

CTEBVI 2023 Workshop 202

Producing Braille Math with the Duxbury Braille Translator

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All files used in this workshop and other sample files can be found in
http://www.duxburysystems.org/downloads/print_to_ueb_with_math.zip

Introduction

We are here to talk about producing post-EBAE braille math with DBT as either UEB with Nemeth or UEB with UEB Math/Science.

Resources

- (UEB with Nemeth) The document *Guidance for Transcription Using the Nemeth Code within UEB Contexts*: The current version (at this point the version approved in April 2018), available for download on the BANA website at:
<http://www.brailleauthority.org/nemeth-code>
- (UEB with Nemeth) Provisional Lessons for the NLS Nemeth Transcription Certification Program (files still being updated), available at: <https://nfb.org/programs-services/braille-certification/mathematics-braille-transcribing>
- (UEB with UEB Math/Science) *Guidelines For Technical Material--2014*, available at: <http://www.iceb.org/ueb.html#GTM>

We will spend more time on UEB with Nemeth because it has more complications.

There are quite a few ways to enter math for producing braille math with DBT.

Data Entry Methods

1. Enter math in DBT itself.
2. Use MathType as a Word add-in to create math in a BANA template Word document to open in DBT.
3. Use Office math shortcuts to enter math as **Office Math Markup Language** (OMML) equations. Then use MathType to convert the OMML equations to MathType equations.
4. Use math shortcuts to enter math as OMML equations without converting them to MathType equations.
5. Use a tool that imports math into Word as OMML. These include MathPix and EquatIO.
6. Enter math in Word without using MathType or creating OMML equations.
7. Use a LaTeX editor to create a .tex file to open in DBT.

8. Work with a TeX or LaTeX file created in other ways, e.g., created in a different math word processor (perhaps by the professor), created from math OCR with InftyReader or MathPix, etc.

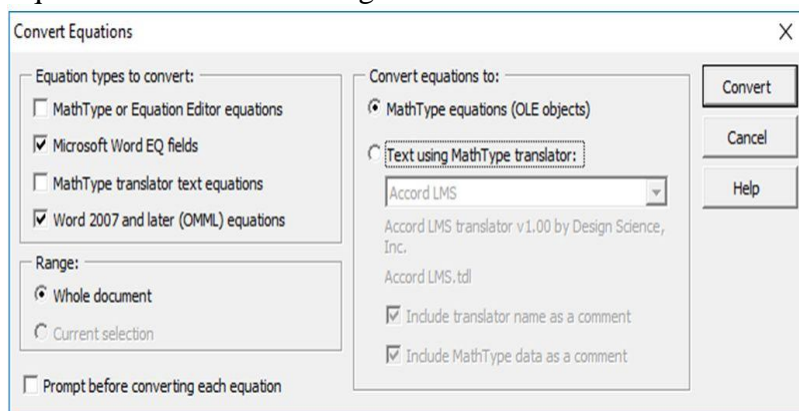
Comments on These Data Entry Methods

Each numbered comment refers to the data entry method above with the same number:

1. DBT does not offer an extensive array of tools to help you with direct math entry.
2. The BANA Braille Word Template helps to improve braille formatting. MathType provides math data entry and editing tools and a sighted-friendly view of the math.
3. Using Office math shortcuts and converting from OMML to MathType has the advantages of using MathType but makes data entry more accessible. The accessible data entry method is to press Alt+= to start a math expression and then use appropriate shortcuts for entering the math notation. For information on this method of data entry, consult any of the documents at the links below:
 - o http://www.chem.mtu.edu/~tbco/cm416/EquationEditor_main.pdf (a comprehensive document)
 - o <https://mathiho.sitehost.iu.edu/doc/equation-editor-shortcut-commands.pdf> (a cheat sheet)

As an example, in Word 2007 or higher, press Alt+= and type $(\sqrt{x^2 + 1})/2$. Then press space to get out of the math entry box. You can also left click or press Control+RightArrow to get out of the math entry box.

To convert from this format of OMML equations, go to MathType, Format Equations, Convert Equations and use the dialog as shown below.



[Caption: Convert from OMML equations is checked, and convert to MathType equations is checked.]

[Note: There are also occasions to check the option Convert MathType or Equation Editor equations, for example if data entry was done in the pre-Word 2007 Equation Editor, or if the data entry was done on a different platform (Mac vs. Windows).]

