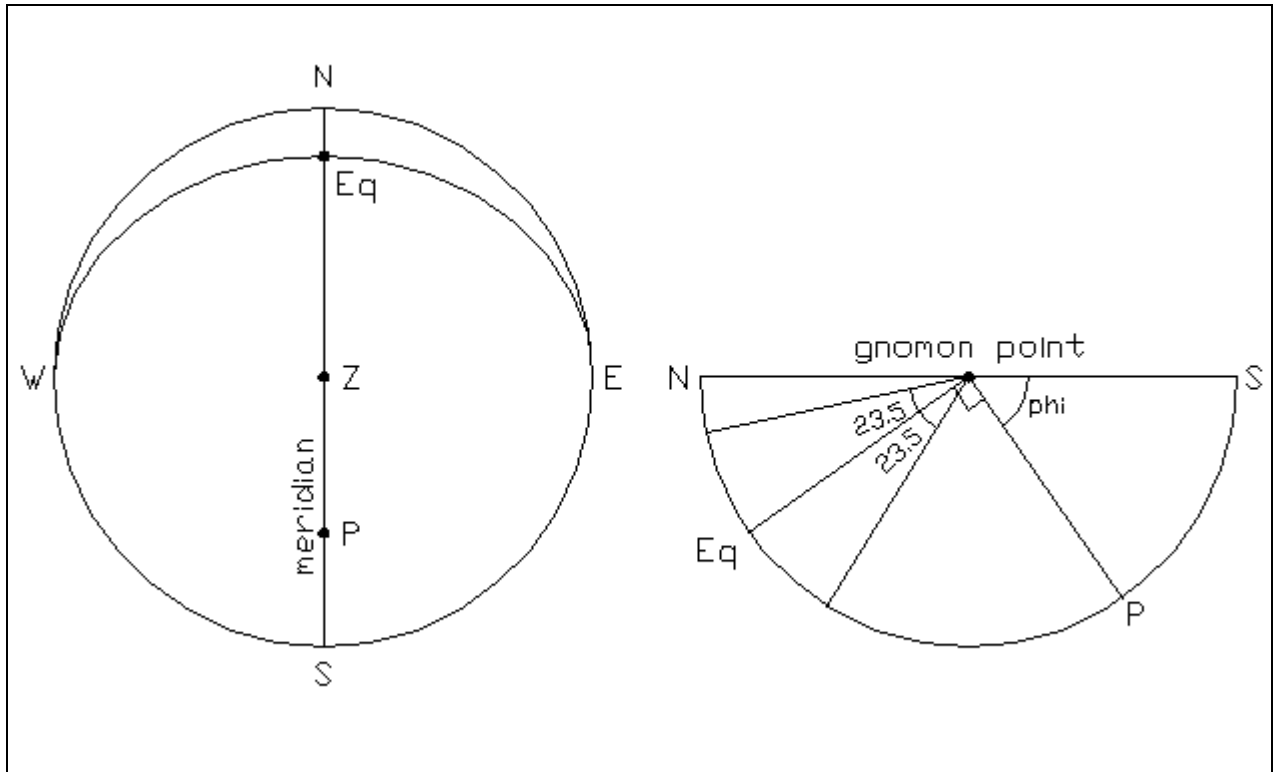


Construction of Hemispherium

by Fer J. de Vries, Netherlands

The hemispherium has a radius R .

When I write "draw arc $E-R\sqrt{2}$ " I mean: draw an arc with center at E and radius $R\sqrt{2}$ or $1.41 R$.



With a pair of compasses open to $R\sqrt{2}$ draw the four cardinal points on the horizontal edge of the hemispherium. These are the points N , S , E and W .

Draw arc $E-R\sqrt{2}$ or arc $W-R\sqrt{2}$. This gives the meridian and has to intersect the points N and S . The meridian may be removed later.

Draw a small arc $N-R\sqrt{2}$ or $S-R\sqrt{2}$ to find the mirror of the zenith point Z on the meridian line.

