

### Answers from the Human Sundial activity

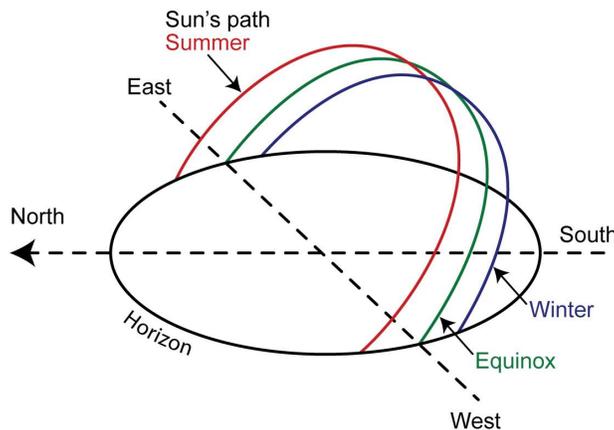
- A shadow happens when something or someone blocks the path light is traveling.
- As you have probably noticed, the sun looks like it travels across the sky during the day. Your shadow is always pointing away from the sun, so as the sun moves, your shadow will point in different directions.
- Your shadow gets shorter when the sun is higher in the sky in the middle of the day (shining almost directly down on your head), and your shadow is longer when the sun is lower in the sky in the morning and evening.

### Vocabulary for young students

**Sundial** - a device used to tell time by the direction of the sunlight striking the Earth. A sundial will tell solar time which is different than clock time because of longitudinal position within a time zone, and time changes (daylight savings time).

### Background information about sundials

From any location on Earth, the sun appears to move across the sky from east to west during the day—this is due to the Earth revolving on its axis. From the Northern Hemisphere, it appears that the sun is higher in the sky in the summer months (May-July), and lower in the sky during the winter months (November-January). This is due to the tilt of the Earth on its axis.



It is not known when the sundial was invented, or what culture invented it. Sundials can be found in many ancient civilizations, including the Babylonian, Greek, Egyptian, Roman, Chinese and the Far Eastern civilizations. Sundials exist in most countries, in various forms, differing in construction according to the knowledge of astronomy and mathematics.

The earliest extant sundial, an Egyptian instrument of 1500 BC, is a flat stone on which is fixed an L-shape bar whose short vertical limb casts a shadow measured by markings on the longer horizontal limb. In the 1<sup>st</sup> century AD, the sundial was greatly improved by setting the gnomon (the shadow-casting pin or object) parallel to the earth's axis of rotation so that the apparent east-to-west motion of the Sun governed the swing of the shadow.

The oldest known 'dial' type sundials are those of Grecian origin, invented by Chaldean Berossus, who lived about 340 BC. It is also evident that this form of sundial was used by the Arabians, and was also popular among the Romans.

The earliest known sundials in England are those of Saxon origin found on some of the oldest churches. Most of the early examples are semi-circular, and although the spaces into

which the dial is divided vary considerably in number and size, they seem to point to the early Norse practice of dividing time by the tides.

One of the earliest English historical records notes the fact that the hours were shorter or longer according to the seasons. This testimony is born out by existing dials, which consist of circles and half-circles, divided by lines which radiate from a hole in the center to the circumference.

In later years the face of the dial was more divided, and moved from being quite plain in appearance to gradually taking a more ornate shape. Sundials continued to be placed into use long after clocks were available and in the 17<sup>th</sup> century many fine specimens were erected. Clocks did not in any way diminish the popularity of sundials, but rather the clocks helped to keep sundials in existence, as clocks stopped running and lost time, sundials were long employed for setting and checking clocks.

Solar (apparent) time indicated by sundial and clock (mean) time are different and must be correlated by the use of tables which show the daily variation in sun time. A correction must also be made for the difference in longitude between the position of the sundial and the standard time meridian of a given locality.

Sundials are still used in many areas, although they are regarded today as adornments usually found in gardens. However, sundials placed in gardens will not generally tell accurate time, except by coincidence.

The largest sundial in the world was constructed in 1724 in Jaipur, India. This sundial covers almost one acre and has a gnomon over 100 ft high surmounted by an observatory.

#### **Related books for students**

*Dark As a Shadow* by Lawrence Lowery (NSTA Kids, 2014)

*Gregory's Shadow* by Don Freeman (Puffin Books, 2002)

*Guess Whose Shadow?* by Stephen R. Swinburne (Boyd's Mills Press, 1999)