

Twelve cuneiform *tenû* numerals

Robin Leroy and Steve Tinney

2024-12-01

Contents

1	Summary	1
2	Proposed changes to the Standard	2
2.1	Core specification text	2
2.2	Code charts	2
2.3	Properties	2
2.3.1	Name, General_Category, Numeric_Value, etc.	2
2.3.2	Line_Break	2
2.3.3	Script	2
2.3.4	Script_Extensions	2
2.3.5	Block	2
3	DIŠ <i>tenû</i> numerals	2
3.1	Name	2
3.2	Ur III usage	4
3.3	Early Dynastic usage	5
3.4	Stacking patterns	8
4	AŠ×(DIŠ <i>tenû</i>) numerals	8
4.1	Stacking patterns	8
Acknowledgements		9
References		9
Artefacts		9
ISO and Unicode documents		9
Online corpora and related projects		9
Other documents		9

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 glyptic range and usage, as well as possible reasons for their absence in the current version of the Standard, are discussed in §3.

The other proposed characters constitute a new series of numerals, formed by ↖ numerals crossing an ← wedge. They are discussed in §4.

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 ↙ CUNEIFORM NUMERIC SIGN NINE ASH TENU

3.1 Name

The existing numerals in the ↖ series are named U+12039 ↖ CUNEIFORM SIGN ASH ZIDA TENU for the first one and U+1244A–U+1244E ↙–↗ CUNEIFORM NUMERIC SIGN *n* ASH TENU for the others.

- 135 -

b) DIE SCHIEFEN KEILE UND DIE WINKELHAKEN (für die Einheiten von 1-9, neben den senkrechten keilförmigen Zahlenzeichen).

a) bei I : RTC. 276: $\text{K}\text{H}\text{K}\text{H}\text{H}$
*Bart. III 116, 249: 3 gín igi- h -gál HH še.
 Legr. TRU. 310: ud- KK kam.
 Gen. TD. 5487: KK áb.*

b) vor kam und àm:
*Bart. III 152, 398: áub- K -ám
 Legr. TRU. 42: a-áu- K -kam
 a-áu K -kam
 a-áu KK -kam
 a-áu KKK -kam
 Legr. TRU. 346: i máš-gal-še KK -kam-uš
 i udu-še KK -kam-uš
 Siehe: itu-šu- KK -ša; itu šu- KK -ša; itu šu- KKK -ša.*

c) nach gud, áb, anše, zur Bezeichnung des Alters:
*ITT III, II 4956: 20 áb- K -še 3 qa-ta
 ITT III, II 6090: 3 anše-sal- I ; 1 anše-nita I ;
 Pinch. AT. I. 53: 3 gud I ; 1 áb I ;
 Bart. III 106, 191: 3 anše-nita I
 ITT II, I. 6965: 20 zu-gud- K 15 zu-gud K .*

Figure 1: [Sch35, p. 135]

Some¹ technical terms used in cuneiform character names are derived originate from the structural descriptions of cuneiform signs by Akkadian-speaking scribes 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 I is described as I *tenû* in [P365233]², K as K *tenû* in [P391514; P467315], K as K *tenû* in [P391514], \square as \square (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 LJ gab₂ “left” and HH zid “right” respectively, are used in [P345960], which contrasts v described as *kaba tenû* and v described as *zida tenû*.

In modern transliteration, v numerals are described as — *tenû* (ATF: asz@t) or I *tenû* (ATF: disz@t), the latter being more common⁴. 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*.

b) GEBRAUCH VON IN .

ITIN. 7164^a: $\ll\text{I}\text{N}$ = 20 minus 3 = 17.

CT. 10, 24964: $\ll\text{I}\text{N}$ = 40 minus 4 = 36.

Gen.TE0.5670: WIN = 240 minus 2 = 238.

Nota: *Pgl. im römischen Zahlen-*

system: IX = Xminus1; XIX=

XXminus1; ferner die ro-

teinischen Ausdrücke:

undeviginti = 20 minus1; duodeci-

ginta = 30 minus 2.

Figure 2: [Sch35, p. 132]

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 IN *lal*⁵, as well as for ordinals⁷ and for ages of animals in years⁸.

Accounts of animals giving their ages in years rarely go beyond three-year old animals. Subtractive notation, which appears in the ED IIIa period [Robo8, p. 77], is used to compactly express numbers close to a larger round number, e.g., K 10 – 1 instead of W for 9, $\ll\text{K}$ 30 – 2 instead of $\ll\text{W}$ for 28, or K 60 – 1 instead of $\ll\text{W}$ for 59; cf. IX instead of VIII in Roman numerals. It is therefore usually limited to small subtrahends⁹. Larger subtrahends do occur for quantities close to a much larger unit; however in Ur III, they are often written I numerals, as in [P109346] $\text{W}\text{I}\text{N}\text{I}\text{N}\text{I}\text{N}$ “4 shekels minus 7 grains of gold”, a weight which would otherwise be written $\text{W}\text{I}\text{N}\text{I}\text{N}\text{I}\text{N} \ll\text{W}\text{I}\text{N}\text{I}\text{N}\text{I}\text{N}$ “3 + $\frac{2}{3}$ shekels and 53 grains”, as $180\ll\text{W}\text{I}\text{N}\text{I}\text{N}\text{I}\text{N}$ = 1 $\text{W}\text{I}\text{N}\text{I}\text{N}\text{I}\text{N}$.

