Chapter 2: Additional Nemeth Code Symbols and Formats Used in Grades PK-1

New Symbols Introduced

⠸⠩ [dots 4-5-6, dots 1-4-6] Opening Nemeth Code indicator (no print equivalent)

⠸⠱ [dots 4-5-6, dots 1-5-6] Nemeth Code terminator (no print equivalent)

⠠⠄ [dot 6, dot 3] Single-word switch indicator (no print equivalent)

⠰ [dots 5-6] English letter indicator (no print equivalent)

⠄⠄⠄ [dot 3, dot 3, dot 3] Ellipsis (…)

⠤⠤⠤⠤ [dots 3-6, dots 3-6, dots 3-6, dots 3-6] Long dash (______)

⠈⠨⠣ [dot 4, dots 4-6, dots 1-2-6] Opening transcriber’s note indicator (no print equivalent)

⠈⠨⠜ [dot 4, dots 4-6, dots 3-4-5] Closing transcriber’s note indicator (no print equivalent)

New BANA Terms

- **Centered heading:** Term used for titles.
- **Exercise:** Term used for math problems.
- **Instructions:** Term used for directions.
- **Itemized material with subdivisions:** Term used for multiple choice problems in Nemeth Code.
- **Runover:** Term used for second or subsequent lines of a problem or a paragraph.

Key Points

- When preparing braille materials, individuals must determine what material on a page is math or science and what material is literary.

- Literary material and page numbers are prepared in UEB.
- The **opening Nemeth Code indicator** is used to begin Nemeth Code. It is placed before the math or science material and is followed by a space.
- The **Nemeth Code terminator** is used to end Nemeth Code. If it is placed on the same line as the Nemeth Code, there must be a space after the Nemeth Code and before the Nemeth Code terminator.
- Contractions are not used in Nemeth Code, unless a single word is proceeded by a **single-word switch indicator**.
- When using Nemeth switch indicators, it’s important to be consistent in preparing material.
- The **general omission symbol** can be used to represent a number, sign of operation, or sign of comparison.
- When a “blank” is displayed as a line in math or science material, use the **long dash** in Nemeth Code.
- If an **ellipsis** is shown in math or science material, use the Nemeth Code ellipsis.
- There is no space between a long dash or ellipsis and a comma, period, or other sign of punctuation with the exception of the hyphen.
- If there is a **shape** on a page showing something is omitted, create a simple tactile graphic for the shape.
- Braille symbols for **shapes** cannot be used when transcribing materials for young students. Instead, create simple tactile graphics for the shapes.
- **Double space** material for pre-kindergarten, kindergarten, and first grade students unless other rules prevent you from doing so.
- **Directions** are formatted 5-3 when followed by numbered and lettered problems.
- **Directions** are formatted 3-1 when followed by problems that are not numbered. In addition, a blank line must separate the directions from the first problem so that the reader can easily distinguish between the directions and the problems.
- **Problem sets** are followed by a blank line. At least one problem must be on the same page as the directions for the problem set.
- Regardless whether problems are numbered or not, if there are no answer choices, use 1-3 formatting.
- Regardless whether problems are numbered or not, use 1-5 formatting for the problem and 3-5 formatting for answer choices.
- When problems or answer choices use letters, use the **English letter indicator** in front of the letter (even a, i, and o) in Nemeth Code.

- When problems or answer choices use letters followed by a period, use the **punctuation indicator** between the letter and the period.
- Use the **opening transcriber note symbol** and **closing transcriber note symbol** to provide braille readers with information that is not available to them.
- At the pre-kindergarten and kindergarten level, a **transcriber's note** only says "Ask." and begins in cell 1.
- At the first grade level use grade-appropriate language in a **transcriber's note** and begin the transcriber's note in cell 7 with run-overs beginning in cell 5.

Nemeth Code Switch Indicators

Math and science notation is transcribed into Nemeth Code or Nemeth-based Chemistry Code, as applicable, for students of all ages. The surrounding literary text is transcribed into Unified English Braille (BANA Guidance, 2018, p. 1).

The **opening Nemeth Code indicator** begins a math or science section. It takes two braille cells to write an opening Nemeth Code indicator. It is written with dots 4-5-6 in the first cell, followed by dots 1-4-6 in the second cell.

⠸⠩

The **Nemeth Code terminator** ends a math or science section. It takes two braille cells to write a Nemeth Code terminator. It is written with dots 4-5-6 in the first cell, followed by dots 1-5-6 in the second cell.

⠸⠱

Example 2.1 contains a first grade worksheet about expanded form. Nemeth Code switch indicators are used when transcribing this worksheet because of the math expressions $10+4$ and $60+8$. Let's look at how the worksheet in Example 2.1 is set up.

- The **title** (BANA term: centered heading) of the worksheet is centered. (See Chapter 1, p. 17 for a review of how to center a heading.)
- Remember, most materials for students in pre-kindergarten, kindergarten, and first grade are double-spaced. *Braille Formats* 1.7.2 recommends using "two blank lines wherever there is normally one blank line" when double-spacing for beginning readers. If the student seems to have difficulty with two blank lines, try putting one blank line after the centered heading as shown in Example 2.1.

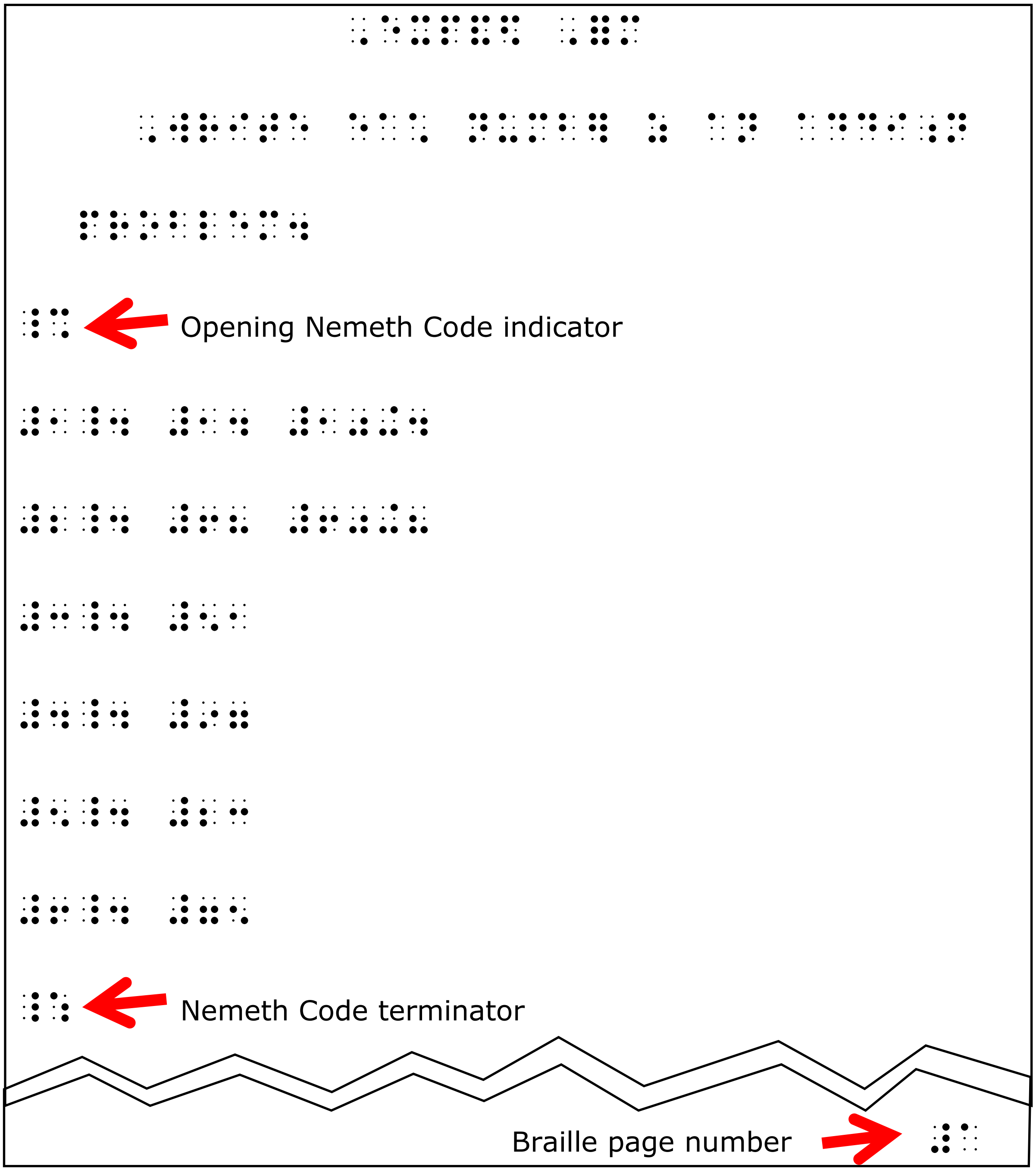
- The **directions** are literary material and should be transcribed into UEB. BANA uses the term **instructions** when referring to directions. Directions begin in cell 5 with runovers in cell 3. The formatting for these directions is based upon the math problems being numbered.
- In order to communicate that the braille reader is transitioning to math content, the **opening Nemeth Code indicator** is placed before the first numbered problem.
- The BANA guidance allows flexibility to transcribe the opening Nemeth Code indicator either at the end of the directions or on a line by itself. For young students, it may be easier for them to detect the opening Nemeth Code indicator on a line by itself.
- Numbered items that include numbers and math expressions are considered math content and are transcribed into Nemeth Code. BANA refers to material such as math problems as **exercise material**.
- Since consistency is so important for young students, in Example 2.1 the remaining numbered problems with only whole numbers were also transcribed into Nemeth Code. Plus, when students complete their assignment, they will need to put their entire assignment within Nemeth Code switch indicators because their answers will all contain math expressions (e.g. 50+1).
- Teachers have two options when using the **Nemeth Code terminator**. In the first option, the Nemeth Code terminator is placed one space after the math ends. In the second option, it is placed on the next line by itself. In Example 2.1, the second method is shown. This option was selected to ensure that the young student did not think that the Nemeth Code terminator was part of the math problem.
- The **braille page number** is on the last line of the braille page in the last cells of the line. (See Chapter 1, p. 19 for a review of how to transcribe braille page numbers.)

