

Day-Date Discrepancy in Gregorian Calendar

Tanaji Santra

Engineer, National Institute of Fashion Technology

ABSTRACT

In 46 BC, Roman Emperor Julius Caesar introduced the Julian Calendar by reforming the ancient Roman Calendar. The Gregorian Calendar was introduced in 1582 to correct the average year time of the Julian Calendar. According to mathematics, the tropical year is 365 days, 5 hours, 48 minutes, and 46 seconds, or 365.24181 days, determined by the Earth’s revolution around the Sun. In the Julian Calendar, the average year time considered was 365.25 days, but in the Gregorian Calendar, the accuracy was increased by considering it as 365.2422 days.

The Gregorian Calendar was introduced in October 1582 and adopted by most countries in the 17th century. In 1752, Britain and the USA accepted the Gregorian Calendar by skipping 11 days from their Julian Calendar. By doing this, they corrected the date but did not calculate the days correctly, meaning 2nd September (Wednesday) was followed by 14th September (Thursday). According to this study, 14th September 1752 should have been a **Monday** instead of **Thursday**. The explanation is provided below.

Introduction

The calendar we follow internationally today is called the Gregorian Calendar, introduced in 1582 by Pope Gregory XIII as a reform of the Julian Calendar.

Basic Differences Between Julian Calendar and Gregorian Calendar

| | Julian Calendar | Gregorian Calendar |
|------------------------------|-------------------------------|---|
| Introduces in | January 46 BC | October 1582 |
| Introduced By | Julius Caesar | Pope Gregory XIII |
| Average Year time | 365.25 Days | 365.2422 Days |
| Leap Year Calculation | If the year is divisible by 4 | If the year is divisible by 4 or by 400 if the last two digits are zero in a year |

Observations & Findings

Solar Year Calculations

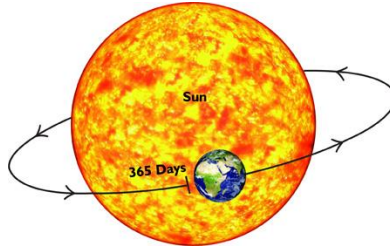
Julius Caesar introduced the Leap Year concept in 46 BC. According to the Julian Calendar, the average year time is 365.25 days. So, every year consists of 365 days, and every 4 years, one day is added to the calendar as a leap year. The calculations are as follows:

$$365.25 \times 4 = 1461 \text{ days}$$

$$\text{Or } (365 \times 4) + 1 = 1461 \text{ days}$$

But the actual Solar year duration is 365.24181 days.

