The babyloniannum package

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𒌋 Introduction

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

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

𒌋𒌋 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: `\babyloninanfont{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:

`\babyloninannum{424000}` is 𒌋 𒐜𒐐 𒐜𒐐 𒐜 (1,57,46,40 in base 60)

`\babyloninannum{21609}` is 𒐐 𒐐 (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}`

[1] `http://tex.stackexchange.com/questions/25939/typesetting-babylonian-numerals/25947#25947`

𒀸𒌋 Table of characters

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

1	𒁹	41	𒌍𒁹	81	𒁹 𒌋𒁹
2	𒁺	42	𒌍𒁺	82	𒁹 𒌋𒁺
3	𒁻	43	𒌍𒁻	83	𒁹 𒌋𒁻
4	𒁼	44	𒌍𒁼	84	𒁹 𒌋𒁼
5	𒁽	45	𒌍𒁽	85	𒁹 𒌋𒁽
6	𒁾	46	𒌍𒁾	86	𒁹 𒌋𒁾
7	𒁿	47	𒌍𒁿	87	𒁹 𒌋𒁿
8	𒂀	48	𒌍𒂀	88	𒁹 𒌋𒂀
9	𒂁	49	𒌍𒂁	89	𒁹 𒌋𒂁
10	𒂂	50	𒌍	90	𒁹 𒌋
11	𒂃	51	𒌍𒁹	91	𒁹 𒌋𒁹
12	𒂄	52	𒌍𒁺	92	𒁹 𒌋𒁺
13	𒂅	53	𒌍𒁻	93	𒁹 𒌋𒁻
14	𒂆	54	𒌍𒁼	94	𒁹 𒌋𒁼
15	𒂇	55	𒌍𒁽	95	𒁹 𒌋𒁽
16	𒂈	56	𒌍𒁾	96	𒁹 𒌋𒁾
17	𒂉	57	𒌍𒁿	97	𒁹 𒌋𒁿
18	𒂊	58	𒌍𒂀	98	𒁹 𒌋𒂀
19	𒂋	59	𒌍𒂁	99	𒁹 𒌋𒂁
20	𒂌	60	𒁹	100	𒁹 𒌍
21	𒂍	61	𒁹 𒁹	101	𒁹 𒌍𒁹
22	𒂎	62	𒁹 𒁺	102	𒁹 𒌍𒁺
23	𒂏	63	𒁹 𒁻	103	𒁹 𒌍𒁻
24	𒂐	64	𒁹 𒁼	104	𒁹 𒌍𒁼
25	𒂑	65	𒁹 𒁽	105	𒁹 𒌍𒁽
26	𒂒	66	𒁹 𒁾	106	𒁹 𒌍𒁾
27	𒂓	67	𒁹 𒁿	107	𒁹 𒌍𒁿
28	𒂔	68	𒁹 𒂀	108	𒁹 𒌍𒂀
29	𒂕	69	𒁹 𒂁	109	𒁹 𒌍𒂁
30	𒂖	70	𒁹 𒂂	110	𒁹 𒌍
31	𒂗	71	𒁹 𒂃	111	𒁹 𒌍𒁹
32	𒂘	72	𒁹 𒂄	112	𒁹 𒌍𒁺
33	𒂙	73	𒁹 𒂅	113	𒁹 𒌍𒁻
34	𒂚	74	𒁹 𒂆	114	𒁹 𒌍𒁼
35	𒂛	75	𒁹 𒂇	115	𒁹 𒌍𒁽
36	𒂜	76	𒁹 𒂈	116	𒁹 𒌍𒁾
37	𒂝	77	𒁹 𒂉	117	𒁹 𒌍𒁿
38	𒂞	78	𒁹 𒂊	118	𒁹 𒌍𒂀
39	𒂟	79	𒁹 𒂋	119	𒁹 𒌍𒂁
40	𒂠	80	𒁹 𒂌	120	𒁺

𒌋 Known issues

𒌋. 𒐗 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 Therefore, it has been replaced by the combination of two 10 glyphs, with a kerning adjustment.

𒌋. 𒐝 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.