Example 2.1

Expanded Form

Write each number as an addition problem.

1. 14	$10+4$
2. 68	$60+8$
3. 51	
4. 97	
5. 23	
6. 75	


Opening Nemeth Code indicator
Nemeth Code terminator
Braille page number

Teacher Tip: When preparing material for a student at any grade level, consistency within the document is important. Teachers need to consider ways in which students will see materials on worksheets, in textbooks, and on assessments. It is important across time to expose students to multiple ways in which material may be prepared by those doing the transcription. At the same time, teachers should not distract students from the content they are learning by constantly “changing up” how material is presented in braille.

Example 2.2 contains sentences used within first grade math worksheets and shows the use of Nemeth Code switch indicators. An addition equation is included in a word problem.

Notice that a period follows the math equation. The period is not part of the math content, so the Nemeth Code terminator is placed directly after the math equation and before the period. There is a space before the Nemeth Code terminator. However, there is not a space between the Nemeth Code terminator and the period.

Example 2.2

Joe wrote $3+6=9$. Is he correct?

⠀⠀⠠⠚⠕⠑ ⠺⠗⠕⠞⠑ ⠸⠩ ⠼⠒⠬⠖ ⠨⠅ ⠼⠔ ⠸⠱⠲

⠠⠊⠎ ⠓⠑ ⠉⠕⠗⠗⠑⠉⠞⠦

The **single-word switch indicator** lets the person preparing braille materials put contractions in one word within a Nemeth Code expression without having to switch in and out of Nemeth Code. It takes two braille cells to write a single-word switch indicator. It is written with dot 6 in the first cell, followed by dot 3 in the second cell.

⠠⠄

Contractions are used in a word following a single-word switch indicator (BANA Guidance, 2018, p. 3). This Nemeth symbol should be used consistently throughout the entire document. This includes using the single-word switch indicator whether the word contains contractions or not (BANA Guidance, 2018, p. 3).

Example 2.3 contains 2 mathematical symbols within a sentence in the directions (BANA term: instructions) of a math worksheet. In the example, the opening Nemeth Code indicator is used before the + (plus sign) and a Nemeth Code terminator is used after the – (minus sign). The single-word switch indicator is used to signal that the “and” is transcribed in UEB.

Example 2.3

Watch the + and – signs!

⠠⠺⠁⠞⠡ ⠮ ⠸⠩ ⠬ ⠠⠄⠯ ⠤ ⠸⠱ ⠎⠊⠛⠝⠎⠖

Teaching tip: It is important that the student becomes familiar with the single-word switch indicator.

Example 2.4 contains three mathematical expressions embedded in a word problem. When commas separate items transcribed in Nemeth Code, use the mathematical comma (BANA Guidance, 2018, p. 3).

In addition, keep the math expressions and switch indicators on a single line if they will fit.

Example 2.4

How should Sunary and his classmates write nineteen minus three: 19 – 3 , 13 – 9 , or 9 – 3 ?

⠠⠓⠪ ⠩⠙ ⠠⠎⠥⠝⠜⠽ ⠯ ⠦ ⠉⠇⠁⠎⠎⠍⠁⠞⠑⠎

⠺⠗⠊⠞⠑ ⠝⠔⠑⠞⠑⠢ ⠍⠔⠥⠎ ⠹⠗⠑⠑⠒

⠸⠩ ⠼⠂⠔⠤⠒⠠ ⠼⠂⠒⠤⠔⠠ ⠠⠄⠕⠗ ⠼⠔⠤⠒ ⠸⠱⠦

Whole Numbers in Word Problems

Examples 2.1 through 2.4 required the use of Nemeth Code switch indicators because they included freestanding signs of operation, math expressions, or equations that were not part of word problems. Since Nemeth Code is only used to transcribe math and science notation such as math expressions and formulas, there are some math materials, especially for young students, that do not require Nemeth Code or Nemeth Code switch indicators.

In word problems, freestanding numbers such as 37 or 100 are not considered math notation. Therefore, Nemeth Code and Nemeth Code switch indicators are not used in word problems that only have whole numbers.

Example 2.5 does not use Nemeth Code and Nemeth Code switch indicators because only whole numbers are used within the word problem on the math worksheet (BANA Guidance, 2018, p. 2). No signs of operation, signs of comparison, math expressions, equations, formulas, or inequalities are contained in this word problem.

Example 2.5

Li read 20 pages in the morning. He read 10 pages less in the afternoon. How many pages did he read in the afternoon?

⠠⠇⠊ ⠗⠂⠙ ⠼⠃⠚ ⠏⠁⠛⠑⠎ ⠔ ⠮ ⠍⠕⠗⠝⠬⠲

⠠⠓⠑ ⠗⠂⠙ ⠼⠁⠚ ⠏⠁⠛⠑⠎ ⠇⠑⠎⠎ ⠔ ⠮ ⠁⠋⠝⠲

⠠⠓⠪ ⠸⠍ ⠏⠁⠛⠑⠎ ⠙⠊⠙ ⠓⠑ ⠗⠂⠙ ⠔ ⠮ ⠁⠋⠝⠦

Example 2.6 contains a kindergarten worksheet transcribed into UEB. Contractions and UEB numbers are used. Tactile graphics are not included since the pictures do not add meaning to the problem. The words "Brushing teeth" and "Sleeping" are adequate.

Example 2.6 (from Helping with Math website)

Brushing teeth

5 minutes or 1 hour

Sleeping

1 year or 8 hours

⠠⠃⠗⠥⠩⠬ ⠞⠑⠑⠹

⠼⠑ ⠍⠔⠥⠞⠑⠎ ⠕⠗ ⠼⠁ ⠓⠳⠗

⠠⠎⠇⠑⠑⠏⠬

⠼⠁ ⠽⠑⠜ ⠕⠗ ⠼⠓ ⠓⠳⠗⠎

Whenever teachers are preparing math materials for young students, they must carefully review the material to decide whether Nemeth Code or Nemeth Code switch indicators are required.

> **Teaching Tip for Nemeth Code Switch Indicators:** It may be helpful to teach young children to think of the opening Nemeth Code indicator as “start” or “begin math” and the Nemeth Code terminator as “stop” or “end math”.

As young children are learning about switch indicators, they may benefit from scanning math materials and locating the switch indicators before they begin their math assignment.

Practice 2.1

Interline the following first grade math review.

