L2/09-397

ISO/IEC JTC 1/SC 2/WG 2
PROPOSAL SUMMARY FORM TO ACCOMPANY SUBMISSIONS
FOR ADDITIONS TO THE REPERTOIRE OF ISO/IEC 10646[1]
Please fill all the sections A, B and C below.
Please read Principles and Procedures Document (P & P) from http://www.dkuug.dk/JTC1/SC2/WG2/docs/principles.html **for guidelines and details before filling this form.**
Please ensure you are using the latest Form from http://www.dkuug.dk/JTC1/SC2/WG2/docs/summaryform.html**.**
See also http://www.dkuug.dk/JTC1/SC2/WG2/docs/roadmaps.html **for latest *Roadmaps*.**

A. Administrative

1. **Title:** *Proposal to Encode Mathematical Diagonals*
2. Requester's name: *Deborah Anderson (University of California, Berkeley, Script Encoding Initiative), Barbara Beeton (American Mathematical Society), Laurențiu Iancu, Murray Sargent (Microsoft Corporation)*
3. Requester type (Member body/Liaison/Individual contribution): *Liaison contribution*
4. Submission date: *2009-October-26*
5. Requester's reference (if applicable):
6. Choose one of the following:
   This is a complete proposal: *Yes*
   (or) More information will be provided later:

B. Technical – General

1. Choose one of the following:
   a. This proposal is for a new script (set of characters): *No*
      Proposed name of script:
   b. The proposal is for addition of character(s) to an existing block: *Yes*
      Name of the existing block: *Miscellaneous Mathematical Symbols-A*
2. Number of characters in proposal: *2*
3. Proposed category (select one from below - see section 2.2 of P&P document):
   A-Contemporary [X] B.1-Specialized (small collection) [ ] B.2-Specialized (large collection) [ ]
   C-Major extinct [ ] D-Attested extinct [ ] E-Minor extinct [ ]
   F-Archaic Hieroglyphic or Ideographic [ ] G-Obscure or questionable usage symbols [ ]
4. Is a repertoire including character names provided?
   a. If YES, are the names in accordance with the "character naming guidelines" in Annex L of P&P document? *Yes*
   b. Are the character shapes attached in a legible form suitable for review? *Yes*
5. Who will provide the appropriate computerized font (ordered preference: True Type, or PostScript format) for publishing the standard? *The authors*
   If available now, identify source(s) for the font (include address, e-mail, ftp-site, etc.) and indicate the tools used:
6. References:
   a. Are references (to other character sets, dictionaries, descriptive texts etc.) provided? *Yes*
   b. Are published examples of use (such as samples from newspapers, magazines, or other sources) of proposed characters attached? *Yes*
7. Special encoding issues:
   Does the proposal address other aspects of character data processing (if applicable) such as input, presentation, sorting, searching, indexing, transliteration etc. (if yes please enclose information)? *Yes*
   Suggested UCD character properties in Section 3

8. Additional Information:

Submitters are invited to provide any additional information about Properties of the proposed Character(s) or Script that will assist in correct understanding of and correct linguistic processing of the proposed character(s) or script. Examples of such properties are: Casing information, Numeric information, Currency information, Display behaviour information such as line breaks, widths etc., Combining behaviour, Spacing behaviour, Directional behaviour, Default Collation behaviour, relevance in Mark Up contexts, Compatibility equivalence and other Unicode normalization related information. See the Unicode standard at http://www.unicode.org for such information on other scripts. Also see http://www.unicode.org/Public/UNIDATA/UCD.html and associated Unicode Technical Reports for information needed for consideration by the Unicode Technical Committee for inclusion in the Unicode Standard.