𒌋. 𒐐𒐐 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 𒐖𒐐𒐐 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.

𒀸 Implementation

```
\ProvidesPackage{babyloniannum}
\RequirePackage{fontspec}
\RequirePackage{xunicode}
\RequirePackage{numname}
```

`\babylonianfont`

```
\newcommand{\babylonianfont}{Santakku}
```

`\unicodedisp`

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

`\babylonian`

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

`\babylonianglyph`

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

```
    \unicodedisp{1230D} %30
    \or
    \unicodedisp{1240F} %40
    \or
    \unicodedisp{12410} %50
  \fi
  \ifnum \c@ism@mctr > \z@ %
    \ifnum \c@xsm@mctr > \z@ %
  \kern-0.5em{} % make glyphs closer
    \fi %
  \fi %
  \ifcase\c@ism@mctr %
    \or
    \unicodedisp{12079} %1
    \or
    \unicodedisp{1222B} %2
    \or
    \unicodedisp{12408} %3
    \or
    \unicodedisp{120FB} %4
    \or
    \unicodedisp{1240A} %5
    \or
    \unicodedisp{1240B} %6
    \or
    \unicodedisp{1240C} %7
    \or
    \unicodedisp{1240D} %8
    \or
    \unicodedisp{1240E} %9
  \fi
  \addtocounter{baby@glyphs}{1}%
\else
  \ifnum\c@baby@glyphs > \z@ %
\kern0.5em{}% empty space for zero
  \fi
\fi
}
```

\babylonian@setcounters

```
\newcounter{baby@ism@mctr}  % "units"
\newcounter{baby@xsm@mctr}  % "tens"
\newcounter{baby@csm@mctr}  % "hundreds"
\newcounter{baby@ksm@mctr}  % "thousands"
\newcounter{baby@xksm@mctr} % "ten thousands"
\newcounter{baby@cksm@mctr} % "hundred thousands"
\newcounter{baby@msm@mctr}  % "millions"
\newcounter{baby@xmsm@mctr} % "ten millions"
\newcounter{baby@cmsm@mctr} % "hundred millions"
\newcounter{baby@bsm@mctr}  % "billions"
```

```
\newcommand{\babylonian@setcounters}{%
  \setcounter{baby@ism@mctr}{\c@ism@mctr}%
  \setcounter{baby@xsm@mctr}{\c@xsm@mctr}%
  \setcounter{baby@csm@mctr}{\c@csm@mctr}%
  \setcounter{baby@ksm@mctr}{\c@ksm@mctr}%
  \setcounter{baby@xksm@mctr}{\c@xksm@mctr}%
  \setcounter{baby@cksm@mctr}{\c@cksm@mctr}%
  \setcounter{baby@msm@mctr}{\c@msm@mctr}%
  \setcounter{baby@xmsm@mctr}{\c@xmsm@mctr}%
  \setcounter{baby@cmsm@mctr}{\c@cmsm@mctr}%
  \setcounter{baby@bsm@mctr}{\c@bsm@mctr}%
}
```

\babyloniannum

```
\newcounter{baby@glyphs}%
\newcommand{\babyloniannum}[1]{%
  \chardef\m@mten=60 % Cut by units of 60
  \numdigits{#1} % Parse number
  \babylonian@setcounters%
  {\fontspec{\babylonianfont}%
  \mbox{%
  \setcounter{baby@glyphs}{0}%
  \babylonianglyph{\c@baby@bsm@mctr}%
  \babylonianglyph{\c@baby@cmsm@mctr}%
  \babylonianglyph{\c@baby@xmsm@mctr}%
  \babylonianglyph{\c@baby@msm@mctr}%
  \babylonianglyph{\c@baby@cksm@mctr}%
  \babylonianglyph{\c@baby@xksm@mctr}%
  \babylonianglyph{\c@baby@ksm@mctr}%
  \babylonianglyph{\c@baby@csm@mctr}%
  \babylonianglyph{\c@baby@xsm@mctr}%
  \babylonianglyph{\c@baby@ism@mctr}%
  }}
}
```