⠠⠎⠏⠊⠗⠁⠇ ⠠⠗⠑⠧⠊⠑⠺ ⠿ ⠠⠺⠑⠑⠅ ⠼⠊

⠠⠩⠪ ⠽⠗ ⠐⠺ ⠿ ⠮ ⠘⠺ ⠏⠗⠕⠃⠇⠑⠍⠎⠲

⠼⠁⠲ ⠠⠐⠮ ⠜⠑ ⠼⠛ ⠗⠫⠤⠑⠽⠫ ⠞⠗⠑⠑ ⠋⠗⠕⠛⠎

⠯ ⠼⠉ ⠺⠁⠭⠽ ⠍⠕⠝⠅⠑⠽ ⠋⠗⠕⠛⠎ ⠔ ⠮

⠗⠁⠔⠿⠑⠌⠲ ⠠⠓⠪ ⠸⠍ ⠋⠗⠕⠛⠎ ⠜⠑ ⠐⠮ ⠁⠇⠞

⠔ ⠮ ⠗⠁⠔⠿⠑⠌⠦

⠼⠃⠲ ⠠⠮ ⠋⠜⠍⠻ ⠓⠁⠎ ⠼⠑ ⠡⠊⠉⠅⠢⠎⠲ ⠠⠩⠑

⠛⠁⠧⠑ ⠼⠃ ⠡⠊⠉⠅⠢⠎ ⠞⠕ ⠓⠻ ⠝⠑⠊⠣⠃⠕⠗⠲

⠠⠓⠪ ⠸⠍ ⠡⠊⠉⠅⠢⠎ ⠙⠕⠑⠎ ⠩⠑ ⠓ ⠝⠪⠦

⠠⠺⠗⠊⠞⠑ ⠮ ⠌⠯⠜⠙ ⠿⠍ ⠷ ⠮ ⠝⠥⠍⠃⠻⠲

⠸⠩

⠼⠒⠸⠲ ⠼⠂⠴⠬⠶

⠼⠲⠸⠲ ⠼⠒⠴⠬⠆

⠼⠢⠸⠲ ⠼⠔⠴⠬⠢

⠸⠱

⠠⠗⠂⠙ ⠑⠁⠡ ⠑⠟⠥⠁⠰⠝ ⠉⠜⠑⠰⠇⠇⠽ ⠯ ⠮⠝

⠺⠗⠊⠞⠑ ⠮ ⠁⠝⠎⠺⠻⠲

⠸⠩

⠼⠖⠸⠲ ⠼⠒⠬⠶ ⠨⠅ ⠿

⠼⠶⠸⠲ ⠼⠔⠬⠂ ⠨⠅ ⠿

⠼⠦⠸⠲ ⠼⠢⠬⠔ ⠨⠅ ⠿

⠸⠱

Transcribe the following math problems for a student in kindergarten.

Sharpen Your Skills

1. Juan checked out 3 books from the library, and his sister, Maria, checked out 6 books. How many books did they check out altogether?

2. Anourack and his stepmother baked 2 cakes and 4 pies for the holiday. Which number sentence shows how many items they baked in total: $2+4$ or $4-2$?

3. Alexis has 8 pencils. She gives a pencil to her teacher. How many pencils does she have now?

Equations and Problems with Omissions

It is important that young students, including students who read and write in braille, can represent an unknown quantity in a math problem or equation in a variety of ways (Common Core State Standards Initiative, 2010).

The **general omission symbol** (Rule X, §57) represented with dots 1-2-3-4-5-6 was introduced in Chapter 1 on p. 8. You learned that the general omission symbol is used when a physical blank space is left in a problem. In addition, the general omission symbol is used when a question mark represents an omission.

The general omission symbol is spaced according to the rules for what it is representing (Rule X, §59).

Example 2.7 contains two problems that use the general omission symbol. The general omission symbol is representing an unknown sum in the math problems. In both problems there is a space between the general omission symbol and the equals sign since a space precedes and follows a sign of comparison.

Example 2.7

$8+2=$

⠼⠦⠬⠆ ⠨⠅ ⠿

$?=4+3$

⠿ ⠨⠅ ⠼⠲⠬⠒

The general omission symbol can be used anywhere in a math problem.

Example 2.8 contains the general omission symbol representing an unknown number. The general omission symbol immediately follows the minus sign because it represents the number 6. If the number 6 was written in the problem, there would be no space between it and the minus sign.

Example 2.8

$7 - ? = 1$

⠼⠶⠤⠿ ⠨⠅ ⠼⠂

> **Teaching Tip:** In subtraction problems the first number is the **minuend**, the second number is the **subtrahend**, and the answer is the **difference**.
>
> In the following example, the numbers being added together are the **addends** and the answer is the **sum**. These are terms used in the general education math curriculum, and it is important to reinforce them with your students.

Example 2.9 contains the general omission symbol representing an unknown number. The general omission symbol immediately precedes the plus sign because it represents the number 8. If the number 8 was written in the problem, there would be no space between it and the plus sign.

Example 2.9

$?+ 8 = 16$

⠿⠬⠦ ⠨⠅ ⠼⠂⠖

More than one general omission symbol may be used within a math problem, math expression, equation, or inequality.

Example 2.10 contains the general omission symbol representing two unknown addends.

Example 2.10

$? + ? = 7$

⠿⠬⠿ ⠨⠅ ⠼⠶

The general omission symbol can also be used to represent a missing sign of operation or comparison.

Examples 2.11 contains the general omission symbol representing an unknown sign of operation in two math problems. No space is used before or after the general omission symbol because it represents a plus sign in the first problem and a minus sign in the second problem. If instead of a question mark or blank, the plus sign or minus sign was written in Nemeth Code, there would be no space between the sign of operation and the numbers.

Example 2.11

3 ? 9 = 12

⠼⠒⠿⠔ ⠨⠅ ⠼⠂⠆

10 ? 5 = 5

⠼⠂⠴⠿⠢ ⠨⠅ ⠼⠢

Example 2.12 contains the general omission symbol representing an unknown sign of comparison in each problem. Also notice:

- The signs of comparison are listed within the directions (BANA term: instructions).
- Since the problems are numbered, the directions begin in cell 5 with runover in cell 3.
- The single-word switch indicator is used with the word "or" even though this word has no contractions.

Example 2.12

Insert <, >, or = for each item.

1. 13   15
2. 37   37
3. 89   88

⠠⠔⠎⠻⠞ ⠸⠩ ⠐⠅⠠ ⠨⠂⠠ ⠠⠄⠕⠗ ⠨⠅ ⠸⠱

⠿ ⠑⠁⠡ ⠊⠞⠑⠍⠲

⠸⠩

⠼⠂⠸⠲ ⠼⠂⠒ ⠿ ⠼⠂⠢

⠼⠆⠸⠲ ⠼⠒⠶ ⠿ ⠼⠒⠶

⠼⠒⠸⠲ ⠼⠦⠔ ⠿ ⠼⠦⠦

⠸⠱

In summary, the general omission symbol can be used anywhere in a math problem or equation. Therefore, spacing around the general omission symbol is the same spacing as would be used with what it replaces (Rule X, §59).

Practice 2.2

Select the correct transcription for each item and justify your response.

1. $10 \ ? \ 10 = 20$

   a. ⠼⠂⠴ ⠿ ⠼⠂⠴ ⠨⠅ ⠼⠆⠴

   b. ⠼⠂⠴⠿⠂⠴ ⠨⠅ ⠼⠆⠴

   c. ⠼⠂⠴⠿⠂⠴ ⠨⠅ ⠆⠴

2. $19 > ?$

   a. ⠼⠂⠔ ⠐⠅ ⠿

   b. ⠼⠂⠔⠨⠂⠿

   c. ⠼⠂⠔ ⠨⠂ ⠿

3. $? + ? = 16$

   a. ⠿⠬⠿ ⠨⠅ ⠼⠂⠖

   b. ⠿⠬⠿ ⠨⠅ ⠂⠖

   c. ⠿ ⠬ ⠿ ⠨⠅ ⠼⠂⠖

4. $8 - 1 =$

   a. ⠼⠦⠤⠂ ⠨⠅

   b. ⠼⠦⠬⠂ ⠨⠅ ⠿

   c. ⠼⠦⠤⠂ ⠨⠅ ⠿

5. 13 + 4 = ?

a. ⠼⠂⠒⠬⠲ ⠨⠅

b. ⠼⠂⠒⠬⠲ ⠨⠅ ⠿

c. ⠼⠂⠒ ⠬ ⠲ ⠨⠅ ⠿

Transcribe the following directions and math problems for a first grade student.

Write what is missing.

? − 5 = 3

2 − ? = 2

10 + 9 =

5 ? 8 = 13

4 + 2 ? 6

? − 7 = 3

Ellipsis

Sometimes the **ellipsis** is used to represent a missing number or series of numbers that follow a pattern in math. Similar to print, it takes a minimum of three braille cells to represent an ellipsis in Nemeth Code. An ellipsis is usually written using three cells of dot 3 (Rule VI, §43).

...

⠄⠄⠄

In general, there is a space before and after the ellipsis unless it is preceded or followed by a mathematical comma, punctuation except for the hyphen, braille indicators, symbols of grouping such as parentheses, and symbols for decimal, percent, money, and primes (Rule VI, §42).

Example 2.13 contains the ellipsis followed by a comma so there is not a space between the ellipsis and the comma.

Example 2.13

10, 20, 30, ..., 100

⠼⠂⠴⠠ ⠼⠆⠴⠠ ⠼⠒⠴⠠ ⠄⠄⠄⠠ ⠼⠂⠴⠴

16, 17, 18, ...

⠼⠂⠖⠠ ⠼⠂⠶⠠ ⠼⠂⠦⠠ ⠄⠄⠄

> **Teaching Tip:** It is very important that young students use the correct finger on each key when learning new Nemeth symbols. This will help students become accurate in their writing! Some students may need to be reminded to use their ring finger on their left hand (instead of their index finger) when writing an ellipsis.

Long Dash

In elementary level texts and worksheets, an element such as a number or a sign of operation is left out of a problem with the intent that the student will determine what goes in the "blank". In print, the “blank” is sometimes called a dash or a line. When a “blank” is used in print, the **long dash** (Rule VI, §42) is used in Nemeth Code. The long dash is represented by four cells of dots 3-6.

