Dating with TEX

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Abstract

Three TEX-coded algorithms are given for performing tricks with dates.

1 Introduction

In this article we give a method for calculating the so-called Julian Date. This date is used in astronomy to avoid problems in counting with leap years, days etc. The Julian Date starts every day at noon.

Three basic algorithms are TEX-coded:

- from calendar date (Gregorian) to Julian Date. Only dates after 1582 October 15 are valid,
- from Julian Date to calender date,
- and the day of week

The algorithms and some examples used can be found in Chapter 3 of the book 'Astronomical Formulae for Calculators' by Jean Meeus (Willmann-Bell Inc. 1988). The TEX-coded algorithms are useful in different daily-life applications.

2 Macro's

Macros are given below, using the as
`\input kalender.sty` or
`\documentstyle[kalender]`.

```
%%%%%%%%%%%%%%%%%%%%%%%
%%% kalender.sty   %%%
%%%%%%%%%%%%%%%%%%%%%%%
  \newcount\a
  \newcount\alfa
  \newcount\b
  \newcount\c
  \newcount\d
  \newcount\dag
  \newcount\dg
  \newcount\dw
  \newcount\e
  \newcount\f
  \newcount\jaar
  \newcount\jd
  \newcount\jr
  \newcount\klad
  \newcount\m
  \newcount\maand
  \newcount\mnd
  \newcount\x
  \newcount\y
  \newcount\z
%%%
\def\datjul#1#2#3{
\jaar=#1
\maand=#2
\dag=#3
\ifnum\maand>2
   \y=\jaar
   \m=\maand
\else
   \y=\jaar \advance\y by-1
   \m=\maand \advance\m by12
\fi
\a=\y
\divide\a by100
\b=2
\advance\b by-\a
\x=\a
\divide\x by4
\advance\b by\x
%
\jd=\y
\multiply\jd by36525
\divide\jd by100
%
\x=\m
\advance\x by1
\multiply\x by306001
\divide\x by10000
\advance\jd by\x
\advance\jd by\dag
\advance\jd by1720995
\advance\jd by\b
}
%
\def\dayofweek#1#2#3{\datjul{#1}{#2}{#3}
\x=\jd
\advance\x by 1
```

```
\dw=\x
\divide\x by 7
\multiply\x by 7
\advance\dw by -\x
}
%
%
\def\juldat#1{
\z=#1
\ifnum\z<2299161
   \a=\z
\else
   \alfa=\z
   \multiply\alfa by100
   \advance\alfa by-186721625
   \divide\alfa by3652425
   \a=\z
   \advance\a by1
   \advance\a by\alfa
   \divide\alfa by4
   \advance\a by-\alfa
\fi
%
\b=\a
\advance\b by1524
%
\c=\b
\multiply\c by100
\advance\c by-12210
\divide\c by36525
%
\d=\c
\multiply\d by36525
\divide\d by100
%
\e=\b
\advance\e by-\d
\multiply\e by10000
\divide\e by306001
%
%
\x=\b
\advance\x by-\d
\dg=\x
\x=\e
\multiply\x by306001
\divide\x by10000
\advance\dg by-\x
%
\mnd=\e
\advance\mnd by-1
\ifnum\e>13
    \advance\mnd by-12
\fi
%
\jr=\c
\advance\jr by-4715
\ifnum\mnd>2
   \advance\jr by-1
\fi
}
%
```

The table below illustrates the use of the macro's.

macro	output variable
`\datjul{year}{month}{day}`	`\jd`
`\juldat{julian_date}`	`\jr \mnd \dg`
`\dayofweek{year}{month}{day}`	`\dw`
	0 = sunday, 1 = monday, 2 = tuesday, 3 = wednesday, 4 = thursday, 5 = friday , 6 = saturday

3 Examples

The date of the launch of the first Sputnik corresponds to a Julian date of 2436116.

```
The date of the launch of the first Sputnik
corresponds to a Julian date of
\datjul{1957}{10}{4} \number\jd .
```

The second Russian Revolution took place at 1991, August 19:

`\dayofweek{1991}{8}{19} \number\dw` ⟶ 1

a Monday.

