Twelve cuneiform *tenû* numerals

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Contents

1 Summary

This document proposes filling the Cuneiform Numbers and Punctuation block with twelve cuneiform numerals used in the third millennium.

Three of those are additional numerals in the AŠ (or DIŠ) *tenû* series, 7↖–9↖, where 1↖ = ↖ through 6↖ = ⬙ are already encoded. Their glyphic range and usage, as well as possible reasons for their absence in the current version of the Standard, are discussed in §**??**.

The other proposed characters constitute a new series of numerals, formed by ↖ numerals crossing an ⊢ wedge. They are discussed in §**??**.

2   Proposed changes to the Standard

2.1   Core specification text

No change is needed in the core specification.

2.2   Code charts

The code charts for the affected block, including the character names list with proposed informative aliases, cross references, and informative notes, are shown on the following pages. A plain text file containing the NamesList.txt lines is attached to this document.

2.3   Properties

Add to the respective UCD files the lines given in this section. These are available as plain text files attached to this document. Changes to derived files are not listed.

#### 2.3.1   Name, General_Category, Numeric_Value, etc.

2.3.2   Line_Break

2.3.3   Script

2.3.4   Script_Extensions

2.3.5   Block

3   DIŠ *tenû* numerals

This section discusses the following proposed characters:
— U+1246F ⬚ CUNEIFORM NUMERIC SIGN SEVEN ASH TENU
— U+12475 ⬚ CUNEIFORM NUMERIC SIGN EIGHT ASH TENU
— U+12476 9↖ CUNEIFORM NUMERIC SIGN NINE ASH TENU

3.1   Name

The existing numerals in the ↖ series are named ↖ CUNEIFORM SIGN ASH ZIDA TENU for the first one and CUNEIFORM NUMERIC SIGN *n* ASH TENU for ↖–⬙.

Some[1] technical terms used in cuneiform character names are derived originate from the structural descriptions of cuneiform signs by Akkadian-speaking scribes

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[1]TODO also note gunû but contrast CROSSING rather than gi-li-mu-u, SQUARED rather than li-mu-bu i-gi-gu-ub-bu-u2

in late second and first millennium lexical texts. [TODO(egg): Cite Yushu Gong on tenu itself] In particular, the word *tenû* is used to describe slanted signs or parts of signs: thus ⸢𒑱⸣ is described as 𒑱 *tenû* in [**P365233**][2], 𒑱 as 𒑱 *tenû* in [**P391514**; **P467315**], 𒑱 as 𒑱 *tenû* in [**P391514**], 𒑱 as 𒑱 (containing) ⸢𒑱⸣ *tenû* in [**P365267**][3]. In most cases, the direction of the slant not explicitly specified. The terms *kaba tenû* and *zida tenû*, from Sumerian 𒑱 gab₂ "left" and 𒑱 zid "right" respectively, are used in [**P345960**], which contrasts 𒑱 described as *kaba tenû* and 𒑱 described as *zida tenû*.

In modern transliteration, 𒑱 numerals are described as ⸢𒑱⸣ *tenû* (ATF: `asz@t`) or 𒑱 *tenû* (ATF: `disz@t`), the latter being more common[4]. Informative aliases using *diš tenû* have been recommended for the existing characters in [**L2/24-239**]. The proposed names use ASH TENU for consistency with the already-encoded characters, and the proposed annotations include informative aliases with *diš tenû*.

3.2 Ur III usage

As described in [Sch35, p. 135] (see Figure 1), slanted signs are used in Ur III economic texts primarily in subtractive notation with 𒑱[5] lal[6], as well as for ordinals[7] and for ages of animals in years[8].

