30 a i) An eclipsing binary varies in luminosity as the two stars orbit their centre of mass. It becomes apparent when the luminosity is graphed against time. ~~The graph will look like~~ ~~A B~~ ~~At points~~ The graph will periodically decrease ~~and increase~~ as one star is hidden by the other

ii) All binary stars must obey Newtons Universal Law of Gravitation. This means that once the radius has been measured, for example by use of trigonometric parallax, the two masses can then be deduced by measuring these apparent magnitude after finding the period and using the equation

$$M_1 + M_2 = \frac{4\pi^2 r^3}{GT^2}.$$

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b i) Lalande 21185

ii) $\frac{I_A}{I_B} = 100^{(M_B - M_A)/5}$

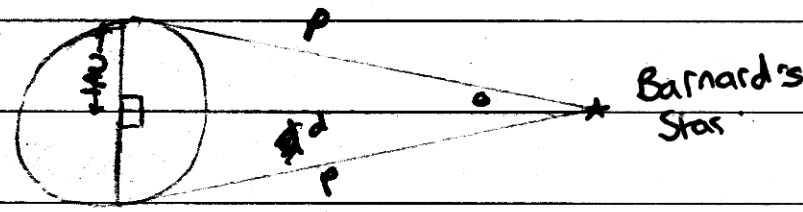
$= 100^{\frac{0.64}{5}}$

$= 1.8$ times brighter

$M_B = 11.01$

$M_A = 10.37$

iii)



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

$= \frac{1}{1.82}$

$= 0.54945$ light years

$= 0.55$ light years

$p = 1.82$

c i) White dwarfs would be found at S. This is because they have low luminosity (they are dull) and their surface temperature is average (10000K - 30000K)

ii) A white dwarf does not continue to shrink in size because once a star reaches white dwarf, there are no more nuclear reactions taking place. Therefore the star is no longer heating or cooling and will not shrink.

iii) A star located in the main sequence undergoes the nuclear reaction of fusion. In this case, the stars source of fuel (hydrogen) is fusing to form the heavier element helium. After it does this it will increase in size and become a red giant.

d) Ground based astronomy is restricted somewhat in resolution and sensitivity. However the development of adaptive optics and inferometry have allowed the resolution and sensitivity to improve. Inferometry's main improvement is with sensitivity. It is the idea of using two telescopes at different locations to view the same celestial object. This improves sensitivy because sensitivity is ~~measure~~ the telescopes light gathering ability and is measured by the area (and therefore the diametre) of the telescopes lens, and because there is two telescopes, it effectively increased the area to include the distance between the two telescopes. This improves sensitivity. The use of adaptive optics has improved resolution. This is because the resolution of a telescope is somewhat hampered by 'blurry spots' on the lens. The way adaptive optics has overcome this is ~~the~~ through the use of computers. With the

~~use of zoom~~ help of computers, astronomers are able to reduce these 'blurry spots' and therefore increase resolution. These developments have improved resolution and sensitivity of ground based astronomy dramatically.