## HISTORY of the CALENDAR

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## The Need for a Calendar

A calendar is necessary to help me, my family, my fellow-workers, and the world's peoples keep track of time. Its purpose is to keep us in touch with appointments and events at home, in the office and world wide..
Currently there are several calendars in use throughout the world. Most are religious calendars used mainly to identify the dates of religious festivals celebrated by the world's many religions. Amongst these is the sacred calendar of the Creator. The sacred calendar is based on the movements of the sun and the moon. It is also linked accurately to many past world events as well as Bible prophecies which describe worldencompassing events shortly to take place. Bible prophecy clearly tells us that there is coming a 'great tribulation, such as was not since the beginning of the world to this time, no, nor ever shall be.' After the tribulation there will be 'signs in the heavens.'

## The Seven Day Week

The fixed 7-day week is so much a part of daily life that it is commonly assumed to be as old as human society. It is not known for sure when the system of fixed 7-day weeks, with no relation to the lunar cycle, came into use, but probably lie in
Sumerian/Babylonian culture. Some Historians believe that around 2350BC. Sargon I, King of Akkad, having conquered Ur and the other cities of Sumeria, instituted a sevenday week, the first to be recorded. The Jews were commanded to observe "the seventh day" as one on which no work was to be performed (in contrast to the other days when work was done). If this is understood as every seventh day (rather than the seventh day of some period such as the month) then a sequence of fixed 7 -day weeks emerges. The fixed 7-day week was not widely used until it was introduced into the Julian Calendar in the 4th Century CE by the Emperor Constantine. Through accidents of history, the Gregorian Calendar has come to be used worldwide as the standard civil calendar for government and business affairs. No improvement has been made in this calendar since it was decreed by Pope Gregory in 1582.

Although some forms of life exhibit cycles of 29-30 days (influenced by the Moon) there is no naturally occurring cycle of seven days. In human society at present this cycle runs on continuously but it has no harmonious relation with the other units of time, the month and the year. The 7-day week exists solely because of social habit and religious tradition, with otherwise no justification. The synodic month (a.k.a. the mean lunar month) is the mean (that is, average) interval in days between exact conjunctions of the Moon and the Sun (as observed from the Earth). The current value of the synodic month (rounded to six decimal places) is 29.530588 days.

The story of Noah contains many allusions to seven days. Note the following in Chapters 7 and 8 of Genesis:

1. "For yet seven days, and I will cause it to rain upon the earth" (7:4)
2. "And it came to pass after seven days that the waters of the flood were upon the earth" (7:10)
3. "And he stayed yet other seven days; and again he sent forth the dove" (8:10)
4. "And he stayed yet other seven days; and sent forth the dove " (8:12)

## Do Weeks of Different Lengths Exist?

If you define a "week" as a 7-day period, obviously the answer is no. But if you define a "week" as a named interval that is greater than a day and smaller than a month, the answer is yes
.The ancient Egyptians used a 10-day "week", as did the French Revolutionary calendar. The Maya calendar uses a 13 and a 20-day "week".
The Soviet Union used both a 5-day and a 6-day week. In 1929-30 the USSR gradually introduced a 5-day week. Every worker had one day off every week, but there was no fixed day of rest. On 1 September 1931 this was replaced by a 6-day week with a fixed day of rest, falling on the 6th, 12th, 18th, 24th, and 30th day of each month (1 March was used instead of the 30th day of February, and the last day of months with 31 days was considered an extra working day outside the normal 6-day week cycle). A return to the normal 7-day week was decreed on 26 June 1940.
Lithuanians used a week of nine days before adopting Christianity.
In international standard ISO-8601 the International Organization for Standardization (ISO) has decreed that Monday shall be the first day of the week.

