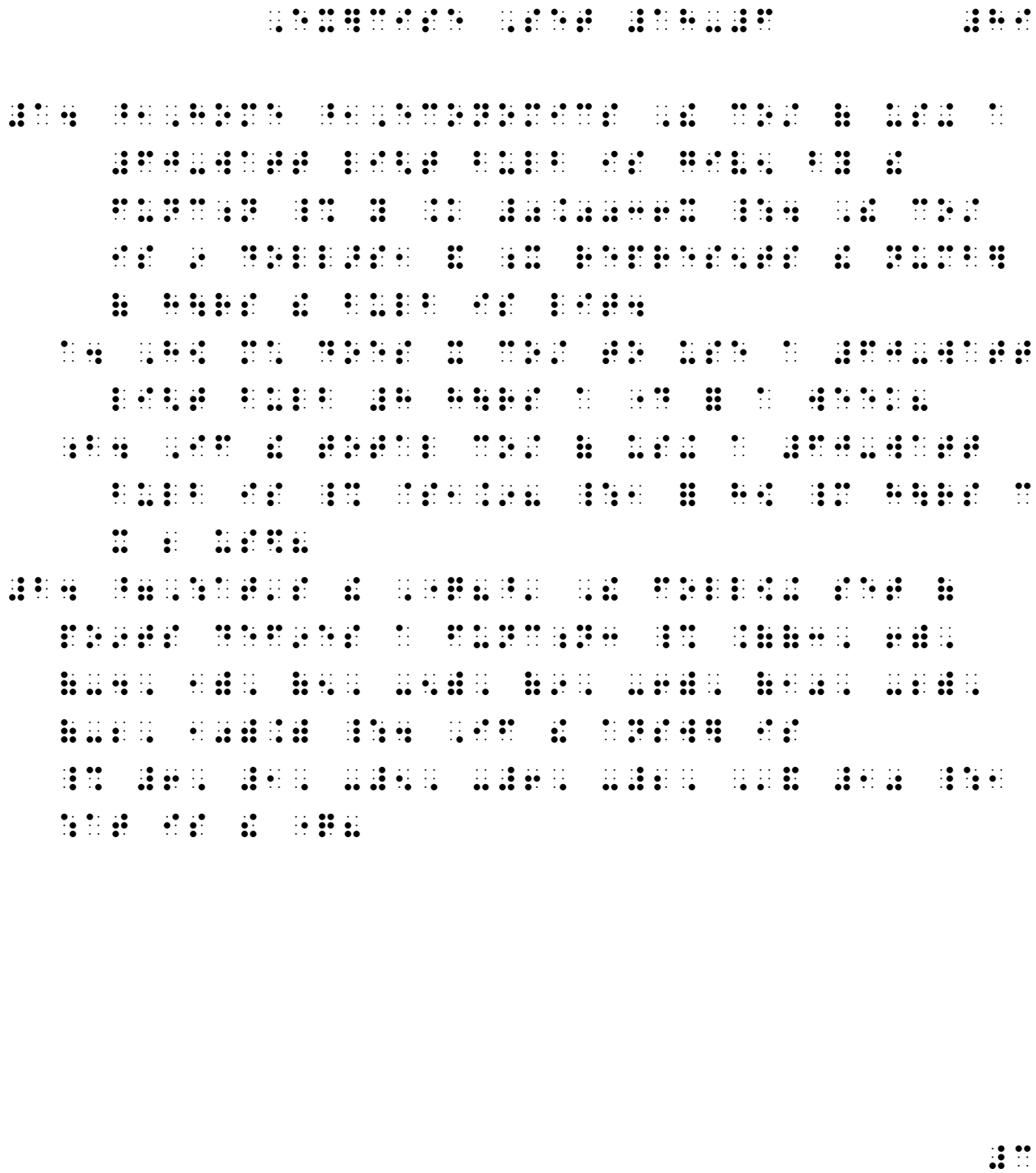
Format Comment: The Nemeth Code switch indicators do not take the place of required blank lines. A blank line follows the centered heading; a blank line precedes and follows the spatial material.

PRACTICE 18B, cont.