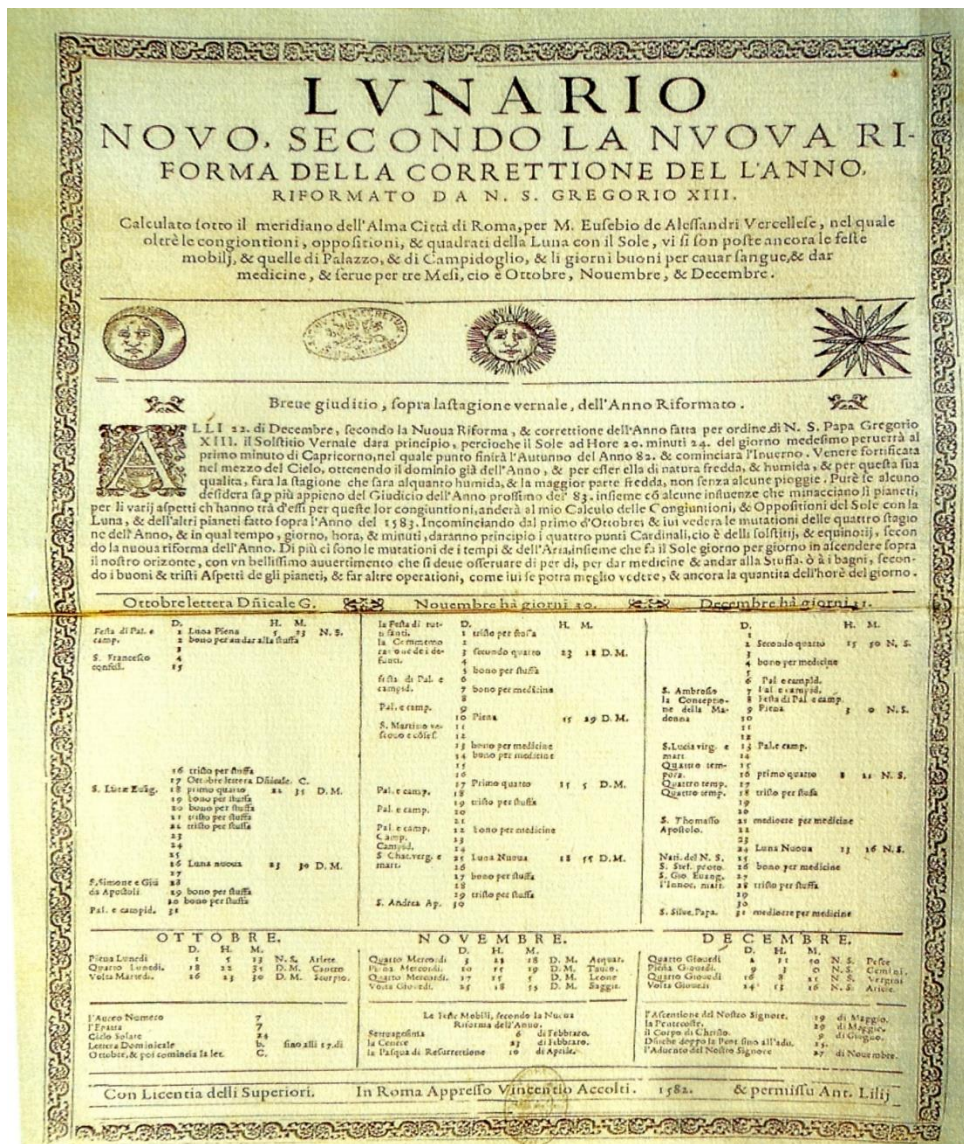
So, in 4 years, the actual Solar year time is $365.24181 \times 4 = 1460.968724$ days.