____

⠤⠤⠤⠤

Identical to the ellipsis, there is a space before and after the long dash unless it is preceded or followed by a mathematical comma, punctuation except for the hyphen, braille indicators, symbols of grouping such as parentheses, and symbols for decimal, percent, money, and primes (Rule VI, §42).

Example 2.14 contains two problems using the long dash. In the first problem the difference is the unknown, so the student will write the number 3. Notice that there is a space between the equals sign and the long dash. In the second problem, the sum is the unknown, so the student will write the number 12.

The long dash is always four cells of dots 3-6 regardless of the length of the print dash. Did you notice that the long dash is transcribed with four cells of dots 3-6 in the first problem even though the “blank” in print was longer than in the second problem?

Example 2.14

7 – 4 = _________

⠼⠶⠤⠲ ⠨⠅ ⠤⠤⠤⠤

8 + 3 + 1 = _____

⠼⠦⠬⠒⠬⠂ ⠨⠅ ⠤⠤⠤⠤

> **Teaching Tip:** When introducing the long dash to young students, coach them to read the long dash as “blank” or “what”.

The long dash can be used to represent an unknown sign of comparison.

Example 2.15 contains two problems using the long dash. In the first problem the long dash represents a greater than sign and in the second problem a less than sign.

Example 2.15

10 _____ 3

⠼⠂⠴ ⠤⠤⠤⠤ ⠼⠒

32 _____ 36

⠼⠒⠆ ⠤⠤⠤⠤ ⠼⠒⠖

> **Teaching Tip:** Young students often benefit from using base ten blocks, a Hundreds Chart, or a Counting to 120 Chart to determine the relationship between numbers in order to write the missing sign of comparison (greater than sign, less than sign, and/or equals sign).

The long dash can be used anywhere in a math problem, including at the beginning of the problem.

Example 2.16 contains two problems. In the first problem the minuend is the unknown, and in the second problem the addend is the unknown. When a long dash precedes or follows a sign of operation, a space is needed between the sign of operation and the long dash.

When a long dash is followed by a minus sign and a number, then the numeric indicator is used in front of the number that follows the minus sign because of the space after the long dash. The numeric indicator is not needed after a plus sign that follows a long dash (Rule II, §9a).

Notice that in the first problem, the problem begins with a long dash in cell 1. In addition, there is a space between the long dash and the minus sign.

In the second problem there is a space before and after the long dash, even when the long dash follows a plus sign.

Example 2.16

____ − 5 = 1

⠤⠤⠤⠤ ⠤⠼⠢ ⠨⠅ ⠼⠂

6 + ____ = 13

⠼⠖⠬ ⠤⠤⠤⠤ ⠨⠅ ⠼⠂⠒

Practice 2.3

Interline the following math problems which use different types of omissions.

⠼⠂⠲⠠ ⠼⠂⠢⠠ ⠼⠂⠖⠠ ⠄⠄⠄⠠ ⠼⠆⠴

⠼⠔⠔ ⠤⠤⠤⠤ ⠼⠔⠦

⠼⠖⠠ ⠼⠦⠠ ⠼⠂⠴⠠ ⠄⠄⠄

⠿ ⠨⠅ ⠼⠲⠬⠂

⠤⠤⠤⠤ ⠼⠴ ⠨⠅ ⠼⠴

⠼⠦⠬⠆ ⠨⠅ ⠤⠤⠤⠤

⠼⠂⠬ ⠤⠤⠤⠤ ⠨⠅ ⠼⠆

⠼⠒⠬⠿ ⠨⠅ ⠼⠂⠶

⠼⠲⠒ ⠤⠤⠤⠤ ⠼⠲⠔

Transcribe the following math problems.

1. 48 ____ 39
2. 7, 8, 9, ..., 15
3. 9 − 6 =
4. ____ − 5 = 0

5. 10 + 8 = ?

6. 76 _____ 43

7. 34, 44, 54, 64, ...

8. 14 − _____ = 5

9. ? + 3 = 19

10. _____ + 3 − 2 = 20

Shapes Used as Omissions

Shapes such as circles, triangles or rectangles are sometimes used in math materials to indicate a missing number, sign of operation, or sign of comparison. Although there are braille representations for shapes, do not use these until students are in fourth grade (*Tactile Graphics*, 11.2.4). Instead those preparing materials for pre-kindergarten, kindergarten, and first grade students should create simple and clear tactile graphics for the shapes.

Shapes can be created with a variety of materials such as tactile stickers, foam stickers, sequins, brass fasteners, reinforcement circles, textured paper, graphic art tape or Wikki Stix®. When selecting materials, think about what will be tactually distinct or appealing to the student.

The shape is placed approximately 1/4 inch away from the preceding and following braille characters (*Tactile Graphics,* 3.4.11.3). Items closer than 1/8 inch apart cannot be felt as being separate, so leaving a 1/8 to 1/4 inch space ensures that the shape will be tactually distinctive from the surrounding braille characters.

Example 2.17 contains two math problems. Each math problem contains a shape. These simple shapes can be made with graphic art tape, a tactile sticker, foam sticker, or textured paper.

Example 2.17

13 □ 14

⠼⠂⠒ ■ ⠼⠂⠲

19 − 2 = ○

⠼⠂⠔⠤⠆ ⠨⠅ ●

Some individuals preparing math materials for young students will use a general omission symbol if the shape does not appear to have a purpose.

However, carefully consider if there may be a purpose for including the actual shapes. For example, on a first grade worksheet, children might have problems where triangles are used in some and squares in others. After the children fill in all missing numbers (e.g., $2 + △ = 6$, $9 - 6 = □$) they may then be asked to tell what the triangles represent (e.g., even numbers) or have in common and what the squares represent or have in common (e.g., odd numbers). Thus, those preparing braille materials need to take care when substituting a general omission symbol for a shape symbol.

For all students, it is important to consider their preferences. Some students who read braille can see colors, and they may appreciate and benefit from having shapes with color. For students who do not see colors, you may choose not to indicate these if their purpose is not meaningful to the material.

Practice 2.4

Use a braillewriter to write the following math problems. Leave adequate room for each shape within the problem. Afterwards, use a variety of materials and create a simple tactile graphic for the circle, triangle, and square.

$5 + 5 = ○$

$13 - ○ = ◇$

$◇ + 4 = △$

The English Letter Indicator and Multiple Choice Questions

Sometimes in math, students of all ages are given **multiple choice questions** with answer choices. The answer choices are often labeled a, b, c, and d.

BANA has a fancy term for multiple choice problems in Nemeth Code — itemized material with subdivision. We are going to use the term multiple choice questions, but you should be aware of the BANA term when using BANA resources.

In Nemeth Code, the English letter indicator (Rule IV, §26) is used with single letter answer choice labels to assist the student in recognizing that the letters are standing alone and are not contractions. The **English letter indicator** is represented with the dots 5-6 which is the same dot configuration as the grade 1 symbol indicator in UEB.

Letters from the English alphabet used as answer choice labels are considered single letters when they are preceded by a space and followed by a space or a punctuation mark such as a period (Rule IV, §25).

In Nemeth Code, an English letter indicator (Rule IV, §25 and §26) is required before all single letters with certain exceptions to be discussed in later chapters. This includes the letters a, i, and o even though they do not have an associated contraction.

Example 2.18 is a multiple choice question with 3 answer choices. The question begins in cell 1 and the answer choices begin in cell 3 (Rule XXV, §191b*)*. The lowercase letters a-d are used as answer choice labels. Notice that an English letter indicator is used with each label, including the letter "a".

Although Example 2.18 was transcribed into Nemeth Code due to the age of the students just learning Nemeth Code, it would have also been correct to transcribe the answer choice labels and answers consisting of whole numbers into UEB.

Example 2.18

1. 5 + _____ = 9

a 3

b 4

c 5

⠼⠂⠸⠲ ⠼⠢⠬ ⠤⠤⠤⠤ ⠨⠅ ⠼⠔

⠀⠀⠰⠁ ⠼⠒

⠀⠀⠰⠃ ⠼⠲

⠀⠀⠰⠉ ⠼⠢

Sometimes letters used as answer choice labels are capitalized, and sometimes they are not. When the letter is capitalized, place the English letter indicator before the capitalization indicator. Each label begins with the English letter indicator and then the capitalization indicator.

For multiple choice questions, the question begins in cell 1 and the answer choices begin in cell 3 (Rule XXV, §191b*)*. If a second line is needed for the multiple choice question, it begins in cell 5 (Rule XXV, §191b*).*

The opening Nemeth Code indicator is placed in cell 3, directly above the answer choice labels (BANA Guidance, 2018, p. 10). Math problems that are in Nemeth Code and that are either numbered or lettered are transcribed in Nemeth Code even though the answer choice labels are not technically part of the math (BANA Guidance, 2018, p. 9-10).

For numbered math problems, the Nemeth Code terminator is placed on the line where the Nemeth Code ends (BANA Guidance, 2018, p. 9-10).

Example 2.19 contains a multiple choice problem where the answer choice labels are capitalized. The multiple choice question is transcribed in UEB, and the answer choices are transcribed in Nemeth Code. Notice that the Nemeth Code terminator was placed on the same line as the last answer choice.

