Accurate timekeeping has always been a human necessity, from early civilizations knowing when to plant crops to today's employees knowing when to hold a meeting (or not).

One of the tools that helps us in this endeavor is the calendar – and the quirky adjustment that makes its return on Feb. 29.

Think of leap day as a bit of cosmic bookkeeping that allows our seasons to occur on a predictable schedule. If it wasn't used, parts of the country would eventually have snowy summers and sultry winters.

**How leap year works**

We all know that leap day exists because a year isn't exactly 365 days.

"The total amount of time it takes the Earth to complete a revolution around the sun is not exactly a whole number of days," said Renu Malhotra, Regents Professor in the Department of Planetary Sciences. "It falls about six hours short of that. So every four years we add a day to compensate."

But even that is not exact enough, Malhotra said. One leap day every four years overshoots by a little bit, because the solar year is 365 days, 5 hours, 48 minutes and 46 seconds, according to NASA.

So how do we compensate for that?

"Every 100 years, with some exceptions, we don't do a leap year," Malhotra explained. "If that year is divisible by 100 but not 400, we skip it."

So, if you are updating your Outlook calendar well in advance, the years 2100, 2200 and 2300 will not be leap years, but 2400 will be a leap year.

The idea of adding leap days dates back thousands of years. A decree from Roman Emperor Julius Caesar in 45 B.C. introduced a leap day every four years; centuries before that, Egyptian civilizations also followed a calendar with a leap year every four years. The Hebrew calendar, which dates back to the fourth century A.D. and is primarily based on 19-year lunar cycles, adds a 30-day leap month seven times each cycle.

**Why we leap**

Accurate timekeeping has been crucial throughout humanity's agricultural history as civilizations needed to keep track of the seasons for planting purposes. Leap days helped ensure they planted at the right time during the right seasons.

Keeping correct time is just as important in modern society, Malhotra said.

"I'm an astronomer, and for any observation of astronomical events, we need high accuracy to know when to schedule certain operations with very expensive equipment and facilities," she said. "Or when using navigation with GPS on your smartphone, the GPS satellites need that kind of accurate timekeeping."

Sometimes, because of the way the earth rotates, we need to "leap" in increments smaller than a day.

"Our calendar is constantly in need of monitoring," Malhotra explained. "Every now and then you'll hear about a leap second being added to a year. That happens sometimes because the Earth's rotation speed fluctuates, for example, from continental movements, and it is also slowing down gradually because of lunar and solar tides and friction within our planet. These can affect spin rate and make the planet rotate a little more or a little less in a given year."

The people in charge of making that decision in the United States work in the National Institute of Standards and Technology, a federal agency under the U.S. Department of Commerce. The first leap second occurred in 1972. The most recent second happened in 2016.

As you prepare for your extra day in February, here are some more leap year facts:

- The term "leap year" is used because dates "leap" a day in those years. For example, if your birthday is on a Friday one year, normally it would be on a Saturday the next year. But following a leap year, your next birthday would "leap" over Saturday and occur on a Sunday.
- Celebrities with Feb. 29 birthdays include actress and singer Dinah Shore, rapper Ja Rule, motivational speaker Tony Robbins and Superman (according to a 1976 "Super Calendar" published by DC Comics, the home of
If you’re looking for another reason to celebrate, leap day this year coincides with National Toast Day [3].

La Bougie du Sapeur [4] (or The Sapper's Candle) is a French satirical newspaper that is published only on leap day. The paper, which was launched in 1980, has a circulation of about 200,000. Subscriptions cost 100 euros per century, or about $108.

Source URL: https://uaatwork.arizona.edu/lqp/science-leap-day-how-it-works-and-why-we-do-it

Links
[1] https://www.grc.nasa.gov/www/k-12/Numbers/Math/Mathematical_Thinking/calculator_calculations.htm