In case the starting file has OMML equations, start by converting from OMML to MathType. Use the instructions for items 2 and 3 as appropriate.

1. Starting with DBT 12.5, DBT can directly import OMML equations. However, Duxbury Systems has not announced this yet because it is not fully tested. Using DBT to import the OMML equations directly can mean you do not have to pay a yearly license fee for MathType. However, we need to make sure that this works well first.
2. When using EquatIO, use the option "Copy MathML." Do not use "Insert math." With MathPix, you can also convert an entire .pdf file with math to a .docx file with OMML equations.
3. Entering math directly in Word, when normal keyboard entry is sufficient. This works better than you might expect in simple situations. If you are working with DBT 12.4 or higher, insert the code for technical notation start at the start of each segment of math notation and the code for technical notation end at the end of it; apply the style Uncontracted to any problem label within the segment.
4. Scientific Notebook is no longer available for purchase but is still popular. The maker, MackKichan Software, has made Scientific Word 6.1 available for free. With LaTeX there are not as many tools for formatting the braille as when working with Word and the BANA template. Starting with DBT 12.2 (and improved later), importing from LaTeX has a nice bonus for UEB with Nemeth: automatic placement of important styles, avoiding extra Nemeth switch indicators.
5. LaTeX files from professors or from InftyReader are very nice when available. This happens most often in a college setting.

Transcribers often prefer using Word with MathType and the Word BANA Braille template. It is fine to use Equation Editor 2007 or higher and convert to MathType. For help with identifying the nature of embedded objects in Word, you can use the **Go To** command. Press Control+G and then Shift+Tab to select what kind of object to go to. Choosing **equation** will take you to MathType equations but not to OMML equations. Choosing **picture** can help to identify math equations that are just embedded graphics. In general, the **Go To** command can help to locate items that need transcriber attention, such as pictures, tables, and footnotes. There are also interesting data entry tips at https://docs.wiris.com/en/mathtype/mathtype_desktop/tips/tips_word#advanced_techniques_for_adding_equations_and_symbols_to_word_documents.

Together, MathType and the BANA template give you good tools for creating and displaying the math and for getting the desired BANA format. MathType is fairly inexpensive, especially for schools. Some schools already have multi-user licenses for other purposes.

The Currently Recommended Tool Set in Spring 2023

1. A recent version of Duxbury DBT.
2. The current version of SWIFT, SWIFT 5.5, works with DBT 12.2 SR1 and above.
3. MS Word (2007 or above)
4. The current version of the BANA Braille template for Word, now BANA Braille 2017
5. Mathtype

Comments

1. Duxbury Systems is currently shipping DBT 12.6 SR2.
 2. SWIFT 5.5 is a free product from Duxbury Systems released in July 2020, to work with DBT 12.2 SR1 or higher. Install SWIFT 5.5 from <http://www.duxburysystems.com/swift.asp>
 3. Microsoft Word is available from many sources.
 4. The BANA Braille 2017 template is supplied with DBT; SWIFT 5.5 makes it easy to attach this Word template to your Word documents.
 5. MathType is available from WIRIS at <https://store.wiris.com/en/products/mathtype/download>. Design Science, which created MathType, joined forces with the Spanish company Wiris in 2018. MathType has a yearly subscription pricing structure. Note that if you are using MathType version 7.0 or higher with DBT, you need to use DBT 12.3 or higher. DBT 12.2 or below works with MathType through version 6.9 but not with 7.0 or higher. Looking backward, the old Microsoft Equation Editor 3.0 built into Word prior to Word 2007, kept in Microsoft Word for backward compatibility, was removed from Word by Microsoft updates on January 9, 2018, due to a security flaw. However, MathType can still handle equations created with Equation Editor 3.0.
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The Basics for UEB with Nemeth

Whichever method you use to create files for producing UEB with Nemeth, it is important that you use the DBT template called **English (UEB) - BANA with Nemeth**. As of DBT 12.5, there are five styles in this template that provide the machinery for UEB with Nemeth. The five styles are:

- math
- math-TextInMath
- math-separation
- math-NLE
- OneWordBridge

The style **math** is for technical notation. Each segment in the math style in this DBT template appears in braille as Nemeth Code with the start and end Nemeth indicators around it, spaced $\mathbf{::}$ and $\mathbf{::}$ (dots 456, 146 and dots 456, 156).

