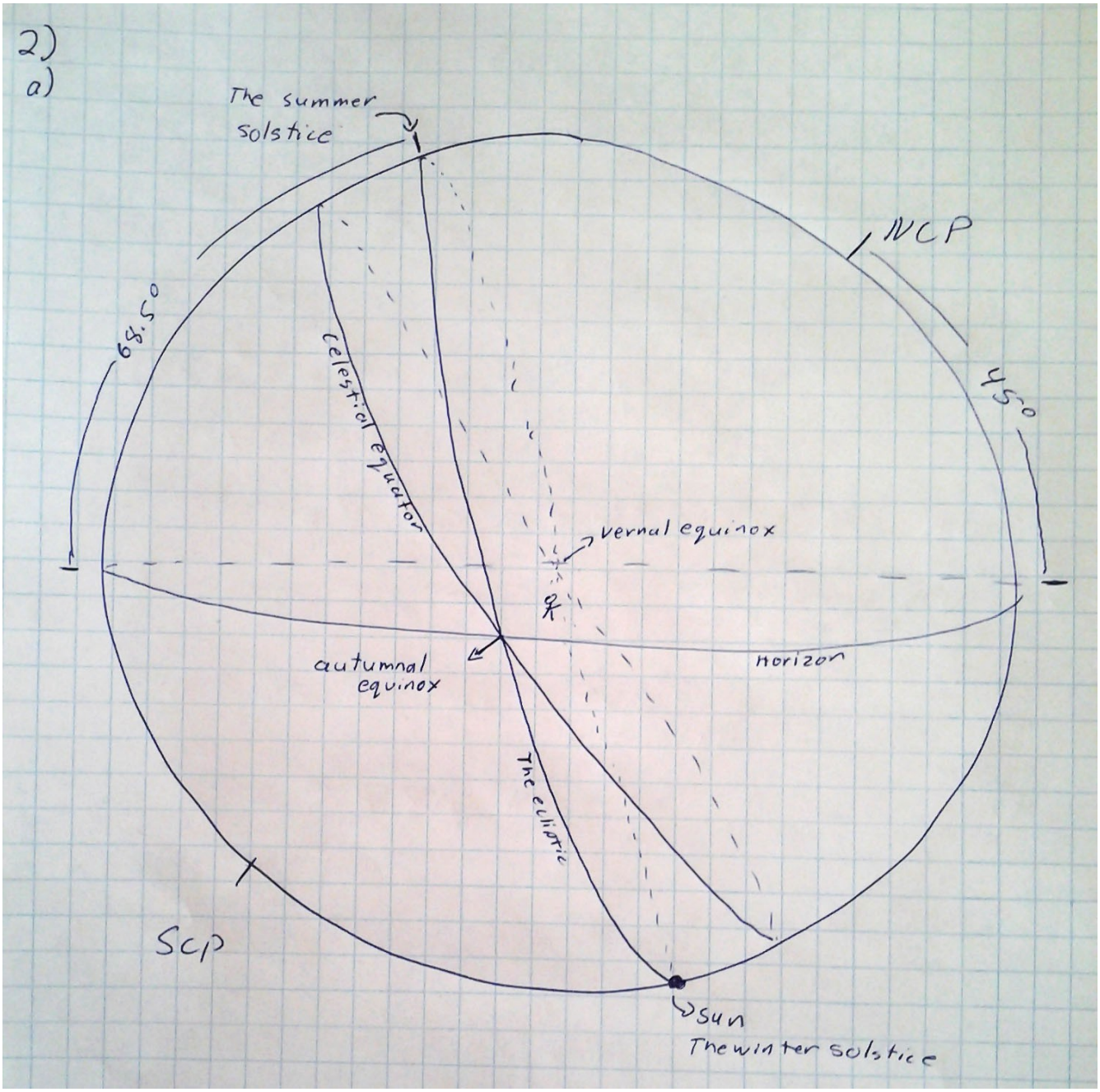