Accounts of animals giving their ages in years rarely go beyond three-year old animals. Subtractive notation, which appears in the ED IIIa period [Rob08, p. 77], is used to compactly express numbers close to a larger round number, *e.g.*, 𒑱 $10 - 1$ instead of 𒑱 for 9, 𒑱 $30 - 2$ instead of 𒑱 for 28, or 𒑱 $60 - 1$ instead of 𒑱 for 59; *cf.* IX instead of VIIII in Roman numerals. It is therefore usually limited to small subtrahends[9]. Larger subtrahends do occur for quantities close to a much larger unit; however in Ur III, they are often written 𒑱 numerals, as in [**P109346**] 𒑱 "4 shekels minus 7 grains of gold", a weight which would otherwise be written 𒑱 "$3 + \frac{2}{3}$ shekels and 53 grains", as $180 𒑱 = 1 𒑱$.

Ordinals with 𒑱 numerals are also typically limited to small numbers or subtractive notation: many of the attestations of $n𒑱𒑱$ "nth" are in year names[10], such as 𒑱 mu kar₂-ḫar^{ki} a-ra₂ 2𒑱-kam-aš ba-ḫul "year Karhar was destroyed for the second time" (31st year of Šulgi's reign), 𒑱 𒑱 mu si-mu-ru-um^{ki} a-ra₂ 3𒑱-kam-aš ba-ḫul "year Simurrum was destroyed for the third time" (32nd year of Šulgi's reign), or 𒑱 𒑱 mu si-mu-ru-um^{ki} u₃

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[2]Note that while the third millennium 𒑱 and 𒑱 are related by a 45° rotation, in the Neo-Assyrian style used by this list, these signs look like 𒑱 and 𒑱, so that only one wedge is slanted, as noted in [**Gong00**].

[3]TODO something on spelling out names 𒑱 *ga-na te-nu-u₂* and 𒑱 *še te-nu-u*; *ku te-nu-u*, etc.

[4]For an example of a transliteration using aš tenû, see [**Greco2021**]; note that only the HTML version uses aš tenû, the PDF uses diš.

[5]As noted in [L2/24-210R, p. 25 n. 40], the sign 𒑱 (lal, "minus") is often ligated with the following numerals, with the subtrahend placed under a sometimes considerably enlarged 𒑱, similar to the layout of the radical in modern mathematical notation, see, *e.g.*, [P020092, rev. 3 1, 2]. The font used in this document ligates or kerns 𒑱 subtrahends, but does not enlarge the 𒑱.

[6]Also transliterated la₂, as in [CDLI]. In the transliterated Ur III corpus on [CDLI], out of 3304 occurrences of (disz@t), 1971 are in 𒑱 n𒑱 la2 n(disz@t).

[7]1583 out of 3304 occurrences are n𒑱𒑱 n(disz@t)-kam, including 647 after 𒑱

[8]203 occurrences of gu4, ab2, ansze, or dur3 n(disz@t)

[9]Of the 1971 Ur III occurrences of lal n(disz@t), 1930 are with $n ≤ 2$, of which 1823 with $n = 1$.

[10]430 occurrences of n(disz@t)-kam are on lines starting with mu, of which 308 are in 𒑱.

lu-lu-bu-um^ki a-ra2 1⟨ lal 1⟍-kam-aš ba-ḫul "year Simurrum and Lullubum were destroyed for the ninth time" (44th year of Šulgi's reign). Larger ordinals are frequent, in particular for the day of the month, but these are written with ⎜ numerals, thus ⟁ 𒐜 ⊕ for "the 7th day" or ⟁ ⟪ 𒐜 ⊕ for "the 28th day".

The rarity of the higher ⟍ numerals in the Ur III corpus likely explains the absence of 7⟍–9⟍ from the répertoire of Unicode Version 5.0, which was aiming to encode a répertoire appropriate for the Ur III period and later.

