

In[81]:= $Z = 120 + 27.9 / 60$ (* Decimal azimuth *)

Out[81]= 120.465

In[82]:=

(* DEC and GHA from From http://reednavigation.com/lunars/lunars_v5.asp?BodySel=Sun&todaycheck=2&GMTmonth=May&GMTday=6&GMTyear=2020&gmtsel=Gr.+Mean+Time&hristep=Every+3+Hours°format=dd+mm.m&OutType=N&LatDeg=&LatMin=&LatName=N&LonDeg=&LonMin=&LonName=W *)

DEC =

16 +

46.8 /

60

Out[82]= 16.78

In[83]:= $GHA = 45 + 51.1 / 60$

Out[83]= 45.8517

In[84]:= $H = 54 + 55.9 / 60$ (* Altitude of Sun from centre of earth *)

Out[84]= 54.9317

In[85]:= $ZD = 90 - H$ (* Zenith Distance *)

Out[85]= 35.0683

In[86]:= (* Local hour angle using spherical sine rule *)

In[87]:= $LHA = \text{ArcSin}[(\text{Sin}[(ZD) \text{Degree}] \text{Sin}[Z \text{Degree}]) / \text{Sin}[(90 - DEC) \text{Degree}]] / \text{Degree}$

Out[87]= 31.1482

In[88]:=

In[89]:=

In[90]:=

In[91]:= $LON = LHA + GHA$

Out[91]= 76.9999

In[92]:= $\text{FractionalPart}[LON] 60$

Out[92]= 59.9947

In[93]:= (* So Longitude is 77 degrees 0.0 minutes West)

In[93]:= $CoLat = 2$

$\text{ArcTan}[\text{Tan}[\text{Degree}(ZD - (90 - DEC)) / 2] \text{Sin}[\text{Degree}(LHA + Z) / 2] / \text{Sin}[\text{Degree}(LHA - Z) / 2]] / \text{Degree}$

Out[93]= 50.9996

In[94]:= (* Using Napier's analogies *)

In[95]:= **Lat = 90 - CoLat**

Out[95]= 39.0004

In[96]:= **FractionalPart [Lat] 60**

Out[96]= 0.0254488

In[97]:= **(* Position is Lat 39° 0.0' N Lon 70° 0.0 W *)**