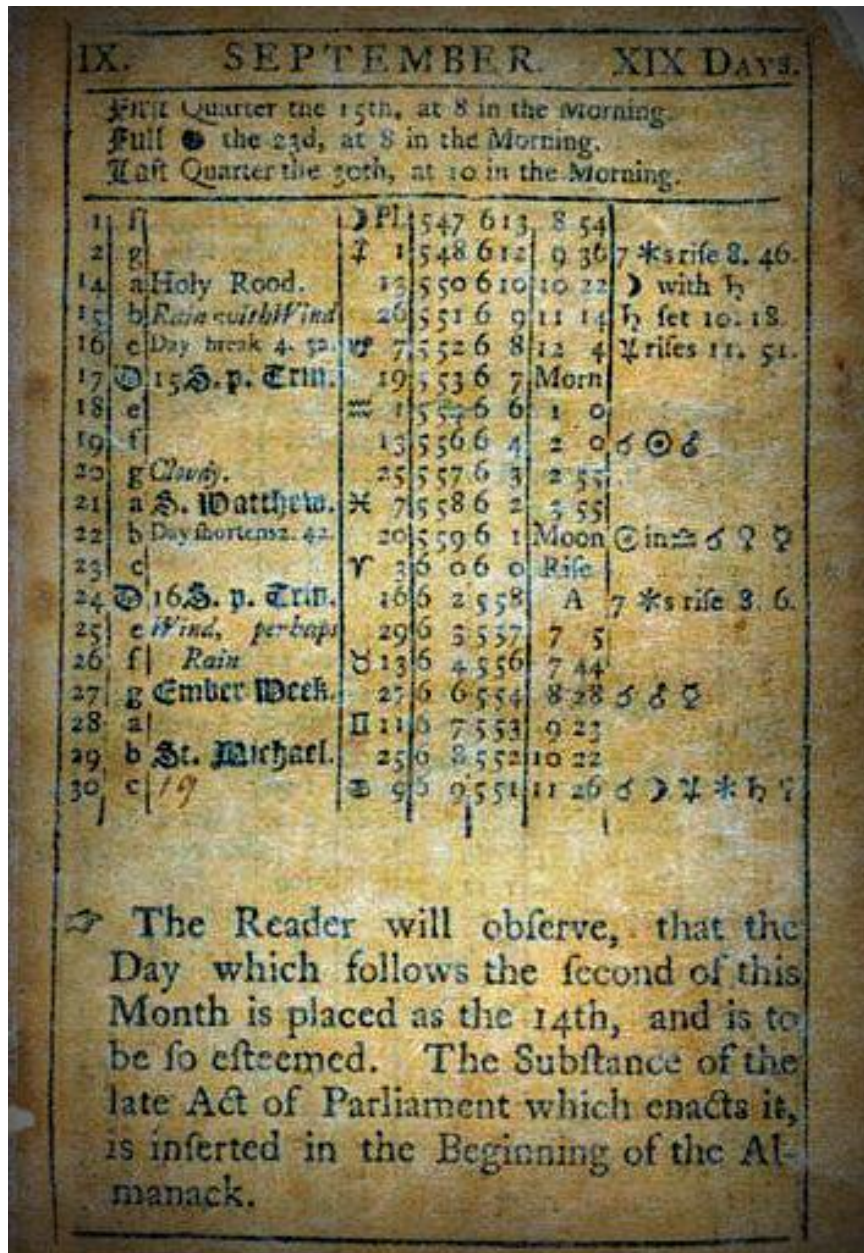


This means that if we compare the Gregorian Calendar time with the actual Solar year time, there is a difference of 0.031276 days or 45 minutes in 4 years, which means the Julian Calendar lags behind 45 minutes in 4 years or lags behind a day in 128 years. This cumulative effect of 0.031276 days error made a difference of 10 days until 1582 when the Gregorian Calendar was introduced and a difference of 11 days until 1752 when England and other countries accepted the Gregorian Calendar.

If we search for the calendar of October 1582 or September 1752 on Google, we will find the following:

- Gregorian Calendar of 1582 October when it was introduced, and 10 Days were skipped from the calendar
- Gregorian Calendar 1752 September when it was adopted by England and other countries and 11 days were skipped from the calendar.