[1] Form number: N3152-F (Original 1994-10-14; Revised 1995-01, 1995-04, 1996-04, 1996-08, 1999-03, 2001-05, 2001-09, 2003-11, 2005-01, 2005-09, 2005-10, 2007-03, 2008-05)

C. Technical - Justification

1. Has this proposal for addition of character(s) been submitted before? *No*
   If YES explain
2. Has contact been made to members of the user community (for example: National Body, user groups of the script or characters, other experts, etc.)? *Yes*
   If YES, with whom? *Barbara Beeton (American Mathematical Society)*
   If YES, available relevant documents: *Examples in proposal*
3. Information on the user community for the proposed characters (for example: size, demographics, information technology use, or publishing use) is included? *No*
   Reference:
4. The context of use for the proposed characters (type of use; common or rare) *Common*
   Reference:
5. Are the proposed characters in current use by the user community? *Yes*
   If YES, where? Reference: *Supporting evidence in Section 4*
6. After giving due considerations to the principles in the P&P document must the proposed characters be entirely in the BMP? *No*
   If YES, is a rationale provided?
   If YES, reference:
7. Should the proposed characters be kept together in a contiguous range (rather than being scattered)? *No*
8. Can any of the proposed characters be considered a presentation form of an existing character or character sequence? *No*
   If YES, is a rationale for its inclusion provided?
   If YES, reference:
9. Can any of the proposed characters be encoded using a composed character sequence of either existing characters or other proposed characters? *No*
   If YES, is a rationale for its inclusion provided?
   If YES, reference:
10. Can any of the proposed character(s) be considered to be similar (in appearance or function) to an existing character? *No*
    If YES, is a rationale for its inclusion provided?
    If YES, reference:
11. Does the proposal include use of combining characters and/or use of composite sequences? *No*
    If YES, is a rationale for such use provided?
    If YES, reference:
    Is a list of composite sequences and their corresponding glyph images (graphic symbols) provided?
    If YES, reference:
12. Does the proposal contain characters with any special properties such as control function or similar semantics? *No*
    If YES, describe in detail (include attachment if necessary)
13. Does the proposal contain any Ideographic compatibility character(s)? *No*
    If YES, is the equivalent corresponding unified ideographic character(s) identified?
    If YES, reference:

1. Introduction

This document proposes the encoding of two symbols in contemporary use in mathematical publications. The proposed symbols are two diagonal bars: a rising diagonal and a falling diagonal. They differ from the ordinary and mathematical forward- and backward-solidus symbols by their slant. As the evidence samples will demonstrate, the slant is significant, the symbols being used contrastively with other solidi, including U+2215 DIVISION SLASH, U+29F5 REVERSE SOLIDUS OPERATOR, and U+2216 SET MINUS. One usage of the proposed diagonals is in the notation of spaces of double cosets.

The symbols are part of the STIX PUA collection, whose standardization in Unicode is an ongoing project. A description of the STIX Fonts Project [1] and the STIX PUA set can be found in the INCITS/L2 proposal documents L2/09-261 and L2/09-262 [2].

2. Comparison to Existing Characters

The proposed characters differ from existing solidi by their slope. Figure 1 contrasts the proposed diagonals with the ordinary and mathematical solidi displayed with the Windows 7 fonts "Cambria Math" and "Segoe UI Symbol" at size 16. For comparison, snapshots from the Unicode 5.2 code charts are reproduced in Figure 2.

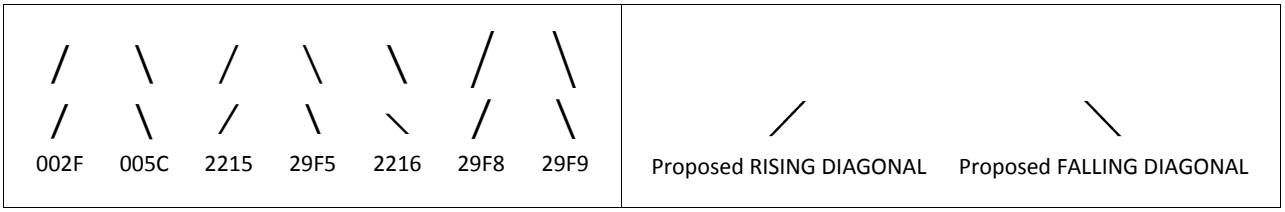


Figure 1: Comparison between existing solidi and the proposed diagonals: solidi in the Window 7 fonts "Cambria Math" and "Segoe UI Symbol" (**left**) vs. the proposed rising and falling diagonals (**right**).

