

Nemeth Code for Math and Science

“Best of” Ask An Expert

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NATIONAL BRAILLE ASSOCIATION

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Introduction

In this workshop we will study seven questions from the more than 850 topics in the [Nemeth Code for Math and Science forum](#) of NBA’s Ask an Expert service.

Our goals are 1) to display how instructive the Ask an Expert archive can be, 2) to use the examples here as gateways to discussions of key concepts for using the Nemeth Code, 3) to have fun working some puzzles from Ask an Expert questions.

This workshop has been prepared according to *Braille Formats: Principles of Print-to-Braille Transcription, 2016*; the *Braille Code for Chemical Notation, 1997*, including the *Provisional Guidance for Chemistry Notation Using Nemeth in UEB Contexts*; and *The Nemeth Braille Code for Mathematics and Science Notation, 1972 Revision, 2007-2015 Updates* including the *Guidance for Transcription Using the Nemeth Code within UEB Contexts*.

In commentary, *The Nemeth Braille Code for Mathematics and Science Notation, 1972 Revision, 2007-2015 Updates* may be referred to as “NC,” and the *Guidance for Transcription Using the Nemeth Code within UEB Contexts* (Approved April 2018) may be referred to as “the Guidance.”

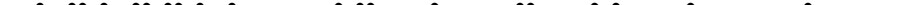
In this workshop, text taken from questions and responses posted to the Ask an Expert forum are not always quoted in full. This editing was done with the goal of making the question and response more clear.


This workshop does not replace or supersede any BANA publication.



Can I use a single-word switch indicator for a word right after an opening grouping sign?

Is this the correct use of single word switch indicator, or does Nemeth need to be terminated then reopened? I am unsure because of the opening parenthesis.

1 

2 

So, the answer to the question of "Can I use a single-word switch indicator for a word immediately following an opening grouping sign?" is "Yes." And, if you do use a single-word switch indicator for a word immediately following an opening grouping sign then the closing grouping sign should be preceded by Nemeth Code material and so also be in Nemeth Code (as it is in your attachment).

A single-word switch indicator may be placed between an opening Nemeth Code grouping symbol and a word (or hyphenated word).

Figure 1 displays four rows of 10x10 grids, each containing a different pattern of black dots. The rows are labeled 1 through 4 on the left. Row 1 contains 15 dots. Row 2 contains 30 dots. Row 3 contains 25 dots. Row 4 contains 35 dots. The dots are arranged in various clusters and lines across the grids.

Line 4: The closing parenthesis is transcribed in Nemeth Code, unspaced from the end of the material that it encloses. Then, Nemeth Code is terminated before the sentence-ending punctuation.



If the material enclosed in grouping symbols ends with word(s) that are transcribed in UEB, then the closing grouping symbol should be in UEB and the opening grouping symbol should be, too.

Thus, if a closing grouping symbol will be in UEB, then before its paired opening parenthesis, we must close Nemeth Code and reopen it where necessary. This puts both grouping symbols in UEB.

The upper incomplete gamma function is $\Gamma(s, x) = \int_x^\infty t^{s-1} e^{-t} dt$ (whereas, $\gamma(s, x) = \int_0^x t^{s-1} e^{-t} dt$ is the lower incomplete gamma function).

Figure 1 displays a 5x10 grid of 50 small 2D plots, arranged in 5 rows and 10 columns. Each plot shows a different stage of a process, likely a simulation or experiment, involving a set of points (dots) in a 2D space. The rows are labeled 1 to 5 on the left, and the columns are labeled 1 to 10 on the top. The plots show a progression of patterns, with some rows (e.g., row 1) showing a sequence of points that form a line or curve, and other rows (e.g., row 2) showing more complex, interconnected structures. The patterns evolve from simple clusters in the early stages to more complex, interconnected structures in later stages.

Lines 2 & 4: The whole equation and its Nemeth Code switch indicators fit all on one braille line, so they are all on one braille line.

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Does a Nemeth Code switch indicator have to be on the same print page as its enclosed material?