## The Lunar Year


#### Abstract

Most calendars are based on the solar year. Solar years have the disadvantage of not being easily observable. Many years of observations are required to fix them with any significant degree of accuracy. On the other hand, the phases of the Moon -- and the first visibility after the new moon in particular -- are very easy and quick to observe. Therefore, the first calendars defined a lunar year, usually consisting of 12 synodic months. A synodic month is the interval from one new moon to the next and lasts 29.530588 days. This is equivalent to 29 days, 12 hours, 44 minutes and 2.9 seconds. Since for practical reasons a month should contain an integer number of days, most calendars alternated between months of 29 and 30 days, respectively. A year made out of six months of each type has 354 days and is thus too short by 0.3672 days as compared with a true lunar year. Therefore lunar calendars have to insert one leap day about every third year to keep in step with the moon phases. A pure lunar calendar is not synchronous with the seasons and after 16 years will put the winter in the summer and vice versa. Over a period of 32 years it will cycle through a complete year.

\section*{The Luni-Solar Year}


A luni-solar year is the attempt to combine the phases of the moon and the seasons into one calendar. This is possible if leap months are inserted. Several schemes were used in history. The best known solution was found by the Greek Meton in the year 432 BC but apparently was known to other cultures before. The Metonic cycle encompasses a total of 235 months of which 125 are full (i.e. they have 30 days) and 110 are `hollow' (having 29 days). The months are combined into 12 normal years with 12 months each and 7 leap
years with 13 months each. The cycle covers 6940 days whereas 225 synodic months sum up to 6939.688 days and 19 tropical years to 6939.602 days. The difference in motion between Sun and Moon amounts to only 0.0866 days so that eclipses repeat in the Metonic cycle with high accuracy. No correction applied

## The Hebrew Calendar

The year is divided into 12 lunar months which each start when the new moon is first visible. This gives a total of approx 354 days. The result of this is that the entire year moves 11 or 12 days per year. This was compensated for by adding an additional month seven times in every 19 years.

The names of the Jewish months are - Tishrei (formally Abib), lyyar (formally Ziv), Sivan, Tammuz, Av, Elul, Tishri (formally Ethanim), Marchesvan (Bul), Kislev, Tebet, Shebat and Adar. In a leap year Adar I is followed by Adar II. The months of Marchesvan and Kislev vary in length to make the year length correct. The new year starts on the first day of the first new moon after the vernal equinox. However there are some days of the week on which the year cannot start as certain holidays cannot precede or succeed the Sabbath. This means that some years a day is added, or removed, to ensure that the day/date rules are abided by.

An ordinary year consists of 353, 354 or 355 days. A leap year consists of 383,384 or 385 days. These three lengths of each type of year are known as 'deficient', 'regular' and 'complete' years.

## The Hebrew Jubilee Calendar

Very little is known about the Hebrew Jubilee Calendar. The year consisted of four quarters, each of 91 days. This gave a year of fixed length of 364 days. No adjustment was made for leap years. There is disagreement about how the quarters were divided into months.

One theory is that each month consisted of 30 days then one extra day was added at the end of each quarter to bring the total to 91 days.

Another theory is that each quarter had two months of 28 days and one month of 35 days. This would mean that the months consisted of four weeks, four weeks and five weeks respectively. This fits in with the idea that the calendar may have been based on the number seven, which has great significance in the Bible. Each month would be a multiple of seven ( 4 or 5 times 7 ), the quarters would be 13 times 7 and the year 52 times 7 .

No correction applied
ed: Possibly the months were based solely on the Lunar Cycle.

## The Julian Calendar

The Julian calendar was introduced by Julius Caesar in 45 BC. Year of Confusion It was in common use until the 1500s, when countries started changing to the Gregorian Calendar. However, some countries (for example, Greece and Russia) used it into this century, and the Orthodox church in Russia still uses it, as do some other Orthodox churches.

This does not mean that years were counted the way we do now. They were counted from the start of the reign of the Emperor or Caesar and reset to one when the next Emperor took over. Historians sometimes counted years ab urbe condita, that is since the founding of Rome.

