

Calculating Days Difference between Gregorian and Julian Calendar Cariño's dd-Algorithm

Dave Ryan T. Cariño
MSU – GSC Alumni, Mathematician
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carinodaveryan@gmail.com

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 cycle.

1 Introduction

- 1.1 This algorithm is devised using basic mathematics, without any condition or modification to the formula, it will provide a direct substitution to the formula.
- 1.2 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.

3.1 1583, first full year of Gregorian calendar.

$$y = 1583$$

$$\begin{aligned} dd &= \left\lfloor \frac{1583}{100} \right\rfloor - \left\lfloor \frac{1583}{400} \right\rfloor - 2 \\ &= \lfloor 15.83 \rfloor - \lfloor 3.9575 \rfloor - 2 \end{aligned}$$

$$\begin{aligned} &= [15] - [3] - 2 \\ &= 15 - 3 - 2 \\ &= \mathbf{10} \end{aligned}$$

So, 1583 has 10days of difference

3.2 1900, latest centennial that is not a leap-year

$$y = 1900$$

$$\begin{aligned} dd &= \left\lfloor \frac{1900}{100} \right\rfloor - \left\lfloor \frac{1900}{400} \right\rfloor - 2 \\ &= [19] - [4.75] - 2 \\ &= [19] - [4] - 2 \\ &= 19 - 4 - 2 \\ &= \mathbf{13} \end{aligned}$$

So, 1900 has 13days of difference

4 The Algorithms

4.1 For the Calendar Year from March 1 to December 31:

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

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

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

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References

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