

Title: On the requirements for alphanumeric fonts for mathematical use

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Action: For distribution to WG2 members and for consideration by the editors

This document provides background information for used by the editors in selecting the final fonts for 10646-2 and for corresponding updates to Part 1.

The mathematical symbols are being encoded because of the strong need by mathematicians to represent the identity of single letter variable in an unambiguous manner. Not only is there a loss of meaning (sometimes even a perversion of meaning) when style information is lost and, *e.g.*, an upright letter in a formula replaces an italic one. This has been noted in previous submissions to this working group and does not need to be explained again in detail.

More importantly, it is also the case that mathematicians place strict requirements on the *actual* fonts being used to represent mathematical variables. Not all italic fonts can be used successfully. For example in the font used for this document, the italic letter *v* and Greek letter ν are not very distinct. A rounded letter *v* (like this one from Century Schoolbook) is therefore preferred.

Theorems are traditionally set in (text) italics. Some languages have common single letter words (English ‘a’, Scandinavian ‘i’, etc.). A font intended for mathematical variables should strive to allow a visual distinction so that variables can be reliably separated from text in a theorem.

Not all sans-serif fonts allow an easy distinction between ‘l’ l, and ‘I’ l and not all monospaced fonts allow a distinction between ‘1’ and ‘l’, Courier New, used in this example, at least does a good job on the digit.

Similarly, ‘0’ must be distinct from ‘O’ for all mathematical alphanumeric sets.

Mathematical equations require that characters be combined with diacritics (dots, tilded, circumflex, or arrows above are common) as well as followed or preceded by super- or subscripted letters or numbers. In particular for the ‘Script’ styles, this leads to designs with smaller overhangs and slant compared to styles that are common for text use, usually in wedding invitations.

The existing SCRIPT characters in the Letterlike Symbols block of the BMP currently are shown with glyphs that in some cases fall outside the expected typographic variation for mathematical script fonts and are considered barely acceptable by experts in mathematical publishing. This situation should be improved.

In some instances, a deliberate unification with a non-mathematical symbol has been undertaken, for example 2133 is unified with the pre-1949 symbol for the German currency unit Mark. This unification restricts the range of glyphs that can be used for this character in the charts. The use of a simplified ‘English Script’ style, as per recommendation by the American Mathematical Society, would conform with the unification in question, but result in necessary and noticeable changes of the reference glyphs for 211B, and 212C, as well as less noticeable changes for the other SCRIPT characters in that block.

In Fraktur, letters \mathfrak{S} and \mathfrak{J} in particular must be made distinguishable. Overburdened Black Letter forms like \mathfrak{B} and \mathfrak{F} are inappropriate.

The double-struck glyphs shown in the current edition of the standard represent an attempt to match the double-struck style with the base, Times-like design used for all the other Latin characters in the standard. The original idea was that a sans-serif font might have glyphs for these characters that are more sans-serif like, etc. With the change in encoding philosophy, these characters now represent a more or less *fixed* style. Therefore it becomes highly inappropriate to continue to use this Times-like design for the double-struck characters.

Instead, after consultation with the American Mathematical Society and leading mathematical publishers, it is now recommended that the glyphs used for all double-struck characters are to be based on the much simpler, more blackboard-derived forms found in the best instances of metal typography.

In other words, instead of \mathbb{C} , \mathbb{N} , and \mathbb{Q} , the glyphs would become more like \mathbb{C} , \mathbb{N} and \mathbb{Q} . (These samples are not from the actual font to be used). This change will accomplish two goals. It would not only lead to a better representation of the common form of double-struck characters, but it would also emphasize that the style of these symbols is rather independent of the style of the text font. In fact, where there is variation in the double-struck designs it tends to be along variables that are more or less different from the distinctions between other faces.

In summary, the current set of fonts that was used to produce the FCD is highly inadequate and misleading as to the typographic intent of these characters. Luckily, due to the well-understood nature of the characters, this does not affect their identification and in the view of the submitter, the recommended changes are therefore editorial and can be remanded to the editors for guidance during preparation of the final document for publication.