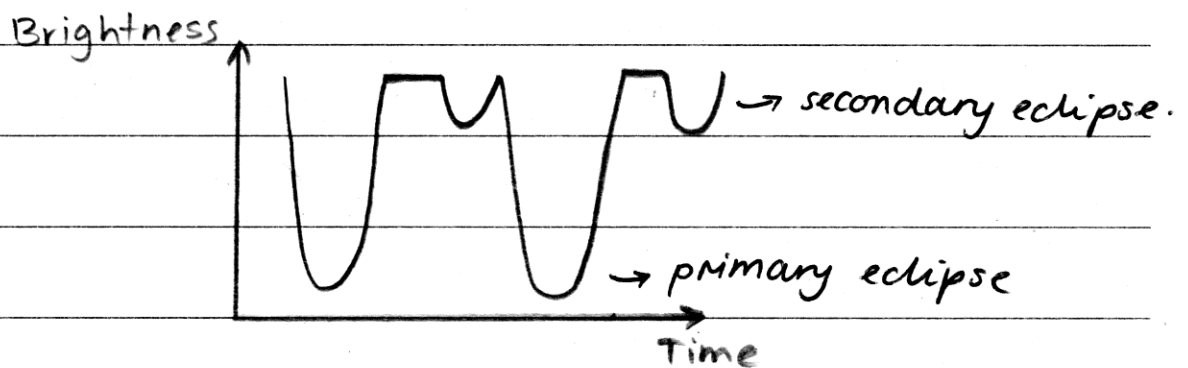


30. a) i) Eclipsing binaries occur when there is a variation in brightness, due to one of the stars in the system orbiting the other in an elliptical orbit. This is seen by astronomers as

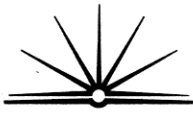
i) Eclipsing binaries occur when there is a variation in ~~intensity~~ brightness of a binary system over time. This can be either a partial eclipse or a total eclipse and is seen by astronomers through a graph of brightness against time. e.g.



A primary eclipse occurs when the brighter star is covered by the duller star, and the secondary eclipse occurs when the duller star is covered by the brighter star.



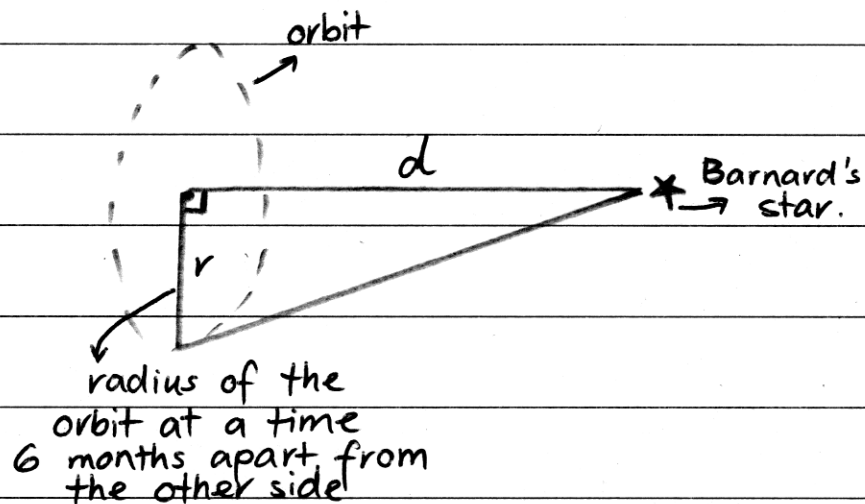
ii) The total mass of a binary system can be calculated by first measuring the apparent magnitude of each star. This can be done through parallax or if the star is far away, through spectroscopy. Through this, the ~~the~~ period-luminosity relationship can then be used to determine the absolute magnitude of the stars, and using the distance modulus equation, $M = m - 5 \log \left(\frac{d}{10} \right)$ the total mass of the binary system can be determined.



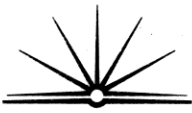
b) i) Proxima Centauri

$$\begin{aligned} \text{ii) } \frac{I_A}{I_B} &= 100^{(m_B - m_A)/5} \\ &= 100^{(11.01 - 10.37)/5} \\ &= 100^{0.128} \\ &= 1.8 \text{ times brighter.} \end{aligned}$$

iii)



$$d = \frac{1}{P}$$



c) i) white Dwarfs ~~are~~ are found at position 5 because at this stage they move off the main sequence and are very hot, dense stars.

ii) White dwarfs don't continue to shrink in size because there is no longer any fusing of elements occurring ⁱⁿ the star, and the core has already collapsed under the pressure of gravity.

iii) In main sequence stars, there is hydrogen being fused into helium and this is done through the proton-proton chain, where two hydrogens get together forming a helium and giving off a positron.



d) The resolution of a telescope refers to how well it can distinguish between two close objects, and the sensitivity of a telescope depends on its light gathering ability.

Adaptive optics uses a method where it samples part of the light for atmospheric distortion, and feeds this information into a wavefront sensor. Any distortions in the waveforms then corresponds to distortions in the atmosphere and ~~the atmosphere~~^{astronomers} then use this information to resolve a picture from a telescope as much as possible.

The sensitivity and resolution of a telescope is affected by the mirror being used, and the larger the mirror the greater its light gathering ability and therefore its ability to see faint objects.

By using new technologies that make light-weight mirrors, it means mirrors of larger surface areas can be used.