

Leap Years

Calendars are based on the movements of the sun and the moon, and we have used them for thousands of years. However, no calendar is truly accurate!

One of the most accurate calendars used was created by the Romans. The “**Julian Calendar**” was authorized by **Julius Caesar** in the year 46 BC. The calendar was based on the assumption that the “**Julian year**” had 365.25 (365¼) days. So, it was ordered that each year have 365 days, and every fourth year, called a “**leap year**”, was given an extra day because of the four “lost” ¼ days. The extra day was added to February, making the month 29 days long.



Saint Bede the Venerable (672-735), an Anglo-Saxon monk, announced in the year 730 AD that the **Julian year** was approximately 11 minutes and 14 seconds longer than the true year. This meant that, using the Julian Calendar, an extra day was created every 128 years. Although Bede's calculation was verified, nothing was done for more than 800 years. Consequently, in 1582, the accumulated error was around 10 days.

So, **Pope Gregory XIII** decreed that the day after October 4th, 1582, should be October 15th, therefore losing the 10 extra days. He also introduced the “**Gregorian Calendar**”, which has been in use until today. Since the accumulated error was previously about 3 days in every 400 years, it was decided that three of every four centesimal years (2000, 2100, 2200, etc.) should be common years (with 365 days), not leap years (with 366 days). Therefore, the year 1600 was a leap year, but the years 1700, 1800, and 1900 were not. The year 2000 was a leap year, but the years 2100, 2200, and 2300 will not be.

Recent leap years were **2000, 2004, 2008, 2012, 2016, 2020**. The next leap year will be **2024**.

Using the Gregorian rules, the number of days per year is:

$$365 + \frac{1}{4} - \frac{1}{100} + \frac{1}{400} = 365.2425$$

However, the Gregorian calendar is not perfect - it is about 25.92 seconds too long, since a year actually has **365.2422** days (365 days, 5 hours, 48 minutes, 46.08 seconds). So, every 3,236 years, there will be an error of one extra day. Until now, nobody has decided how this will be corrected! The “problem” will need to be fixed before the year **4818**!