Example 2.19

5. Which problem has a difference of 10?

A $5 + 5 =$

B $20 - 10 =$

C $10 - 5 =$

```
⠼⠑⠲ ⠠⠱ ⠏⠗⠕⠃⠇⠑⠍ ⠓⠁⠎ ⠁ ⠙⠊⠖⠻⠰⠑ ⠷ ⠼⠁⠚⠦

  ⠸⠩

  ⠰⠠⠁ ⠼⠢⠬⠢ ⠨⠅ ⠿

  ⠰⠠⠃ ⠼⠆⠴⠤⠂⠴ ⠨⠅ ⠿

  ⠰⠠⠉ ⠼⠂⠴⠤⠢ ⠨⠅ ⠿ ⠸⠱
```

Sometimes a period follows the letter in answer choice labels. A punctuation indicator (See Chapter 1) is used between the letter and the period.

Example 2.20 contains a multiple choice problem with answer choices that use periods in their labels. In the choices, the braille letters are followed by a punctuation indicator and period. Notice that the answer choices still begin in cell 3 even though they are placed at the left margin in print.

Example 2.20

3. 6 – _____ = 3

a. 3

b. 4

c. 5

⠼⠒⠸⠲ ⠼⠖⠤ ⠤⠤⠤⠤ ⠨⠅ ⠼⠒

⠰⠁⠸⠲ ⠼⠒

⠰⠃⠸⠲ ⠼⠲

⠰⠉⠸⠲ ⠼⠢

Practice 2.5

Interline the following multiple choice math problems.

⠠⠉⠊⠗⠉⠇⠑ ⠮ ⠉⠕⠗⠗⠑⠉⠞ ⠁⠝⠎⠺⠻⠲ ⠸⠩

⠼⠂⠸⠲ ⠼⠖⠬⠒ ⠨⠅ ⠤⠤⠤⠤

⠰⠁ ⠼⠦

⠰⠃ ⠼⠶

⠰⠉ ⠼⠔

⠼⠆⠸⠲ ⠼⠶⠤⠖ ⠨⠅ ⠤⠤⠤⠤

⠰⠁ ⠼⠲

⠰⠃ ⠼⠢

⠰⠉ ⠼⠂

⠼⠒⠸⠲ ⠼⠔⠤ ⠤⠤⠤⠤ ⠨⠅ ⠼⠦

⠰⠠⠁ ⠼⠴

⠰⠠⠃ ⠼⠂

⠰⠠⠉ ⠼⠆

⠰⠠⠙ ⠼⠒

⠼⠲⠸⠲ ⠤⠤⠤⠤ ⠬⠲ ⠨⠅ ⠼⠦

⠰⠁⠸⠲ ⠼⠖

⠰⠃⠸⠲ ⠼⠒

⠰⠉⠸⠲ ⠼⠲

⠼⠢⠸⠲ ⠼⠔⠤⠲ ⠨⠅ ⠤⠤⠤⠤

  ⠰⠠⠁⠸⠲ ⠼⠴

  ⠰⠠⠃⠸⠲ ⠼⠲

  ⠰⠠⠉⠸⠲ ⠼⠢ ⠸⠱

Transcribe the following multiple choice math problems.

1. $13 - 8 =$ ____
   a. 3
   b. 4
   c. 5
   d. 6
2. $19 - 2 =$ ____
   A. 13
   B. 15
   C. 17
   D. 16
3. 16 ____ 17
   A $<$
   B $>$
   C $=$
4. Susan had 8 stickers, but then she gave 3 to her friend. Which equation below could be used to find how many stickers she has left?
   a. $8 + 3 = 11$
   b. $8 - 3 = 5$
   c. $8 - 5 = 3$

Formatting Materials for Young Students

It is essential that teachers and others transcribe worksheets and other instructional materials according to the BANA guidelines. Consistent formatting leads to predictability for a student learning to read braille. This in turn leads to efficiency for the student. Placement of headings, page numbers, directions (BANA term: instructions), problems (BANA term: exercise material), and blank lines are key components of proper formatting.

Directions

Math materials often include directions (BANA term: instructions) and numbered problems (BANA term: exercise material).

- When directions precede numbered problems, they begin in cell 5 with runover lines beginning in cell 3 (BANA Guidance, 2018, p. 20).
- Numbered problems with no subdivisions, such as answer choices, begin in cell 1 with runover lines beginning in cell 3 (Rule XXV, §191a).
- Numbered problems with subdivisions, such as answer choices, begin in cell 1 with runover lines beginning in cell 5 (Rule XXV, §191b). The answer choices begin in cell 3 with runover lines in cell 5 (Rule XXV, §191b).

Sometimes math materials include directions (BANA term: instructions) with problems (BANA term: exercise material) that are not numbered.

- When directions precede unnumbered problems, the directions are formatted as a paragraph (BANA Guidance, 2018, p. 20). Begin in cell 3 with runover lines beginning in cell 1. A blank line is needed after the directions, and the unnumbered problems would begin in cell 1 with run-overs in cell 3.

Example 2.21 includes an exit ticket for a first grade classroom. Notice:

- The title is centered, and a blank line follows the title.
- The problems are not placed in boxes. With the exception of the third problem, all of the others have subdivisions.
- Consistency is especially important for young students so the numbering of the problems is in UEB. As recommended in the *BANA Guidance* document, it is desirable not to overdo switching in and out of Nemeth Code. This is especially true for young students.
- In the first problem, the UEB underscore is used to represent the blanks since they follow numbers written in word form.

- In the second problem the answer choice labels are transcribed in Nemeth Code since each answer choice contains an equation.
- In the last two problems, the long dash is used to represent the blanks in an equation written in Nemeth Code. It is important to follow print, so whenever a blank is used in math, a long dash is used in braille.
- The picture of the cookies has been ignored since it has been included simply for visual appeal.

Example 2.21

Day 8 Exit Ticket

1. Write the number for each number word: eighteen ____________________ ten _________________________ seventy-two _________________	3. $5 + 7 =$ _____
2. Tam makes 8 cookies, and his grandmother makes 8 cookies. How many cookies did they make altogether? a. $8 + 0 = 8$ b. $8 + 8 = 16$ c. $8 + 8 = 15$	4. 3 less than 10 _____ – _____ = _____

⠠⠐⠙ ⠼⠓ ⠠⠑⠭⠊⠞ ⠠⠞⠊⠉⠅⠑⠞

⠼⠁⠲ ⠠⠺⠗⠊⠞⠑ ⠮ ⠝⠥⠍⠃⠻ ⠿ ⠑⠁⠡ ⠝⠥⠍⠃⠻ ⠘⠺⠒

⠑⠊⠣⠞⠑⠢ ⠨⠤

⠞⠢ ⠨⠤

⠎⠑⠧⠢⠞⠽⠤⠞⠺⠕ ⠨⠤

⠼⠃⠲ ⠠⠞⠁⠍ ⠍⠁⠅⠑⠎ ⠼⠓ ⠉⠕⠕⠅⠊⠑⠎⠂ ⠯ ⠦

⠛⠗⠯⠐⠍ ⠍⠁⠅⠑⠎ ⠼⠓ ⠉⠕⠕⠅⠊⠑⠎⠲ ⠠⠓⠪

⠸⠍ ⠉⠕⠕⠅⠊⠑⠎ ⠙⠊⠙ ⠮⠽ ⠍⠁⠅⠑⠦

⠸⠩

⠰⠁⠸⠲ ⠼⠦⠬⠴ ⠨⠅ ⠼⠦

⠰⠃⠸⠲ ⠼⠦⠬⠦ ⠨⠅ ⠼⠂⠖

⠰⠉⠸⠲ ⠼⠦⠬⠦ ⠨⠅ ⠼⠂⠢ ⠸⠱

⠼⠉⠲ ⠸⠩ ⠼⠢⠬⠶ ⠨⠅ ⠤⠤⠤⠤ ⠸⠱

⠼⠙⠲ ⠼⠉ ⠇⠑⠎⠎ ⠹⠁⠝ ⠼⠁⠚ ⠸⠩

⠤⠤⠤⠤ ⠤ ⠤⠤⠤⠤ ⠨⠅ ⠤⠤⠤⠤ ⠸⠱

Special Considerations

When students are first learning Nemeth Code, they need many opportunities to practice reading and writing whole numbers. To give them practice, teachers may elect to use Nemeth numerals throughout all their math materials.

Placing the opening Nemeth Code indicators and Nemeth Code terminators on separate lines assists young students in easily identifying when they are beginning or ending math notation.

Pre-kindergarten and kindergarten students are sometimes given pictures of objects and asked to count them. There are several options for activities such as this.

1. Students can use manipulatives such as counting bears, base ten blocks, or Digi-blocks to complete these activities.
2. Teachers can provide tactile shapes (e.g., squares, circles) on their worksheets.
3. Although not recommended in *Tactile Graphics* for young students, teachers sometimes represent the number of shapes to be counted using a full braille cell or other braille configuration. If a teacher elects to use full braille cells, ensure that students have the tactile discrimination skills to understand the meaning.