The old Roman calendar was very complicated and required a group of men, known as the pontiffs, to decide when days should be added or removed to keep the calendar in track with the seasons. This made planning ahead difficult and the pontiffs were open to bribery in order to prolong the term of elected officials or hasten elections. In order to avoid these problems Julius Caesar abolished the use of the lunar year and the intercalary month, and regulated the civil year entirely by the sun. With the advice and assistance of Sosigenes, he fixed the mean length of the year at $3651 / 4$ days, and decreed that every fourth year should have 366 days, the other years having each 365 . In order to restore the vernal equinox to the 25th of March, the place it occupied in the time of Numa, he ordered two extraordinary months to be inserted between November and December in the current year, the first to consist of thirty three, and the second of thirty-four days. The intercalary month of twenty-three days fell into the year of course, so that the ancient year of 355 days received an augmentation of ninety days; and the year on that occasion contained in all 445 days. This was called the last year of confusion. The first Julian year commenced with the 1st of January of the 46th before the birth of Christ, and the 708th from the foundation of the city.

In the distribution of the days through the several months, Caesar adopted a simpler arrangement than that which we have now. He had ordered that the first, third, fifth, seventh, ninth, and eleventh months, that is January, March, May, July, September and November, should each have thirty-one days, and the other months thirty, except February, which in common years should have only twenty-nine day, but every fourth year thirty days. This order was interrupted in 8 BC to gratify the vanity of Augustus, by giving the month bearing his name as many days as July, which had been re-named after the first Caesar during 44BC. A day was accordingly taken from February and given to August; and in order that three months of thirty-one days might not come together, September and November were reduced to thirty days, and thirty-one given to October and December.

The additional day which occurred every fourth year was given to February, being the shortest month, and was inserted in the calendar between the 24th and 25th day. February having then twenty-nine days, the 25th was the 6th of the calends of March, sexto calendas; the preceding, which was the additional or intercalary day, was called bis-sexto calendas,--hence the term bissextile, which is still employed to distinguish the year of 366 days. The English denomination of leap year would have been more appropriate if that year had differed from common years in defect, and contained only 364 days. In the modern calendar the intercalary day is still added to February, not, however, between the 24th and 25th, but as the 29th.

In the Julian calendar, the tropical year is approximated as 365 1/4 days $=365.25$ days. This gives an error of 1 day in approximately 128 years.

The approximation $3651 / 4$ is achieved by having 1 leap year every 4 years (as explained above) and the rule for calculation is that every year divisible by 4 is a leap year.

However, this rule was not followed in the first years after the introduction of the Julian calendar in 45 BC. Due to a counting error, every 3rd year was a leap year in the first years of this calendar's existence. The leap years were:

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45 BC, 42 BC, 39 BC, 36 BC, 33 BC, 30 BC,
27 BC, 24 BC, 21 BC, 18 BC, 15 BC, 12 BC, 9 BC,
AD 8, AD 12, and every 4th year from then on.
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There were no leap years between 9 BC and AD 8. This period without leap years was decreed by emperor Augustus as part of his reform.

It is a curious fact that although the method of reckoning years after the (official) birth year of Messiah was not introduced until the 6th century, by some "stroke of luck" the Julian leap years coincide with years of "our Lord" that are divisible by 4.

The seven day week was introduced by the Emperor Constantine I in the 4th century AD.

## Problems with the Julian Calendar.

The Julian calendar introduces an error of 1 day every 128 years. So every 128 years the tropical year shifts one day backwards with respect to the calendar. Furthermore, the method for calculating the dates for Easter was inaccurate and needed to be refined.

In order to remedy this, two steps were necessary: 1) The Julian calendar had to be replaced by something more adequate. 2) The extra days that the Julian calendar had inserted had to be dropped.

The solution to problem 1) was the Gregorian Calendar.
The solution to problem 2) depended on the fact that it was felt that 21 March was the proper day for vernal equinox (because 21 March was the date for vernal equinox during the Council of Nicaea in AD 325). The Gregorian calendar was therefore calibrated to make that day vernal equinox. By 1582 vernal equinox had moved (1582-325)/128 days = approximately 10 days backwards. So 10 days had to be dropped.