Starting in DBT 12.5, the style **math-TextInMath** is intended only for embedded text in a math expression. In braille, the style math-TextInMath does not add any start or end Nemeth indicators. The braille for the math-TextInMath style in this DBT template is in Nemeth context, with Nemeth digits, literary punctuation, Nemeth grouping signs, etc. It uses no contractions.

The new style **math-separation** is for short segments with up to one word, between math expressions. We used to use the style math-TextInMath for these "separation sections" between

technical notation as well. But we came to realize that embedded text within technical notation needs to be treated a little differently from this. The style `math-separation` does not add any Nemeth switch indicators. In this style digits are Nemeth digits, letters are preceded by the English letter indicator, and punctuation is generally preceded by the punctuation indicator, with the exception that the comma is dot 6 with no punctuation indicator. In both the `math-TextInMath` and the `math-separation` styles, capitalized words use a double dot 6.

The style **math-NLE**, like the style **math** is for technical notation. The NLE stands for "new line end." The only difference from the style **math** is that the braille in this style ends with the end Nemeth indicator at the start of the next line, in the current indent position, with no extra space before it. I used to overuse this style to line up the end Nemeth switch indicator with the problem labels. However, the rules say that "in general, switch indicators are kept on the same line as the mathematics to which they apply. Exceptions occur with certain displayed material, itemized material, lists, spatial material, and tables." The math-NLE style is appropriate for an end Nemeth switch that follows a Nemeth table or Spatial or displayed Nemeth.

The style **OneWordBridge** is intended for one word separating two segments of technical notation. In braille, the word appears in UEB with unspaced `..` (dots 6, 3 – the one-word switch indicator – before it).

To understand the basics, let's start with working entirely in DBT, without using Microsoft Word, MathType, or Scientific Notebook. To apply a style in DBT, highlight some text, press **F8**, and select the correct DBT style from the list.

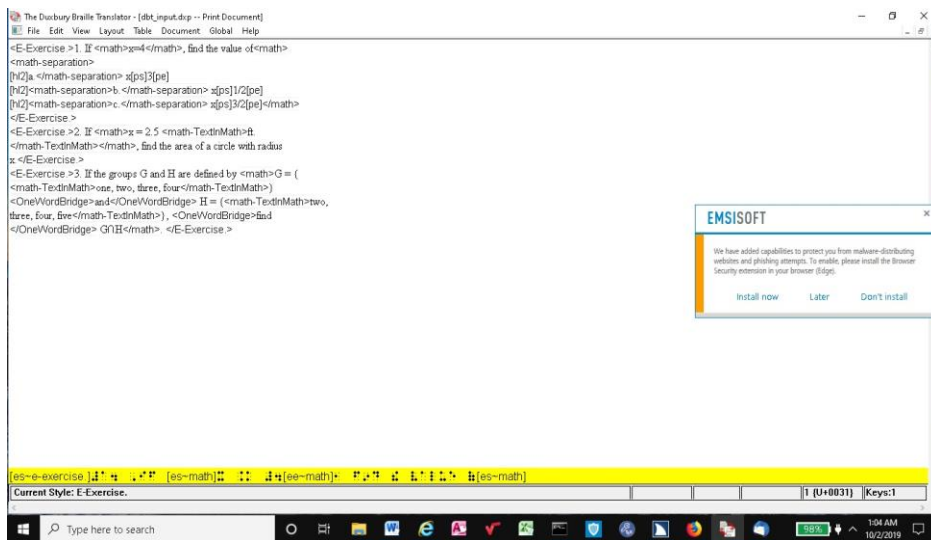
The number 12 followed by period can appear in braille in three different forms in this template.