Draw a small arc $S-2R\sin(0.5\phi)$ to find the pole P on the meridian line.

Draw arc $P-R\sqrt{2}$ as the equator. The equator must intersect the points E and W on the horizon.

Draw six arcs $P-2R\sin(0.5(90 - \text{decl}))$ as the other zodiac lines in the hemispherium.

Decl in the range -23.5 , -20 , -11.5 , 11.5 , 20 , 23.5

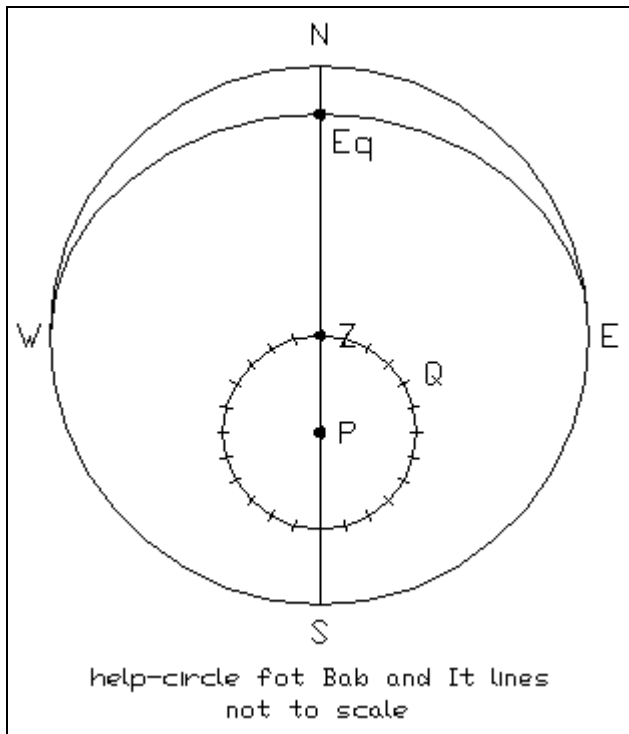
Divide the equator in 12 equal parts. These points on the equator are the hour points H for the hours 6 to 18 solar time with 6 and 18 on the horizon.

Draw from each H arc $H-R\sqrt{2}$ to get the hourlines for all the hours.

These lines have to be drawn only between the zodiac lines for summer and winter, but they all pass through point P .

Now you have your hemispherium ready for solar time and for the zodiac lines.

Divide the winter and summer zodiac line into 12 parts. (and if you want the other zodiac lines also)
 With trial and error draw arcs for the antique or unequal hours, but they must intersect the hour points H on the equator.



To draw the Babylonian and Italian hours draw a circle $P-2R\sin(0.5(90 - \phi))$.

The circle intersects the zenith point Z.

This circle is just for the construction and has to be removed later.

Divide this circle into 24 parts to get a number of center points Q.

Draw arcs $Q-R\sqrt{2}$ through the hour points H on the equator for all the Babylonian and Italian hours.

Think of it that the intersection of a Babylonian and an Italian hour line coincides with a whole solar time hour line.

In this way you can see how precise you are working.

For the sidereal houlines the procedure is like for the Babylonian and Italian hours, but now draw a circle $P-2R\sin(0.5*23.5)$ and divide this circle in 24 center points Q.

