

Archaic cuneiform numbers

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1 Summary

2 Background

The Unicode Standard includes some cuneiform numbers: 𐎶–𐎶𐎵 1–9(diš) and 𐎶–𐎶𐎵 1–9(aš), 𐎶–𐎶𐎵 1–5(u), 𐎶–𐎶𐎵 1–9(šeš₂), 𐎶–𐎶𐎵 1–5(šeš₃u), etc., used in the Sumerian-Akkadian Cuneiform script (ISO 15924: Xsux, Script property value long name: Cuneiform).

In the investigation that led to their encoding in Unicode Version 5.0, it was thought appropriate to unify these with the earlier curviform numerals 𐎶–𐎶𐎵 1–9(aš^c = N_1), 𐎶–𐎶𐎵 1–5(u^c = N_{14}), 𐎶–𐎶𐎵 1–9(šeš₂^c = N_{34}), 𐎶–𐎶𐎵 1–5(šeš₃u^c = N_{48}), etc., see [L2/04-099](#). While the curviform numerals sometimes co-occur with the cuneiform ones, this was analysed as a stylistic distinction which should not be encoded in plain text. It has now become apparent that a distinction needs to be

In addition, these numerals will be needed for the representation of proto-cuneiform texts from the earlier archaic period. The non-numeric signs of proto-cuneiform (ISO 15924: P_{cun}) will be the subject of a separate proposal; we need only note here that the divergence between the approaches to character identity in modern scholarship requires that proto-cuneiform be disunified from cuneiform: proto-cuneiform is effectively treated as an undeciphered script. In contrast, the cuneiform encoding model is semantic, requiring an understanding of the text to correctly encode it.

	Uruk III & earlier	ED – Ur III	OB & later
Non-numeric signs	Future Pcun	Existing Xsux	
Numbers	This proposal	This proposal + Existing Xsux	Existing Xsux

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Edubba'a D

As is well known¹ a sexagesimal place value system (SPVS) was used in Mesopotamia from the late third millennium onwards. One should bear in mind, however, that other systems were used; the SPVS was primarily used in calculations, with results being expressed in non-positional systems. The digits 1–59 of the SPVS have inner structure which is reflected in the encoding: the digits 1–9 are the individual characters $\text{I}-\text{III}$, the multiples of ten (10–50) are $\text{I}-\text{X}$, but the other digits 11–59 are sequences $\text{I}-\text{X} \text{ III}$; in effect the base-sixty digits are themselves written in base ten, with a different set of symbols for the tens place. This reflects the origin of the sexagesimal place value system; it derives from a *non-positional* system, hereafter the *cuneiform discrete counting system* $\text{S}_{\text{Ur III/OB}}$, which had different signs for the units $\text{I}-\text{III}$, tens $\text{I}-\text{X}$, sixties $\text{I}-\text{XVI}$ (with larger wedges than the units), six hundreds $\text{I}-\text{VI}$, three thousand six hundreds $\text{I}-\text{XVI}$, and thirty-six thousands $\text{I}-\text{XVI}$.

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The relations between the values of the signs in the cuneiform discrete counting system may be summarized as follows, where the number over arrow indicates the multiple of the preceding sign (right of the arrow) corresponding to the following sign (left).

$$\diamond \xleftarrow{10} \diamond \xleftarrow{6} \text{𐎶} \xleftarrow{10} \text{𐎵} \xleftarrow{6} \text{𐎴} \xleftarrow{10} \text{𐎳} \quad (S_{Ur III/OB})$$

For example, the number 1729 = ((2 × 10 + 8) × 6 + 4) × 10 + 9 = 28 × 60 + 49 would be written 𐎶𐎵𐎶𐎴𐎵 in the discrete counting system, and 𐎶𐎵𐎶𐎴𐎵 in the sexagesimal place value system.