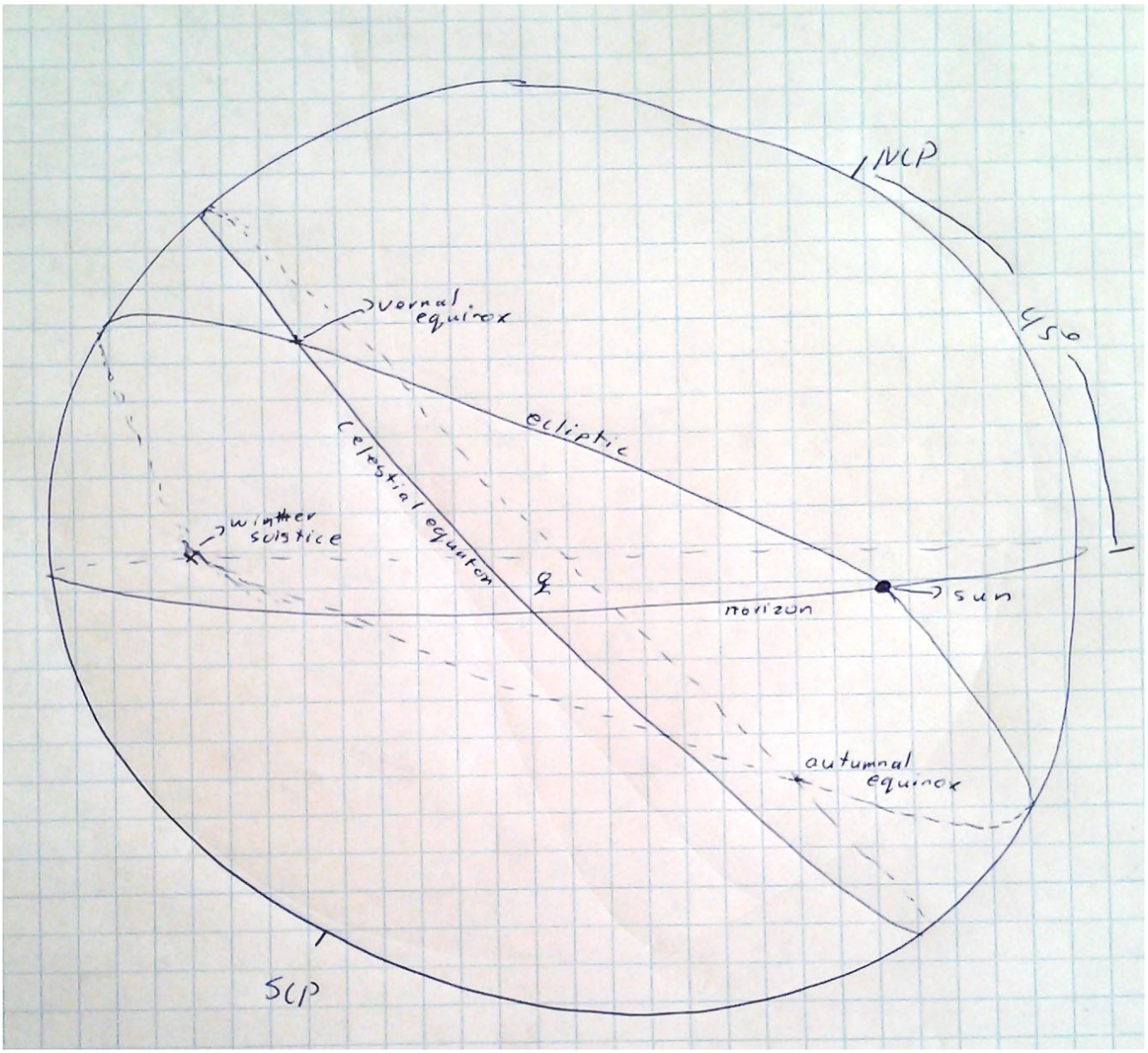
