About the Dozenal Solstice calendar

This calendar is a rational response to four goals:

1. Make the calendar as regular as possible;
2. Start the year at a justifiable point;
3. Start the count of the years at a notable historical-astronomical point;
4. Use the dozenal number base.

The following discussion addresses those goals in reverse order. *Where necessary, a subscript* z *indicates the dozenal number base (counting by dozens), and a subscript* d *the decimal number base (counting by tens).*

4. It's long been recognized that counting by dozens has advantages, mostly because a dozen has factors of 2, 3, 4, and 6, as opposed to ten's 2 and 5. Dividing things into even, whole thirds and quarters is extremely useful. It's not possible to divide $_{d}10$ into quarters without a fractional remainder, nor $_{d}10$, $_{d}100$, $_{d}1000$, etc. into thirds without an unending fractional remainder. $_{z}10$ (a dozen) and its powers don't have those problems. Decimal 0.1666 repeating, 0.25, 0.333 repeating, and 0.5 are respectively dozenal 0.2, 0.3, 0.4, and 0.6.

In the dozenal number base, single digits are needed for ten and eleven, because $_{z}10$ is a dozen ($_{d}12$). In the Dozenal Solstice calendar, $_{d}10$ is $_{z}$↊ and $_{d}11$ is $_{z}$↋, using numerals designed for this purpose in the mid-19th century by Isaac Pitman. (There are various systems of names for dozenal numbers, and other numerals have been used for $_{d}10$ and $_{d}11$. The Pitman numerals may also be redesigned slightly to disguise their origins.)

The dozenal number base (sometimes called *duodecimal,* after the Latin *duodecim,* for *twelve*) is ideal for a year having a dozen months and for creating a six-day week. We could then divide the week in half or in thirds.

In the Dozenal Solstice calendar, the months are numbered from 1 to $_{z}10$, and the years counted dozenally also, which brings us to the question of when the count of the years should start, i.e. when year 1 was.

3. Nothing happened $_{d}2016$ years ago (as of the date of this discussion) to suggest starting to count the years then. Even the Christian saviour wasn't born then (more likely between 4 and 6 years earlier).

In 2013, for Version 1.0 of this calendar, I suggested that if we want a date that reflects the starting point of three ancient major calendar cycles together—solar ($_{d}28$), lunar ($_{d}19$), and indiction ($_{d}15$)—that is the so-called Julian day, specified by Joseph Scaliger in the 16th century. That made year 1 of the Dozenal Solstice calendar almost all of $_{d}4713$ BCE (or BC). (See point 2 below for why "almost all.”) Accordingly, ${}_{d}$2016 CE (or AD) is ${}_{d}$6729, or ${}_{z}$3↊89, where ↊ is ten: 3 dozen dozen dozen plus ${}_{d}$10 dozen dozen plus 8 dozen plus 9.

Although the Julian Day is used by astronomers, it comes from no astronomical event, arising from a cycle that includes a secular tax period. Sanketh Kolhar suggested starting the count of years near the beginning of the Holocene Epoch, i.e. after the latest ice age. Although that cannot be said to be a particular year, there *is* an astronomical event near the epoch’s beginning: in 9564 BCE. That is the latest time that the perihelion, the shortest distance between the sun and the Earth, occurred on the summer solstice. (In 2016, it occurred on January 2 Co-ordinated Universal Time, or Greenwich Mean Time.)

Year 1 of the Dozenal Solstice Calendar is now almost all of 9563 BCE, 9564 being year 0. Accordingly, ${}_{d}$2016 CE is ${}_{d}$11579, or ${}_{z}$684↋, where ↋ is eleven: 6 dozen dozen dozen plus 8 dozen dozen plus 4 dozen plus ${}_{d}$11.

The change to the Holocene starting point created Version 1.5 of the calendar. Version 2 (the latest) is described below.

2. Although there’s understandable lore behind the year’s starting on January 1, just as there is behind the calendar’s starting 2016 years ago, it makes more sense to start the year on the winter solstice just before January, analogous to the day’s starting at midnight. The problems are that 1) the solstice moves slightly (since 1900 falling on December 23, 22, and 21); 2) the specific time of the solstice in a year may fall on two different dates depending on time zones; 3) a date in December is valid only for the northern hemisphere.

Problem 1. Because of the moving winter solstice date, leap years in the Dozenal Solstice calendar are not when they are in the Gregorian calendar. That also means that it’s difficult to predict which are leap years. The four-year cycle of the Gregorian calendar (one leap year, three non-leap) becomes slightly irregular in the Dozenal Solstice calendar. Once every few decades in the Dozenal Solstice, there are five years from a leap year to the next.

