

REPORT OF THE BANA TASK FORCE ON CONCURRENT USE OF UEB AND NEMETH CODE

September 6, 2012

1. INTRODUCTION

1.1 By teleconference in July 2012, the Board of the Braille Authority of North America (BANA) adopted a motion that "in response to the resolutions adopted by the 2012 conventions of the National Federation of the Blind and the American Council of the Blind, BANA create a task force to draft a concept paper dealing with issues related to the concurrent use of UEB and Nemeth Code." Within a few weeks of the passage of that motion, this Task Force was appointed by the BANA Chair and asked to prepare the concept paper named in it; this report is that paper.

1.2 The resolutions named in the motion basically called for BANA to consider adoption of the rules and symbols of UEB for use in literary or non-technical material while in general continuing to use the Nemeth code in the production of material to which Nemeth currently applies. The discussion at the BANA Board teleconference made clear that the scope of our work as a task force is to identify code-related issues that would need to be considered if such a path were pursued, and to propose possible solutions for handling the challenges. We are meant to do so in "concept" form rather than trying to finalize every solution at this point, that is to provide as much guidance as possible on broader questions while avoiding getting bogged down on any particular issue.

1.3 Based upon that context as well as the literal wording of the motion, this task force interpreted its charge as looking forward to the ways and means by which UEB and Nemeth Code would be used concurrently, rather than somehow blended into a single "super-unified" code.

1.4 As also implicit in that charge, the recommendations of this paper are meant to apply to circumstances in which UEB has come to be the code used for general transcription purposes, should BANA decide to move in that direction. While we recognize that BANA would need to incorporate provisions for a transitional period, where current BANA codes would continue to be used, into any practical implementation plan for UEB, these recommendations are not meant to apply to such a transitional period, but rather to long-term needs.

1.5 In light of the above, this task force, meeting by email list and conference calls, considered two primary questions, i.e.: (1) by what means it would be possible for UEB and Nemeth Code to coexist, and (2) in a world in which the two codes coexist, in what context each should be used. We reached general consensus as given below.

2. FINDINGS AND RECOMMENDATIONS REGARDING UEB AND NEMETH CODE

2.1 How Can UEB and Nemeth Code Coexist?

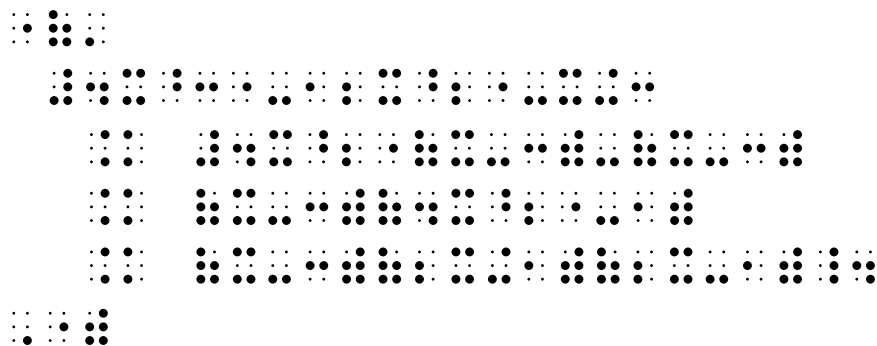
2.1.1 The task force noted that Nemeth Code (i.e. the 1972 standard as maintained and updated, including the Chemistry Code) is characterized by two distinct "modes," one intended for actual math and related technical notation, and the other for surrounding English-language text. While mentioned explicitly with respect to punctuation in Nemeth rule 36, these modes also affect such matters as capitalization and emphasis, as implied in other rules. Most noticeably, English contractions are not used in math mode though they are generally used, albeit with some special restrictions, in the surrounding-text mode. In any event, by means of these two modes, Nemeth Code provides a way for math and related scientific notation and general text to coexist in the same document.

2.1.2 UEB provides general "switching" mechanisms by which codes other than UEB, including Nemeth Code as well as foreign languages, music, etc., may be incorporated into a general UEB context without ambiguity. Examples of switching into Nemeth Code are included in a pending (recently approved though not yet published) update to the UEB Rulebook. In the following example excerpted from the rulebook, the first and last indicators are the opening and closing non-UEB passage indicators. Although these indicators can currently be used in UEB for entering and exiting Nemeth code, specific Nemeth indicators which use fewer cells are proposed later in this paper.

Solution. Again we group the first two terms and the last two terms.

$$\begin{aligned}
 4x^3 - 12x^2 - x + 3 &= 4x^2(x - 3) - (x - 3) \\
 &= (x - 3)(4x^2 - 1) \\
 &= (x - 3)(2x + 1)(2x - 1).
 \end{aligned}$$

The image shows the algebraic solution from the previous block rendered in Braille. It consists of two lines of Braille characters. The first line contains the expression $4x^3 - 12x^2 - x + 3 = 4x^2(x - 3) - (x - 3)$. The second line contains the simplified forms $= (x - 3)(4x^2 - 1)$ and $= (x - 3)(2x + 1)(2x - 1)$.



