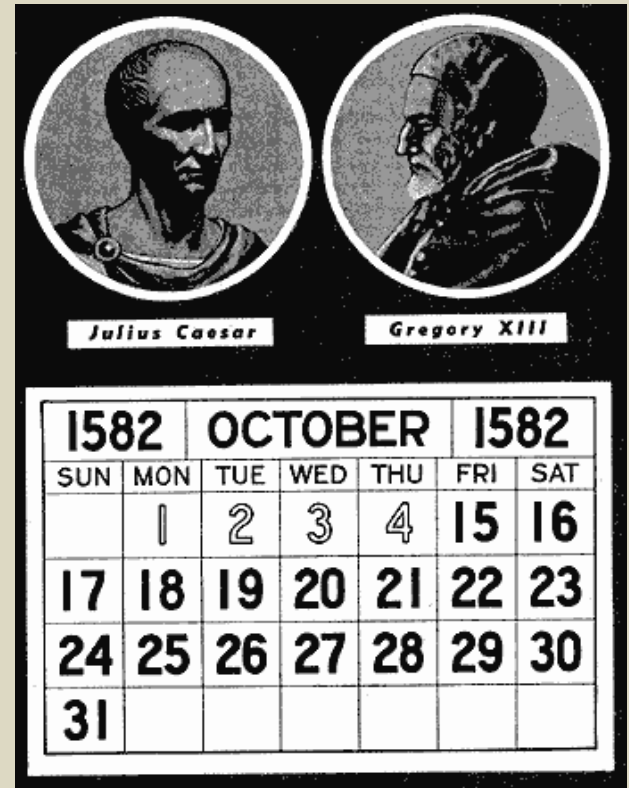# Doomsday Algorithm

How to find the day of the week an event occurred .

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HRUMC 2013

Calendars

- Julian Calendar
  - 365 days split into 12 months
- Gregorian Calendar
  - 400 year cycle
  - New Leap year rule

1582	OCTOBER				1582	
SUN	MON	TUE	WED	THU	FRI	SAT
	1	2	3	4	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

Julius Caesar   Gregory XIII

History

- 1882-Christian Zeller (Zeller Congruence)
- 1887-Lewis Carrol
- 1967-Martin Gardner ("Tricks of Lightning Calculators")
- 1973-John Horton Conway (Doomsday Algorithm)
- 1993-Tomohiko Sakamoto
- 1994-Rudy Limeback (website on the Doomsday Algorithm)
- 1995-Sidney Graham (website on the Doomsday Algorithm)
- 2004-Sohael Babwani (not a mental calculation)
- 2008-Mike Walters
- 2009-Bob Goddard ("First Sunday Doomsday Algorithm")
- 2010-Chamberlain Fong (Decade Method)
- 2010-Chamberlain Fong & Mike Walters (Odd +11)
- 2010-Yingking Yu (mnemonics-January 11 and February 22)

Mental Calculations

- 1887- Lewis Carrol

- 1973- John Conway

- 2010-Chamberliain Fong and Mike Walters

Carrol Algorithm - 1887

4 portions to the date

The Century-item For Old Style (which ended September 2, 1752) subtract from 18. For New Style (which began September 14) divide by 4, take overplus from 3, multiply remainder by 2.

The Year-item Add together the number of dozens, the overplus, and the number of 4s in the overplus.

The Month-item If it begins or ends with a vowel, subtract the number, denoting its place in the year, from 10. This, plus its number of days, gives the item for the following month. The item for January is "0"; for February or March, "3"; for December, "12".

The Day-item The total, thus reached, must be corrected, by deducting "1" (first adding 7, if the total be "0"), if the date be January or February in a leap year: remembering that every year, divisible by 4, is a Leap Year, excepting only the century-years, in New Style, when the number of centuries is *not* so divisible (e.g. 1800).

What is Doomsday?

- Conway 1973

Doomsday Algorithm

A. Determine the "anchor day" for the century.

When advancing a century from a century you know the Doomsday for, go back two days, unless the new century is divisible by 400, in which case only go back one day

B. Use the anchor day for the century to calculate the doomsday for the year.

C. Choose the closest date out of the ones that always fall on the doomsday and count the number of days (mod 7) between that date and the date in question to arrive at the day of the week.

Century Day:
Tuesday = 1600, 2000,...
Sunday = 1700, 2100, ...
Friday = 1800, 2200, ...
*Wednesday = 1900, 2300, ...

Conway Algorithm-1973

- January Rule
  - we know that the leap year is followed by 3 non leap years, therefore, during leap years, January 4th is a doomsday and in non leap years, January 3rd is a doomsday.
- Even Months
  - For even months, 4,6,8,10,12...the same day as the number of the month is a doomsday.
- Odd Months
  - She worked 9-5 at the 7/11. is the saying to help remember the doomsday for May, September, July and November. It works in both ways: 5/9. 9/5, 11/7, 7/11 are doomsdays
  - **March Rule:** the last day of Feb is treated as March 0, so March 7th, 14th...adding 7 are doomsdays also.
- 12 Year rule
  - He noted that every 12 years, Doomsday advances one day. This is because every 12 years contains 3 Leap Years, and 12 + 3 = 1 (casting out 7s).
- Mod 7
  - Each week has a doomsday...by adding 7, we can find the date of the next doomsday.

