Reflect

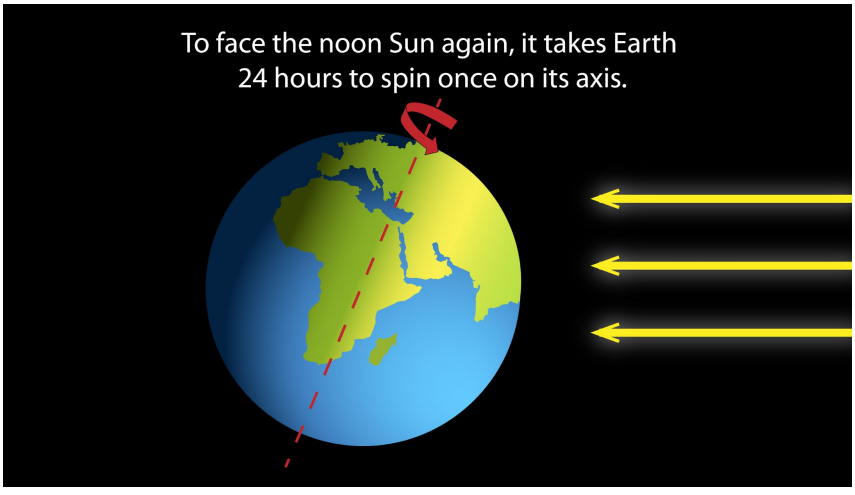
What happens as Earth rotates?

Earth moves through space in several important ways. One type of motion is called *rotation*. A rotation is a spin around a center. For example, imagine a spinning top. Like a top, Earth spins around a central line, called an *axis*. Earth's axis is an imaginary vertical line that runs through the planet from the North Pole to the South Pole. If you held a globe by putting one finger at the North Pole and another finger at the South Pole, the invisible line that connected your fingers would represent the axis. Earth's axis is tilted at an angle of 23.5°.

As you read this sentence, Earth is rotating around its tilted axis at a rate of about 1,000 miles (1,609 kilometers) per hour! Why, then, does it feel like Earth is standing still?! Because Earth spins at a constant speed, we don't feel it speed up or slow down. Think of this example—if you're in a car moving at a constant speed, you don't really feel the car's motion. If the car speeds up or if the driver hits the brakes, you feel the change in motion.

Like a spinning top (right), a globe (left) spins around a central line, called an axis. Earth's axis travels through the planet's center, connecting the North Pole to the South Pole.

Earth makes one complete rotation on its axis every 23 hours and 56 minutes, which is rounded up to 24 hours. Does this time sound familiar? The 24 hours that Earth takes to make one rotation is equal to 1 *day*. Suppose you have a big math test in 3 days. How many rotations will Earth make in that time? If you answered three, you are correct.

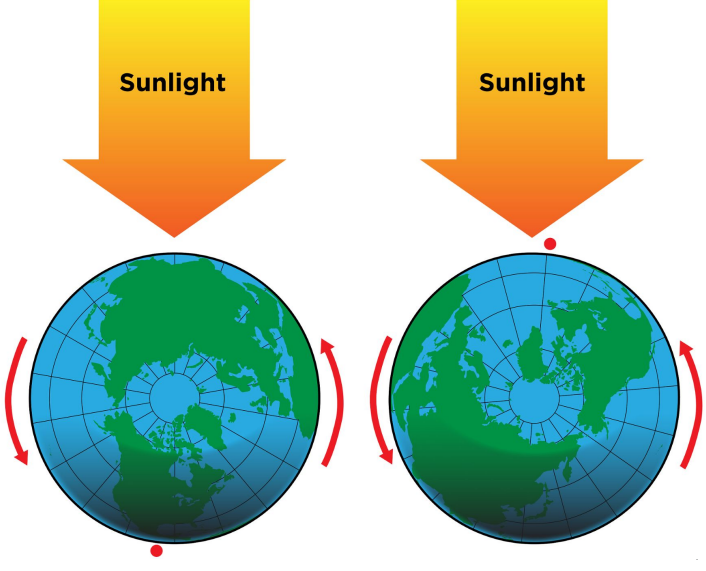


Describe the positions of Earth and the Sun when it is daytime. How are they different at night?

As Earth rotates on its axis, the different locations on Earth change position in relation to the Sun. A city on Earth that faces toward the Sun at noon will face away from the Sun 12 hours later. The positions of Earth and the Sun over the course of a 24-hour rotation cause sunrise, day, sunset, and night.