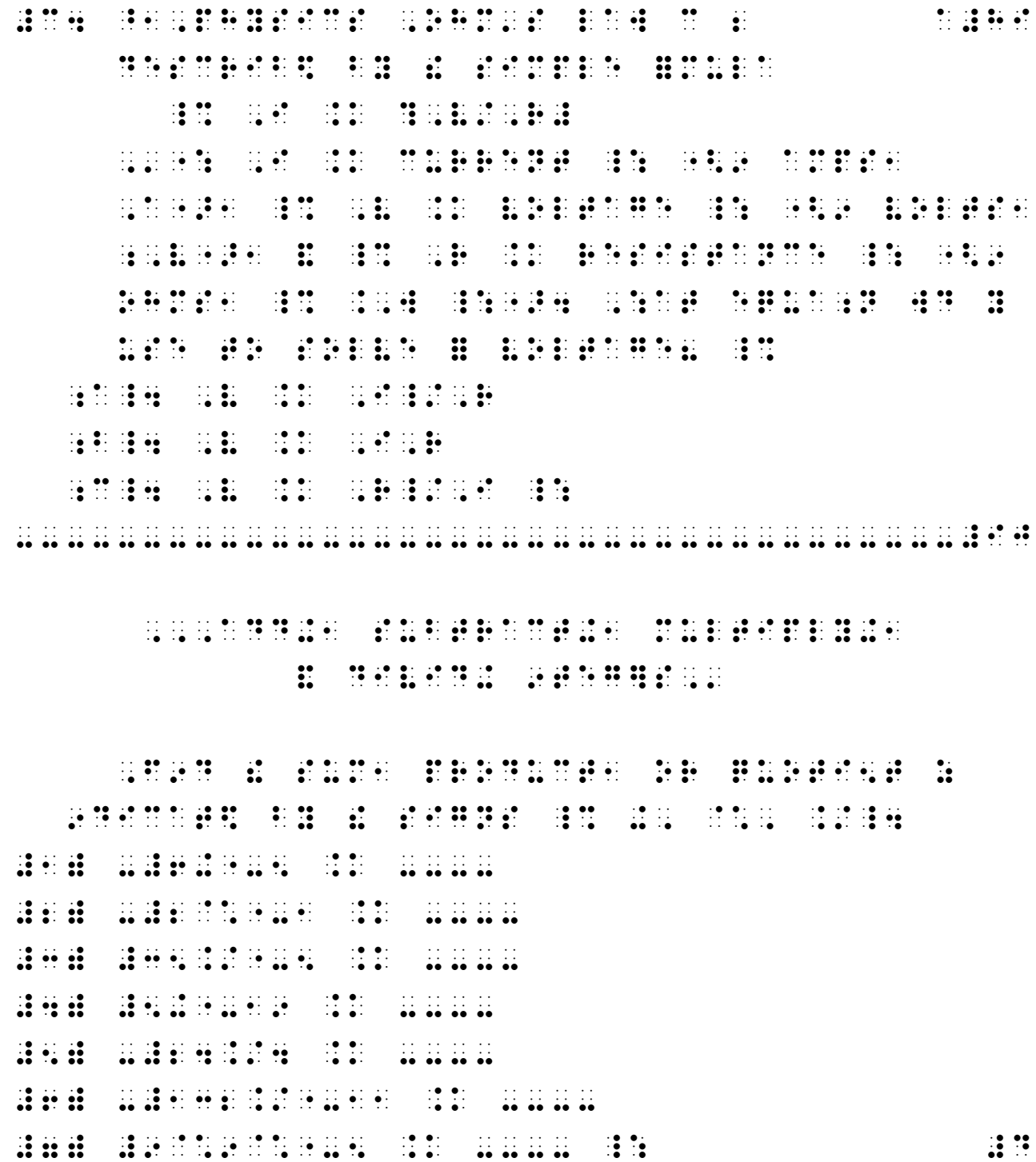
Lines 5-10: Side-by-side arrangement of nonspatial itemized material is not allowed in the braille transcription. Each identifier starts in cell 1. [NC]