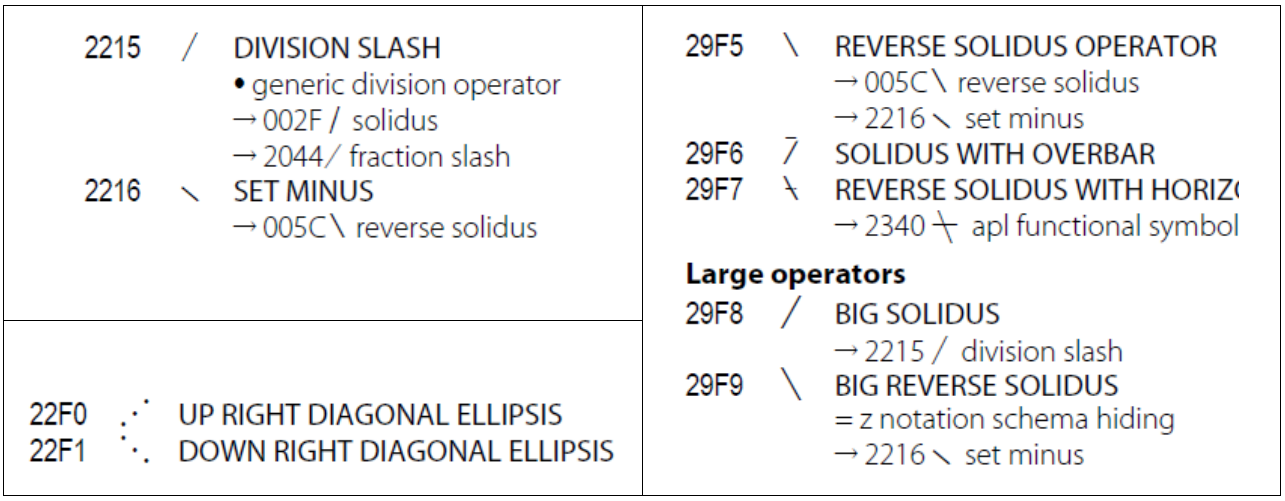


Figure 2: The solidi present in Unicode have a steeper slope than the proposed diagonals, which are drawn at a 45° angle, similar to U+22F0 UP RIGHT DIAGONAL ELLIPSIS and U+22F1 DOWN RIGHT DIAGONAL ELLIPSIS. Contrast with the proposed diagonals in Figure 1.

Several public entity sets and symbol lists were consulted to confirm that there are no already-encoded Unicode characters being used in existing mappings to represent the proposed symbols. The entity sets and symbol lists include the following:

- SGML Entity Set ISO/IEC DTR 9573-13:1990 – http://www.dcarlisle.demon.co.uk/9573/;
- XML Entity Definitions for Characters – latest draft http://www.w3.org/2003/entities/2007doc/;
- MathML – latest MathML 3.0 draft http://www.w3.org/TR/MathML3/;
- STIX Fonts Project [1] and PUA collection [2] – the proposed symbols are mapped to code points in the PUA;
- The Comprehensive LaTeX Symbol List [3];
- Elsevier Science Grid in Unicode – http://info.sciencedirect.com/techsupport/xmlsgml/dtd50/esgrid.pdf;
- OASIS DocBook – http://www.oasis-open.org/docbook/specs/wd-docbook-xmlcharent-0.3.pdf;
- Adobe Systems Inc. Mathematical Pi Fonts One–Six;
- Design Science Font Encoding Tables and MTCode Encoding Tables – http://www.dessci.com/en/support/mathtype/tech/encodings/font_enc.htm and http://www.dessci.com/en/support/mathtype/tech/encodings/mtcode.htm;
- Wolfram Research, Inc., Mathematica Listing of Named Characters – http://reference.wolfram.com/mathematica/guide/ListingOfNamedCharacters.html and http://www.mathmlcentral.com/characters/.

3. Proposed Characters

The proposed characters are

- U+27CB RISING DIAGONAL
- U+27CD FALLING DIAGONAL

allocated in the remaining unassigned code points of the Miscellaneous Mathematical Symbols-A block.

The proposed characters have the properties suggested below, similar to those of other mathematical symbols, such as U+2215 DIVISION SLASH, U+29F5 REVERSE SOLIDUS OPERATOR, U+29F8 BIG SOLIDUS, and 29F9 BIG REVERSE SOLIDUS.

