

# The `babyloniannum` package

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## I Introduction

This package was created as an answer to a question<sup>1</sup> about typesetting Babylonian numerals asked on <http://tex.stackexchange.com>.

This package allows to typeset Babylonian numerals using X<sub>Y</sub>TeX or LuaTeX. It makes use of the Santakku Paleo-Babylonian TrueType font which can be downloaded at <http://www.hethport.uni-wuerzburg.de/cuneifont/>.

## II Usage

`\babylonianfont`

Set the font used. Currently, only the Santakku font has been tested. Let me know if you get the package to work with other fonts.

Example usage: `\babylonianfont{Santakku}`

`\babyloniannum`

This is the main macro of this package. It takes a number between 1 and 59 as argument and typesets it with Babylonian numerals.

Example usage:

`\babyloniannum{424000}` is 𐎶 𐎠𐎺𐎠 𐎠𐎺𐎠 𐎶 (1,57,46,40 in base 60)

`\babyloniannum{21609}` is 𐎶 𐎠𐎺 (6,0,9 in base 60)

`\babylonian`

Like `\arabic` or `\roman`, this macro takes a counter name as argument and returns its Babylonian representation.

For example, this documentation is typeset with:

`\renewcommand{\thesection}{\babylonian{section}}`

`\unicodedisp`

This macro lets you print characters using their unicode reference. It is used by `\babyloniannum` to display Babylonian numbers.

Example usage: `\unicodedisp{1230B}`

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<sup>1</sup><http://tex.stackexchange.com/questions/25939/typesetting-babylonian-numerals/25947#25947>



Below is a sample list of Babylonian characters this package can typeset:

1	┐	41	ㄥ┐	81	┐ ㄥ┐
2	┐┐	42	ㄥ┐┐	82	┐ ㄥ┐┐
3	┐┐┐	43	ㄥ┐┐┐	83	┐ ㄥ┐┐┐
4	ㄴ┐	44	ㄥㄴ┐	84	┐ ㄥㄴ┐
5	ㄴ┐┐	45	ㄥㄴ┐┐	85	┐ ㄥㄴ┐┐
6	ㄴ┐┐┐	46	ㄥㄴ┐┐┐	86	┐ ㄥㄴ┐┐┐
7	ㄴ┐┐	47	ㄥㄴ┐┐	87	┐ ㄥㄴ┐┐
8	ㄴ┐┐	48	ㄥㄴ┐┐	88	┐ ㄥㄴ┐┐
9	ㄴ┐┐	49	ㄥㄴ┐┐	89	┐ ㄥㄴ┐┐
10	ㄴ	50	ㄥㄴ	90	┐ ㄥㄴ
11	ㄴ┐	51	ㄥㄴ┐	91	┐ ㄥㄴ┐
12	ㄴ┐┐	52	ㄥㄴ┐┐	92	┐ ㄥㄴ┐┐
13	ㄴ┐┐┐	53	ㄥㄴ┐┐┐	93	┐ ㄥㄴ┐┐┐
14	ㄴㄴ┐	54	ㄥㄴㄴ┐	94	┐ ㄥㄴㄴ┐
15	ㄴㄴ┐┐	55	ㄥㄴㄴ┐┐	95	┐ ㄥㄴㄴ┐┐
16	ㄴㄴ┐┐┐	56	ㄥㄴㄴ┐┐┐	96	┐ ㄥㄴㄴ┐┐┐
17	ㄴㄴ┐┐	57	ㄥㄴㄴ┐┐	97	┐ ㄥㄴㄴ┐┐
18	ㄴㄴ┐┐	58	ㄥㄴㄴ┐┐	98	┐ ㄥㄴㄴ┐┐
19	ㄴㄴ┐┐	59	ㄥㄴㄴ┐┐	99	┐ ㄥㄴㄴ┐┐
20	ㄴㄴ	60	┐ ㄴㄴ	100	┐ ㄴㄴ
21	ㄴㄴ┐	61	┐ ㄴ┐	101	┐ ㄴㄴ┐
22	ㄴㄴ┐┐	62	┐ ㄴ┐┐	102	┐ ㄴㄴ┐┐
23	ㄴㄴ┐┐┐	63	┐ ㄴ┐┐┐	103	┐ ㄴㄴ┐┐┐
24	ㄴㄴㄴ┐	64	┐ ㄴㄴ┐	104	┐ ㄴㄴㄴ┐
25	ㄴㄴㄴ┐┐	65	┐ ㄴㄴ┐┐	105	┐ ㄴㄴㄴ┐┐
26	ㄴㄴㄴ┐┐┐	66	┐ ㄴㄴ┐┐┐	106	┐ ㄴㄴㄴ┐┐┐
27	ㄴㄴㄴ┐┐	67	┐ ㄴㄴ┐┐	107	┐ ㄴㄴㄴ┐┐
28	ㄴㄴㄴ┐┐	68	┐ ㄴㄴ┐┐	108	┐ ㄴㄴㄴ┐┐
29	ㄴㄴㄴ┐┐	69	┐ ㄴㄴ┐┐	109	┐ ㄴㄴㄴ┐┐
30	ㄴㄴ	70	┐ ㄴㄴ	110	┐ ㄴㄴ
31	ㄴㄴ┐	71	┐ ㄴ┐	111	┐ ㄴㄴ┐
32	ㄴㄴ┐┐	72	┐ ㄴ┐┐	112	┐ ㄴㄴ┐┐
33	ㄴㄴ┐┐┐	73	┐ ㄴ┐┐┐	113	┐ ㄴㄴ┐┐┐
34	ㄴㄴㄴ┐	74	┐ ㄴㄴ┐	114	┐ ㄴㄴㄴ┐
35	ㄴㄴㄴ┐┐	75	┐ ㄴㄴ┐┐	115	┐ ㄴㄴㄴ┐┐
36	ㄴㄴㄴ┐┐┐	76	┐ ㄴㄴ┐┐┐	116	┐ ㄴㄴㄴ┐┐┐
37	ㄴㄴㄴ┐┐	77	┐ ㄴㄴ┐┐	117	┐ ㄴㄴㄴ┐┐
38	ㄴㄴㄴ┐┐	78	┐ ㄴㄴ┐┐	118	┐ ㄴㄴㄴ┐┐
39	ㄴㄴㄴ┐┐	79	┐ ㄴㄴ┐┐	119	┐ ㄴㄴㄴ┐┐
40	ㄴㄴ	80	┐ ㄴㄴ	120	┐ ㄴㄴ

## 𐤠 Known issues

### 𐤠 . 𐤠 Glyph for 20

The glyph for number 20 was not found in the Santakku font. Therefore, it has been replaced by the combination of two 10 glyphs, with a kerning adjustment.

### 𐤠 . 𐤠 Glyph for 0

The Babylonian system has no glyph for 0, which is represented by a large space. In this package, 0 is implemented as a 0.5em kerning space.

### 𐤠 . 𐤠 Multiples of 60

The Babylonian numeral system is a sexagesimal system (a positional base 60 system), which does not feature a glyph for 0. Therefore, a number such as 𐤠𐤠 can stand for 23,  $23 \times 60$  or  $23 \times 60 \times 60$  or even  $23/60$ . Only the context allows to decide which number is represented.