## What is a Julian date and a modified Julian date?

It's the number of days since noon 4713 BC January 1. What's so special about this date?
Joseph Justus Scaliger (1540--1609) was a noted Italian-French philologist and historian who was interested in chronology and reconciling the dates in historical documents. As many calendars were in use around the world this created the problem of which one to use. To solve this Scaliger invented his own era and reckoned dates by counting days. He started with 4713 BC January 1 because that was when solar cycle of 28 years (when the days of the week and the days of the month in the Julian calendar coincide again), the Metonic cycle of 19 years (because 19 solar years are roughly equal to 235 lunar months) and the Roman indiction of 15 years (decreed by the Emperor Constantine) all coincide. There was no recorded history as old as 4713 BC known in Scaliger's day, so it had the advantage of avoiding negative dates. Joseph Justus's father was Julius Caesar Scaliger, which might be why he called it the Julian Cycle. Astronomers adopted the Julian cycle to avoid having to remember "30 days hath September ...." and to avoid the 10/11 day hiatus in the Gregorian calendar.

For reference, Julian day 2450000 began at noon on 1995 October 9. Because Julian dates are so large, astronomers often make use of a "modified Julian date"; MJD = JD 2400000.5. (Though, sometimes they're sloppy and subtract 2400000 instead.)

## The Gregorian Calendar

The Gregorian calendar is the one commonly used today. It was proposed by Aloysius Lilius, a physician from Naples, and adopted by Pope Gregory XIII in accordance with instructions from the Council of Trent (1545-1563) to correct for errors in the older Julian Calendar. It was decreed by Pope Gregory XIII in a papal bull in February 1582.

In the Gregorian calendar, the tropical year is approximated as 365 97/400 days $=$ 365.2425 days. Thus it takes approximately 3300 years for the tropical year to shift one day with respect to the Gregorian calendar.

The approximation 365 97/400 is achieved by having 97 leap years every 400 years.
These are calculated as follows : Every year divisible by 4 is a leap year. However, every year divisible by 100 is not a leap year. However, every year divisible by 400 is a leap year after all.

So, 1700, 1800, 1900, 2100, and 2200 are not leap years. But 1600, 2000, and 2400 are leap years.
(Destruction of a myth: There are no double leap years, i.e. no years with 367 days. See, however, the note on Sweden lower down this page.)

## The 4000-year rule.

It has been suggested (by the astronomer John Herschel (1792-1871) among others) that a better approximation to the length of the tropical year would be 365 969/4000 days = 365.24225 days. This would dictate 969 leap years every 4000 years, rather than the 970 leap years mandated by the Gregorian calendar. This could be achieved by dropping one leap year from the Gregorian calendar every 4000 years, which would make years divisible by 4000 non-leap years.

This rule has, however, not been officially adopted.

## The change-over from the Julian to the Gregorian calendar.

The papal bull of February 1582 decreed that 10 days should be dropped from October 1582 so that 15 October should follow immediately after 4 October, and from then on the reformed calendar should be used.

This was observed in Italy, Poland, Portugal, and Spain. Other Catholic countries followed shortly after, but Protestant countries were reluctant to change, and the Greek orthodox countries didn't change until the start of this century.

The following list contains the dates for changes in a number of countries.

Albania: December 1912

Austria: Different regions on different dates
5 Oct 1583 was followed by 16 Oct 1583
14 Dec 1583 was followed by 25 Dec 1583
Belgium: Different authorities say
14 Dec 1582 was followed by 25 Dec 1582
21 Dec 1582 was followed by 1 Jan 1583
Bulgaria: Different authorities say
Sometime in 1912
Sometime in 1915
18 Mar 1916 was followed by 1 Apr 1916
China: Different authorities say
18 Dec 1911 was followed by 1 Jan 1912
18 Dec 1928 was followed by 1 Jan 1929
Czechoslovakia (i.e. Bohemia and Moravia):
6 Jan 1584 was followed by 17 Jan 1584
Denmark (including Norway):
18 Feb 1700 was followed by 1 Mar 1700

Egypt: 1875
Estonia: January 1918

Finland: Then part of Sweden. (Note, however, that Finland later became part of Russia, which then still used the Julian calendar. The Gregorian calendar remained official in Finland, but some use of the Julian calendar was made.)