UnicodeData.txt entry (gc, ccc, bc, dt, Bidi_M, etc.)	bmg	Script	lb	Math
27CB;RISING DIAGONAL;Sm;0;ON;;;;;Y;;;;;	27CD	Common	AL	Yes
27CD;FALLING DIAGONAL;Sm;0;ON;;;;;Y;;;;;	27CB	Common	AL	Yes

Table 1: UCD properties of the proposed characters (`Math = Yes` derives implicitly from `gc = Sm`).

To obtain the negated forms of the proposed symbols, combining character sequences involving the overlays U+0338 COMBINING LONG SOLIDUS OVERLAY and U+20E5 COMBINING REVERSE SOLIDUS OVERLAY can be used. These overlays appear in canonical decomposition sequences of other negated mathematical symbols. Thus, if the proposed symbols are approved, the following combining character sequences can be used for the negated symbols:

- <U+27CB, U+20E5> Negated RISING DIAGONAL;
- <U+27CD, U+0338> Negated FALLING DIAGONAL.

The corresponding LaTeX entities (“\ndiagup” and “\ndiagdown”) are illustrated in Figure 4 in the next section.

4. Supporting Evidence

This section attests the proposed symbols with from samples from two main sources:

- Several LaTeX symbol charts, consolidated in the "The Comprehensive LaTeX Symbol List" [3];
- An article [4] published by the American Mathematical Society, which illustrates the contrastive use of the proposed diagonals together with the other solidi.