## 𐤠 Implementation

```
1 \ProvidesPackage{babyloniannum}
2 \RequirePackage{fontspec}
3 \RequirePackage{xunicode}
4 \RequirePackage{numname}

\babylonianfont
5 \newcommand{\babylonianfont}{Santakku}

\unicodedisp
6 \newcommand{\unicodedisp}[1]{\char"#1}

\babylonian
7 \newcommand{\babylonian}[1]{%
8   \protect\babyloniannum{\arabic{#1}}}

\babylonianglyph
9 \newcommand{\babylonianglyph}[1]{%
10 \ifnum #1 > \z@ % glyph is not zero
11   \chardef\m@mten=10 % cuts by units of 10
12   \numdigits{#1} % parse number
13   \ifcase\c@xsm@mctr %
14     \relax %
15     \or
16     \unicodedisp{1230B} %10
17     \or
18     \unicodedisp{1230B}\kern-0.15em{}\unicodedisp{1230B} %20 -- unknown?
19     \or
```

```

20    \unicodedisp{1230D} %30
21    \or
22    \unicodedisp{1240F} %40
23    \or
24    \unicodedisp{12410} %50
25    \fi
26    \ifnum \c@ism@mctr > \z@ %
27      \ifnum \c@xsm@mctr > \z@ %
28        \kern-0.5em{} % make glyphs closer
29      \fi %
30    \fi %
31    \ifcase\c@ism@mctr %
32      \or
33      \unicodedisp{12079} %1
34      \or
35      \unicodedisp{1222B} %2
36      \or
37      \unicodedisp{12408} %3
38      \or
39      \unicodedisp{120FB} %4
40      \or
41      \unicodedisp{1240A} %5
42      \or
43      \unicodedisp{1240B} %6
44      \or
45      \unicodedisp{1240C} %7
46      \or
47      \unicodedisp{1240D} %8
48      \or
49      \unicodedisp{1240E} %9
50    \fi
51    \addtocounter{baby@glyphs}{1}%
52  \else
53    \ifnum \c@baby@glyphs > \z@ %
54      \kern0.5em{}% empty space for zero
55    \fi
56  \fi
57 }

```

\babylonian@setcounters

```

58 \newcounter{baby@ism@mctr} % "units"
59 \newcounter{baby@xsm@mctr} % "tens"
60 \newcounter{baby@csm@mctr} % "hundreds"
61 \newcounter{baby@ksm@mctr} % "thousands"
62 \newcounter{baby@xksm@mctr} % "ten thousands"
63 \newcounter{baby@cksm@mctr} % "hundred thousands"
64 \newcounter{baby@msm@mctr} % "millions"
65 \newcounter{baby@xmsm@mctr} % "ten millions"
66 \newcounter{baby@csm@mctr} % "hundred millions"
67 \newcounter{baby@bsm@mctr} % "billions"

```

```

68 \newcommand{\babylonian@setcounters}{%
69   \setcounter{baby@ism@mctr}{\c@ism@mctr}%
70   \setcounter{baby@xsm@mctr}{\c@xsm@mctr}%
71   \setcounter{baby@csm@mctr}{\c@csm@mctr}%
72   \setcounter{baby@ksm@mctr}{\c@ksm@mctr}%
73   \setcounter{baby@xksm@mctr}{\c@xksm@mctr}%
74   \setcounter{baby@cksm@mctr}{\c@cksm@mctr}%
75   \setcounter{baby@msm@mctr}{\c@msm@mctr}%
76   \setcounter{baby@xmsm@mctr}{\c@xmsm@mctr}%
77   \setcounter{baby@csm@mctr}{\c@csm@mctr}%
78   \setcounter{baby@bsm@mctr}{\c@bsm@mctr}%
79 }

```

\babyloniannum

```

80 \newcounter{baby@glyphs}%
81 \newcommand{\babyloniannum}[1]{%
82   \chardef\m@nten=60 % Cut by units of 60
83   \numdigits{#1} % Parse number
84   \babylonian@setcounters%
85   {\fontspec{\babylonianfont}}%
86   \mbox{%
87     \setcounter{baby@glyphs}{0}%
88     \babylonianglyph{\c@baby@bsm@mctr}%
89     \babylonianglyph{\c@baby@csm@mctr}%
90     \babylonianglyph{\c@baby@xsm@mctr}%
91     \babylonianglyph{\c@baby@msm@mctr}%
92     \babylonianglyph{\c@baby@cksm@mctr}%
93     \babylonianglyph{\c@baby@xksm@mctr}%
94     \babylonianglyph{\c@baby@ksm@mctr}%
95     \babylonianglyph{\c@baby@csm@mctr}%
96     \babylonianglyph{\c@baby@xsm@mctr}%
97     \babylonianglyph{\c@baby@ism@mctr}%
98   }}
99 }

```