

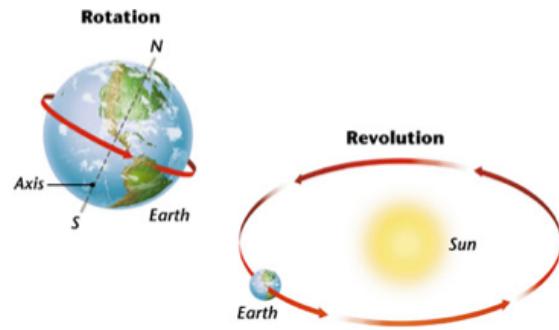
Earth in Space

Days and Years

The ancient Egyptians were among the first people to study the stars. The study of the moon, stars and other objects in space is called **astronomy**.

Ancient astronomers also studied the movements of the sun and the moon as they appeared to travel across the sky. It seemed to them as though Earth were standing still and the sun and moon were moving. Actually, the sun and moon seem to move across the sky each day mainly because Earth is rotating on its axis.

Rotation The imaginary line that passes through Earth's center and the North and South poles is called Earth's **axis**. The north end of the axis currently points toward a point in space near Polaris, the North Star. Earth's spinning on its axis is called its **rotation**. A point on the equator rotates at about 1,600 kilometers per hour. Even most commercial jet planes can't fly this fast!



Earth's rotation on its axis causes day and night. As Earth rotates eastward, the sun appears to move westward across the sky. It is day on the side of Earth facing the sun. As Earth continues to turn to the east, the sun appears to set in the west. Sunlight can't reach the side of Earth facing away from the sun, so it is night there. It takes Earth about 24 hours to rotate once on its axis. As you know, each 24-hour cycle of day and night is called a day.

Earth's Rotation and Revolution Earth rotates on its axis and revolves around the sun. *Applying Concepts* What is one full rotation called? What is one complete revolution called?

Revolution In addition to rotating on its axis, Earth travels around the sun. The movement of one object around another object is called **revolution**. One complete revolution around the sun is called a year. Earth's path as it revolves around the sun is called its **orbit**. As it travels around the sun, Earth's orbit is not quite a circle. It is a slightly flattened circle, or oval shape.

Seasons on Earth

Most places outside the tropics have four distinct seasons: winter, spring, summer, and autumn. But there are great differences in temperature from place to place. For instance, it is warmer near the equator than near the poles. Why is this so?

How Sunlight Hits Earth The diagram below shows how sunlight hits Earth's surface. Notice that at the equator, sunlight hits Earth's surface directly. Closer to the poles, sunlight hits Earth's surface at an angle. Near the poles, energy from the sun is spread out over a greater area. That is why it is warmer near the equator than near the poles.



Sunlight Hitting Earth It is warm near the equator because sunlight hits Earth's surface directly and is less spread out. The more direct the light is the warmer those areas will be. The more spread out the sun's light is the cooler the area will be.

Earth's Tilted Axis If Earth's axis were straight up and down relative to the sun, temperatures would remain fairly constant year-round. There would be one season. **Earth has seasons because its axis is tilted as it moves around the sun.**

Look at Earth's position in space in *Exploring Solstices and Equinoxes*. Notice that Earth's axis is tilted at an angle of 23.5° from the vertical. As Earth revolves around the sun, its axis is tilted away from the sun for part of the year and toward the sun for part of the year.

When the north end of Earth's axis is tilted toward the sun, the Northern Hemisphere has summer. At the same time, the south end of Earth's axis is tilted away from the sun. As a result, the Southern Hemisphere has winter.

Summer and winter are not affected by changes in Earth's distance from the sun. In fact, when the Northern Hemisphere is having summer, Earth is actually at its greatest distance from the sun.

Year

It takes Earth $365 \frac{1}{4}$ days, or one year, to orbit the Sun one time. Since a calendar year is 365 days long, we have an extra $\frac{1}{4}$ day every year that needs to be accounted for. So every four years we add the $\frac{1}{4}$'s to make 1 full day ($\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = 1$). February 29 – is added to our calendar every four years to represent that day.