Question – [Switch indicators at page turns](#)

There is some confusion regarding the placement of Nemeth Code Switch indicators at **Print page** turns.

...

Question: Should the opening Nemeth Code indicator remain as is, or should it be moved to the **print page (816)** to which the mathematical material it applies to **and** where the Closing Nemeth Code indicator is located?

We use the volume formula to determine the amount of cubic feet added to the house.

new print page

$$V = l \times w \times h$$

$$V = 15 \text{ ft} \times 12 \text{ ft} \times 10 \text{ ft}$$

$$V = 1800 \text{ cu. ft}$$

So we know ...





How would I transcribe g/mol (an abbreviation in Chemistry)?



Even when it is not paired with a number that includes a decimal, the abbreviation “g/mol” should be transcribed in Nemeth Code. This is because the slash in g/mol indicates division (i.e., it means “per”). (#1 under **Basic Guidance on When to Switch** in the *Guidance*)

The mole was defined in such a way that the molar mass of a compound in g/mol is numerically equal (for all practical purposes) to the average mass of one molecule in daltons. Thus, for example, the average mass of a molecule of water is about 18.0153 daltons, and the molar mass of water is about 18.0153 g/mol.

Figure 1 displays a 10x10 grid of 100 small 10x10 grids, each containing a different 100-dot pattern. The patterns are arranged in a grid where the first 10 rows show a progression of patterns, and the last 10 rows show a different progression. The patterns are composed of black dots on a white background.

Line 1: In a UEB with Nemeth transcription, all paragraphs are indented, even if they are blocked in print. (#3 under **Formatting** in the *Guidance*)

Line 2: The expression with a slash meaning “per” (i.e., g/mol) is transcribed within Nemeth Code switch indicators.

Line 7: The **unabbreviated** measurement unit “daltons” is not included in the Nemeth Code switch indicators that are required for its associated decimal. (**#5** under **Additional Guidelines** in the *Guidance*)

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How would I transcribe \mathbb{R} and similar letters?

Question – [Sets of numbers – R, N, Z](#)

How do you represent sets of numbers in braille - R, N, Z? I think it is what you called a double struck R.

We can also define Cartesian products of three or more sets by moving beyond ordered pairs. An **ordered triple** is a list (x, y, z) . The Cartesian product of the three sets \mathbb{R} , \mathbb{N} and \mathbb{Z} is $\mathbb{R} \times \mathbb{N} \times \mathbb{Z} = \{(x, y, z): x \in \mathbb{R}, y \in \mathbb{N}, z \in \mathbb{Z}\}$. Of course there is no reason to stop with ordered triples. In general, ...



Formatting and Indentions

Should I align equals symbols as in print?

Question – [aligning steps to an equation](#)

Under exercise 32, next to the word solution ... In Nemeth, do we align the problem like this in print (how the equal signs line up), or do we start each step of the problem in the same cell, different lines?

32. *Mathematical Reasoning* Justify each step in the solution of the system of equations.

$$\begin{aligned}x + y &= 19 \\ x &= 5 + y\end{aligned}$$

Solution: $5 + y + y = 19$	_____
$5 + 2y = 19$	_____
$2y = 14$	_____
$y = 7$	_____
$x = 5 + 7 = 12$	_____

Response

Left justify each step of the demonstrated solution.

1
$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$

2
$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$

3

4
$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$

5
$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$

6

7
$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$

8
$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$

9
$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$

10
$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$

11
$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$

12
$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$

13
$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$

14
$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$

15
$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$

Lines 11-15: Each step is a full equation, with material before *and* after the symbol of comparison, so this is not a linked expression requiring special margins. (NC §189.b.iii) That is why the equals symbols are not aligned in braille.

Lines 1-2: The question is formatted as a one-level item, so it starts in cell 1 with runovers in cell 3. (NC §191.a)

Lines 3 & 6: Spatial material is preceded and followed by a blank line, and the blank lines are within the Nemeth Code switch indicators. (**#9.b** under **Additional Guidelines** in the *Guidance*)

Line 11: "Solution" is treated as an additional paragraph and so is formatted in 5-3.