- In UEB, outside of math style: $\cdot \cdot \cdot$
- In math style: $\cdot \cdot \cdot$
- In math-separation style within math style: $\cdot \cdot \cdot$

As examples of the OneWordBridge style,

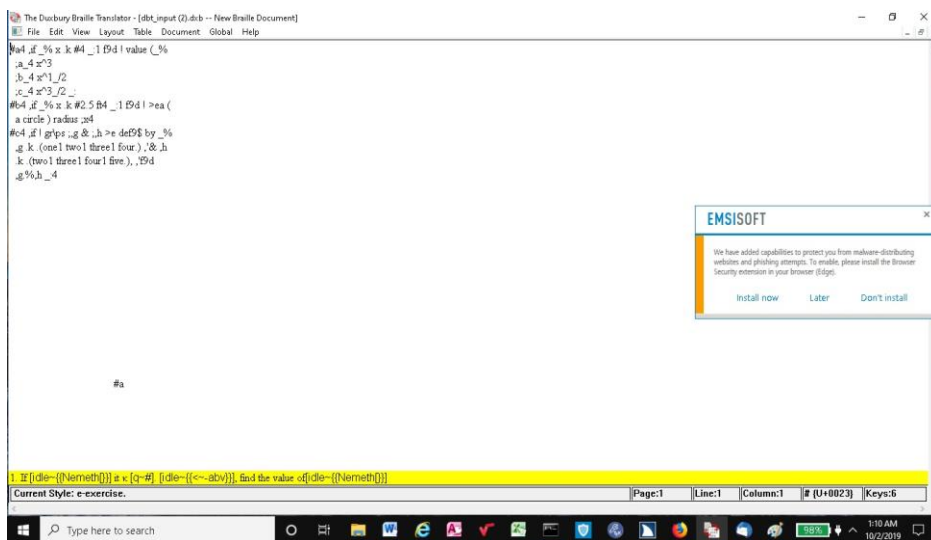
- the word "and" appears as: .. ::
- the word "or" appears as: .. ::, and
- and the word "then" appears as: .. ::.

In the file below I entered an exercise in DBT. Since the answer choices are entirely technical notation, I entered them all with one use of the math style. Within that use of the math style I applied the style math-separation to the letter plus the period in all three labels.



[Caption: See the file dbt_input.dxp.]

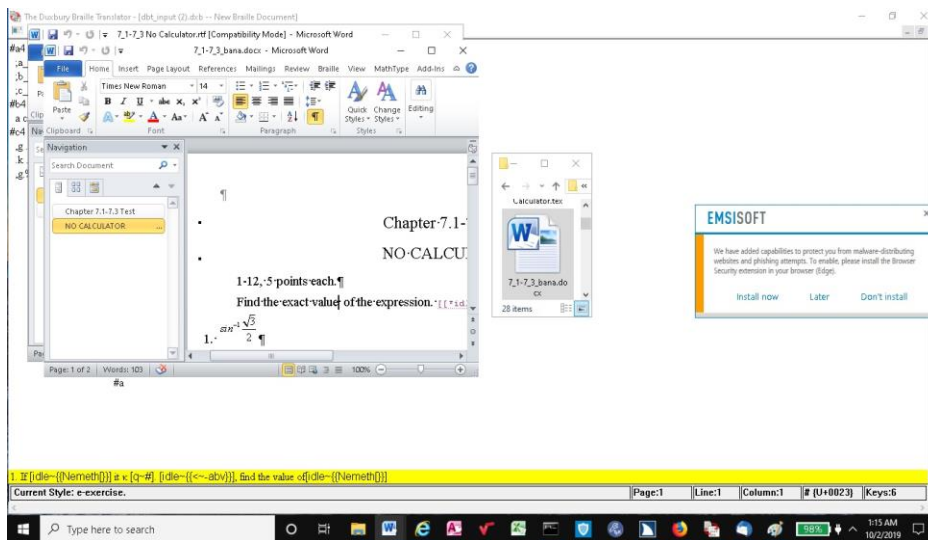
Translation gives the resulting .dxb file below.



[Caption: See the file dbt_input.dxb.]

Now we switch gears to doing data entry in Word. If you do not have SWIFT installed, install it before doing data entry in Word for creating UEB with Nemeth.

An Example in Word



[Caption: See the file 7_1-7_3_bana.docx.]

Any MathType object automatically creates the math style in DBT, and any use of MathType's text style within an object automatically creates the style math-TextInMath in DBT.

To create this file, I started with an online practice test file. It already had MathType equations. I added the BANA template, adjusted the styles, etc.

Each MathType object will create a separate use of the math style, with its own use of the start and end Nemeth indicators. To avoid that, create a **technical chain** in Word around the desired MathType objects, by inserting special start and end tags. In the BANA Braille 2017 template for Word, the buttons for starting and ending a technical chain are called **Technical Chain Start** and **Technical Chain End**.