PRACTICE 18C



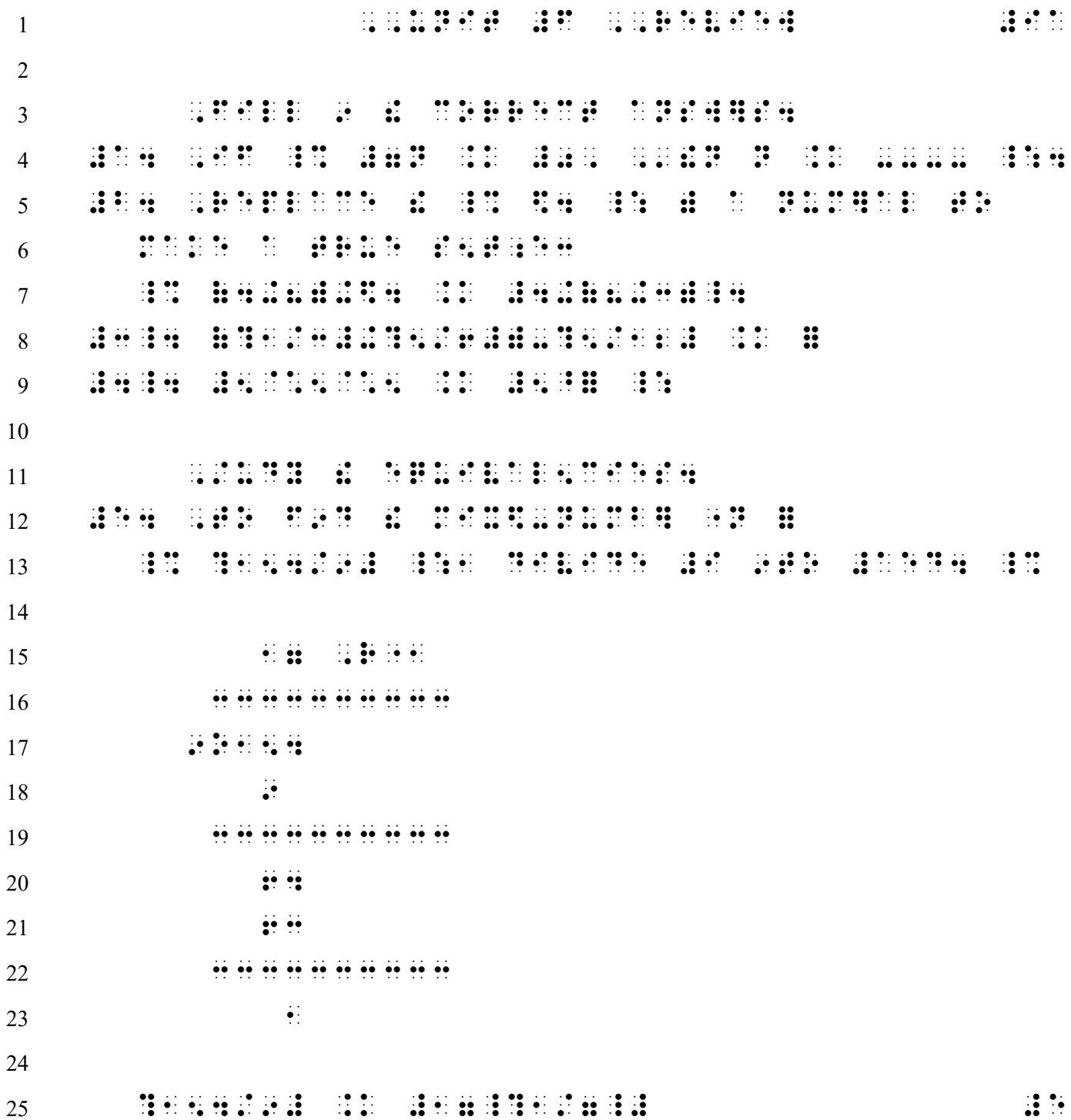
Line 1: The heading could be formatted as a cell-5 heading, in which case line 2 would not be blank. [BF]
Lines 14-18: Runover margins for itemized material are determined individually for each question. Problem #2 has no subitems, so its runovers are in cell 3. [NC]
Lines 19-25: The next problem set starts on the next braille page because question and answer choices should appear on a single page whenever space permits, regardless of the amount of blank space resulting on a page. [BF]

PRACTICE 18C, cont.