When preparing materials for students in pre-kindergarten, kindergarten, and first grade, include a print Teacher’s Reference Page. This page may include different information, depending on who will be assisting the student in completing the activity. If a general education teacher, special education teacher, paraprofessional, volunteer, or family member will be assisting the student, use layperson terms and offer specific information about how the student can complete alternate activities, including what materials will be needed. Also offer brief descriptions for pictures that have been omitted and alternative instructions for completing activities (if any). This print document should help the individual to support the student in completing the assignment, gather models or materials, and know when the student may need their assistance.

If the person is familiar with the Nemeth Code, include information on the Teacher’s Reference Page about newly learned braille symbols that the student may need assistance with as well as a list of transcriber’s notes.

When a note about the format or alternate directions is needed within a braille transcription, include a transcriber’s note (*Braille Formats*, 3.1.1). These notes should be brief and use grade-level vocabulary and sentence structure (*Braille Formats*, 3.1.1).

Transcriber's notes begin with an opening transcriber’s note indicator. This symbol uses three braille cells. It is written with dot 4 in the first cell, followed by dots 4-6 in the second cell, and dots 1-2-6 in the third cell.

⠈⠨⠣

Transcriber’s notes end with a closing transcriber’s note indicator. This symbol uses three braille cells. It is written with dot 4 in the first cell, followed by dots 4-6 in the second cell, and dots 3-4-5 in the third cell (*Braille Formats*, 3.2.1).

⠈⠨⠜

Promising Practices includes information about how to format transcriber's notes for young students. Begin the transcriber's note in cell 1 for students in kindergarten. The notes are often limited to "Ask." For students in first grade, the transcriber's note begins in cell 7.

In the younger grades including a transcriber's note that says more than "Ask your teacher for help." is not recommended. When you prepare a problem and have changed the directions, write the directions in print on the braille transcription and/or on the Teacher Reference Page. This document enables an adult to more easily assist the student. Keep in mind however that the student still needs access to the print directions if the worksheet will be done in class with sighted peers.

Example 2.22 has two sample transcriber's notes. The first transcriber's note is for a kindergarten student. It begins in cell 1 and only includes the word "Ask". The second transcriber's note is for a first grade student. It begins in cell 7.

Example 2.22

⠈⠨⠣⠠⠁⠎⠅⠲⠈⠨⠜

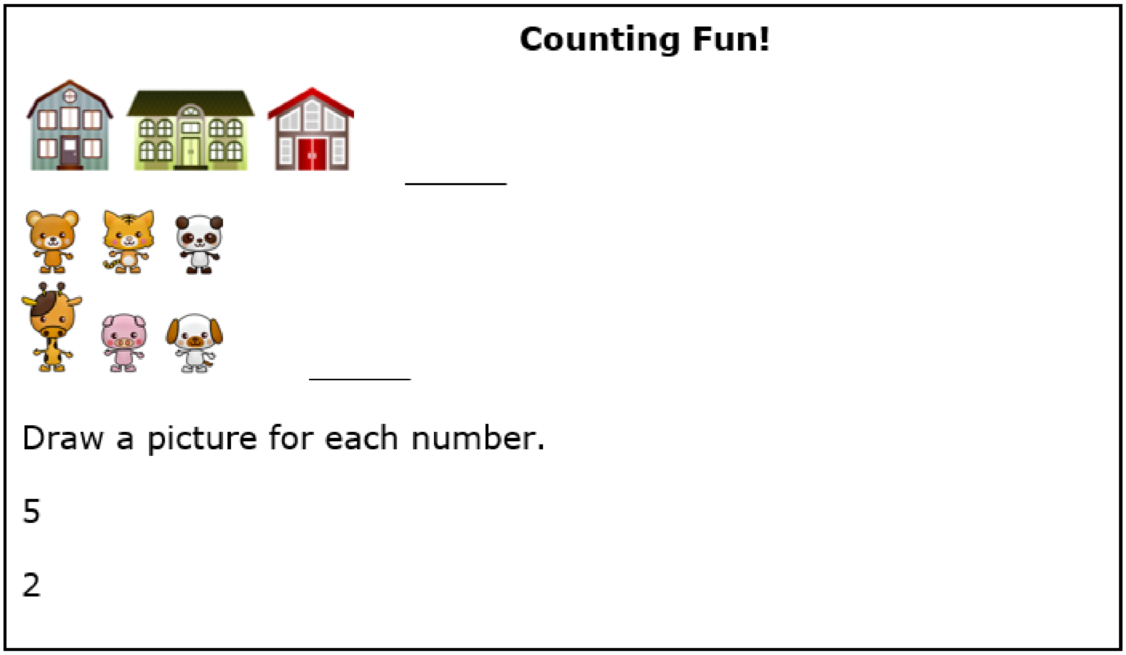
⠀⠀⠀⠀⠀⠀⠈⠨⠣⠠⠁⠎⠅⠀⠽⠗⠀⠞⠂⠡⠻⠀⠿⠀⠓⠑⠇⠏⠲⠈⠨⠜

Example 2.23 contains a worksheet for a kindergarten grade student in which a transcriber's note is used. Notice that:

- A title (BANA term: centered heading) is included at the top followed by a blank line.
- The opening Nemeth Code indicator is on a line by itself beginning in cell 1.
- The first two math problems (BANA term: exercise material) are not numbered so they begin in cell 1. Instead of including graphics of houses and animals, simple shapes have been used. Solid tactile shapes are used in the transcription. A solid raised shape is often easier for young students to identify and count than a tactile outline of a shape (*Tactile Graphics*, 11.4.3).
- After the second problem, the Nemeth Code terminator is used as the math has ended. It is placed on a line by itself in cell 1 so that the student will easily locate it.

- Next, the directions (BANA term: instructions) are in paragraph format. They begin in cell 3 with runover in cell 1. Paragraph formatting is used because the following problems are not numbered.
- After the directions, a transcriber's note with a single word (Ask.) is written. The transcriber's note is included so the student can be given verbal directions of what she will need to do. There are many options for the drawing activity. Students could use tactile art supplies to create a tactile picture for the numbers. They could also use foam stickers or counters. The students could also draw on tactile film, using the inTACT Sketchpad from E.A.S.Y. LLC or the DRAFTSMAN: Tactile Drawing Board from the American Printing House for the Blind. In addition, they could use base ten blocks to represent the numbers.
- Even though "5" and "2" are whole numbers and can be written in UEB, Nemeth numerals are used since the focus of the lesson is whole numbers. Therefore, notice the use of the Nemeth Code opening indicator and the Nemeth Code terminator. Since the problems are not numbered, the Nemeth switch indicators and the problems are treated as paragraphs and begin in cell 3. If there was a runover, it would be placed in cell 1.
- Also notice that the transcription ends with the Nemeth Code terminator. This symbol must be used to end math notation, even if the document concludes with a math item.

Example 2.23



Counting Fun!

______

______

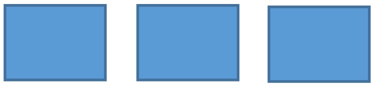
Draw a picture for each number.

5

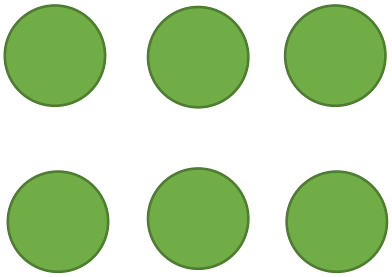
2

⠠⠉⠨⠞⠬ ⠠⠋⠥⠝⠖

⠸⠩



⠤⠤⠤⠤



⠤⠤⠤⠤

⠸⠱

⠠⠙⠗⠁⠺ ⠁ ⠏⠊⠉⠞⠥⠗⠑ ⠿ ⠑⠁⠡ ⠝⠥⠍⠃⠻⠲

⠈⠨⠣⠠⠁⠎⠅⠲⠈⠨⠜

⠸⠩

⠼⠢

⠼⠆

⠸⠱

A Teacher Reference Page should be included along with the braille document.

Example 2.24 contains two Teacher Reference Pages for the worksheet in the previous example. The first Teacher Reference Page is designed for a general education teacher, and the second Teacher Reference Page is designed for a paraprofessional who knows Nemeth Code.

The Teacher Reference Page for the paraprofessional includes the symbols for the opening and closing transcriber's note indicators as well as alternate directions for the last two problems. The braille symbols are listed in order of their use. The teacher is responsible for providing the alternate activity and introducing the student to new braille symbols, not the paraprofessional.

Example 2.24

Teacher Reference Page for the General Education Teacher

Instead of drawing, the student will use magnetic shapes and a metal cookie sheet to create a tactile picture for each number. I left the magnetic shape and cookie sheet in your mailbox in the teacher's workroom. The student practiced building numbers with the magnetic shapes and the cookie sheet with me yesterday. Email me if you have questions.

