

Teacher Answer Key

Leap Day Math

The length of a year is based on how long it takes a planet to revolve around the Sun. Earth takes about 365.2422 days to make one revolution around the Sun. That's about 6 hours longer than the 365 days that we typically include in a calendar year. As a result, every four years we have about 24 extra hours that we add to the calendar at the end of February in the form of leap day. Without leap day, the dates of annual events, such as equinoxes and solstices, would slowly shift to later in the year, changing the dates of each season. After only a century without leap day, summer wouldn't start until mid-July!

1. Earth revolves around the Sun in approximately 365.2422 days. How long is that in days, hours, minutes and seconds?
 - $0.2422 * 24 \text{ hours} = 5.8128 \text{ hours}$
 - $0.8128 * 60 \text{ minutes} = 48.768 \text{ minutes}$
 - $0.768 * 60 \text{ seconds} = 46.08 \text{ seconds}$
 - **Answer: 365 days, 5 hours, 48 minutes, 46 seconds**
2. After Earth orbits the Sun four times, how many extra hours, minutes and seconds need to be balanced out by a leap year?
 - $4 * 0.2422 \text{ days} = 0.9688 \text{ days}$
 - $0.9688 * 24 \text{ hours} = 23.2512 \text{ hours}$
 - $0.2512 * 60 \text{ minutes} = 15.072 \text{ minutes}$
 - $0.072 * 60 \text{ seconds} = 4.32 \text{ seconds}$
 - **Answer: 23 hours, 15 minutes, 4 seconds**
3. What is the difference in hours, minutes and seconds between what is added to the calendar every four years with Leap day and what is actually needed?
 - 1 day minus 23 hours, 15 minutes, 4 seconds
 - Count on from 23 hours, 15 minutes, 4 seconds to get to 24 hours.
 - **Answer: 44 minutes, 56 seconds**
4. With the extra, unneeded time that has been added to the calendar every four-year leap cycle, how many extra days, would be added to the calendar every 400 years?
 - $44 \text{ minutes, } 56 \text{ seconds} * 100 = 4400 \text{ minutes, } 5600 \text{ seconds}$
 - $5600 \text{ seconds} / 60 = 93.33 \text{ minutes}$
 - $4400 \text{ minutes} + 93.33 \text{ minutes} = 4493.33 \text{ minutes}$
 - $4493.33 \text{ minutes} / 60 / 24 = 3.12 \text{ days}$
 - **Answer: 3.12 days**
5. Because of the extra time that gets added to the calendar over a 400-year span, years that are divisible by 100 omit leap day unless they are also divisible by 400. Which years in the past 500 years and the next 500 years have omitted leap day?
 - **Answer: 1700, 1800, 1900, 2100, 2200, 2300, 2500**