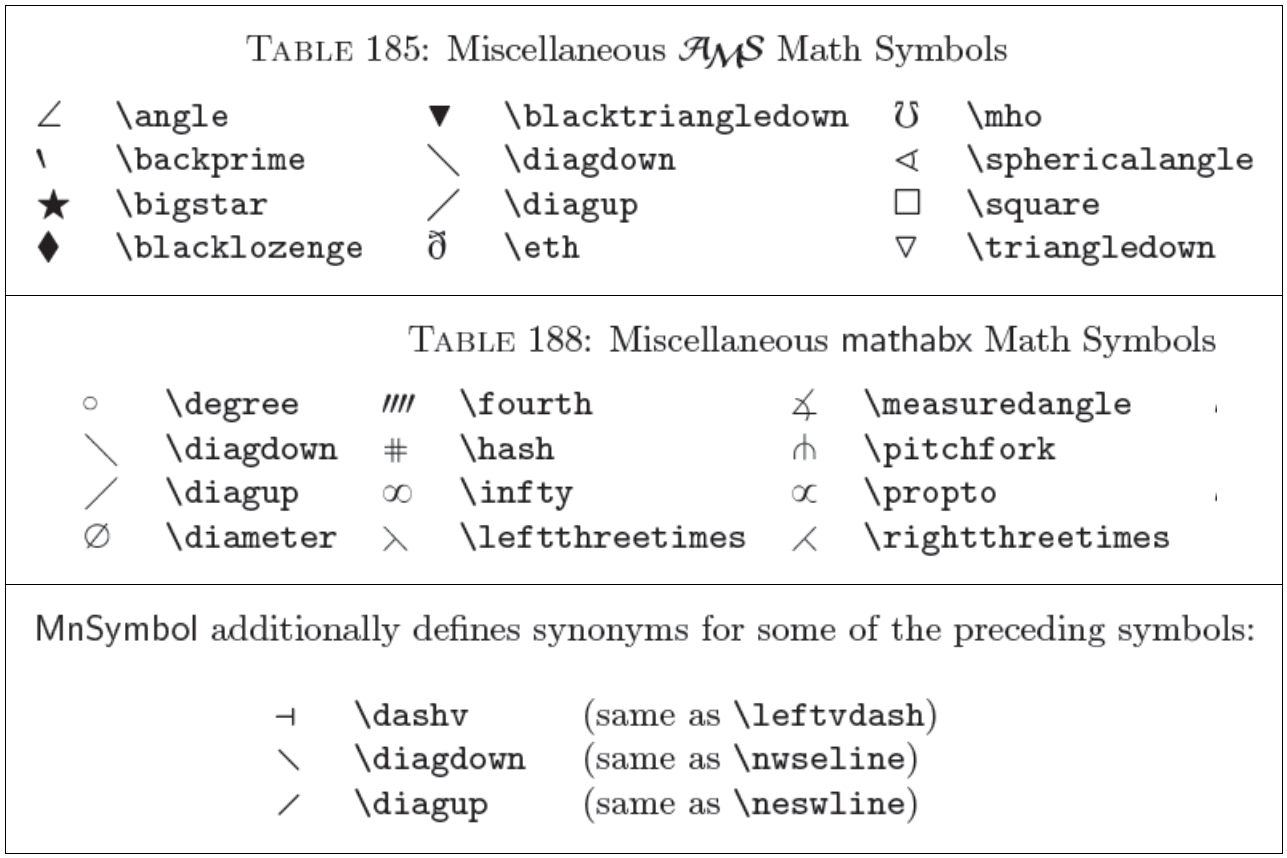


TABLE 185: Miscellaneous $\mathcal{AMS}$ Math Symbols

∠	\angle	▼	\blacktriangledown	℧	\mho
‵	\backprime	╲	\diagdown	◁	\sphericalangle
★	\bigstar	╱	\diagup	□	\square
⧫	\blacklozenge	ð	\eth	▽	\triangledown

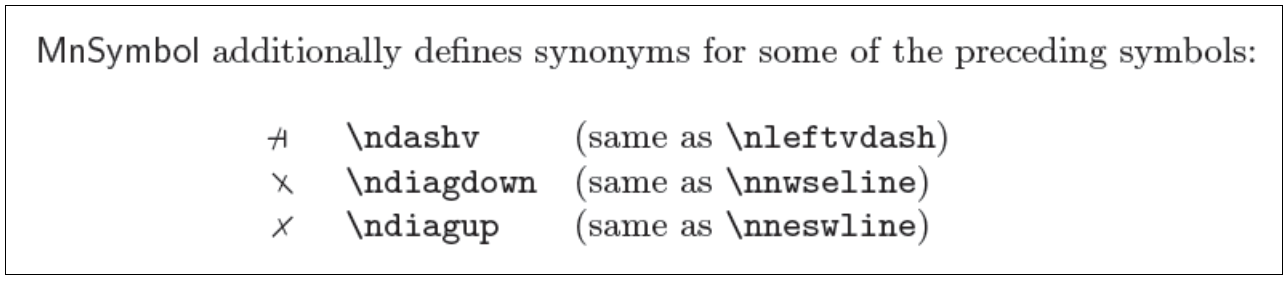
TABLE 188: Miscellaneous mathabx Math Symbols

°	\degree	////	\fourth	∡	\measuredangle
╲	\diagdown	#	\hash	⅄	\pitchfork
╱	\diagup	∞	\infty	∝	\propto
∅	\diameter	⋋	\leftthreetimes	⋌	\rightthreetimes

MnSymbol additionally defines synonyms for some of the preceding symbols:

⊣	\dashv	(same as \leftvdash)
╲	\diagdown	(same as \nwseline)
╱	\diagup	(same as \neswline)

Figure 3: Samples illustrating the entities "\diagup" and "\diagdown" in several LaTeX packages, consolidated in "The Comprehensive LaTeX Symbol List" [3] (one package defining additional synonyms). From the top: "AMSsymbols" package, p. 67; "mathabx" package, p. 68; "MnSymbol" package, p. 34.



MnSymbol additionally defines synonyms for some of the preceding symbols:

⊬	\ndashv	(same as \nleftvdash)
⋉	\ndiagdown	(same as \nnwseline)
⋊	\ndiagup	(same as \nneswline)

Figure 4: Samples illustrating the entities "\ndiagup" and "\ndiagdown" (and their synonyms "\nneswline" and "\nnwseline") in the "MnSymbol" LaTeX package, from p. 35 of "The Comprehensive LaTeX Symbol List" [3].

over the set of double cosets space $H\backslash G/B$ and that any isotopic component is of the form $\mathrm{ind}_{B(x)}^{H}\chi_{\ell(x)}$, where $B(x) = H \cap \psi(x)B\psi(x)^{-1}, x \in H\backslash G/B$, $\ell(x) = \mathrm{Ad}^*(\psi(x))\ell_{|\mathfrak{h}}$ and $\psi : H\backslash G/B \to G$ is a section for the double cosets space. So,

Figure 5: Excerpt from p. 819 of [4] illustrating the proposed diagonals inline text.

$$\mathcal{I}^{\mathfrak{g}/\mathfrak{c}} = \mathcal{I}^{\mathfrak{g}/\mathfrak{b}} \setminus \{l\} = \{k_1 < \cdots < k_{p-1}\},$$

whence, by intersecting with $\mathcal{I}^{\mathfrak{g}/\mathfrak{h}}$, we obtain that $\mathcal{I}^{\mathfrak{h},\mathfrak{c}} = \mathcal{I}^{\mathfrak{h},\mathfrak{b}} \setminus \{l\}$.