Teacher Reference Page for the Paraprofessional

Newly Introduced Braille Symbols

- Dots 4-5-6, dot 1-4-6 Opening Nemeth Code indicator
- Dots 4-5-6, dot 1-5-6 Nemeth Code terminator
- Dot 4, dots 4-6, dots 1-2-6 Opening transcriber's note symbol
- Dot 4, dots 4-6, dots 3-4-5 Closing transcriber's note symbol

Transcriber's Note Page

Page 1

Ask.

The student will use foam stickers to create a tactile picture for each number. The stickers are in a baggie in the student's cubby.

Collaboration with Paraprofessionals

An important role of a teacher of students with visual impairment is supporting paraprofessionals who work directly with young students. In addition to adapting materials, paraprofessionals are often responsible for reinforcing new concepts, providing access to visual information, and assisting students to participate in activities when plans change.

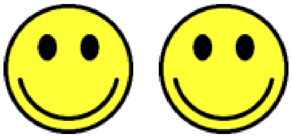
Teachers of students with visual impairment support paraprofessionals by:

- Explaining how braille documents should be formatted
- Providing braille materials that can be used as a model when adapting materials
- Offering specific recommendations for alternate activities and confirming that all materials are readily available
- Communicating when new concepts or braille symbols are taught and providing activities that the paraprofessional can use with the student to reinforce newly learned skills
- Being available to answer any questions that arise

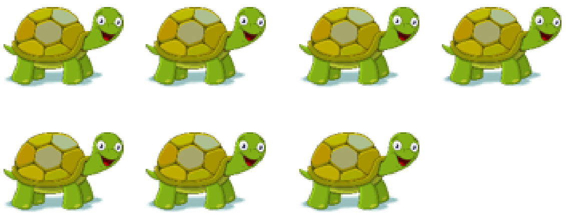
Practice 2.6

Transcribe the following math problems for a kindergarten student. Then create a Teacher Reference Page for the paraprofessional.

Use tally marks in the box to show how many are in each group. Then circle the correct number.



1 2 3 4



5 6 7 8 9

Additional Expectations for Students by the End of First Grade

By the time students complete first grade, they should be able to:

- Locate, identify, and write the Nemeth Code switch indicators
- Locate, read, and write the following Nemeth symbols:
    - General omission symbol
    - Ellipsis
    - Long dash
    - English letter indicator
- Solve a variety of addition and subtraction word problems with sums up to 20
- Determine the unknown number in an addition or subtraction equation that relates three whole numbers up to 20
- Scan, locate, and read centered headings, directions, numbered problems without answer choices, and numbered problems with answer choices
- Count, sort, or group simple tactile shapes to answer questions such as how many or which shapes are circles

Chapter Summary

Tips for Using Nemeth Code Switch Indicators

- Use Nemeth Code when transcribing all math and science notation (BANA Guidance, 2018, p. 1-2), including:
    - Parts of formulas
    - Expressions, equations, and/or inequalities
    - Signs of operation
    - Signs of comparison
- The opening Nemeth Code indicator is (*UEB Rulebook*, 14.6.2 and 14.6.3)
    - placed before the math material
    - followed by a space
    - placed before the sequence to which it applies, on a separate line, or at the end of the previous line of UEB text
- The Nemeth Code terminator is (*UEB Rulebook*, 14.6.2 and 14.6.3)
    - placed after the math material
    - preceded by a space
    - placed after the sequence to which it applies, on a separate line, or at the end of the previous line of math material

- Contractions are not used when transcribing math or science components in Nemeth Code (BANA Guidance, 2018, p. 3).
- A single-word switch indicator is used within Nemeth Code to signify that the next word is in UEB.
- Contractions are used in a word following a single-word switch indicator (BANA Guidance, 2018, p. 3).

Equations and Problems with Omissions

- Many signs, including shapes, question marks, and blanks, are used in print to indicate a missing number, sign of operation, or sign of comparison.
- Omission symbols (except the ellipsis) can be used anywhere in a math problem.
- Spacing around the general omission symbol is the same spacing as would be used with what it replaces (Rule X, §59).
- When a "blank" is used in print, the long dash (Rule VI, §42) must be used in Nemeth Code.
- Leave a space before and after the ellipsis and long dash unless it is preceded or followed by a mathematical comma, punctuation except for the hyphen, braille indicators, symbols of grouping such as parentheses, and symbols for decimal, percent, money, and primes (Rule VI, §42).
- Braille symbols for shapes cannot be used when transcribing materials for young students. Instead, create simple tactile graphics for shapes.

Guidelines for Transcribing Math Materials for Students in Pre-Kindergarten, Kindergarten, and First Grade

- Spacing
    - Double space throughout the braille transcription.
- Title (BANA term: centered heading)
    - Center the title of the worksheet or instructional material (*Braille Formats*, 4.2.1). Leave a blank line after a centered title.
    - For young students learning braille, it is recommended that two blank lines follow the centered heading (*Braille Formats*, 1.7.2).
- Set of Problems (BANA term: exercise materials)
    - Each set of problems, including the directions, is preceded and followed by a blank line (*Braille Formats*, 10.3.1).
    - When possible, place the directions and the associated set of problems on a single braille page (*Braille Formats*, 10.3.1).
    - If not possible, place at least one line of the directions on the same page as the problems (BANA Guidance, 2018, p. 20).

- Directions (BANA term: instructions)
    - When directions precede a set of numbered problems, they begin in cell 5 with runover lines beginning in cell 3 (BANA Guidance, 2018, p. 20).
    - When directions precede a set of unnumbered problems, they are formatted as a paragraph (BANA Guidance, 2018, p. 20). Begin in cell 3 with runover lines beginning in cell 1.
    - When problems are numbered, do not leave a blank line between the directions and the beginning of an exercise unless the exercise contains spatially aligned math problems, an example, or a displayed list of words (*Braille Formats*, 10.3.1).
    - However, when problems are not numbered, leave a blank line between the directions and the first problem.
- Numbered Problems (with no subdivisions such as answer choices)
    - Begin each problem in cell 1 (Rule XXV, §191a).
    - Begin runover lines of the problem in cell 3 (Rule XXV, §191a).
- Numbered Problems with subdivisions such as answer choices
    - Begin each problem in cell 1 (Rule XXV, §191b).
    - Begin runover lines of the problem in cell 5 (Rule XXV, §191b).
    - Begin subdivisions (such as answer choice labels) in cell 3, with runover lines beginning in cell 5 (Rule XXV, §191b).
    - Follow print for capitalization and punctuation of answer choice labels.

Chapter 2: Answer Key

Answer 2.1

Spiral Review for Week 9

Show your work for the word problems.

1. There are 7 red-eyed tree frogs and 3 waxy monkey frogs in the rainforest. How many frogs are there altogether in the rainforest?
2. The farmer has 9 chickens. She gave 2 chickens to her neighbor. How many chickens does she have now?

Write the standard form of the number.

3. $10 + 7$
4. $30 + 2$
5. $90 + 5$

Read each equation carefully and then write the answer.

6. $3 + 7 = ?$ or 6. $3 + 7 =$ (Both options are correct.)
7. $9 + 1 = ?$ or 7. $9 + 1 =$ (Both options are correct.)
8. $5 + 9 = ?$ or 8. $5 + 9 =$ (Both options are correct.)

⠠⠩⠜⠏⠢ ⠠⠽⠗ ⠠⠎⠅⠊⠇⠇⠎

⠼⠁⠲ ⠠⠚⠥⠁⠝ ⠡⠑⠉⠅⠫ ⠳ ⠼⠉ ⠃⠕⠕⠅⠎ ⠋ ⠮
⠇⠊⠃⠗⠜⠽⠂ ⠯ ⠦ ⠎⠊⠌⠻⠂ ⠠⠍⠜⠊⠁⠂ ⠡⠑⠉⠅⠫
⠳ ⠼⠋ ⠃⠕⠕⠅⠎⠲ ⠠⠓⠪ ⠸⠍ ⠃⠕⠕⠅⠎ ⠙⠊⠙
⠮⠽ ⠡⠑⠉⠅ ⠳ ⠁⠇⠞⠦

Answer 2.1 (continued)

⠼⠃⠲ ⠠⠁⠝⠳⠗⠁⠉⠅ ⠯ ⠦ ⠌⠑⠏⠐⠍ ⠃⠁⠅⠫ ⠼⠃

⠉⠁⠅⠑⠎ ⠯ ⠼⠙ ⠏⠊⠑⠎ ⠿ ⠮ ⠓⠕⠇⠊⠐⠙⠲ ⠠⠱

⠝⠥⠍⠃⠻ ⠎⠢⠞⠰⠑ ⠩⠪⠎ ⠓⠪ ⠸⠍ ⠊⠞⠑⠍⠎ ⠮⠽

⠃⠁⠅⠫ ⠔ ⠞⠕⠞⠁⠇⠒

⠸⠩ ⠼⠆⠬⠲ ⠠⠄⠕⠗ ⠼⠲⠤⠆ ⠸⠱⠦

⠼⠉⠲ ⠠⠁⠇⠑⠭⠊⠎ ⠓⠁⠎ ⠼⠓ ⠏⠢⠉⠊⠇⠎⠲ ⠠⠩⠑

⠛⠊⠧⠑⠎ ⠁ ⠏⠢⠉⠊⠇ ⠞⠕ ⠓⠻ ⠞⠂⠡⠻⠲ ⠠⠓⠪

⠸⠍ ⠏⠢⠉⠊⠇⠎ ⠙⠕⠑⠎ ⠩⠑ ⠓ ⠝⠪⠦

Answer 2.2

Select the correct transcription for each item and justify your response.