Lines 12-16: The transcriber chose to treat the equations that show the steps in solving for the variables as math expressions displayed to text that is formatted in 5-3, so they are formatted starting in cell 5. [If there were any runovers, they would be in cell 7.] (NC §191.a and **#7** under **Formatting** in the *Guidance*)



When the equals signs (or other comparison sign) are part of a layout that meets the Nemeth Code criteria for a “linked expression requiring special margins,” then the required format makes it so the equals symbols are brailled aligned.

```
preceding text ...

12\frac{1}{2}\% = 12.5\%

= .125

= \frac{125}{1000} = \frac{1}{8}

text following ...
```

The criteria for a linked expression requiring special margins are:

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$$\begin{aligned} 8x^3 + 125y^3 &= (2x)^3 + (5y)^3 \\ &= (2x + 5y)[(2x)^2 - (2x)(5y) + (5y)^2] \\ &= (2x + 5y)(4x^2 - 10xy + 25y^2). \end{aligned}$$

That is how the example is transcribed in the Nemeth Code book.

Logical Division for Lines 5-6 of This Additional Opposite Example

This division of the next-to-last link keeps together on a braille line the “logical unit” that is the material enclosed in square brackets.

How would I transcribe Pascal's triangle?

Question – [Pascal's Triangle](#)

Can you please provide the provisional rule for transcribing the Pascal's Triangle for UEB with Nemeth, if there is NO provisional rule please provide past code reference with an example.

Pascal's triangle	<p>If you arrange the values of ${}_nC_r$ in a triangular pattern in which each row corresponds to a value of n, you get what is called Pascal's triangle.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> $\begin{array}{c} {}_0C_0 \\ {}_1C_0 \quad {}_1C_1 \\ {}_2C_0 \quad {}_2C_1 \quad {}_2C_2 \\ {}_3C_0 \quad {}_3C_1 \quad {}_3C_2 \quad {}_3C_3 \\ {}_4C_0 \quad {}_4C_1 \quad {}_4C_2 \quad {}_4C_3 \quad {}_4C_4 \end{array}$ </div> <div style="text-align: center;"> $\begin{array}{c} 1 \\ 1 \quad 1 \\ 1 \quad 2 \quad 1 \\ 1 \quad 3 \quad 3 \quad 1 \\ 1 \quad 4 \quad 6 \quad 4 \quad 1 \end{array}$ </div> </div>
-------------------	--

Response

We can point to no rules that specifically address Pascal's triangle.

If possible, it would be appropriate to follow print's triangular layout of a representation of Pascal's triangle. The content of the triangle determines which code (Nemeth or UEB) will be used.

Since we're talking about a transcription using Nemeth within UEB, in your sample of print, the triangle made up of C's with subscripts must be transcribed in Nemeth Code, and the triangle made up of whole unmodified numbers may be transcribed in Nemeth Code or in UEB.

Attached is a BRF with both triangles from your sample print transcribed, with the longest row (i.e., the base) of the triangle beginning in cell 1 and each smaller row centered relative to the row below it.

Lines 7-11 & 15-19: Two blank cells are inserted between the expressions or numbers so as to more closely reproduce the shape of the printed layout. Each line is centered based on the number of cells required for the line immediately below it.

Lines 15-19: The triangle made up of simple, unmodified numbers we chose to transcribe in UEB both because no part of it requires Nemeth Code and because we expect that UEB material follows after it. We chose to use individual numeric indicators (instead of a numeric passage) so as to make the single-digit numbers easier to read.

Line 12: A blank line follows a spatial arrangement, and that blank line is in Nemeth Code (i.e., it precedes the Nemeth Code terminator). (#9.b under **Additional Guidelines** of the *Guidance*)

Line 14: A blank line precedes the spatially arranged numbers.



Closing Words

Thank you! Without your thoughtful questions, this collection could not exist.

As always, NBA's [Ask an Expert](#) is open 24/7. Here's to another decade of learning from and helping each other!

End of the material for
"Best of" Ask An Expert (Nemeth Code)