France: 9 Dec 1582 was followed by 20 Dec 1582
Germany: Different states on different dates:
Catholic states on various dates in 1583-1585
Prussia: 22 Aug 1610 was followed by 2 Sep 1610
Protestant states: 18 Feb 1700 was followed by 1 Mar 1700
Great Britain and Dominions (including what is now the USA):
2 Sep 1752 was followed by 14 Sep 1752
The Calendar(new style) Act, 1750
Year of Confusion

|  | Su |  | M |  | Tu |  | W |  | Th |  | F |  | Sa |
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| 17 | 6 | 18 | 7 | 19 | 8 | 20 | 9 | 21 | 10 | 22 | 11 | 23 | 12 |


| 24 | 13 | 25 | 26 | 27 | 28 | 29 | 30 |
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link article: How Britain got the Calendar Wrong
Greece: 9 Mar 1924 was followed by 23 Mar 1924
Hungary: 21 Oct 1587 was followed by 1 Nov 1587
Italy: 4 Oct 1582 was followed by 15 Oct 1582
Japan: Different authorities say:
19 Dec 1872 was followed by 1 Jan 1873
18 Dec 1918 was followed by 1 Jan 1919
Latvia: During German occupation 1915 to 1918
Lithuania: 1915

Luxembourg: 14 Dec 1582 was followed by 25 Dec 1582
Netherlands:
Brabant, Flanders, Holland, Artois, Hennegau:
14 Dec 1582 was followed by 25 Dec 1582
Geldern, Friesland, Zeuthen, Groningen, Overysel:
30 Nov 1700 was followed by 12 Dec 1700
Norway: Then part of Denmark.
Poland: 4 Oct 1582 was followed by 15 Oct 1582
Portugal: 4 Oct 1582 was followed by 15 Oct 1582
Prussia : 22 Aug 1610 was followed by 2 Sept 1610
Romania: 31 Mar 1919 was followed by 14 Apr 1919
Russia: 31 Jan 1918 was followed by 14 Feb 1918
Spain: 4 Oct 1582 was followed by 15 Oct 1582
Sweden (including Finland):
17 Feb 1753 was followed by 1 Mar 1753 (see note below)
Switzerland:
Catholic cantons: 1583 or 1584
Zurich, Bern, Basel, Schafhausen, Neuchatel, Geneva:
31 Dec 1700 was followed by 12 Jan 1701 St Gallen: 1724

Transylvania : 14 Dec 1590 was followed by 25 Dec 1590
Turkey: 18 Dec 1926 was followed by 1 Jan 1927
Tyrol : 5 Oct 1583 was followed by 16 Oct 1583
USA: See Great Britain, of which it was then a colony.
Yugoslavia: 14 January 1919 was followed by 28 January 1919 but parts of the country had changed over earlier.

Sweden has a curious history. Sweden decided to make a gradual change from the Julian to the Gregorian calendar. By dropping every leap year from 1700 through 1740 the eleven superfluous days would be omitted and from 1 Mar 1740 they would be in sync with the Gregorian calendar. (But in the meantime they would be in sync with nobody!)

So 1700 (which should have been a leap year in the Julian calendar) was not a leap year in Sweden. However, by mistake 1704 and 1708 became leap years. This left Sweden out of synchronisation with both the Julian and the Gregorian world, so they decided to go 'back' to the Julian calendar. In order to do this, they inserted an extra day in 1712, making that year a double leap year! So in 1712, February had 30 days in Sweden.

Later, in 1753 , Sweden changed to the Gregorian calendar by dropping 11 days like everyone else.

It should be noted that the Gregorian Calendar is useless for astronomy because it has a ten-day hiatus in it. For the purpose of calculating positions backward in time, astronomers use the Julian Date Calendar.
-- source:Calendopaedia
Calendar changes over time...
The Julian calendar, introduced by Julius Caesar in 45 BC, began on 1st January, with the length of months alternating between 31 and 30 days - except for February, which had 30 days in a leap year and 29 days otherwise. (This replaced an earlier Roman calendar which had 10 months of alternating 30 and 31 days, followed by a "winter gap", the length of which varied from year to year. The last year of this old calendar actually had 445 days.)