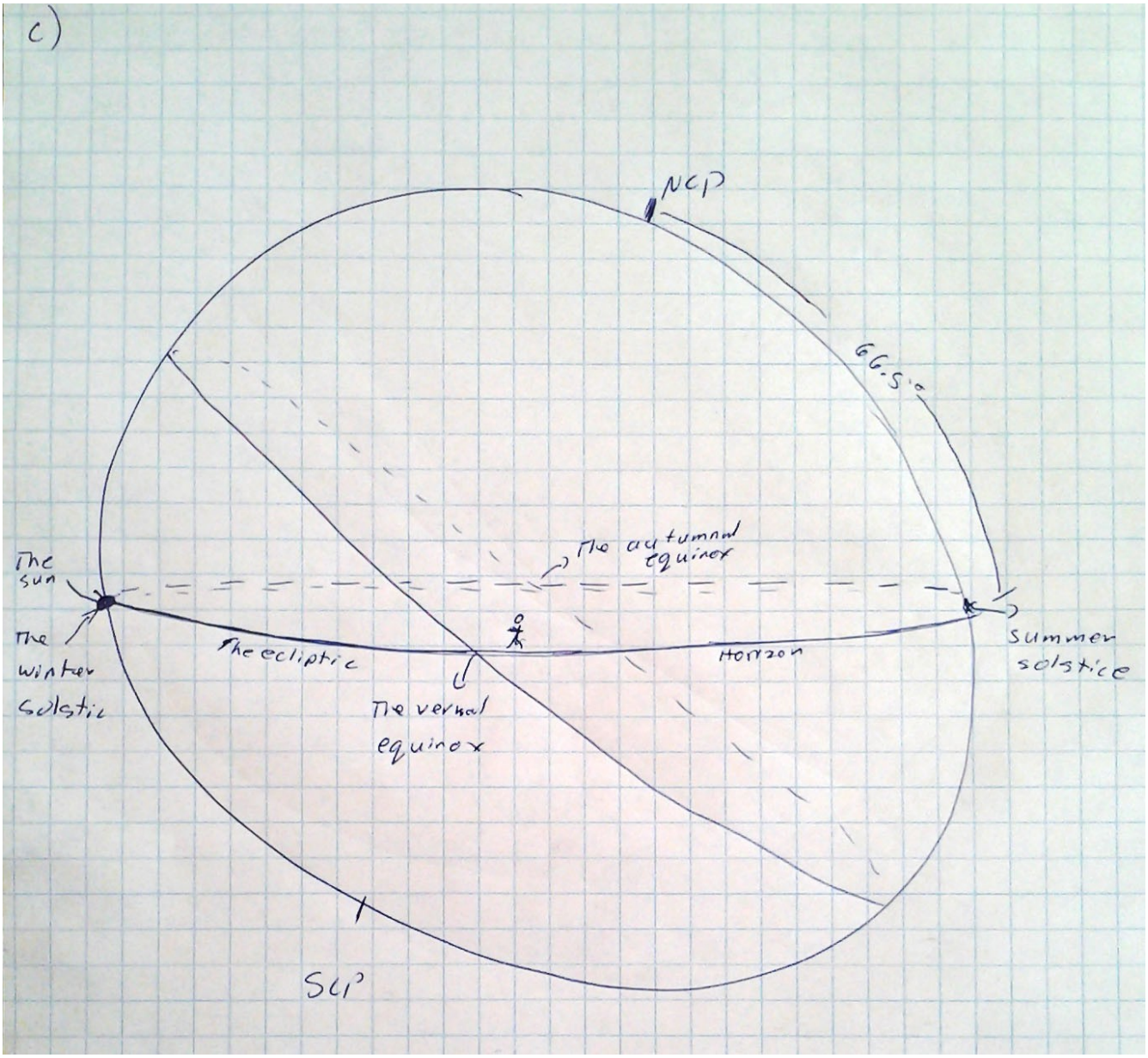
2)
a)