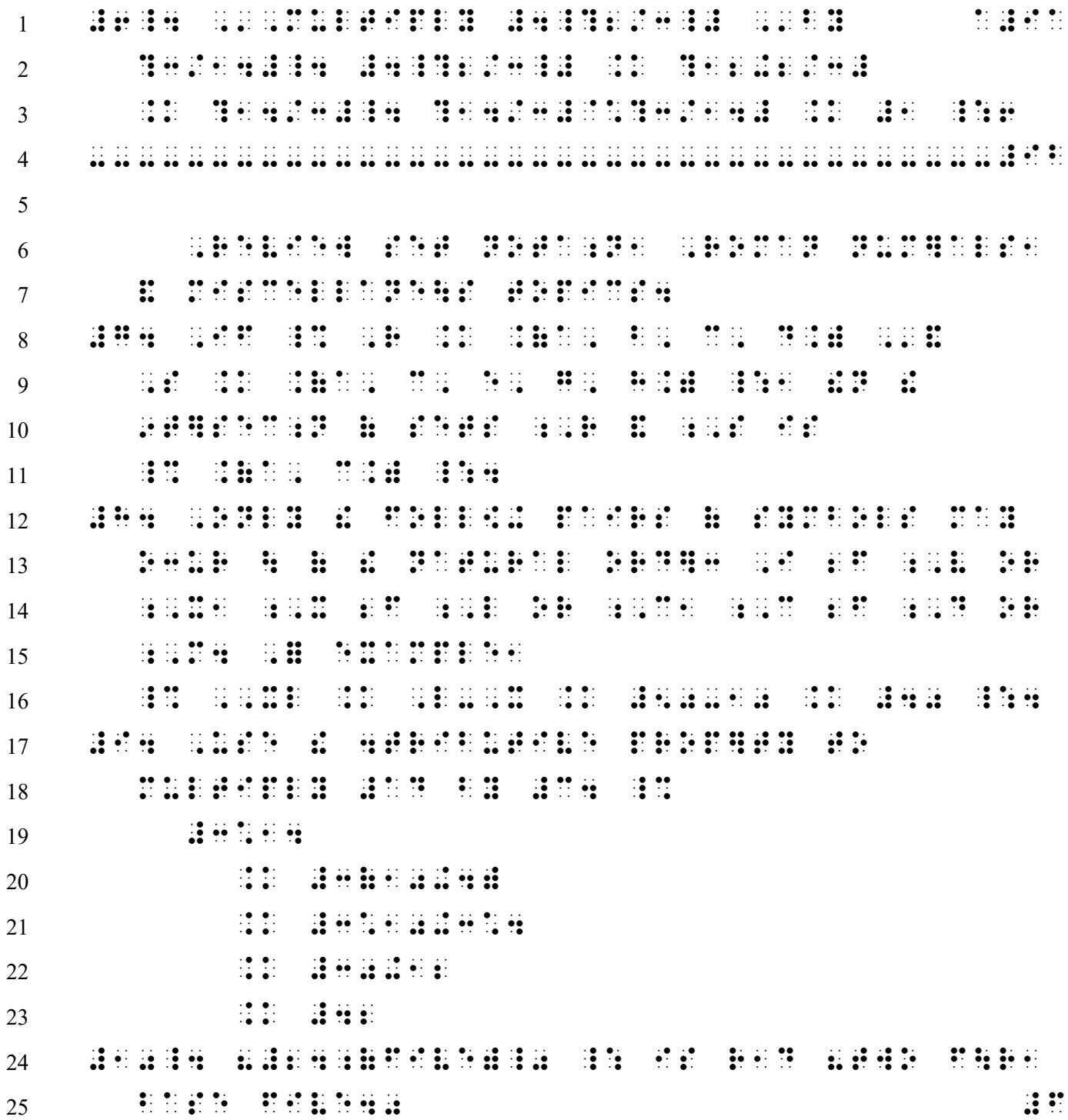


Lines 19-25: Side-by-side arrangement of nonspatial itemized material is not allowed in the braille transcription. Each identifier starts in cell 1. [NC]