Ordinals with N numerals are also typically limited to small numbers or subtractive notation: many of the attestations of $n\text{N}$ “nth” are in year names¹⁰, such as $\text{K}\text{K}\text{K}\text{K}\text{K}$ mu kar₂-har^{ki} a-ra₂ 2 N -kam-aš ba-hul “year Karhar was destroyed for the second time” (31st year of Šulgi’s reign), $\text{K}\text{K}\text{K}\text{K}\text{K}$ mu si-mu-ru-um^{ki} a-ra₂ 3 N -kam-aš ba-hul “year Simurrum was destroyed for the third time” (32nd year of Šulgi’s reign), or $\text{K}\text{K}\text{K}\text{K}\text{K}$ mu si-mu-ru-um^{ki} u₃ lu-lu-bu-um^{ki} a-ra₂ 1 N lal 1 N -kam-aš ba-hul “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 I numerals,

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

²Note that while the third millennium I and L are related by a 45° rotation, in the Neo-Assyrian style used by this list, these signs look like I and N , so that only one wedge is slanted, as noted in [Gong2000].

³TODO something on spelling out names $\text{K}\text{K}\text{K}\text{K}\text{K}$ ga-na te-nu-u₂ and $\text{K}\text{K}\text{K}\text{K}\text{K}$ še te-nu-u; ku te-nu-u, etc.

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

⁵As noted in [L2/24-210R, p. 25 n. 40], the sign I (lal, “minus”) is often ligated with the following numerals, with the subtrahend placed under a sometimes considerably enlarged I , similar to the layout of the radical in modern mathematical notation, see, e.g., [Po20092, rev. 3 1, 2]. The font used in this document ligates or kerns N subtrahends, but does not enlarge the I .

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

⁷1583 out of 3304 occurrences are N n(disz@t)-kam, including 647 after I

⁸203 occurrences of gu4, ab2, ansze, or dur3 n(disz@t)

⁹Of the 1971 Ur III occurrences of la₂ n(disz@t), 1930 are with n ≤ 2, of which 1823 with n = 1.

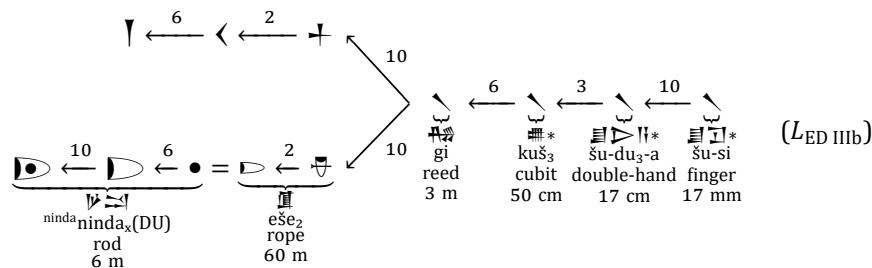
¹⁰430 occurrences of n(disz@t)-kam are on lines starting with mu, of which 308 are in K .

thus $\text{𒌵 } \text{𒂗 } \diamond$ for “the 7th day” or $\text{𒌵 } \text{𒂗 } \text{𒂗 } \diamond$ for “the 28th day”.

The rarity of the higher 𒂗 numerals in the Ur III corpus likely explains the absence of $7\text{𒂗}-9\text{𒂗}$ 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], 𒂗 numerals are used in many Early Dynastic metrological systems, and in particular in the Early Dynastic IIIb length system



While these systems have a unit $\text{𒂗 } \text{𒂘} = 2 \text{𒂘}$, lengths above 1 𒂘 are only expressed in 𒂘 , or equivalently in tens of 𒂘 , and in half- 𒂘 equal to 10 𒂘 . We can therefore expect 7–9 𒂘 to occur, expressed using 𒂗 numerals. Indeed, 37 texts in the transliterated ED IIIb corpus on [CDLI] contain undamaged attestations of either $\text{𒂘 } \text{𒂘}$ or $\text{𒂘 } \text{𒂘}$ ¹¹; some of these attestations are shown in Figures 6–5. However, $\text{𒂘 } \text{𒂘}$ is not attested, since instead subtractive notation is used, as in $\text{DDD } \text{::: } \text{𒂘 } \text{𒂘 }$ in [P020129, obv. 3 3], $\text{D } \text{::: } \text{𒂘 } \text{𒂘 } \text{𒂘 }$ in [P221272], or in [P020304].

TODO something about sila, see P220703

The use of 𒂗 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 frequent¹². In these numbers. We therefore find attestations of in “nth day”, some of which are shown in Figures 7–??

