

The `babyloniannum` package

Raphaël Pinson
raphink@gmail.com

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Ⅰ Introduction

This package can be used to typeset Babylonian numerals using \XeTeX or \LuaTeX . It makes use of the Santakku Paleo-Babylonian 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 Ⅰ 𐎶𐎵 𐎶𐎵 𐎶 (1,57,46,40 in base 60)

`\babyloniannum{21609}` is 𐎶 𐎵 (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}`

III

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	ㄱ	44	ㄥㄱ	84	┐ㄥㄱ
5	ㅋ	45	ㄥㅋ	85	┐ㄥㅋ
6	ㆁ	46	ㄥㆁ	86	┐ㄥㆁ
7	ㅍ	47	ㄥㅍ	87	┐ㄥㅍ
8	ㅑ	48	ㄥㅑ	88	┐ㄥㅑ
9	ㅓ	49	ㄥㅓ	89	┐ㄥㅓ
10	ㅕ	50	ㄥㅕ	90	┐ㄥㅕ
11	ㅗ	51	ㄥㅗ	91	┐ㄥㅗ
12	ㅛ	52	ㄥㅛ	92	┐ㄥㅛ
13	ㅝ	53	ㄥㅝ	93	┐ㄥㅝ
14	ㅟ	54	ㄥㅟ	94	┐ㄥㅟ
15	ㅡ	55	ㄥㅡ	95	┐ㄥㅡ
16	ㅣ	56	ㄥㅣ	96	┐ㄥㅣ
17	ㅦ	57	ㄥㅦ	97	┐ㄥㅦ
18	ㅨ	58	ㄥㅨ	98	┐ㄥㅨ
19	ㅪ	59	ㄥㅪ	99	┐ㄥㅪ
20	ㅬ	60	┐	100	┐ㄥ
21	ㅮ	61	┐┐	101	┐ㄥ┐
22	ㅰ	62	┐ㅰ	102	┐ㄥㅰ
23	ㅲ	63	┐ㅲ	103	┐ㄥㅲ
24	ㅴ	64	┐ㅴ	104	┐ㄥㅴ
25	ㅶ	65	┐ㅶ	105	┐ㄥㅶ
26	ㅸ	66	┐ㅸ	106	┐ㄥㅸ
27	ㅺ	67	┐ㅺ	107	┐ㄥㅺ
28	ㅼ	68	┐ㅼ	108	┐ㄥㅼ
29	ㅾ	69	┐ㅾ	109	┐ㄥㅾ
30	ㅿ	70	┐ㅿ	110	┐ㄥㅿ
31	ㅻ	71	┐ㅻ	111	┐ㄥㅻ
32	ㅽ	72	┐ㅽ	112	┐ㄥㅽ
33	ㅿ	73	┐ㅿ	113	┐ㄥㅿ
34	ㅿ	74	┐ㅿ	114	┐ㄥㅿ
35	ㅿ	75	┐ㅿ	115	┐ㄥㅿ
36	ㅿ	76	┐ㅿ	116	┐ㄥㅿ
37	ㅿ	77	┐ㅿ	117	┐ㄥㅿ
38	ㅿ	78	┐ㅿ	118	┐ㄥㅿ
39	ㅿ	79	┐ㅿ	119	┐ㄥㅿ
40	ㅿ	80	┐ㅿ	120	ㅿ

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 Therefore, it has been replaced by the combination of two 10 glyphs, with a kerning adjustment.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 𐤠𐤠𐤠 can stand for 23, 23×60 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@nten=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-1.5pt{}\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@mten=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 }

```