

HW 3, #1

Dr. Bessel measures parallax of a star to be

$$\pi = 20.6 \pm 3.7 \text{ mas}$$

Best estimate for dist

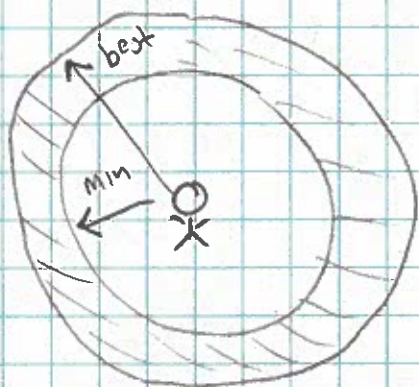
$$\text{best } d = \frac{1}{\pi} = \frac{1000 \text{ mas} \cdot \text{pc}}{20.6 \text{ mas}} = 48.5 \text{ pc}$$

Min dist

$$\text{min } d = \frac{1}{\pi + \sigma} = \frac{1000 \text{ mas} \cdot \text{pc}}{(20.6 + 3.7) \text{ mas}} = 41.2 \text{ pc}$$

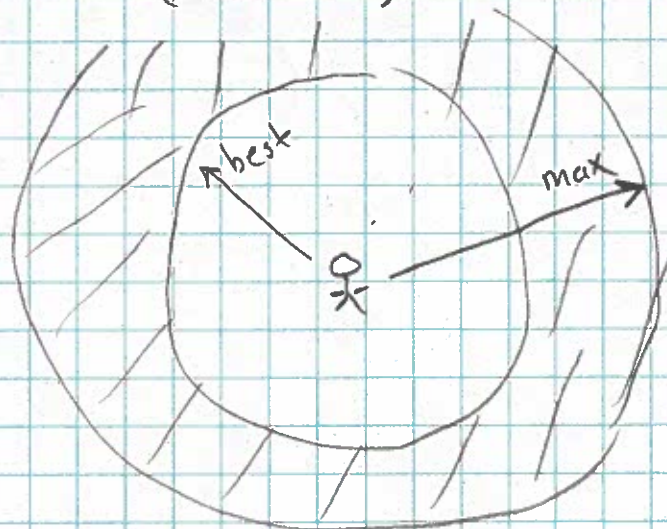
Max dist

$$\text{max } d = \frac{1}{\pi - \sigma} = \frac{1000 \text{ mas} \cdot \text{pc}}{(20.6 - 3.7) \text{ mas}} = 59.2 \text{ pc}$$



Volume of "inner" shell

$$V_{\text{in}} = \frac{4}{3} \pi [d_{\text{best}}^3 - d_{\text{min}}^3] \\ = 1.86 \times 10^5 \text{ pc}^3$$



Volume of "outer" shell

$$V_{\text{out}} = \frac{4}{3} \pi [d_{\text{max}}^3 - d_{\text{best}}^3] \\ = 3.91 \times 10^5 \text{ pc}^3$$

The outer shell is larger by

$$R = \frac{V_{\text{out}}}{V_{\text{in}}} = 2.1$$

so it is 2.1x more likely that the true location of this star is in the outer shell.