In Ebla, the 𒂗 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, 𒂗 numerals remain used for large subtrahends, thus [Gor24, p. 101 n. 355] cites occurrences of $\text{::: } \text{ }$ for 36 and $\text{ } \text{ }$ for 94. In particular, [Gor24, pp. 129 sq.] cites occurrences of in Ebla: $\text{ } \text{ }$ “9 minas and 51 shekels of silver” in [P241283], and $\text{ } \text{ }$ “1 mina and 51 shekels of silver” in [P241325].

¹¹Of those, 34 have and 9 have .

¹²Although also attested, see, e.g., [P221346] $\text{ } \text{ }$, [P221006] $\text{ } \text{ }$, [P221006] $\text{ } \text{ }$.

¹³Recall that *mi-at* is Eblaite for “hundred”, see [Arc15, p. 33; L2/24-210R, p. 27].



Figure 3: ٥٠١ “501 m (first) width” (of a field) in [P221254] from Nirsu, dated to the reign of . Left: Copy from [AllottededelaFuye1920]. Right: [CDLI] photograph.

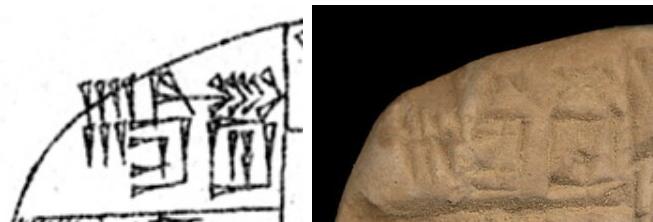


Figure 4: ٢١ “21 m of reed-bed dyke” (attributed to the farmer) in [P221266, obv. 11] from Nirsu, dated to the reign of . Left: Copy from [AllottededelaFuye1920]. Right: [LouvreCollections] photograph.



Figure 5: ١٣٤٤ “1344 m, its height 2 m” (dimensions of a dyke on the river) in [P020303] from Nirsu, dated to the reign of . Left: Copy from [Marzahn1991]. Right: [CDLI] photograph.

¹⁴TODO something about rhomboidal numerals, cite [Gor24].



Figure 6: 𠂔 𠂔 𠂔 𠂔 “444 m equal widths” (of a field) in [P221254]. Left: Copy from [AllottededelaFuye1920]. Right: [CDLI] photograph.



Figure 7: 𠂔 𠂔 𠂔 “seventh day” in [P220703] from Nirsu, dated to 3rd year of the reign of 𠁷 𠁷 𠁷. Left: Copy from [AllottededelaFuye1918]. Right: [LouvreCollections] photograph.



Figure 8: 𠂔 𠂔 𠂔 “seventh day passed” in [P221590] from Nippur. Left: Copy from [Westenholz1975]. Right: [CDLI] photograph.



Figure 9: 𠂔 𠂔 𠂔 “eighth day” in [P220703]. Left: Copy from [AllottededelaFuye1918]. Right: [LouvreCollections] photograph.

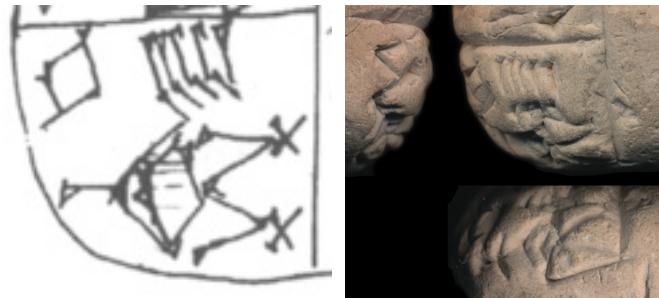


Figure 10: “ninth day” in [P222129] from Šuruppag. Left: Copy from [Martin2001]. Right: [CDLI] photograph.

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-itî 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 11: TODO note that this should cite BIN 8, 116, not 117.

A connection of **IM** with the later usage of **im(.ma)** (presargonic Lagash and later; Akkadian **šaddaqdi/a(m)** with lexical equivalent **MU.IM.MA** [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 **Urukagina** [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.hi** (/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 12: TODO

Acknowledgements

The *CuneiformComposite* font by Steve Tinney is used when referring to the reference glyphs for already-encoded cuneiform. *Noto Sans Cuneiform*, by Monotype Imaging, is used to for most of the cuneiform text in this document, with modifications (cuneiform glyph for ◇ ŠAR₂, corrected glyphs for 𒃩 𒃪 UN and 𒃩 𒃪 KALAM per [Uni16], alternate glyph ܲ for ܲ). Arabic text is set in *Scheherazade New* by SIL International; Traditional Chinese text is set in *Noto Serif TC* by Ken Lunde et al.; monospace text is set in *Consolas* by Luc(as) de Groot; the remainder of the text is set in *Cambria* and *Cambria Math* by Monotype Imaging and Tiro Typeworks.

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](#).
- [P221266] AO 13825. Paris, France: Musée du Louvre.
CDLI: [P221266](#).
ORACC: [epsd2/P221266](#).
Louvre Collections: [ark:/53355/cl010138527](#).

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](https://doi.org/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.