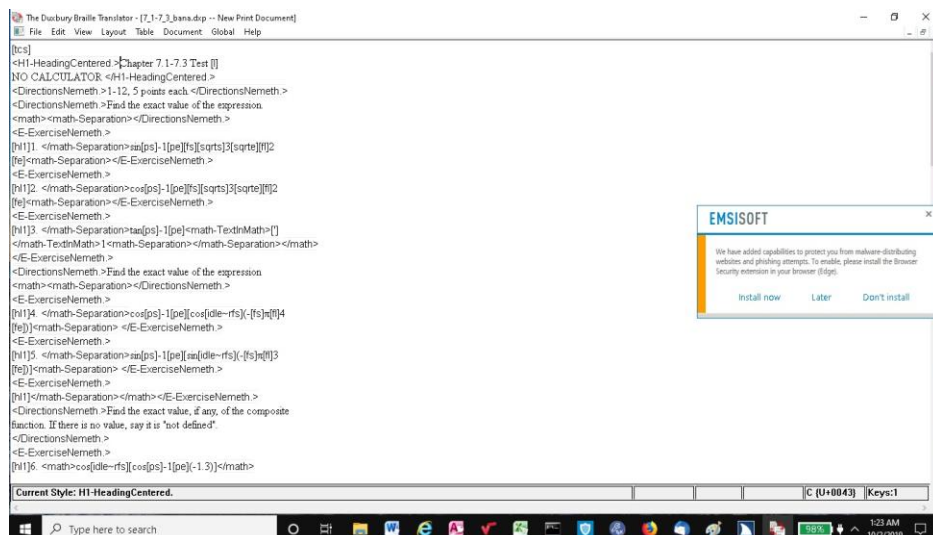
You can think of each MathType object as a pearl. A technical chain strings them together. It turns the whole section into one necklace in the math style, with everything between the pearls also enclosed in the math-separation style. Pressing the Technical Chain Start or Technical Chain End button creates the hidden text `[[*ptims*]]` or `[[*idle~ptime*]]`, respectively, in the Word document. Here, ptim stands for "pass through in math," and the letter s or e stands for "start" or "end."

When you place the technical chain start and technical chain end markers, you control where the Nemeth start and Nemeth end indicators appear in braille. You can position them where you want with regard to line breaks. If you position the technical chain end marker at the start of a line, the resulting technical chain in DBT will use the math-NLE style instead of math, to position the Nemeth end indicator at the indent position at the start of a new line at the indent position.

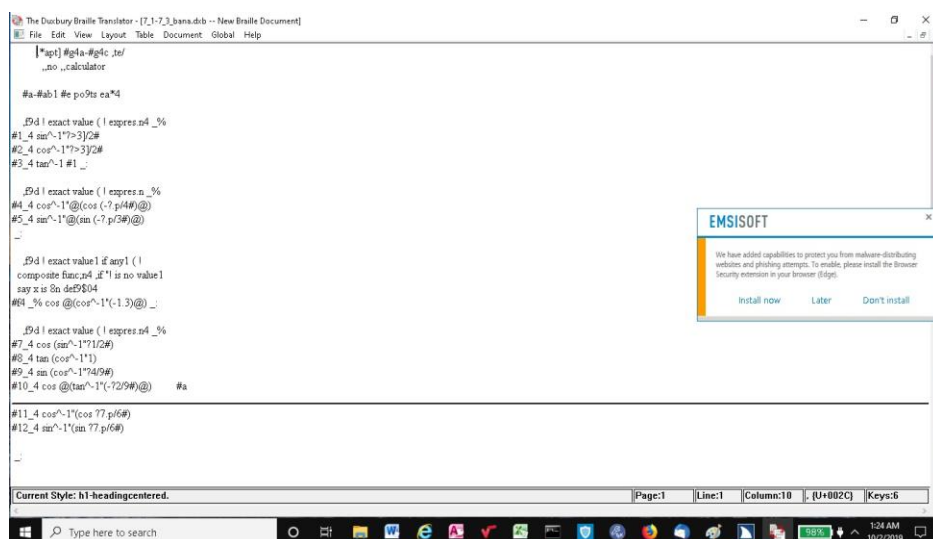
In the screenshot above, the marks `[[*ptims*]]` and so on are showing even though they are marked as hidden text. Being marked as hidden text means they do not get printed. To toggle the showing of hidden text on or off in the Word display, press: Alt followed by the letters F, T, D.