We encounter the following two cases which must be discussed also in the proof of Lemma 3.9.

a): $Z_l \notin \mathfrak{h} + \mathfrak{g}_{l+1}$, which means that $l \in \mathcal{I}^{\mathfrak{g}/\mathfrak{h}}$ and so $\mathcal{I}^{\mathfrak{h},\mathfrak{b}} = \mathcal{I}^{\mathfrak{h},\mathfrak{c}} \cup \{l\}$.

b): $Z_l \in \mathfrak{h} + \mathfrak{g}_{l+1}$, whence $Z_l \in \mathfrak{h}$ while we assume (2.3). In this case we have $l \notin \mathcal{I}^{\mathfrak{g}/\mathfrak{h}}$ and so $\mathcal{I}^{\mathfrak{h},\mathfrak{b}} = \mathcal{I}^{\mathfrak{h},\mathfrak{c}}$.

Since $\mathfrak{g}_l \subset \mathfrak{g}_{i+1}$ for all $i < l$, it follows that

$$\mathfrak{h} + \mathrm{Ad}(g)\mathfrak{c} + \mathfrak{g}_{i+1} = \mathfrak{h} + \mathrm{Ad}(g)(\mathfrak{b} + \mathfrak{g}_l) + \mathfrak{g}_{i+1} = \mathfrak{h} + \mathrm{Ad}(g)\mathfrak{b} + \mathfrak{g}_{i+1}, \ \forall g \in G.$$

This tells us that $\mathcal{I}(\mathfrak{g}/\mathfrak{h}, \mathfrak{g}/\mathfrak{c}) = \mathcal{I}(\mathfrak{g}/\mathfrak{h}, \mathfrak{g}/\mathfrak{b}) \setminus \{l\}$.

We can also deduce from this equality that all the nonempty Zariski open subsets $\mathcal{U}_i^{\circ}$ $(i \in \mathcal{I}^{\mathfrak{h},\mathfrak{c}})$ of G, defining the canonical Zariski open subset $\mathcal{U}^{\circ} = \bigcap_{\mathcal{I}^{\mathfrak{h},\mathfrak{c}}} \mathcal{U}_i^{\circ}$ as in Remark 3.4 for $H\backslash G/C$, coincide with the $\mathcal{U}_i$ $(i \in \mathcal{I}^{\mathfrak{h},\mathfrak{b}} \setminus \{l\})$ for $H\backslash G/B$. In particular, from $\mathcal{I}^{\mathfrak{h},\mathfrak{b}} \supseteq \mathcal{I}^{\mathfrak{h},\mathfrak{c}}$, we obtain that $\mathcal{U} \subseteq \mathcal{U}^{\circ}$.

Hence in the case **b**), we have that

$$\mathcal{I}(\mathfrak{g}/\mathfrak{h}, \mathfrak{g}/\mathfrak{b}) = \mathcal{I}(\mathfrak{g}/\mathfrak{h}, \mathfrak{g}/\mathfrak{c}),$$

since $l \notin \mathcal{I}^{\mathfrak{g}/\mathfrak{h}} \supset \mathcal{I}(\mathfrak{g}/\mathfrak{h}, \mathfrak{g}/\mathfrak{b})$ by Proposition 3.3 (2).