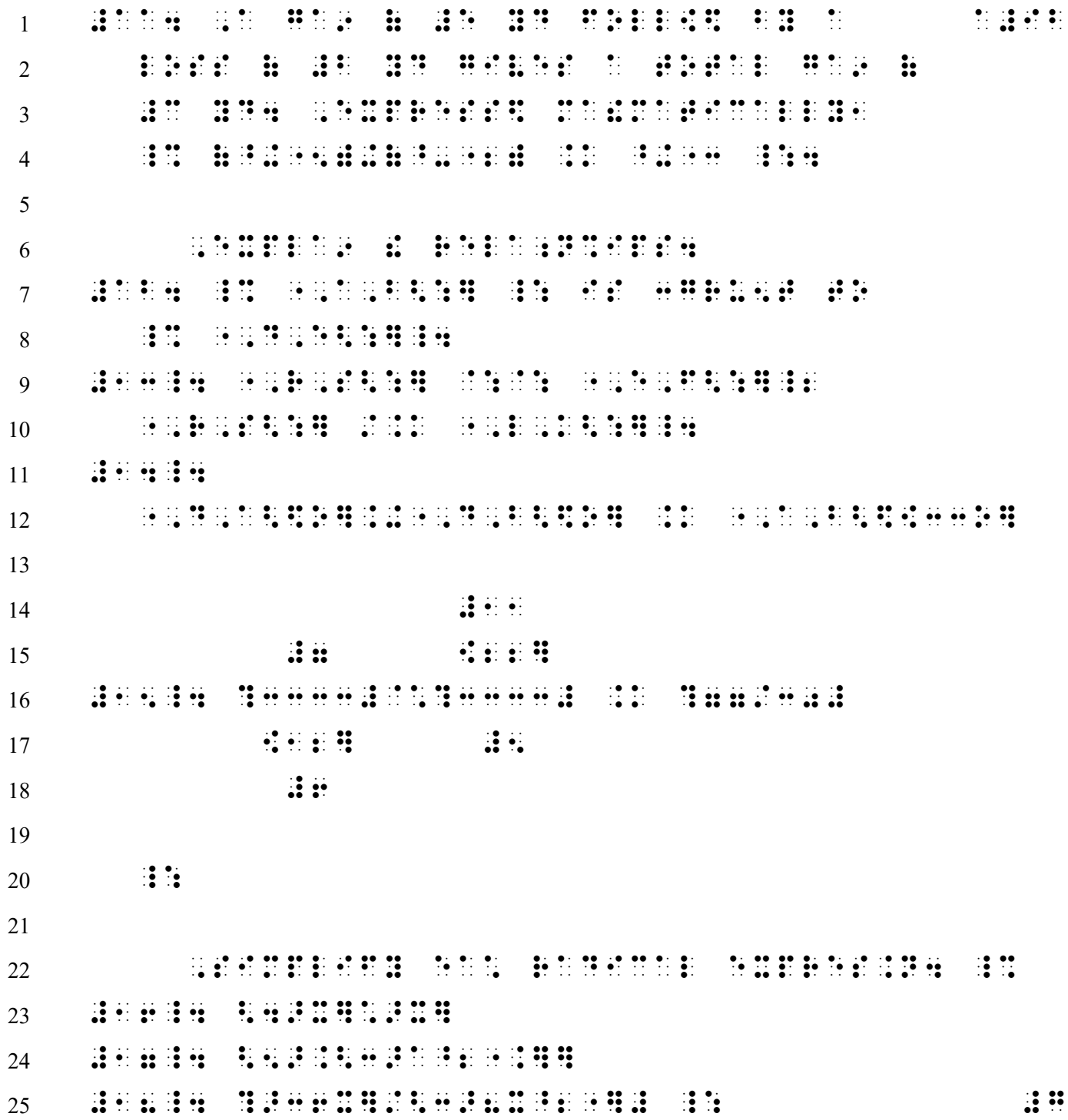
PRACTICE 18D



