

## Computing the length of the longest day

The purpose is to compute the length of the longest day of the year, when the earth's polar axis is tilted approximately  $\alpha^\circ = 23.5^\circ$  towards the sun. It turns out that the length of this day measured in hours at latitude  $\beta^\circ$  North is equal to

$$24 \cdot \left( 1 - \frac{1}{\pi} \cdot \text{Arc cos} (\tan \alpha \tan \beta) \right)$$

provided  $0 \leq \beta^\circ \leq 90^\circ - \alpha^\circ$ . If  $\beta \geq 90^\circ - \alpha^\circ$  then the length of the longest day is simply 24 hours. A table giving the length of the longest day as a function of latitude is in the document `solstice-table.pdf`. — These figures are not quite accurate, for they do not take atmospheric refraction into account; this phenomenon makes it appear that the sun rises earlier and sets later than it actually does.