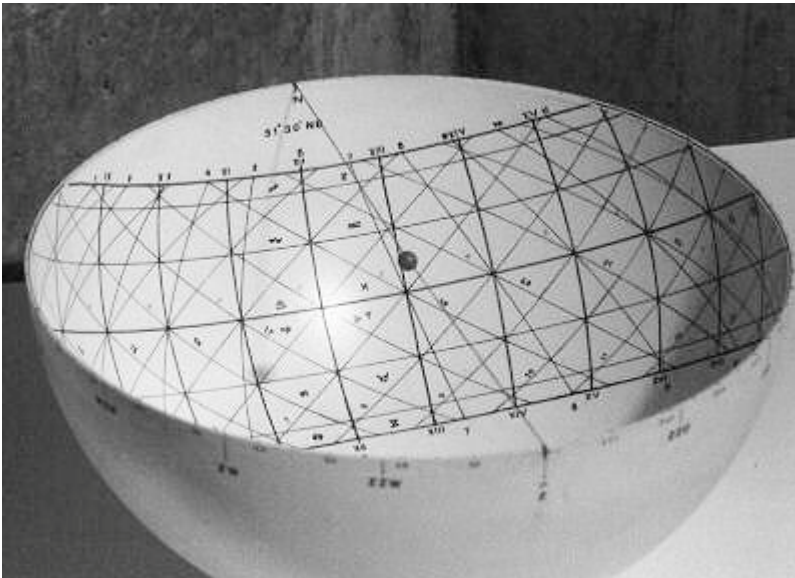
This circle thus is concentric with the circle for the Babylonian and Italian hours.

Draw arcs $Q-R\sqrt{2}$ between the tropics.

It is advisable to use two colours, one for each half of the year.

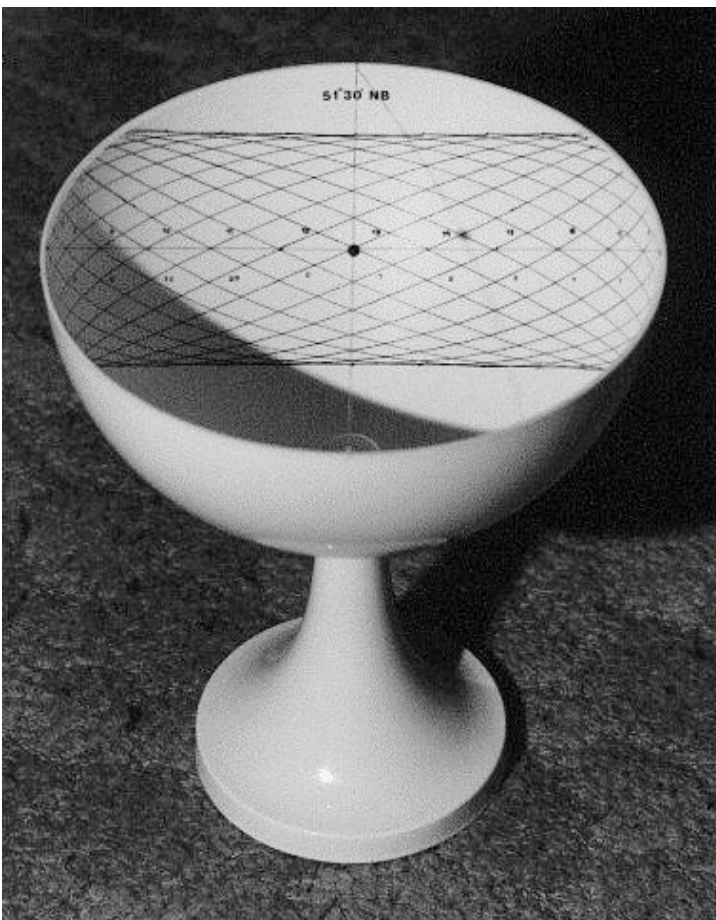
You see in all the constructions how important the value $R\sqrt{2}$ (1.41 R) is and how easy it is to construct a hemispherium.

The method described here is based on an article in the bulletin nr. 3 of "De Zonnewijzerkring", (the Netherlands' Sundial Society), published in 1979. That article is based on the Dutch book by Johann Hermann Knoop, 1761.



Example of hemispherium in a plastic bowl, with:

- *lines for solar time*
- *antique hourlines*
- *Babylonian hourlines*
- *Italian hourlines*
- *Zodiac lines*



Hemispherium with sidereal lines. For each half year a series of lines is drawn.