Days Difference between Gregorian and Julian Calendar
Calendar dd Algorithm

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January 14, 2018

Abstract

This study is an algorithm of calculating days difference between Gregorian & Julian calendar using simplified formula. It consists of two integer function by substituting the year. This formula will determine the exact number of days in any given Year as of December 31. This algorithm has no condition even during leap-year and 400-year rule.

1 Introduction

This algorithm is devised using basic mathematics, without any condition or modification to the formula. This algorithm will provide a direct substitution to the formula, without referring to a table.

For any calendar year, y denotes for calendar year in either Gregorian & Julian calendar.

2 The Formula

This is the formula for the calendar difference,

$$dd = \left\lfloor \frac{(y)}{100} \right\rfloor - \left\lfloor \frac{y}{400} \right\rfloor - 2$$

where

- dd is the number of difference in days in a Year as of December 31
- y is the calendar year

3 Examples

Several examples are presented/shown to illustrate the algorithm.

Example 1: 1583, first full year of Gregorian calendar.

$y = 1583$

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$$dd = \left\lfloor \frac{1583}{100} \right\rfloor - \left\lfloor \frac{1583}{400} \right\rfloor - 2$$
$$= \lfloor 15.83 \rfloor - \lfloor 3.9575 \rfloor - 2$$
$$= \lfloor 15 \rfloor - \lfloor 3 \rfloor - 2$$
$$= 15 - 3 - 2$$
$$= 10$$

So, 1583 has 10days of difference

Example 2: 1900, latest centennial that is not a leap-year

$y = 1900$

$$dd = \left\lfloor \frac{1900}{100} \right\rfloor - \left\lfloor \frac{1900}{400} \right\rfloor - 2$$
$$= \lfloor 19 \rfloor - \lfloor 4.75 \rfloor - 2$$
$$= \lfloor 19 \rfloor - \lfloor 4 \rfloor - 2$$
$$= 19 - 4 - 2$$
$$= 13$$

So, 1900 has 13days of difference

5 The Algorithm

For the Calendar Year from March 1 to December 31:

$$dd = \left\lfloor \frac{(y)}{100} \right\rfloor - \left\lfloor \frac{y}{400} \right\rfloor - 2$$

For the Calendar Year from January 1 to February 28/29:

$$dd = \left\lfloor \frac{(y+99)}{100} \right\rfloor - \left\lfloor \frac{(y-1)}{400} \right\rfloor - 3$$

Acknowledgements

This work is dedicated to my family especially to my wife Melanie and two sons, Milan and Mileone.

References

[1] https://en.wikipedia.org/wiki/Gregorian_calendar
[2] https://en.wikipedia.org/wiki/Julian_calendar