The macro's can also be used to calculate date differences.

```
\datjul{1961}{9}{9}
\global\advance\jd by-150
\juldat{\number\jd}
\number\jr\ \number\mnd\ \number\dg .
```

1961 4 12. This date is corresponding with the date of the launch of the first man into space: Yoeri Gagarin. In other words 150 days before the birth of the author.

```
\newcount\klad
\datjul{1992}{3}{15}
\klad=\jd
\datjul{1961}{9}{9}
\advance\klad by-\jd
\number\klad
```

At the moment of writing the author is 11145 days old.

In the appendix you find an other dating example, calculating the dates of easter, the algorithms can be find also in the book of Meeus.

A Date of Easter

```
\newcount\x
\newcount\klad
\newcount\a
\newcount\b
\newcount\c
\newcount\d
\newcount\e
\newcount\f
\newcount\g
\newcount\h
\newcount\i
\newcount\j
\newcount\k
\newcount\l
\newcount\m
\newcount\n
\newcount\o
\newcount\p
\newcount\start
\newcount\einde
\def\pasen#1{
\x=#1
\a=\x
\divide\a by 19
\klad=\a
\multiply\klad by 19
\a=\x
\advance\a by -\klad
\b=\x
\divide\b by 100
\klad=\b
\c=\x
\multiply\klad by 100
\advance\c by -\klad
\d=\b
\divide\d by 4
\e=\b
\klad=\d
\multiply\klad by 4
\advance\e by -\klad
\f=\b
\advance\f by 8
\divide\f by 25
\g=\b
\advance\g by -\f
\advance\g by 1
\divide\g by 3
\h=\a
\multiply\h by 19
\advance\h by \b
\advance\h by -\d
\advance\h by -\g
\advance\h by 15
\klad=\h
\divide\h by 30
\multiply\h by 30
\advance\klad by -\h
\h=\klad
\i=\c
\divide\i by 4
\k=\c
\klad=\i
\multiply\klad by 4
\advance\k by -\klad
\l=32
\klad=\e
\multiply\klad by 2
\advance\l by \klad
\klad=\i
\multiply\klad by 2
\advance\l by \klad
\advance\l by -\h
\advance\l by -\k
\klad=\l
\divide\l by 7
\multiply\l by 7
\advance\klad by -\l
\l=\klad
\m=\a
\klad=\h
\multiply\klad by 11
\advance\m by \klad
\klad=\l
\multiply\klad by 22
\advance\m by \klad
\divide\m by 451
\n=\h
\advance\n by \l
\advance\n by 114
\klad=\m
\multiply\klad by -7
\advance\n by \klad
\klad=\n
\divide\n by 31
\p=\n
\multiply\p by 31
\advance\klad by -\p
\p=\klad
\advance\p by 1
%
\hbox to 3cm{
\the\x %
\ifnum\n=3    %
      \ \ March %
        \else %
      \ \ April %
\fi %
\hfill \the\p}%
\hfill\break
}
%starting year after 1583}
\start=1992
%end year
\einde=2020
%
%
\loop\ifnum\start<\einde
\pasen{\start}
\advance\start by 1
\message{\the\start}
\repeat
```

1992 April 19

1993 April 11
1994 April 3
1995 April 16
1996 April 7
1997 March 30
1998 April 12
1999 April 4
2000 April 23
2001 April 15
2002 March 31
2003 April 20
2004 April 11
2005 March 27
2006 April 16
2007 April 8
2008 March 23
2009 April 12
2010 April 4
2011 April 24
2012 April 8
2013 March 31
2014 April 20
2015 April 5
2016 March 27
2017 April 16
2018 April 1
2019 April 21