Check the choice for **hidden text** . (File, Options, Display, Always show these formatting marks on the screen, Hidden text checked, OK)

This Example in DBT



[Caption: View the file 7_1-7_3_bana.dxp in coded view in DBT.]



{Caption: See the file 7_1-7_3_bana.dxb in DBT.}

A Sample LaTeX File

Review of Chapter 1

Lesson 1

1. What is a rational number? _

Write each fraction as a decimal.

2. $\frac{1}{8}$

3. $\frac{5}{6}$

4. $-\frac{1}{4}$

5. $-2\frac{4}{9}$

Write each decimal as a fraction in simplest form.

6. 0.8

7. 0.12

8. $0.\bar{3}$

9. 0.84

Lesson 2

10. Define power, base and exponent in your own words. _

11. Write using exponents $2 \cdot 2 \cdot 3 \cdot x \cdot x \cdot x \cdot y \cdot y$

Evaluate.

12. 5

13. $(-2)^4$ □

14. $\left[\frac{}{}\right]^5$

15. $c^2 + d^3$ if $c = -3$ and $d = 5$

Lesson 3

16. Write down the rule for multiplying powers. _

[Caption: You can view the underlying LaTeX by opening chap1review.tex in a text editor like Notepad.]

[tcs]

<para.>Review of Chapter 1</para.>

<para.>Lesson 1</para.>

<para.>1. What is a rational number? --</para.>

<para.>Write each fraction as a decimal.</para.>

<para.>2. $[\text{fs}]1[\text{fl}]8[\text{fe}]$$\text{Separation}$</para.>

<para.>3. Separation[fs]5[fl]6[fe]Separation

</para.>

<para.>4. [.]Separation-[fs]1[fl]4[fe]Separation

</para.>

<para.>5. Separation-2[fs]0[fl]9[fe]0$$</para.>

<para.>Write each decimal as a fraction in simplest form.

</para.>

<para.>6. $0.8$$\text{Separation}$</para.>

<para.>7. Separation0.12Separation</para.>

<para.>8. Separation0.[e]3[bar]Separation</para.>

<para.>9. Separation0.84$$</para.>

<para.>Lesson 2</para.>

<para.>10. Define power, base and exponent in your own words. --

</para.>

<para.>11. Write using exponents $2.2.3.x.x.x.y.y$

Separation</para.>

<para.>Evaluate.</para.>

<para.>12. Separation5Separation</para.>

<para.>13. Separation(-2)[ps]4[pe]Separation

Separation[ps][pe]Separation</para.>

<para.>14. Separation() 13[ps]5[pe]Separation

</para.>

<para.>15. Separationc[ps]2[pe]+d[ps]3[pe]

Separation <OneWordBridge>if</OneWordBridge>

Separationc = -3Separation <OneWordBridge>and

Current Style: para.

<

Windows Type here to search



[Caption: See the file chap1review.dxp in Coded view in DBT.]

```
[review (,*apt] #a
,lesson #a
#af4 ,at is a rational numb]8 ,
,write ea* frac;n z a decimal4
#b4 _% ?1/8#
#3_4 ?5/6#
#4_4 -?1/4#
#5_4 -#2_?4/9_# _:
,write ea* decimal z a frac;n 9
simple/=m4
#f4 _% #0.8
#7_4 #0.12
#8_4 #0.3:
#9_4 #0.84 _:
,lesson #b
#aj4 ,define p[]1 base & exponent 9 yr
[n ^ws4 ,
#aa4 ,write us+ exponents _%
#2*2*3*x*x*x*y*y
,evaluate_4
#12_4 #5
#13_4 (-2)^4^
#14_4 () #13^5
#15_4 c^2"+d^3 ,if c .k -#3 ,& d .k
#5 _: #a
```

```
,lesson #c
#af4 ,write d[n ! rule = multiply+
p[]s4 ,
,simplify us+ exponents4
```

Review of Chapter 1

Current Style: para.

<

[Caption: See the file chap1review.dxb in DBT.]