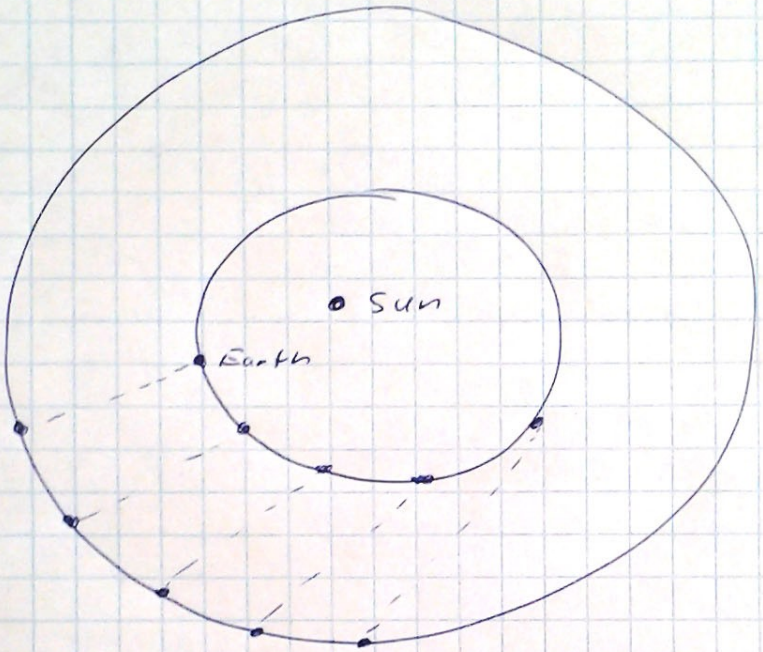

The summer solstice
NCP
68.5°
celestial equator
45.5°
vernal equinox
autumnal equinox
horizon
The ecliptic
SCP
Sun
The winter solstice


NCP
vernal equinox
ecliptic
celestial equator
winter solstice
horizon
sun
autumnal equinox
SCP

c)


NCP
GG.S.
The autumnal equinox
The sun
The winter solstic
The ecliptic
Horizon
Summer solstice
The vernal equinox
SCP

3) Retrograde motion from the heliocentric perspective



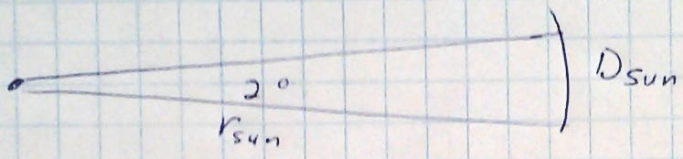
5) Information

$r_{sun} = 3 \times 10^8$ km
$r_{moon} = 2 \times 10^5$ km

angular size of sun = 2°
angular size of moon = 2°

$D_{Risa} = 4 D_{moon}$

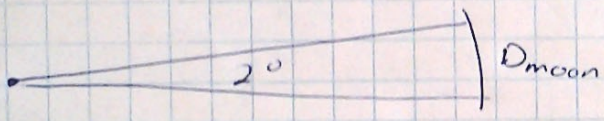
a)



$$\frac{2\pi r_{sun}}{360^\circ} = \frac{D_{sun}}{2^\circ}$$

$$D_s = 2\pi \left(\frac{2^\circ}{360^\circ}\right) r_{sun} = 1 \times 10^7 \text{ km}$$

b)



$$\frac{2\pi r_{moon}}{360^\circ} = \frac{D_{moon}}{2^\circ}$$

$$D_{moon} = 2\pi \left(\frac{2^\circ}{360^\circ}\right) r_{moon}$$

$$= 7 \times 10^3 \text{ km}$$

c) $D_{risa} = 4 D_{moon} = 2.8 \times 10^4$ km

6) Use Kepler's Third Law

$$P^2 \propto a^3$$

Use a constant of proportionality based on the Risan system → $k = 1$

$$P^2 = a^3$$

$$(125)^2 = a^3$$

$$= (5^3)^2 = a^3$$

$$= 5^6 = a^3 \Rightarrow a = 5^2 = 25 \text{ Risan AU}$$

We know from question 5 that the Risan AU $= 3 \times 10^8$ km

So,

$$a = 25 \text{ Risan AU} \times \frac{3 \times 10^8 \text{ km}}{\text{Risun AU}}$$

$$= 7.5 \times 10^9 \text{ km}$$