**DotsPlus Braille for the Mainstream Teacher**

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**Abstract**

DotsPlus Braille was developed to facilitate written scientific communication between mainstream people and blind braille readers. DotsPlus reads much like grade 1 braille except that many intuitive non-braille symbols are used - for punctuation and most math characters. Any braille reader can learn basic DotsPlus by reading a one page tutorial that is written in DotsPlus. Math expressions can be represented in standard visual layout with DotsPlus characters. Any computer user can make DotsPlus text, including most common unicode characters, by using a Tiger font set to 36 point. MathType users can select a Tiger environment so that MathType equations will emboss properly as DotsPlus on any ViewPlus embosser. Screen characters are big but look normal to sighted computer users. ViewPlus ink embossers will print the standard characters as well as emboss them as DotsPlus. Communications from sighted faculty members to blind students can be direct, fast, and accurate if a ViewPlus embosser is available.

**Introduction**

DotsPlus Braille is essentially a tactile font that, in principle, can have tactile equivalents for any unicode character. Regular letters, Greek letters, and numbers are all braille as are a small number of other common characters (eg @ $) whose graphical image is hard to recognize tactually. Lower case letters have universal braille representations but none of the other characters do. The standard DotsPlus font represents capital letters by a double cell in which the first cell is dot-6, the standard US braille capital indicator. DotsPlus Euro is the same except that the capital indicator is dots-4,6. Numbers are represented by the German (DIN) braille numbers that are familiar to most non-US readers but need to be learned by American DotsPlus users. They are closely related to the letters used with a prefix to represent numbers in literary braille and consequently very easy to learn. Greek characters are represented by double cells in which the first cell is dots-4,5 for lower case and dots-4,5,6 for upper case. The second cell is the braille Greek letter equivalent used in all western math braille codes.

DotsPlus Expert represents capital and Greek letters in single 8-dot braille cells and is recommended for use in equations. It is very intuitively related to the regular and Euro versions. The lower left dot is the usual 8-dot capital letter indicator, and the lower right dot is the Greek indicator. The top six dots are the same as the second cell in capital or Greek letter double cells. All three DotsPlus fonts are identical apart from the capital and Greek letters. Anecdotal evidence suggests that DotsPlus Braille can be learned in minutes by a braille reader. The standard DotsPlus one page (on 11.5x11 braille paper) introduction is included as the first appendix.

DotsPlus can represent equations in normal two dimensional layout and is the major strength of the method. Some blind people may have no idea of standard layout such as positions of sub and superscripts, numerators and denominators, etc. Few will recognize a radical enclosure or an integral sign, but the learning process is similar to that of sighted people and should be far easier to retain in memory than are complex braille string definitions. In general one expects that more training may be needed to acquaint blind students with equation layouts than is needed for them to learn the DotsPlus symbols, but none is a serious learning curve. The standard Quadratic Equation and solution example is included as Appendix 2.

**Creating DotsPlus Braille**

Any person who uses MS Word and the MathType equation editor (which is by far the most common authoring environment for US scientists and faculty members) can convert a scientific Word document to DotsPlus form by merely making a font change for the standard text and an environment change in MathType. I recommend using the Tiger Expert environment in MathType and the Tiger font for the text. The Tiger text font size needs to be set to 36 point. This is important, because braille is not scalable - it needs to be the right size. When one prints this document to any ViewPlus embosser, the result is an embossed document in which each Tiger or Tiger Expert character is embossed as DotsPlus or DotsPlus Expert respectively. Presto, a mainstream document in a completely readable form to sighted people, although with pretty large text, magically prints as something readable by a blind person. The Tiger screen fonts and Tiger MathType environments may be downloaded from the ViewPlus web site.

Most Word documents simply reformat themselves when the font is changed to Tiger, but tables might be an exception. Documents with large complex tables might need more work. My recommendation for tables is to clip them into a separate document where the margins can be expanded up to 22 inches and then printed to a Tiger embosser in "inverse landscape" mode. Few Word tables are so big as to need more space than 22 inches.

**Summary**

DotsPlus Braille can be learned quickly by a blind reader who can then read most scientific documents in their natural state of layout. Such documents can be made by any MS Word author who needs only to make a simple font change and a MathType environment change from what is otherwise a normal Word document.

I recommend DotsPlus to conscientious faculty members who want to improve their ability to communicate more quickly and directly with blind students. The blind student must be willing to learn to read DotsPlus, but this seems a very small price to pay for getting so much better communication with his/her teacher.

**Appendix 1**

Introduction to DotsPlus MS Braille Word document. The original document is formatted for printing on 11.5x11 inch braille paper. It has been reduced to fit on this letter size page.

This page is an intro to DotsPlus, a tactile font similar to grade one braille but requiring no translation. The punctuation marks are different from braille but intuitive. Common marks are comma, semicolon;Colon: exclamation! Question mark? “quotes” (parentheses) [brackets] slash/ and period. DotsPlus has symbols for the at @ number # dollar $ percent % caret ^ ampersand & asterisk \* plus + equals = and virtually all other common symbols. Numbers cannot be coded as letters following # so DotsPlus numbers are European Computer Braille. One to nine are letters a to I with an exttra dot on bottom right. These are 123456789. DotsPlus zero is zero.

When the above Word file is printed to a ViewPlus embosser, the dot pattern shown below is embossed. It is formatted for an 11.5x11 inch braille paper page and has been reduced to fit on letter size paper.



**Appendix 2**

Standard Quadratic Equation solution written in DotsPlus. The dot image is reduced by 50%

The MS Word file is formatted for 8.5x11 braille paper.

The solution to the equation

is

Prepared using Word and MathType 6.5a and a ViewPlus® embosser.

When printed to a ViewPlus embosser, the following dot copy is embossed. It has been reduced to fit on this letter size page.



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