# Solutions optics model 4 – Sundial

## Topic

*Optics – Shadows*

## Example solution for construction task

Build the sundial



## Topic task solution:

Sundials were used in all cultures as the first instruments for measuring time. The Egyptians used them as early as 5000 B.C. to determine the exact time. Of course, “exact” means something different than you might understand from modern time measurement technology. Telling the time almost down to the minute was an outstanding achievement for the time.

The unique thing about a sundial is that the angle of the shadow on the clock is always the same at the same time every day. Once marked correctly on the clock face, the shadow will always point to exactly this marking every day at the same time. Because of this, people who built sundials would mark and label the hours, allowing them to read exactly what time it was (if the sun was shining).

Place the sundial (one day/week after the start of the experiment) exactly in the same place where you started the experiment. Now, look at the markings on your sundial: the shadow should point exactly to the same markings at the times you noted. Compare the times recorded with the position of the shadow. You will see that it is at exactly the same place at the same time. Fascinating, isn’t it?

The advantage of using the sun as the light source is that the shadow is shown very clearly, allowing you to read the time down to the minute. This is significantly worse than a modern digital clock, of course, which can display even down to the hundredths of a second, but the sun isn’t dependent on any power supply and isn’t subject to mechanical faults. Generally, sundials are mounted on buildings or rocks, so that they could not be moved. This was the only way to guarantee they would always show the “right” time. However, the sundial does have one significant disadvantage: it unfortunately only works when the sun is shining. Because of this, this type of time measurement did not last; today we use other devices to measure time.

Some sundials can even display a “calendar”: In the summer, the shadow indicator is shorter since the sun is at a steeper angle; in the winter, it is longer, since the sun shines on the sundial at a flatter angle.