3.3   Early Dynastic usage

The situation is different in the Early Dynastic corpus. As described in [L2/24-210R], ⟍ numerals are used in many Early Dynastic metrological systems, and in particular in the Early Dynastic IIIb length system
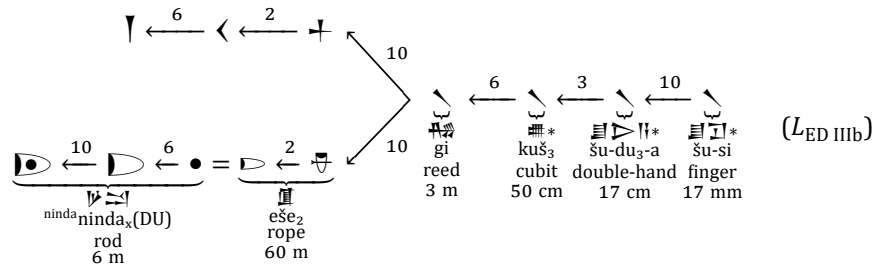
$(L_{\text{ED IIIb}})$

While these systems have a unit 1 𒑉 = 2 𒐏, lengths above 1 𒐏 are only expressed in 𒁹, or equivalently in tens of 𒑉, and in half-𒁹 equal to 10 𒐏. We can therefore expect 7–9 to occur, expressed using ⟍ numerals. Indeed, 37 texts in the transliterated ED IIIb corpus on [CDLI] contain undamaged attestations of either 7⟍𒐏 or 8⟍𒐏[11]. TODO(egg): Figures. However, 9⟍𒐏 is not attested, since instead subtractive notation is used, as in ▷▷▷𒐈𒌋𒐏 in [P020129, obv. 3 3], ▷𒐈𒑉𒐏𒈦≈ in [P221272], or ⟨𒐏 in [P020304].

The use of ⟍ numerals for ordinals, especially for days, is more prevalent in the Early Dynastic period than in the Ur III period, and the use of subtractive notation is less frequent in these numbers. We therefore find many attestations of 7⟍–9⟍ in ⟁ *n*⟍ ⊕. TODO(egg) Figures.

In Ebla, the ⟍ numerals are primarily used in subtractive notation, see [Gor24, p. 88 n. 298, p. 120 n. 465, p. 167 n. 739, p. 180 n. 801]. However, contrary to Ur III, ⟍ numerals remain used for large subtrahends, thus [Gor24, p. 101 n. 355] cites occurrences of 𒐈𒑆≈ for 36 and ▷𒐈≈⟨𒐕𒌍[12] for 94. In particular, [Gor24, pp. 129 sq.] cites occurrences of 𒐕9⟍ in Ebla: ●𒐕 9⟍ 𒑲⊕ 𒍝 ⟁ "9 minas and 51 shekels of silver" in [P241283], and ▷▷𒐕 9⟍ 𒑲⊕ 𒍝 ⟁ "1 mina and 51 shekels of silver" in [P241325].

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[11]Of those, 34 have 7⟍𒐏 and 9 have 8⟍𒐏.
[12]Recall that ⟨𒐕𒈦 *mi-at* is Eblaite for "hundred", see [Arc15, p. 33; L2/24-210R, p. 27].

Figure 1: [Sch35, p. 135]

Figure 2: [Sch35, p. 132]

3.4   Stacking patterns

4   AŠ×(DIŠ *tenû*) numerals

https://cdli.mpiwg-berlin.mpg.de/artifacts/452986/reader/209489 https://cdli.mpiwg-berlin.mpg.de/artifacts/467743/reader/213564

4.1   Stacking patterns

The subsequent mu-iti system, which saw limited use at the end of the presargonic and the beginning of the Old Akkadian periods, seems, on its surface, to be a rational development from the system it replaced; the *basis* of a 30-day month carries on (cf. for instance the texts B. Foster, Umma in the Sargonic Period [Hamden 1982] pl. 18, Nr 37, discussed by J Friberg, Scientific American 250/2 [Feb. 1984] 114 and Foster, ASJ 4 [1982] 43 obv iii9-11) and, for a period at least, a graphically comparable method of representing year dates, with now vertical strokes impressed on either side of the long horizontal, was used (the date of the text BIN 8, 117, ⚏⚏⚏, which both Powell, HUCA 49, 9 and B. Foster, Or.NS 48 (1979) 156 and USP p. 7 read 7 (mu) 1 (iti) 7 (ud), should be registered with some scepticism). Only here is the refinement of day added, so that documents

Figure 3: TODO note that this should cite BIN 8, 116, not 117.

