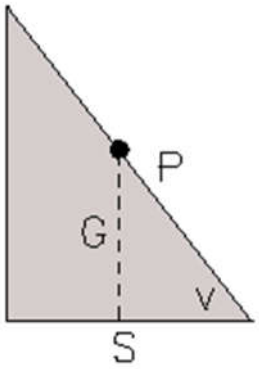
Year 2003

Article of the month December

Style height

In Article of the month for November 2003, I wrote about definitions concerning the style triangle.
In particular, the words **gnomon, pole style, substyle** and **style height** were explained.
We will now pay extra attention to **style height**, because some properties may be inferred directly from it.
The drawing below repeats the definitions used:



P = pole style
S = substyle
G = gnomon
v = style height

We cannot avoid the use of equations any longer, and with equations come formal definitions.
Those definitions will now established.
Consider that these definitions are arbitrary. Other definitions are possible, but those used here are quite common in gnomonics.
The definitions apply for both hemispheres, and this article is thus universally applicable.

Definitions

The orientation of a sundial face

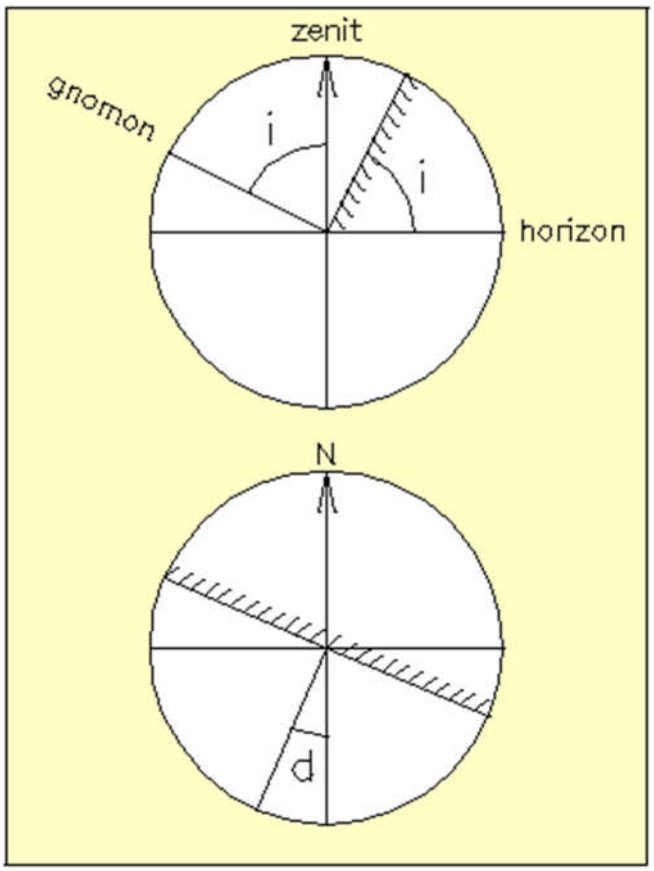
A sundial face is defined by:

phi: local latitude:

-90° <= phi <= 90°, north latitude positive, south latitude negative.

i: inclination of the plane:
the zenith distance of the terminus of the gnomon on the face:
0° <= i < 180°, °, (horizontal plane i = 0, vertical plane i = 90)
The inclination is also the angle between the horizontal plane and the back of the sundial face.

d: declination of the plane:
the azimuth of the gnomon on the face:
-180° <= d <= 180°, south = 0°, positive to West, negative to East.



upper: side view
lower: view in the horizontal plane

The equation

The equation for the style height for a sundial face is:

sin v = sin phi . cos i - cos d . cos phi . sin i

What can we do with this?

The value of the calculated style height v, including the sign + or -, tells us quite a lot.

The direction of the pole style:
If v = 0 : the pole style lies parallel to the sundial face.
If v > 0 : the pole style points towards the northern celestial pole.
If v < 0 : the pole style points towards the southern celestial pole.

The direction of the hour lines:
If v = 0 : the hour lines are parallel.
If v > 0 : the hour lines run clockwise.
If v < 0 : the hour lines run anticlockwise.

On which latitude is this a horizontal plane:
If v = 0 : the sundial face is parallel to a horizontal plane on a latitude of 0 degrees.
If v > 0 : the sundial face is parallel to a horizontal plane on a northern latitude v.
If v < 0 : the sundial face is parallel to a horizontal plane on a southern latitude v.

The last property is also called the translation rule.
Any sundial face is parallel to a horizontal plane in some (generally different) latitude and longitude.
For completeness sake, here is the equation for the longitude shift. Please note that the value returned should be tested for the correct quadrant.

tan ts = sin i . sin d / (cos phi . cos i + sin phi . sin i . cos d)

The translation rule makes it possible to calculate or construct a randomly oriented sundial simply as a horizontal sundial, but that is separate story.

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English translation: RH