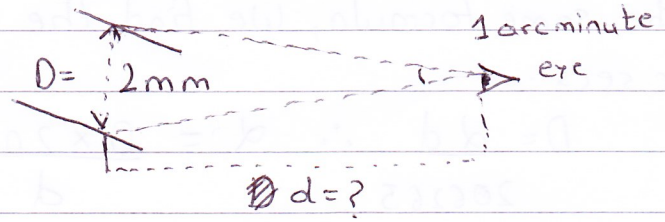
Solutions H.W. 1.

1.35 Angle subtended is the angle made by two imaginary lines originating from the object's ends with your eye.



The above scenario is the farthest at which the person would distinctly Identify the two lines.

Using the formula.

$$D = \frac{\alpha d}{206265}$$

where $D = 2\,mm$, $\alpha = 1$ arcminute $= 60$ arcsecs.

we need to find d.

$$\therefore d = \frac{206265 \times D}{\alpha} = \frac{206265 \times 2\,mm}{60 \text{ arcsecs.}}$$

$$= \frac{206265 \times 2 \times 10^{-3}}{60} (m)$$

$$\therefore d = 68755 \times 10^{-3} m$$

$$[\therefore d = 68.755 \text{ meters}]$$

1.39 a) From the figure 1.7 we know:-

Distance From earth = 1500 light years.

Diameter across = 30 light years.

Using the same formula, we find the angular size in arc secs.

$$D = \frac{\alpha d}{206265} \quad \therefore \quad \alpha = \frac{D \times 206265}{d}$$

$$\alpha = \frac{30 \text{ (light years)} \times 206265}{1500 \text{ (light years)}}$$

$$\alpha = \frac{206265}{50}$$

$$\alpha = 4125.3 \text{ arc secs}$$

$$\alpha = \frac{4125.3}{60 \times 60} \text{ degrees} \quad \text{(As 1 degree} = 60 \times 60 \text{ arcsecs)}$$

$$\alpha = 1.146 \text{ degrees.}$$

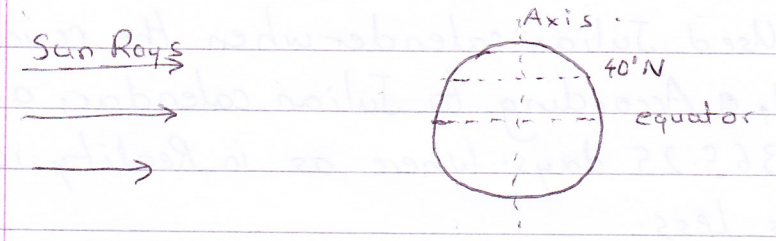
b) Moon is about half a degree wide.

∴ Orion is more than twice as wide in angular size as visible from earth.

a) Position at vernal ~~equinox~~ equinox

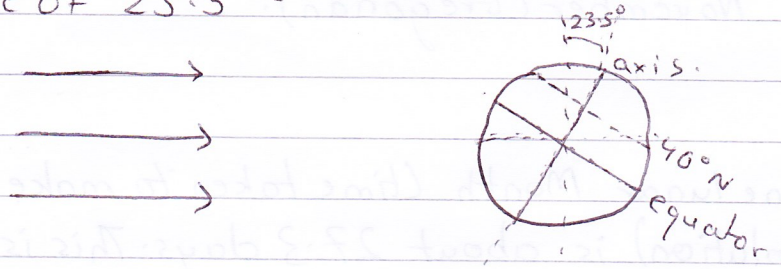
2.40

a)



At equator during vernal equinox the sun would be exactly over-head.
Hence at 40°N the elevation of sun would be $(90-40)^\circ = 50^\circ$.

b) At winter solstice, the earth is tilted at an angle of 23.5°.



Using the similar reasoning at winter solstice elevation of sun is $(90-40-23.5)^\circ = 26.5^\circ$.

2.46. Russia Used Julian calender when the revolution happened, According to Julian calendar, an year is of 365.25 days. Where as in Reality it is 11 mins less.
This error was Rectified in the Modern Gregorian.
The error of 11 minutes ~~over~~ for over 1900 years contributed to a difference of 12-13 days in g. Gregorian & Julian systems.
As a result the event which occurred on 25th October (Julian) was actually ~~he~~ on 8th November (Gregorian).

3.31 a) One lunar-Sideral month is of about 27.3 earth days.
hence the moon takes 655.2 hours to go 360° around earth.
∴ for 0.5 degrees it takes:-

$$\frac{360}{655.2} = \frac{0.54}{}\ ^\circ/\text{hour}.$$

For 0.5 degrees $\frac{0.5}{0.54}$ (hours) = 0.9 hrs.

b) In 12 hours, the moon moves $(12 \times 0.54)^\circ$
$= 6.48^\circ$.
A angular movement of 6.48° is indeed observa-ble.

3.43. a) The number of total solar eclipses would increa-se as many partial eclipses would convert into total due to increase in angular size of moon.

b) Total eclipse wont ever happen as moon's disk would be very small to cover the sun.