Shadow of the Season

Description

Repeated examination of the cast shadow from the Sun to show how Earth's tilt is responsible for the seasonal change in the length of the day.

Materials

- Yard stick or meter Stick
- Tape Measure
- Clock
- Data sheet (2nd page)

Time - *2-3 minutes for 3-6 weeks*

Seasons are caused by Earth's tilt relative to the sun

Earth — Earth's axis of rotation
Sun
Plane of Earth's orbit around the sun
23.5 degrees of tilt
Top view
Equator

Spring
No tilt relative to the sun

Summer
Northern hempisphere
tilted toward sun

Winter
Southern hemisphere
tilted toward sun

Fall
No tilt relative to the sun

Source: Kent Fairfield   Andy Zeigert / The Bulletin

Instructions

1. Place yard or meter stick upright outside (any post of known height will work), make sure the stick in in a sunny area and will not be disrupted.
2. Pick a time of the day where the shadow of the post will be visible and measurable, e.g. 3pm every day and only on clear day (days with a clearly visible).
3. Use the tape measure to determine the length of the shadow on the ground from cast by the post. For additional practice with math, calculate the hypotenuse of the triangle using the Pythagorean theorem ($a^2+b^2=c^2$)
4. Make a record of the length of the shadow (and/or its hypotenuse) every few days (weather permitting), for 3 to 6+ week. The longer the observational period, the more data will be collected and a more accurate result can be determined.
5. At the end of the observational period record your findings, and draw conclusions about why the shadow's length has changed.

Background

Axial tilt is the reason for the season! Earth is tilted on its axis (the imaginary line running from the North to the South poles on which the Earth rotates every 24 hours) relative to the orbital plane of the solar system. This 23.5 degree tilt remains "fixed" as the Earth's revolves around the Sun, as the Northern and Southern hemisphere's change their angle to the Sun the through the year the Sun will appear higher and lower in the sky, resulting in longer and shorter days and corresponding shadows respectively. The Solstices are the longest and shortest days of the year with the greatest axial tilt towards and away from the Sun, when it is Northern hemisphere's summer, it will be the Southern hemisphere's winter, the Equinoxes are the days of equal day and night, when Earth's tilt is neither toward nor away from the Sun.

Below is a data sheet for your collected observations, happy science!

Shadow of the Season Observations Data

Date:	Shadow Length	Hypotenuse (optional)