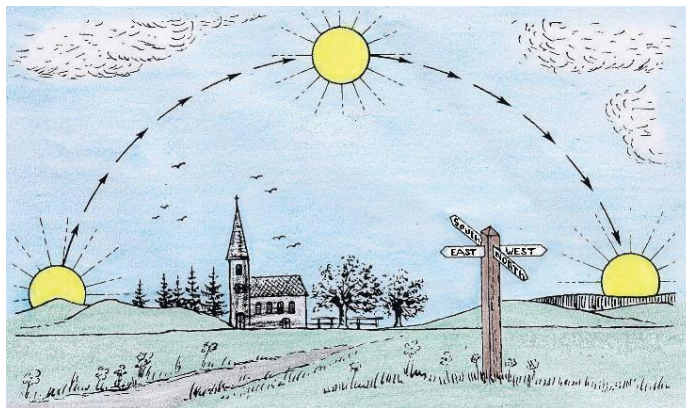


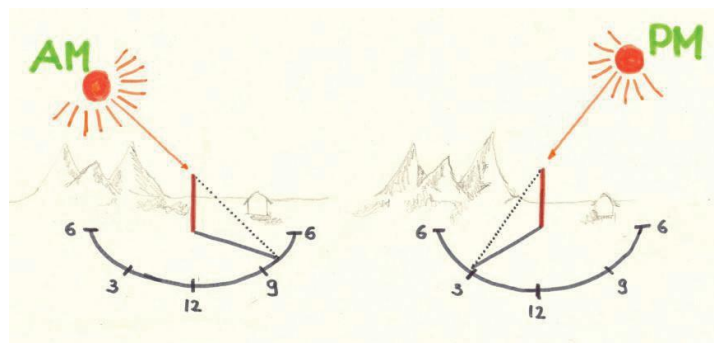
The sun to tell the time.

The earth rotates once about its own axis within 24 hours. As a result we experience , 'day when our side of the earth faces the sun and ,night' when it faces away from it.

The day begins with the first rays of sun that appear on the horizon. The sun then seems to traverse the sky on a big arc, reaching the highest point at noon and slowly descending until it disappears below the horizon in the evening. This is the course of the sun. When you are on the northern hemisphere, the sun rises in the east, descending in the west. On the southern hemisphere, it is the opposite.



With the help of a sundial one can use the course of the sun to measure time. Stick a pole into the ground and you can watch its shadow wander in the opposite direction of the sun throughout the day.



- In what direction (North, South, West, East) must the arrow of the sundial point so that the sundial indicates the correct time?
- In what direction would one have to hold the sundial in South Africa (southern hemisphere) in order to indicate the correct time ?

For this sundial, you'll need a copy of the template and an (elastic) string.

1. Copy and Print the Sundial template on the next page
2. Glue it evenly on cardboard.
3. Cut at the outer line and the short dashed line in the middle (bottom of the two Flaps only).
4. Find out your latitude (e.g. in an Atlas) and mark a line on the left and right of the base (marked with scales 35° – 55°). Draw a line from your required latitude through the “X” Symbols at the top of the scale. Cut at these lines. You may want to note at the top of the Sundial your location/latitude.
5. Fold on dashed lines to the indicated direction. For sharper folds, score on the opposite side (fold backwards, score on front + vice versa).
6. Score on the back along the horizontal line in the middle (between “noon” and “a.m. p.m.”) and fold to the front. The flaps help you bringing it into a right angle.
7. At the top and bottom, where all lines converge, make a small hole. Attach a String through these holes. The string is the gnomon of your sundial.
8. You’re done! You only need to position your sundial in the right direction.

The sundial needs to be placed, where the gnomon can cast a shadow. During the day, as this sundial is portable, you can change place (e.g. inside a building). It also must be positioned with the gnomon pointing north/south.

Here are described three methods:

Purist Method:

North can be found by observing Polaris, the North Star, at night. In orientating the sundial, the gnomon is actually being pointed to the North Celestial Pole which is within 1° of the North Star. Thus, if you can find Polaris at the end of the Little Dipper, line up your dial by pointing the gnomon towards Polaris. You might want to record the orientation for your dial by making light pencil marks on a windowsill for future reference. Those in southern latitudes will not be able to use this method as there is no bright star near the South Celestial Pole.

Practical Method:

A magnetic compass may be used to determine the north/south line, but, because of the difference between magnetic north and true north, the dial reading could be out by an hour or more depending on the local difference between magnetic and true north (or south if in southern latitudes).

Lazy Person’s Method:

To a first approximation, the orientation can be found by finding the orientation at any time from a clock or watch and orientating the dial so the shadow shows the correct time. However, if left in this position, there could be an error of up to 30 minutes over the year as a result of what is known as the equation of time. Because of the Earth’s orbital motion around the Sun, the solar day (apx. 24 hours) is not exactly the same length from day to day varying by up to ± 16 minutes a day. However, if the orientation is carried out on April 15, June 10, Sept. 1 or Dec. 20, this error will be negligible and any orientation made between April 15 and 1 Sept. will be in error by, at most, a few minutes (but don’t forget the effect of daylight savings time).