In the first case, we consider the following two eventualities.

a-1) $l \in \mathcal{I}(\mathfrak{g}/\mathfrak{h}, \mathfrak{g}/\mathfrak{b})$**:** This case is characterized by the existence of a nonempty Zariski open subset $\mathcal{U}_l$ of G, given by Definition 3.2 (2), such that for every $g \in \mathcal{U}_l$, we have $Z_l \notin \mathfrak{h} + \mathrm{Ad}(g)\mathfrak{b}$ (since $\mathfrak{g}_{l+1} \subseteq \mathrm{Ad}(g)\mathfrak{b}$ for $g \in G$).

a-2) $l \notin \mathcal{I}(\mathfrak{g}/\mathfrak{h}, \mathfrak{g}/\mathfrak{b})$**:** Here we have $\mathcal{I}(\mathfrak{g}/\mathfrak{h}, \mathfrak{g}/\mathfrak{c}) = \mathcal{I}(\mathfrak{g}/\mathfrak{h}, \mathfrak{g}/\mathfrak{b})$ as in the case *b*). Hence for every g in a nonempty Zariski open subset $\mathcal{U}_l$ of G, we have that $Z_l \in \mathfrak{h} + \mathrm{Ad}(g)\mathfrak{b}$.

Remark 3.8. For every $(w, \tilde{g}) \in G_l \times H\backslash G/B$, we have $H \cdot wgw^{-1} \cdot B = \tilde{g}$. This is an

Figure 6: Excerpt from p. 825 of [4] illustrating the proposed diagonals being used contrastively with other solidi. The proposed diagonals are highlighted in green, forward (division) solidi (U+2215) in yellow, backward (reverse) solidi (U+29F5) in blue, and (small) set minus (U+2216) in purple.

5. Code Charts

A UniBook code chart is appended at the end of this document. UniBook source project files and a font will be made available to the editors. Updated UCD files (such as `BidiMirroring.txt` and `MathClass*.txt` to accompany UTR #25) will also be made available to the Unicode Technical Committee.

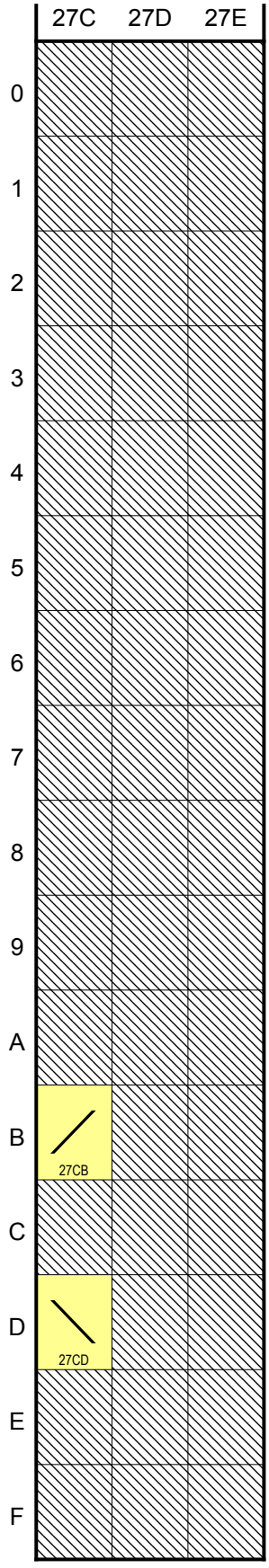
6. References

[1] The STIX Font Project, http://www.stixfonts.org/, an activity of the STIX Pub companies listed at http://www.stixfonts.org/stipubs.html. The latest version of the STIX table is linked from http://www.ams.org/STIX/.

[2] Deborah Anderson et al., "Preliminary Proposal to Encode Characters from the STIX PUA Collection," INCITS/L2 documents L2/09-261 and L2/09-262, http://www.unicode.org/L2/L2009/09261-stix-pua-proposal-1.pdf and http://www.unicode.org/L2/L2009/09262-stix-pua-proposal-2.pdf.

[3] Scott Pakin, "The Comprehensive LaTeX Symbol List," version of Jan. 2008, http://www.ctan.org/tex-archive/info/symbols/comprehensive/.

[4] Jawhar Abdennadher and Jean Ludwig, "Disintegrating Tensor Representations of Nilpotent Lie Groups," Transactions of the American Mathematical Society, vol. 361, no. 2, Feb. 2009, pp. 819–848.


27C
27D
27E
0
1
2
3
4
5
6
7
8
9
A
B
C
D
E
F
27CB
27CD

Miscellaneous Symbol

27CB ⟋ RISING DIAGONAL
= \diagup
→ 2215 ∕ division slash

Miscellaneous Symbol

27CD ⟍ FALLING DIAGONAL
= \diagdown
→ 2216 ∖ set minus
→ 29F5 \ reverse solidus operator