1. Answer choice b is correct. No space is used before or after the general omission symbol because it represents a plus sign, which is a sign of operation. A numeric indicator is used at the beginning of the linear problem and after the space that follows the equals sign. However, a numeric indicator is not used after the general omission symbol.

2. Answer choice c is correct. Since the greater than sign is a sign of comparison, there is a space before and after the symbol in braille. It takes two cells to write the greater than sign in braille. It is written with dots 4-6 in the first cell, followed by dot 2 in the second cell.

Answer 2.2 (continued)

3. Answer choice a is correct. No space is used before or after the plus sign because it is a sign of operation. A numeric indicator is used after the space that follows the equals sign.

4. Answer choice c is correct. The minus sign is represented by dots 3-6. When print leaves a blank space at the end of a problem, a general omission symbol would be used in Nemeth Code.

5. Answer choice b is correct. No space is used before or after the plus sign because it is a sign of operation. When print leaves a blank space at the end of a problem, a general omission symbol would be used in Nemeth Code.

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⠿⠤⠢ ⠨⠅ ⠼⠒

⠼⠆⠤⠿ ⠨⠅ ⠼⠴

⠼⠂⠴⠬⠔ ⠨⠅ ⠿

⠼⠢⠿⠦ ⠨⠅ ⠼⠂⠒

⠼⠲⠬⠆ ⠿ ⠼⠖

⠿⠤⠶ ⠨⠅ ⠼⠒

⠸⠱

Answer 2.3

14, 15, 16, ..., 20

99 _____ 98

6, 8, 10, ...

Answer 2.3 (continued)

? = 4 + 1 or   = 4 + 1 (Both options are correct.)

_____ + 0 = 0

8 + 2 = _____

1 + _____ = 2

3 + ? = 17 or 3 +   = 17 (Both options are correct.)

43 _____ 49

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⠼⠂⠸⠲ ⠼⠲⠦ ⠤⠤⠤⠤ ⠼⠒⠔

⠼⠆⠸⠲ ⠼⠶⠠ ⠼⠦⠠ ⠼⠔⠠ ⠄⠄⠄⠠ ⠼⠂⠢

⠼⠒⠸⠲ ⠼⠔⠤⠖ ⠨⠅ ⠿

⠼⠲⠸⠲ ⠤⠤⠤⠤ ⠤⠼⠢ ⠨⠅ ⠼⠴

⠼⠢⠸⠲ ⠼⠂⠴⠬⠦ ⠨⠅ ⠿

⠼⠖⠸⠲ ⠼⠶⠖ ⠤⠤⠤⠤ ⠼⠲⠒

⠼⠶⠸⠲ ⠼⠒⠲⠠ ⠼⠲⠲⠠ ⠼⠢⠲⠠ ⠼⠖⠲⠠ ⠄⠄⠄

⠼⠦⠸⠲ ⠼⠂⠲⠤ ⠤⠤⠤⠤ ⠨⠅ ⠼⠢

⠼⠔⠸⠲ ⠿⠬⠒ ⠨⠅ ⠼⠂⠔

⠼⠂⠴⠸⠲ ⠤⠤⠤⠤ ⠬⠒⠤⠆ ⠨⠅ ⠼⠆⠴ ⠸⠱

Answer 2.4

⠸⠩

⠼⠢⠼⠢ ⠨⠅ ●

⠼⠂⠒⠤● ⠨⠅ ◆

◆ ⠬⠲ ⠨⠅ ▲

⠸⠱

Note: *Some students who read braille can see colors, and they may appreciate and benefit from having shapes with color. For students who do not see colors, you may choose not to indicate the color of the shapes if their purpose is not meaningful to the material.*

Answer 2.5

Circle the correct answer.

1. 6 + 3 = _____

   a 8

   b 7

   c 9

2. 7 – 6 = _____

   a 4

   b 5

   c 1

Answer 2.5 (continued)

3. 9 – _____ = 8

A 0

B 1

C 2

D 3

4. _____+ 4 = 8

a. 6

b. 3

c. 4

5. 9 – 4 = _____

A. 0

B. 4

C. 5

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⠼⠂⠸⠲ ⠼⠂⠒⠤⠦ ⠨⠅ ⠤⠤⠤⠤

⠰⠁⠸⠲ ⠼⠒

⠰⠃⠸⠲ ⠼⠲

⠰⠉⠸⠲ ⠼⠢

⠰⠙⠸⠲ ⠼⠖

Answer 2.5 (continued)

⠼⠆⠸⠲ ⠼⠂⠔⠤⠆ ⠨⠅ ⠤⠤⠤⠤

⠰⠠⠁⠸⠲ ⠼⠂⠒

⠰⠠⠃⠸⠲ ⠼⠂⠢

⠰⠠⠉⠸⠲ ⠼⠂⠶

⠰⠠⠙⠸⠲ ⠼⠂⠖

⠼⠒⠸⠲ ⠼⠂⠖ ⠤⠤⠤⠤ ⠼⠂⠶

⠰⠠⠁ ⠐⠅

⠰⠠⠃ ⠨⠂

⠰⠠⠉ ⠨⠅ ⠸⠱

Answer 2.5 (continued)

⠼⠙⠲ ⠠⠎⠥⠎⠁⠝ ⠸⠓ ⠼⠓ ⠌⠊⠉⠅⠻⠎⠂ ⠃ ⠮⠝ ⠩⠑

⠛⠁⠧⠑ ⠼⠉ ⠞⠕ ⠓⠻ ⠋⠗⠲ ⠠⠱ ⠑⠟⠥⠁⠰⠝

⠆⠇ ⠉⠙ ⠆ ⠥⠎⠫ ⠞⠕ ⠋⠔⠙ ⠓⠪ ⠸⠍

⠌⠊⠉⠅⠻⠎ ⠩⠑ ⠓⠁⠎ ⠇⠑⠋⠞⠦

⠸⠩

⠰⠁⠸⠲ ⠼⠦⠬⠒ ⠨⠅ ⠼⠂⠂

⠰⠃⠸⠲ ⠼⠦⠤⠒ ⠨⠅ ⠼⠢

⠰⠉⠸⠲ ⠼⠦⠤⠢ ⠨⠅ ⠼⠒ ⠸⠱

Answer 2.6

⠠⠥⠎⠑ ⠞⠁⠇⠇⠽ ⠍⠜⠅⠎ ⠔ ⠮ ⠃⠕⠭ ⠞⠕

⠩⠪ ⠓⠪ ⠸⠍ ⠜⠑ ⠔ ⠑⠁⠡ ⠛⠗⠳⠏⠲ ⠠⠮⠝

⠉⠊⠗⠉⠇⠑ ⠮ ⠉⠕⠗⠗⠑⠉⠞ ⠝⠥⠍⠃⠻⠲

⠈⠨⠣⠠⠁⠎⠅⠲⠈⠨⠜

Answer 2.6 (continued)

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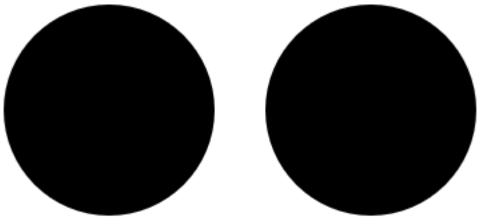

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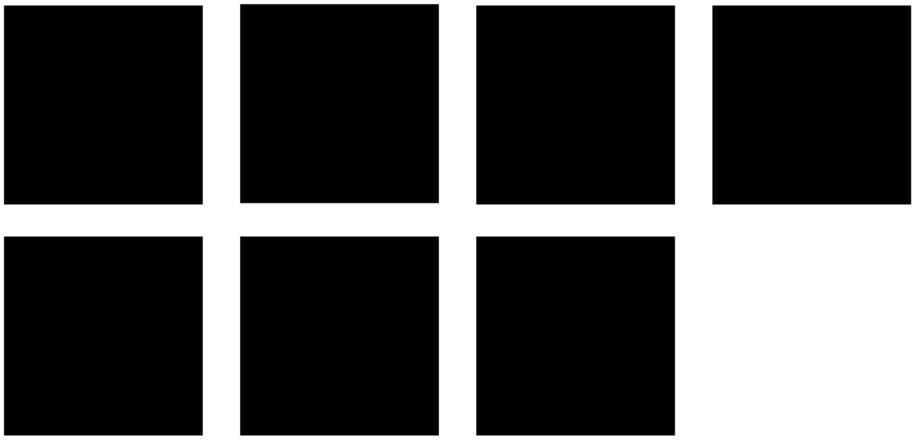

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