Even if it may be a chore not to know whether a year is a leap year by dividing it by 4, the Dozenal Solstice calendar has the advantage that the years never go out of alignment with the sun. There’s no longer a correction needed to the leap year cycle. (In the Gregorian calendar, years divisible by ${}_{d}$100 aren’t leap years, except that those divisible by 400 are, with another negative correction needed in 3200…)

Problem 2. This may be solved by taking the winter solstice at Co-ordinated Universal Time. A table for the solstices and equinoxes may be found here.

Problem 3. The southern hemisphere countries may create their own calendar starting on the winter solstice in June. At 0 degrees longitude (as for Greenwich, England), the only difference would be that the year would presumably start six months later, taking June 9563 BCE instead of December 9564 to start year 1. If having a year number that doesn't agree for six months with the one in the northern hemisphere is too awkward, the south may continue to follow what has been established in the north, which has the larger proportion of land and population.

1. Making the calendar completely regular is impossible, because it presents either $_{d}$365 or 366 days per year. The nearest and most useful number of days, divisible by $_{d}$12, is 360. That means either $_{d}$12 months of 5 weeks ($_{d}$30 days) each, or $_{d}$10 months of 6 weeks ($_{d}$36 days) each. Anyone who has contemplated living with a decimal metric day divided into $_{d}$10 or $_{d}$20 hours will know why the first alternative for the calendar is better.

For $_{d}$12 $_{d}$30-day ($_{z}$10 $_{z}$26-day) months, totalling $_{d}$360 ($_{z}$260) days, some people have suggested gathering the extra 5 or 6 days at the end of the year. Because that throws off the seasons' alignment, it's necessary to disperse the extra days throughout the year.

In the Dozenal Solstice calendar, the extra days are designated S-days (from the Latin *super,* meaning *beyond* or *above*) and are not part of any month, even though they occur between months. To disperse them evenly would require them every $_{d}$12 ($_{z}$10) weeks in a non-leap year, every $_{d}$10 ($_{z}$↊) weeks in a leap year. Because the former would interrupt the 5-week months, that option has not been chosen.

For leap years, we might place the S-days as described: three in the first half and three in the second. (Non-leap years might have two in one half and three in the other.) That would lead to an undesirable result, however: although the winter solstice would always fall on the first day of the first month of the year (as planned), the summer solstice would always falls on the S-day between months 6 and 7. To have the latter solstice always on the first day of the seventh month, the S-days are placed in each half of the year as follows:

	first half of the year	second half of the year
leap year	two S-days	four S-days
non-leap year, first pattern	one S-day	four S-days
non-leap year, second pattern	two S-days	three S-days

In Version 1.0 and 1.5 of the calendar, the leap year pattern was S3 S5 / S7 S8 S↊ S10, derived from S2 S4 S6 / S8 S↊ S10 but making a slight change to adhere to the principle and table above. The number following *S* refers to the month which the S-day follows.

Version 2.0 uses S5 S6 / S7 S8 S9 S↊, after the suggestion from Sanketh Kolhar. That is the astronomically most accurate placement of the S-days in a leap year. There's minimal change from it for the non-leap years, as may be seen in the following:

	1	2	3	4	5	6	7	8	9	↊	↋	10
leap year pattern					S	S	S	S	S	S		
non-leap year, first pattern						S	S	S	S	S		
non-leap year, second pattern					S	S	S	S	S			

Months 6, 7, 8, and 9 are always followed by an S-day. Month 5 or month ↊ may be, or both. Which years use which pattern is indicated here.

Although it would be good to have the equinoxes always fall on the beginning of the fourth and tenth month, that isn't possible if all the months have the same number of days, partly because spring and summer are longer than autumn and winter in the northern hemisphere. Other aspects of the day and year, e.g. the varying length of both over millennia, together with different ways of measuring them, make differences too small to affect the calendar.

To keep month and day names as they are in the Gregorian calendar would be confusing. In the Dozenal Solstice calendar, the months have names from the twelve original signs of the Zodiac. They are used in classical Greek or their Latin-alphabet transcription to avoid connection with astrology, even though each month begins approximately where older astrology says it should. The days are named after the six vowels in the Latin alphabet.

As explained, making a completely regular calendar isn't possible. While using a number base better than ten, the Dozenal Solstice calendar minimizes irregularities and anomalies, and brings time reckoning at the level of the day, month, and year much closer to solar reality.

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684↋-05-15
(2016 May 06)