2.1.3 These mechanisms therefore provide two possible means by which math in Nemeth Code and general text in UEB can coexist in the same document. Of these two possibilities, this task force recommends that Nemeth code be used for the actual math or technical notation, and UEB be used for the surrounding text. Our observations and reasons for this recommendation are detailed in sections 2.1.4-2.1.8.

2.1.4 When people say they are accustomed to Nemeth code for math, they are virtually always speaking of the math mode, not the surrounding-text mode. This is clear from the examples brought forward to oppose the adoption of UEB, which are generally drawn from secondary-school or college level algebra, calculus, or chemical formulas with little or no notice of surrounding text. This makes sense because Nemeth Code (math mode) is naturally designed with its primary focus on algebraic notation (in the general sense, which includes related "higher" notation such as differential equations), especially when letters (as opposed to words) are used as variables. In such math notation, Nemeth code provides single-cell representations for common mathematical signs and structures such as the plus sign, indices, and radical and fraction boundaries. It also takes advantage of the relative scarcity of punctuation marks in such notation and uses lower signs for digits, thus reducing the number of indicators that might otherwise be needed when digits and letters are juxtaposed. Consequently, algebraic math notation with single-letter variables typically takes fewer cells to express in Nemeth math mode than in codes such as UEB that are designed with a broader focus.

Nemeth math mode is also relatively unambiguous in representing the salient content of that kind of notation. (There is a well-known exception in that the lowercase Greek kappa and the equals sign have the same representation, but that is seldom a practical difficulty in most algebraic math, probably because the kappa so closely resembles a lowercase Latin k that it takes extra effort to make the distinction in common forms of print, especially handwriting on a blackboard. There is a listing of the accepted uses of the kappa in the online Wikipedia article on "Greek letters used in

mathematics, science, and engineering"; all of the listed uses are relatively narrow and infrequently encountered in math generally.)

These features -- compactness without loss of clarity in math -- are the primary strengths of Nemeth Code and what people are seeking to preserve in situations where intense immersion in math notation is envisioned.

2.1.5 By contrast, the provisions in Nemeth Code for surrounding text are focused not so much on compactness nor clarity but rather are intended to adapt the then-current North American literary code (i.e. English Braille American Edition [EBAE]) for the somewhat specialized needs of English-language text surrounding math notation, while preserving most of the literary provisions, including most contractions in most circumstances. While this focus is relevant to EBAE readers, it would not be particularly relevant to future UEB readers.

2.1.6. One reason for not continuing to use the Nemeth provisions for surrounding text is that they can lead to ambiguous braille -- even beyond cases (e.g. those related to short-forms) that could be considered as inherited from EBAE. For example, the use of the Nemeth math parentheses, which normally stand for "of" and "with" in a literary context, can create ambiguities, not all of which are corrected by Nemeth rule 55e. For instance, "forthwith" and "forth)" are identical in Nemeth surrounding-text mode. While a human reader would very likely be able to utilize context to sort out which meaning is intended, such ambiguities can impact those users who compose material in braille and who rely upon automated conversion to produce print for sighted teachers, students or colleagues.

2.1.7 A second problem for Nemeth surrounding-text mode is that, as in EBAE and Nemeth math mode, computer notation cannot be accurately represented. This was the reason that it was necessary to develop CBC in the mid-1980s. Thus it would be necessary to switch to CBC or UEB when sample computer programs or similar inclusions of computer notation, even ordinary URLs, were encountered in otherwise math-oriented material.

2.1.8 The third reason for not continuing to use the Nemeth surrounding-text mode after general adoption of UEB is that it would constitute a step back to an earlier literary standard that has been supplanted, which would be at least detrimental and potentially confusing to readers. The differences between EBAE and UEB include the nine discontinued contractions in UEB and affect such things as capitalization and emphasis. The extent of numeric mode, and the usage rules for short-forms as well as certain symbols such as brackets are also impacted. While the thought might come to mind that UEB could be modified similarly to the way that EBAE is modified in current

Nemeth surrounding-text mode, e.g. substituting Nemeth-style parentheses, etc., such an idea was judged impractical because the cascading changes that would be necessary to produce a clear code would be so numerous, even if they could be worked out, that the result would be so far afield from either UEB or Nemeth Code that it would be impossible to integrate Nemeth Code into UEB. Let each code be used concurrently, rather than trying to modify either one to somehow suit the other.