The discrete counting system was not the only non-positional system in use in the Ur III and Old Babylonian periods; different systems were in use depending on what was being counted or measured. For instance, field areas were measured using the following system, where for the named units we have provided the name of the unit in transliterated Sumerian, normalized Old Babylonian Akkadian, and the approximate metric equivalent:

$$\diamond \xleftarrow{10} \diamond \xleftarrow{6} \text{𐎶} \xleftarrow{10} \text{𐎵} \xleftarrow{3} \text{𐎴} \xleftarrow{6} \text{𐎳} \xleftarrow{2} \text{𐎲} \xleftarrow{2} \text{𐎱} \quad (G_{Ur III/OB})$$

1 bur ₃	1 eše ₃	1 iku	1 ubûm
1 būrum	1 eblum	1 ikûm	1800 m ²
6,48 ha	2,16 ha	3600 m ²	

Note that for the range of areas given above², this system does not use any symbols separate from the numerals for the individual units (*ubûm*, *ikûm*, *eblum*, and *būrum*). The whole numeric expression for the area would be followed by the sign 𐎶𐎵 functioning as punctuation, but the numerals are tied to the metrology; thus a surface of 5 būrū 1 eblum 4 ikû (100 ikû, 36 ha) would be written³ 𐎶𐎵𐎶𐎴𐎵𐎶𐎴𐎵. Contrast this with systems where the same numerals are used for different units, and overt units are used, as in “88 acres 3 roods 33 perches”. Note also that the same signs are shared between multiple systems, with different relations; the ŠAR₂ sign 𐎶 is equal to sixty times the U sign 𐎵 in the area system, but to three hundred and sixty times 𐎵 in the discrete counting system.

Another such system of note is the one for volumes,

$$\diamond \xleftarrow{10} \diamond \xleftarrow{6} \text{𐎶} \xleftarrow{10} \text{𐎵} \xleftarrow{6} \text{𐎴} \xleftarrow{10} \text{𐎳} \xleftarrow{5} \text{𐎲} \xleftarrow{6} \text{𐎱} \xleftarrow{10} \text{𐎰} \quad (C)$$

1 gur	1 bariga	1 ban ₂	1 sila ₃
1 kurrum	1 parsiktum	1 sūtum	1 qām
			1 l

where the numerals for ban₂ are 𐎶, 𐎵, 𐎴, 𐎳, and 𐎲, and those for bariga are 𐎶, 𐎵, 𐎴, and 𐎳 (contrast ordinary 𐎶 and 𐎵 otherwise used with 𐎶-numerals). Note that while it is used only with volumes in excess of one gur, the sign GUR 𐎶𐎵 is written after the whole expression, after the overt unit sign 𐎶 if present, and after the word for “grain” if present, as in 𐎶𐎵𐎶𐎴𐎵𐎶𐎴𐎵𐎶𐎴𐎵 (3554 gur 3 ban₂ 6 sila₃

²For areas smaller than a quarter *ikûm*, an overt unit is used, with 1 *mūšarum* (36 m²) written 𐎶𐎵𐎶, equal to one hundredth of an *ikûm*, then sexigesimally subdivided in 60 𐎶𐎵 (shekels). For areas greater than 3600 *būrū*, the 𐎶- and 𐎵-numerals are reused with a suffix 𐎶𐎵 (gal, Sumerian: big), as follows:

$$\diamond \text{𐎶𐎵} \xleftarrow{10} \diamond \text{𐎶𐎵} \xleftarrow{6} \diamond \text{𐎶𐎵} \xleftarrow{10} \diamond \text{𐎶𐎵} \xleftarrow{6} \text{𐎶} \xleftarrow{10} \text{𐎵} \xleftarrow{3} \text{𐎴} \xleftarrow{6} \text{𐎳} \xleftarrow{2} \text{𐎲} \xleftarrow{2} \text{𐎱} \xleftarrow{2,5} \text{𐎶𐎵} \xleftarrow{10} \text{𐎶} \xleftarrow{6} \text{𐎴} \xleftarrow{10} \text{𐎵}.$$

³As in the surface of the field of 𐎶𐎵𐎶𐎴𐎵𐎶𐎴𐎵 (Apisal) reported on P102305 r. 1.