A connection of ɪᴍ with the later usage of im(.ma) (presargonic Lagash and later; Akkadian šaddaqdi/a(m) with lexical equivalent ᴍᴜ.ɪᴍ.ᴍᴀ [MSL 5, 65:195]), meaning "previous (year)" is not apparent. For the latter usage cf. particularly DP 280 (= 281), a presargonic temple document which "loads onto the backs" (gu₂.ne.ne.a e.ne.gar) of the fisheries foremen Ne.sag and Lugal.ša₃.la₂.tuku the quota arrears of im.im.ma.kam ⚏, im.ma.kam ⚏ and mu.a.kam ⚏, that is of the year before last = year one (of the king Uruᴋᴀgina [second regnal year]), of last year = year 2 and of this year = year 3 Also DP 243 goats of various colors / maš im.ma.kam / ditto / maš mu.a.kam and DP 94. maš im.ma as delivery arrears noted after grown nannies (ud₅) and before maš ša₃.ʜɪ (//mu.a.kam, "of the current year"), further maš im.ma = maš.gal.gal in the summation rev i2 (see footnote 17 to the notations of the type ⚏). A parallel usage is found in the Old Akkadian text ITT 2/1, 3078 obv 1-4. 3 1/2 ma.na siki / [i]m.ma.kam / 1 gu₂ la₂.4 ma.na siki / mu.a.kam. It would seem difficult to reconcile this clear usage im = "previous year" with the often translated im = "account tablet" (im = clay)

Figure 4: TODO

Acknowledgements

References

Artefacts

[P020092]   VAT 04428. Berlin, Germany: Vorderasiatisches Museum.
CDLI: P020092.
ORACC: epsd2/P020092.

[P020129]   VAT 04713. Berlin, Germany: Vorderasiatisches Museum.
CDLI: P020129.
ORACC: epsd2/P020129.

ISO and Unicode documents

[L2/24-210R]   R. Leroy, A. Pandey and S. Tinney. *Archaic cuneiform numerals*. 23rd Oct. 2024.
UTC: L2/24-210R.

[Uni16]   The Unicode Consortium. *The Unicode Standard*. Version 16.0.0. The Unicode Consortium, 10th Sept. 2024.
ISBN: 978-1-936213-34-4.
https://www.unicode.org/versions/Unicode16.0.0/core-spec/.

Online corpora and related projects

[CDLI]   É. Pagé-Perron, J. L. Dahl, B. Lafont, J. Renn, R. K. Englund and P. Damerow, eds. *Cuneiform Digital Library Initiative*. 2000–.
https://cdli.mpiwg-berlin.mpg.de.

Other documents

[Arc15]   A. Archi. *Ebla and Its Archives. Texts, History, and Society*. Studies in ancient Near Eastern records 7. Walter de Gruyter, 2015.
ISBN: 978-1-61451-716-0.
DOI: 10.1515/9781614517887.

[Gor24]   F. Gori. "Numeracy in Early Syro-Mesopotamia. A study of accounting practices from Fāra to Ebla". PhD thesis. Università degli studi di Verona, 2024.
https://iris.univr.it/bitstream/11562/1114808/1/Diss_Fiammetta_Gori.pdf.

[Rob08]   E. Robson. *Mathematics in Ancient Iraq. A Social History*. Princeton University Press, 2008.
ISBN: 978-0-691-09182-2.

[Sch35]   N. Schneider. *Die Keilschriftzeichen der Wirtschaftsurkunden von Ur III*. Editrice Pontificio Istituto Biblico, 1935.