What would be the doomsday of the year when Conway devised the algorithm? (1973)

Wednesday

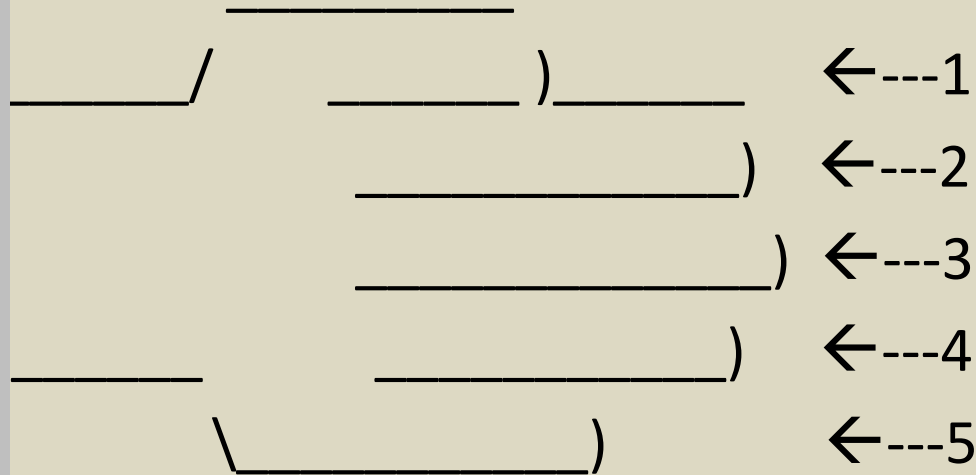# What is the doomsday of the current year 2013?

Thursday

Doomsdays

Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Sun.	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Sun.
→	1972	1973	1974	1975	→	1976	1977	1978	1979	→	1980	1981	1982
1983	→	1984	1985	1986	1987	→	1988	1989	1990	1991	→	1992	1993
1994	1995	→	1996	1997	1998	1999							

Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Sun.	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Sun.
→	2000	2001	2002	2003	→	2004	2005	2006	2007	→	2008	2009	2010
2011	→	2012	2013	2014	2015	→	2016	2017	2018	2019	→	2020	2021
2022	2023	→	2024	2025	2026	2027	→	2028	2029	2030	2031	→	2032
2033	2034	2035	→	2036	2037	2038	2039	→	2040	2041	2042	2043	→

Conway: Poem

The last of Feb., or of Jan. will do
 (Except that in Leap Years it's Jan. 32).
 Then for even months use the month's own day,
And for odd ones add 4, or take it away.?

 Now to work out your doomsday the orthodox way
Three things you should add to the century day
 Dozens, remainder, and fours in the latter,
 (If you alter by sevens of course it won't matter)
 In Julian times, lackaday, lackaday
Zero was Sunday, centuries fell back a day
 But Gregorian 4 hundreds are always Tues.
 And now centuries extra take us back twos.
 According to length or simply remember,
you only subtract for September, or November.

Counting shortcut using the Hand Rule

```
        _____
_____/      _____ )_____      ←---1
                      _____ )  ←---2
                       _____ ) ←---3
_____        _____ )          ←---4
      _____ )                ←---5
```

←---1
←---2
←---3
←---4
←---5

What was the day of the week for July 5th 1980?

Saturday

1 -- Doomsday Difference
2 -- Century Day
3 -- number of DOZENS
4 -- remainder
5 -- number of 4s in remainder
6 – Add steps 1-5

Century Day:
Tuesday = 1600, 2000,...
Sunday = 1700, 2100, ...
Friday = 1800, 2200, ...
Wednesday = 1900, 2300, ...

Chamberlain Fong & Mike Walters-2010

- Odd plus 11

Keep a tally of T to find the Doomsday:
1. T is the 2 year digits YY
2. If T is odd then T1=T+11, otherwise T=T1
3. Let T2=(T1)/2
4. If T2 is odd then T3=T2+11, otherwise T3=T2
5. Let T4=7-((T3) mod7)
6. Count forward T4 days from the anchor day to get the Doomsday for that year.

- Use Conway's Months Rule

Example

Dr. John Conway was born on   December 26th 1937. What day of the week was he born?

Doomsday in 1937: Sunday

Sunday

Example

- What day of the week will Pi day(3/14) land on in 2115?

Doomsday in 2115:   Thursday

Century day in 2100: Sunday

Thursday

Bloopers

Fried Green Tomatoes

The Gunslinger

Star Trek: Deep Space Nine

Demolition Man

August 3, 2032 will be a Tuesday.

Leona married John Justice."   However, in

1919, April 1 was a Tuesday.

Work Cited

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