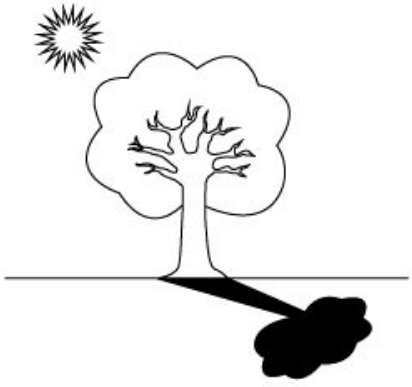
At all times, half of Earth faces toward the Sun and half faces away from the Sun. The half that faces toward the Sun is illuminated by the Sun's glow. It is daytime on that half of the planet. At the same time, the half of Earth that faces away from the Sun is in darkness. It is nighttime on that half of the planet. As Earth rotates, the Sun-facing half steadily moves from sunlight into darkness. From our position on Earth, this appears as sunset. *Sunset* is the exact moment when the last edge of the Sun falls below the horizon. Meanwhile, the dark-facing half of Earth steadily moves into the sunlight. We see this process as sunrise. *Sunrise* is the exact moment when the first edge of the Sun peeks over the horizon. In reality, the Sun is neither rising nor setting. The Earth is rotating toward and away from the Sun (depending upon what point of Earth you are on).

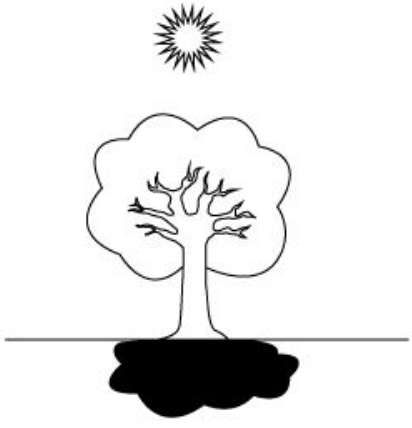
Look at these pictures of Earth. The picture on the left shows a red dot marking Venezuela's location at a certain time of day. The picture on the right marks Venezuela 12 hours later. In which picture would it be daytime in Venezuela?



On Earth, it looks like the Sun is moving across the sky. Why is this not true? Throughout the day, the Sun appears to move from east to west across the sky. In reality, Earth is rotating from west to east. Shadows offer some evidence to support this. You can see the apparent motion of the Sun by watching shadows move during the day.

When the Sun appears to rise above the horizon in the morning, its light casts long shadows that point to the west.

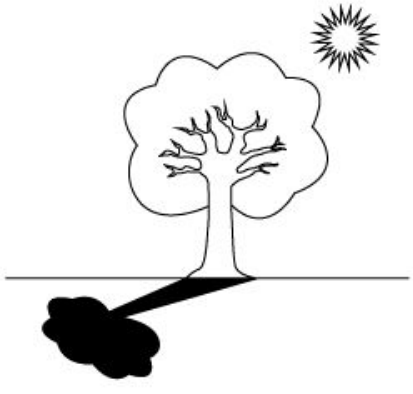




As the Sun takes its arc-shaped path across the sky, the shadows change. As the hour approaches noon, the shadows become shorter. When the Sun is directly overhead, very little shadow is observed.

Before clocks and wristwatches were invented, people used the Sun's apparent motion to tell time. A *sundial* uses shadows to determine the time of day.

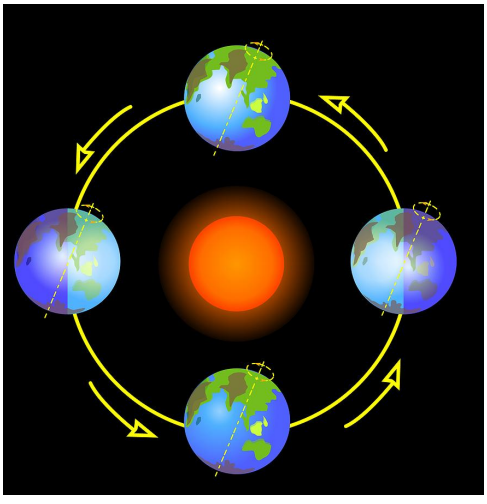
As the day continues, the Sun appears to move toward the western horizon. Again the shadows lengthen, but they now point toward the east.



A sundial uses shadows to tell the time of day. Notice how the numbers on a sundial are different from those on a traditional clock.

Look Out!

Why are days and nights not always equal?
Because one rotation takes 24 hours, you might think that every place on Earth spends approximately 12 hours facing the Sun and 12 hours in darkness. This is true of places located on or near the equator. However, as you move toward the North and South Poles, the length of daytime and nighttime varies. The closer a city is to the North or South Pole, the more extreme is the difference in daylight and nighttime hours throughout the year. This is due to the tilt of the axis and Earth's **revolution** around the Sun.



revolution – Earth's motion around the Sun; Earth takes 1 year, or 365 days, to make a single revolution

As Earth moves around the Sun, the North Pole tilts toward the Sun for part of the year. When this happens, the days are very long and the nights are very short. Eventually, Earth's revolution causes the North Pole to tilt away from the Sun. When this happens, the days are very short and the nights are very long. There is even a time of year when the Sun doesn't rise at the North Pole! This is in the middle of winter, when the pole is facing completely away from the Sun. Of course, when days are long at the North Pole, they are short at the South Pole. And when days are short at the North Pole, they are long at the South Pole. Even when there is sunlight for 23+ hours at the North Pole or the South Pole, the sunlight is indirect, so it does not heat the polar areas too much. The equator gets direct sunlight year-round, which causes warmer temperatures.