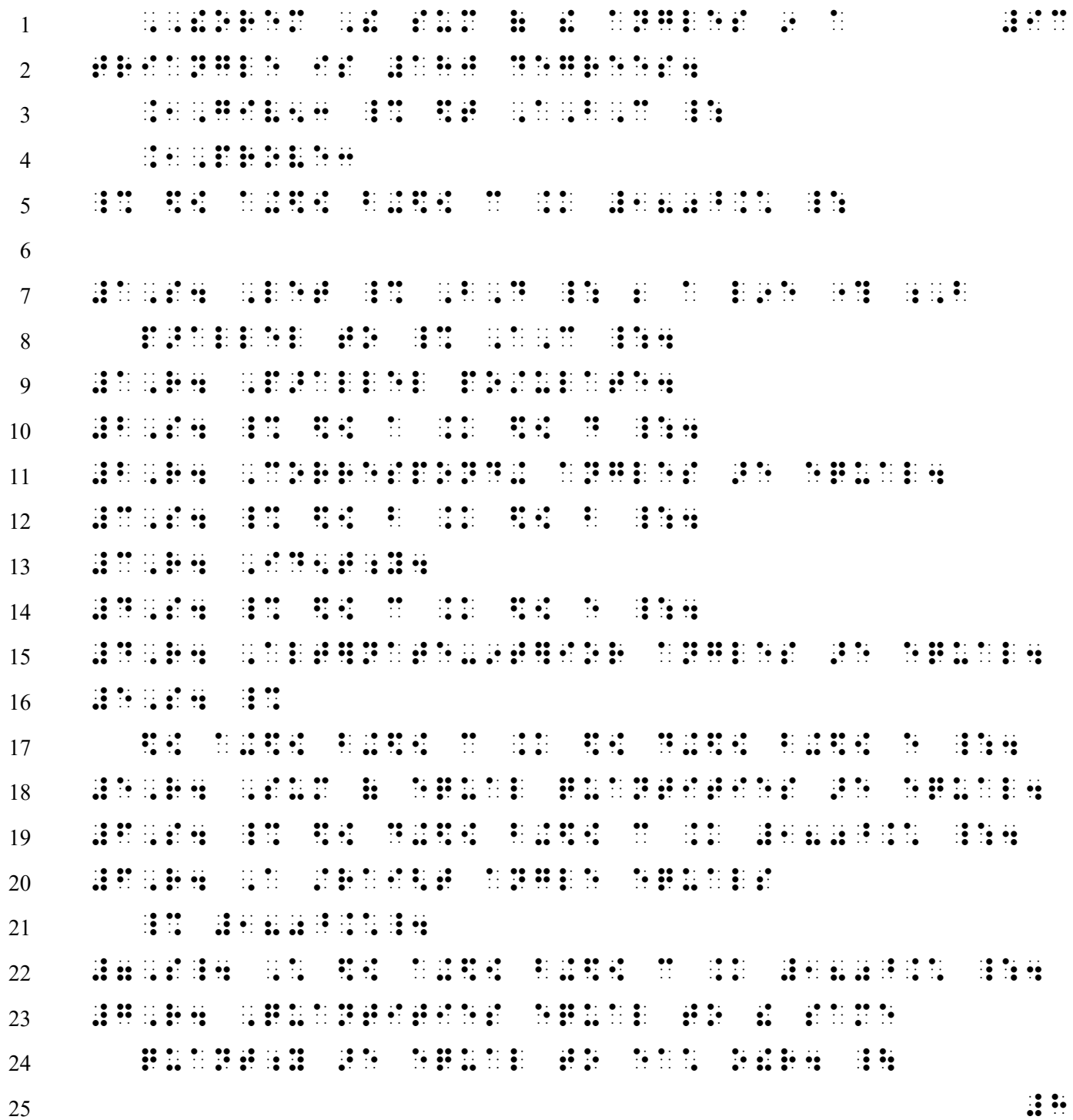
PRACTICE 18D, cont.