Complications to the Julian system began when the Senate wanted to name a month after the then Emperor Augustus. To avoid slighting the Emperor, the month named for Augustus must be as long as the month named for Julius, and should follow it directly. And so July and August became 31 days each, and February surrendered an extra day. (To avoid 3 successive 31 day months, September was shortened to 30 days, October lengthened to 31, and so on.)

The Romans initially introduced leap years every 3 years, but by about 9 BC it was seen that the calendar was getting out of step with the solstices, so leap years were abandoned altogether, until about AD 4 or 8, when leap years were re-introduced as every 4 years. Even this was not completely accurate, giving an error of 45 minutes in 4 years, or 3 days in 400 years. In time, this miscalculation became quite noticeable.

Around 150 AD Christian churches decided to take over the pagan festival of Saturnalia (the winter solstice) and celebrate 25th December as Christ's birthday. Later, when the cult of the Virgin Mary became popular, it was thought that the Christian era should start on the day of Christ's conception, that is, 9 months earlier on 25th March, which they named Ladyday. The year began on 25th March and ended on the following 24th March.

All moveable feasts in the church calendar relate to Easter. In turn, gospel tradition related Easter to the Jewish festival of Passover, which in turn was related to the spring equinox, the phase of the moon and the celebration of the Sabbath. Over the centuries, by following the Julian calendar, the Easter festival was slowly but surely moving away from the spring equinox towards the summer solstice. The new system adopted by Pope Gregory in the 16th century, specified a calendar with a year length of 365 days, 5 hours, 40 minutes, 20
seconds. Therefore 3 days had to be dropped every 400 years. So those years which were divisible by 100 would only be leap years if they were divisible by 400. To correct errors which had built up over centuries, Pope Gregory declared that Thursday 4th October 1582 in the Julian Calendar should be immediately followed by Friday 15th October in the Gregorian Calendar.

Scotland and most Roman Catholic countries of Europe adopted the Gregorian Calendar in 1582 or soon after. Most Protestant countries however ignored this Papal decision for another 200 years. In England, they still followed the old Julian Calendar (year ending 24th March) until 1751. Lord Chesterfield's Act of 1751/2 stated that the year 1752 would begin on 1st January and end on the following 31 December. In addition, in 1752 only, the calendar was adjusted to omit 11 days (2nd September was followed by 14 th September) to bring their "new" (Gregorian) calendar back in line with most of the rest of Europe.

Orthodox countries (those following allegiance to the Patriarch of Constantinople) were even slower to change. Russia, for example, did not convert to the new calendar until after the Russian Revolution. An interesting consequence of this was that when London hosted the 1908 Olympic Games, the Russian team arrived 12 days late because of it! Turkey was the last major European country to adopt the Gregorian Calendar - on 1st January 1927.

In England, the "quarter days" (for quarterly events like the Quarter Court sessions) were Lady Day (March 25) when the legal year started, St John the Baptist Day (Midsummer Day, June 24), Michaelmas (September 29) and Christmas (December 25). These were close to the equinoxes and solstices and were regarded as the beginning of the dates of the seasons. In the City of London, when the calendar changed, bankers refused to pay their taxes 11 days early, and so would not pay before 5th April, which still remains the date of the end of the fiscal year.

When reading English dates prior to 1752, regard the years with care. Was the date written by someone from that time? - in which case remember the year ran from March to March. However if the date was written by a modern researcher, did they understand the calendar in place at the time - and what system were they using when they described a date such as 2nd January 1701? To avoid confusion the convention is to write that date as 2nd January 1701/2 which uniquely identifies the year. (1701 in this case being the year according to the old Julian Calendar, and 1702 according to the "new" Gregorian Calendar.)

an article by Kerry Farmer

