Rotation is the spin of the Earth around an imaginary line running from the north pole to the south pole of the planet.

- Earth rotates from WEST to EAST (counter clockwise if viewed from the north pole)
- Causes Day and Night (as your part of Earth turns away from the Sun the Sun “goes down” and you experience night. As your part turns toward the Sun, the Sun “rises” and you experience day.)
What kind of effects might the direction of the Earth's *Rotation* cause?

Apparent motion of things in the sky.
- the Sun, Moon and Starts *appear* to approach us from the East because *we rotate* toward them *from West to East*
Revolution of the Earth

• Earth’s orbit around the Sun is called a Revolution
• Earth completes one revolution around the Sun every 365.26 days - one year

Direction of Earth’s revolution around the Sun - called “the Plane of the Ecliptic” (from West to East if viewed from the North Pole)

Why do we have Leap Year?
Revolution of the Earth

Why do you see different parts of the night sky at different times of the year?

Not to scale! (obviously)
What kind of effects might the direction of the Earth's Revolution cause?

We see different constellations at different times of the year. We cannot see things on the other side of the orbit because the Sun is in the way!

If we orbited West to East then
- the constellations would appear to us in a different order
- The equinoxes would occur in different locations of the orbit. (opposite)
The **same amount of energy** strikes the surface **EVERYWHERE, EVERYDAY**

Average over the entire earth = 164 Watts per square meter over a 24 hour day

So why is it warmer in some places and cooler in others?
When energy from the sun strikes a curved surface:
- the closer it is to the equator, the more concentrated it will be.
- so there is more energy per square foot to turn into “heat”.
- the further from the equator, the more spread out it would be.
- so there is less energy per square foot to turn into “heat”.

**RESULT:**
Warmer near the Equator than areas further away.
Revolution of the Earth

Earth’s Axis of Rotation is tilted 23.5° compared to the vertical to the plane of the Earth’s orbit.

The tilt of the Earth’s Axis causes the seasons:
- the hemisphere tilted *toward* the Sun experiences *Summer*.
- the hemisphere tilted *away* the Sun experiences *Winter*.

[link to animation](#) by Barth Van Bossuyt 2011
Effect of the Tilt of the Earth’s Axis:

1. Energy is more concentrated in the hemisphere tilted toward the sun, so there is more energy per square foot to turn into “heat”

2. Hemisphere tilted toward the sun has longer day length, so there is more time to absorb the more concentrated energy

RESULT:
The hemisphere tilted toward the sun is warmer in the summer than the winter.

Avg. at 40° latitude: 300 W/m² winter, 600 W/m² summer.
Path the Sun appears to follow through the sky

Summer Solstice Sun highest in the sky all year

Equinox

Winter Solstice Sun lowest in the sky all year

How high it gets in the sky on these days depends on latitude.
- June 21
  - North Pole tilted toward the Sun
  - Summer Solstice in Northern Hemisphere
  - Longest day length

- March 21
  - Vernal Equinox
  - Day and Night equal length
  - Neither pole tilted toward or away from sun

- September 22
  - Autumnal Equinox
  - Day and Night equal length
  - Neither pole tilted toward or away from sun

- December 21
  - North Pole tilted away from the Sun
  - Winter Solstice in Northern Hemisphere
  - Shortest day length

- Noon sun 90° overhead at 23.5° north latitude
  - Energy more concentrated in northern hemisphere so it is warmer than other times of year

- Noon sun 90° overhead at 23.5° south latitude
  - Energy less concentrated in northern hemisphere so it is colder than other times of year

Not to scale! (obviously©)
Newton’s Universal Law of Gravitation

There is a force of attraction among all objects in the universe. The strength of that attraction depends upon:

- The mass of the objects
- The distance between them

This means that anything that has mass, from atoms to stars, are attracted to each other and will move toward each other.
Newton’s Laws of Motion

1. The Law of Inertia:
   An object in motion will tend to stay in motion in a straight line, at a constant speed until acted upon by an outside force.

2. An object will go in the direction it is pushed!

3. Action/Reaction Law: For every action there is an equal and opposite reaction.
1. The Law of Inertia:
   An object in motion will tend to **stay in motion in a straight line**, at a constant speed **until acted upon by an outside force**.

   Like **GRAVITY**!
Gravity pulls bodies together.

Inertia makes orbiting body move in a straight line.

The combined effect of inertia and gravity cause orbiting bodies (like planets around the sun or satellites around a planet) to move in a path called an ellipse.
Planet Newton has two moons, Fig and Strawberry. Use the diagram above to describe which moon (if any) has more of a gravitational affect on Planet Newton and why.