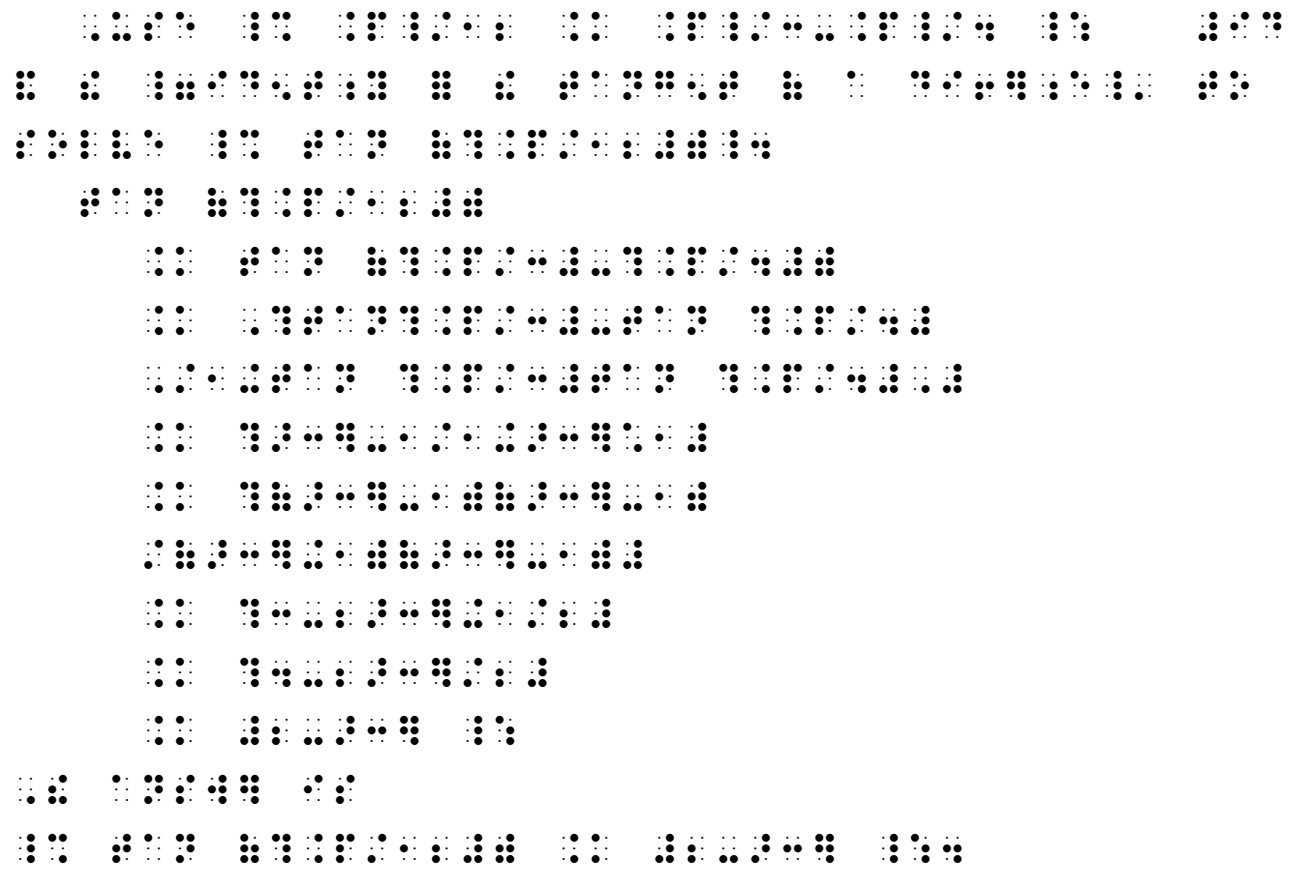
PRACTICE 18D, cont.



PRACTICE 18E



PRACTICE 18E, cont.



(line 25)

Notes: The displayed expression begins in cell 3 with runovers in cell 5. Because two of the links require division, each link begins on a new line in the runover cell. The divided links begin a new line with the main fraction line, and are not indented further because in print the signs of comparison are not vertically aligned.

EXERCISE 18

Exercise 18 will be available when this course is finished being written and is no longer "Provisional".