2.1.9 If UEB is used as the primary code according to this recommendation, there remains the question as to whether "switching" between UEB and Nemeth should be formal and explicit, as presented in the UEB Rulebook, or by using some other method. The task force considered three possibilities:

2.1.10 The first possibility is to omit any explicit switches, simply using Nemeth code (math mode) as applicable and UEB for all else. This minimizes cell count, is consistent with the way that the two modes of Nemeth Code are presently used, and is probably suitable for many human readers who would be familiar with both UEB and Nemeth (math mode) and the general subject matter. It does mean that many expressions would be formally ambiguous, and there is a chance that such ambiguity could sometimes be confusing even for human readers. For example, "rings" ⠠⠠⠠⠠ and "r+s" ⠠⠠⠠⠠ would appear the same in such mixed braille (as they currently do in Nemeth Code), but as noted above, such ambiguities are usually sorted out easily enough by experienced readers.

2.1.11 The second possibility would be to incorporate an unobtrusive clue which would alert the human reader to when a code change occurs e.g. two spaces instead of one when such a code change would take place inline, and a skipped line to accommodate displayed expressions (as in current CBC). Such a provision would not eliminate the formal ambiguity problem entirely, but it could prove useful for some readers, especially for those just getting into a subject area.

2.1.12 The third possibility would be to provide for an explicit switch at each change. While probably overkill in cases where a transcription is intended only for human consumption (as are most), it would certainly be necessary to provide for switches when a user is preparing mixed-code braille that is intended to be converted to print by automated means. The existing general-purpose switch that UEB provides is rather cumbersome for frequent use since it is at least three cells long. If Nemeth Code is to be used commonly as an adjunct code to UEB, then it would be possible to assign specific and unambiguous two-cell switches for this purpose. We noted that the begin- and end-Nemeth Code symbols from CBC, i.e. dots 456-146 and

456-156 respectively, would be suitable not only in terms of BANA history (as they are also referenced in the current Formats Guidelines) but also available given current UEB and Nemeth code assignments. (Dots 456-146 has no current meaning in UEB and therefore could be used in UEB to signal the beginning of a Nemeth code passage. Likewise, 456-156 has no current meaning in Nemeth math mode and could be used within Nemeth code to indicate a switch back from Nemeth to UEB.) As has been the case with previous requests, such as for the assignment of the copyright symbol, we expect that the ICEB UEB maintenance committee will be receptive to a request from BANA to reserve assignment of the 456-146 symbol as a "begin Nemeth Code" indicator.

2.2 In What Contexts Should Each Code be Used?

2.2.1 We agreed that this is a very broad question, the answer to which could not be fully developed by this task force because it involves such matters as educational philosophy and personal preference that will require consultation and experience over a possibly lengthy period of time. Our general recommendation to BANA, therefore, is to avoid being overly prescriptive, even though some guidelines will no doubt need to be developed as part of any UEB implementation plan.

2.2.2 Concerns were raised, however, that any guidelines would need to ensure that students' school work would be transcribed in the same code that would be used for brailleing their tests -- especially high-stakes tests, which may be produced by an entirely separate entity from that which produces the school work.

3. DISCUSSION REGARDING FUTURE ROLE FOR COMPUTER BRAILLE CODE

3.1 Although not directly mentioned in the charges, we also briefly considered the possible continued use of BANA's Computer Braille Code (CBC) for certain transcriptions of computer notation. Some task force participants noted that, within its target domain of notation, CBC holds, at least in theory, special advantages that essentially parallel those of Nemeth Code within algebraic math, and therefore BANA might want to contemplate its continued use in some special circumstances. After discussion, this task force agreed that there is no particular need to take any action regarding CBC even if UEB is adopted. Programmers who wish to do so can of course use CBC for their purposes regardless of its "official" status, as it is a well-defined and mature code that has changed little since its original development. There would probably be no need for a standing BANA CBC

committee, as the only issues that have come to that committee's attention in recent years have involved the interaction between CBC and literary code for surrounding context, e.g. the use or non-use of the CBC continuation indicator.

4. SUMMARY OF FINDINGS AND RECOMMENDATIONS

- The use of Nemeth Code with UEB should be relatively straightforward. The recommendations in this paper are meant to apply to long-term needs rather than to any transition period which may be necessary as part of an implementation plan.
- When Nemeth Code is to be used for mathematics, the actual math (and technical notation) should be presented in Nemeth code, while the surrounding text should be presented in UEB.
- Three viable possibilities exist for moving between mathematical expressions and their surrounding text:
 - 1) Use no formal switch mechanism as is the case in the current Nemeth code;
 - 2) use multiple spaces or line breaks to signal the switch; or
 - 3) use explicit indicators such as dots 456-146 as a "begin-Nemeth" indicator and dots 456-156 to return to UEB.
- The matter of when to use which codes is a broad question which will need to be answered as part of the larger implementation plan. BANA should avoid being overly prescriptive but develop guidelines that ensure that, for example, students' schoolwork will be transcribed in the same manner as their tests.

Respectfully submitted,

The BANA Task Force on Concurrent use of UEB and Nemeth Code:

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(This report was accepted by the board of the Braille Authority of North America on September 10, 2012).