Some Improvements

1. For several years the LaTeX importer has assigned the styles math-separation and OneWordBridge between segments of technical notation where appropriate.
2. Both the MathType and LaTeX importers automatically assign the style math-nle (math with new line end) instead of math when the markup for the end of technical notation is at the start of a line. This allows the end Nemeth indicator to appear at the proper indent position, without a preceding space.
3. In the BANA Braille 2017 template in the Misc group we have added the styles **Box Top Nemeth** and **Box Bottom Nemeth**.
4. For importing from the BANA Braille 2017 template, we have fixed the format of the Nemeth Exercise style.
5. We added the codes [:] and [;] in the ending codes for the math style, to keep the end Nemeth indicator on the same line as the preceding Nemeth Code.
6. In DBT 12.5, if you assign the OneWordBridge style to a word, you no longer have to make sure that it is within a technical chain. As long as it is between two segments of technical notation, the OneWordBridge style works as desired.

Producing UEB with UEB Math/Science

You can use most of the same tools as above when producing math using UEB Math/Science. In fact, you can use the same Word document to do the prep work for both formats. However, you don't need to worry about technical chains. That is, you don't need to use the Technical Chain Start and Technical Chain End buttons, because you are not trying to change the translation of short sections between technical notation. Then what things do cause confusion when producing UEB with UEB Math/Science?

The minus sign can be confusing. If you use a normal hyphen in Word as if it were a minus sign, you will be disappointed unless you mark it as being within technical notation. That is not a problem with MathType, since anything inside a MathType equation is automatically within technical notation.

If you want spaces around signs of comparison, use the appropriate setting in DBT under Global -> Import options. If you check Add spaces around signs of comparison, then those spaces will appear when you open the document in DBT.

There is some transcriber discretion in UEB regarding the use of the grade 1 indicator (dots 56). When a math expression or equation in UEB has several symbols that require the grade 1 indicator, the transcriber can decide whether to apply the single grade 1 indicator to the individual symbols or to use a grade 1 word indicator (dots 56, 56) for a word or a grade 1 passage indicator (dots 56, 56, 56) for a passage. You may find that sometimes you prefer a different choice than the UEB translator has made. However, you can influence this choice by issuing a code that is interpreted by the UEB translator. The code is [utpN] where N is a number from 0 to 2. The letters utp stand for "use transcriber preference."

The code [utp1] sets the preference for maximum text within the influence of a grade 1 indicator. That means more use of grade 1 passage indicators.

- the code [utp2] sets the preference for limiting the text within the influence of grade 1 indicators.
- The code [utp0] sets the preference to the default choices.

You can use one of these codes wherever you want to change this behavior. The preference in effect at a particular spot is gotten from the last [utpN] code before that spot. Thus [utp0] removes any utp changes you have made

A Few Tips

When viewing math in a .dxd file, always use the coded view since some of the math is shown as codes. Pressing Alt+F3 switches this on or off.

What do you do if you know what sign you want in Nemeth Code but you do not know how to enter it in Word or MathType?

1. Start a new braille document in DBT in the template English (UEB) - BANA with Nemeth.
2. Inside the math style, enter the desired Nemeth Code.
3. Translate to print.
4. Make sure that in Global --> View preferences, the checkbox **Use verbose labels for non-ANSI characters in coded view** is checked. You see the Unicode number for the desired character on the status line.
5. With DBT 12.4 or higher, if you are working in Word and all the math symbols can be entered without MathType, to simplify the data entry, you can try using just the buttons for **technical notation start** and **technical notation end** or the **Technical Notation** style. Also mark any problem labels with the style **uncontracted**, as shown in the graphic below.

Find $\sin \theta$ for each value of θ :

1. $\theta = 90^\circ$

2. $\theta = 30^\circ$

3. $\theta = 45^\circ$

4. $\theta = 30^\circ$

[Caption: See the file simple.docx in Word.]

You can try a different method for bringing a Word document with MathType equations into DBT for producing UEB with Nemeth, making use of Scientific Notebook. Save your Word document as an .rtf file. Open the .rtf file in Scientific Notebook and then save the document as a .tex file. The advantage is that when you open a .tex file in DBT as UEB with Nemeth Code, DBT automatically assigns the styles math-separation and OneWordBridge where they are needed. Even if you don't plan to use the LaTeX conversion for producing your braille, importing the .TeX converted from MathType and looking for the styles math-separation and OneWordBridge can show you where you need to insert markers for technical chains and the OneWordBridge style in your Word document.