



1.
 - 47 Tucanae
 - MS Turnoff point (B-V): 0.5
 - Approx age: 4×10^9 years
 - Pleiades
 - MS Turnoff point (B-V): -0.1
 - Approx age: 9.25×10^7 years
2. It tells me that the stars with same color could have different apparent magnitude with the different distance. In this case, the stars with $(B-V) \approx 1.0$ at 47 Tuc have a larger apparent magnitude than those stars with same $(B-V)$ value in Pleiades, indicating that stars with $(B-V) \approx 1.0$ in 47 Tuc is more distant than those in Pleiades. Also, because both clusters are much distant from us and we can say that all stars within the same cluster have approximately same distance from us. Thus, we can conclude that 47 Tuc is more distant than Pleiades.

3.
 - D to 47 Tuc:

$$D = 10^{\frac{(m-M+5)}{5}} = 10^{\frac{21-6.6+5}{5}} = 7585.78 \text{ parsecs}$$

- D to Pleiades:

$$D = 10^{\frac{(m-M+5)}{5}} = 10^{\frac{12.5-6.6+5}{5}} = 151.36 \text{ parsecs}$$

4. For the distance to 47 Tuc,

$$\frac{|7586 - 5000|}{5000} \times 100\% = 52\%$$

my percentage error compared to the distance measured by using parallaxes is about

50%, which strongly disagrees with the more precise value.

For the distance to Pleiades,

$$\frac{|151 - 180|}{180} \times 100\% = 16\%$$

my percentage error compared to the distance measured by using parallaxes is about 16%, which is much closer to the more precise value and more likely agrees with it.

5.
 - While fusing as red giants, the cores of them collapse and make interior heat up again and fuse. But for the surface, it expands and become cooler. Overall, the Red Giant becomes a new equilibrium. This process creates huge radiative and thermal pressure from central region, and makes the red giants have a higher luminosity compared to those young stars in main sequence with similar red color.
 - As we can see on the graph and the picture of 47 Tuc, it is a globular cluster that has already passed a long lifetime. For O and B stars that are much brighter, the quick fusion rate results in a shorter lifetime compared to those that are dimmer. So for an old cluster, the O and B stars had finished their life cycles and left main sequence.