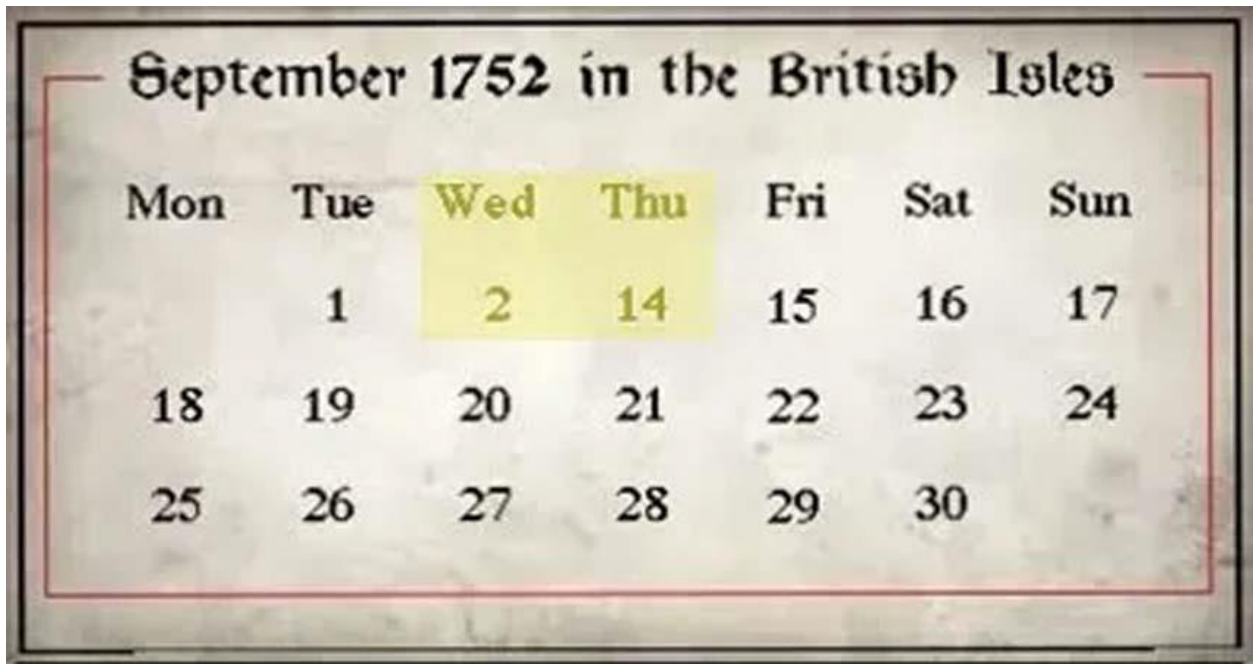




The Gregorian Calendar was introduced in October 1582 by adjusting 10 days in the Julian Calendar, and it was accepted by Britain and other countries in September 1752 by skipping 11 days in the Julian Calendar. Eleven days were adjusted in the September 1752 calendar, and 2nd September (Wednesday) was followed by 14th September (Thursday). However, as the 11 days were skipped to align with the solar year, the day should also have been adjusted along with the date. Simply put, 14th September 1752 should have been a **Monday** instead of **Thursday**. Therefore, a mistake was made in the calendar of September 1752, and the mistake continues as no reformation has been done on it till now.

The Gregorian Calendar and My Proposed Calendar of September 1752

Year 1752 Month September Gregorian Calendar



My Proposed Calendar

| Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
|--------|---------|-----------|----------|--------|----------|--------|
| | 1 | 2 | X | X | X | X |
| X | X | X | X | X | X | X |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | | | | |

Conclusions

The Gregorian Calendar, which is universally followed, maintains the most accurate solar year but reflects a **wrong day**. According to the above observations, from 14th September 1752, a day discrepancy started, and we have been mentioning the **wrong day every day**.

Below is the conclusion of the study, listing the correct days against the days mentioned in today's calendars:

| Days mentioned in Gregorian Calendar/ Today's Calendar | Correct Days |
|--|--------------|
| Monday | Friday |
| Tuesday | Saturday |
| Wednesday | Sunday |
| Thursday | Monday |
| Friday | Tuesday |
| Saturday | Wednesday |
| Sunday | Thursday |

Real World Impact & Consequences

The implementation of the above study will impact our religious beliefs and practices. Studying the above research paper, we can realize that for the last 300 years, we have been worshiping Lord Hanuman (in Hindu religion) on Saturday instead of Tuesday. Similarly, the Friday prayer to Allah, which is very special in the Muslim religion, has actually been done on Tuesday.

The above study also says that for the last 300 years, we have been going to offices on Sundays and taking off on Thursday, thinking it is the weekend.

(The day correction could have been done in October 1582 in the same way as explained above for September 1752.)

References

1. <https://en.wikipedia.org/wiki/1752>
2. [https://en.wikipedia.org/wiki/Gregorian_calendar#/media/File:Reforma Gregoriana del Calendario Juliano.jpg](https://en.wikipedia.org/wiki/Gregorian_calendar#/media/File:Reforma_Gregoriana_del_Calendario_Juliano.jpg)
3. <https://todayinhistory.blog/2020/10/15/october-15-1582-double-dating/>
4. <https://todayinhistory.blog/2022/09/14/september-14-1752-double-dating/>