



Inquiry Approaches

Initial Inquiry

Why does the sun cast shadows at different lengths depending on the time of day?

Depending on the time of day, the light from the sun hits objects (or in the case of the sundial, the gnomon) at different angles. Early and late in the day, the angle between the light and the ground is very small, so objects block a lot of light and shadows are long. In the middle of the day, the angle is large and shadows are short.

At what time will the shadow be the shortest?

The shadow will be the shortest at noon because the angle between the light and the ground is the largest.

Which way will the shadow move around the gnomon?

For objects in the Northern hemisphere, the shadow will move in a clockwise direction.

Experimental Procedure Inquiry

What is an ellipse?

An ellipse is a closed curve that results by cutting a cone at an angle.

Why is an ellipse a better shape for a sundial than a circle?

The hour marks on an ellipse will be evenly spaced and on a circle they will not. The path of the sun in the sky will depend on the location of the observer. An elliptical sundial accounts for the geographical location of the sundial while a circular sundial does not.

Why should the position of the gnomon be changed depending on the time of year?

The sun will be lower or higher in the sky depending on the time of year, so the position of the gnomon should be adjusted accordingly.

In-Depth Inquiry

What causes the change in seasons?

The reason for the different seasons is that the Earth rotates around a tilted axis. When the axis is tilted towards the sun, the Northern Hemisphere receives a high intensity of sunlight, resulting in summer, and the Southern Hemisphere receives a lower intensity of sunlight, resulting in winter. When the axis is tilted away from the sun, it is winter in the Northern Hemisphere and summer in the Southern Hemisphere.