

AST 250 – Fall 2017

Homework Due: Friday January 25

1. Astronomy uses unique measures of distance (parallax) and angular separation (arcseconds).

- (a) Angles measured in the sky can be much smaller than 1 degree, so subdivisions have been defined. For every 1 degree, there are 60 arcminutes (denoted with a single prime superscript: 60'). For every 1 arcminute, there are 60 arcseconds (denoted with a double prime superscript: 60"). For smaller angles, we use MKS/cgs prefixes with arcseconds – for instance, 10^{-3} of an arcsecond is a milli-arcsecond (denoted "mas") and 10^{-6} of an arcsecond is a micro-arcsecond (denoted "μas"). Calculate how many arcseconds are in 1 radian and write this number to 6 significant digits.

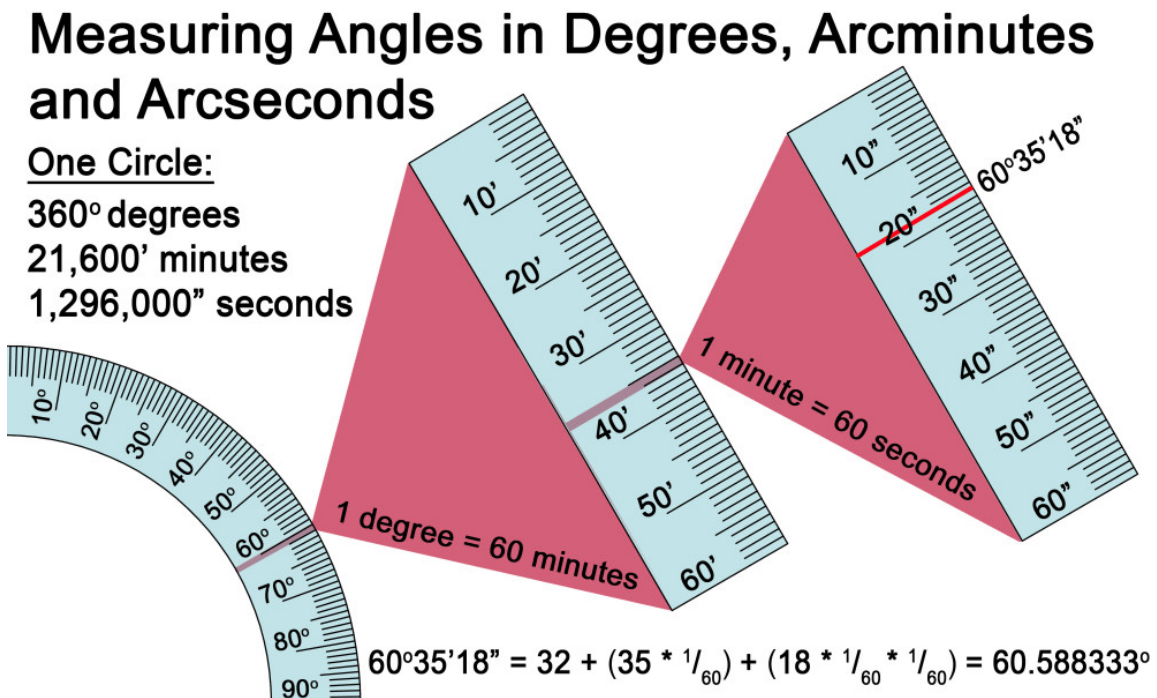
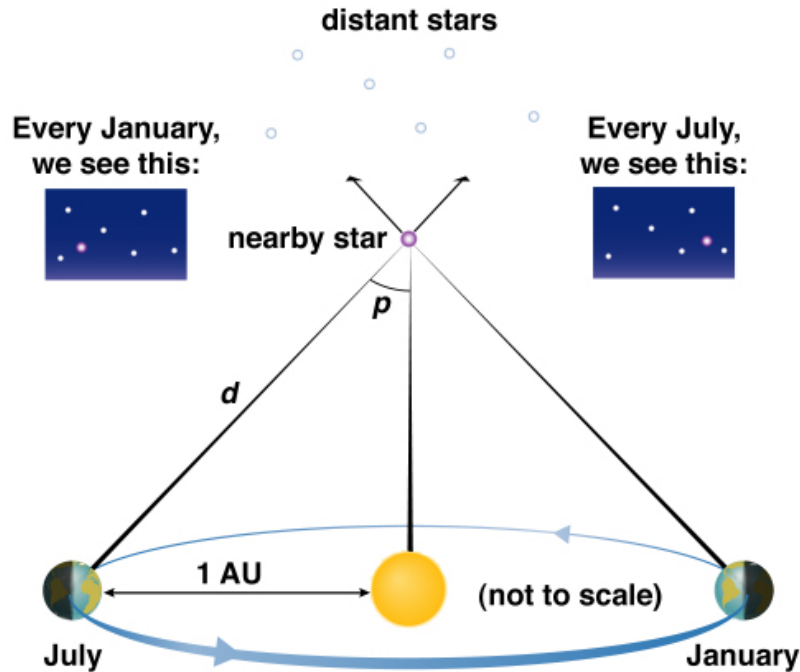


Figure 1: Definition of arcminutes and arcseconds and their notation.



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Figure 2: Parallax is the apparent motion of a nearby object relative to very distant objects due to the motion of the Earth. When $d = 1$ parsec (1 pc) the angle $p = 1''$.

- (b) The parsec (denoted by “pc”) is defined by the distance to a source that would result in a parallax of 1 arcsecond (See Figure 2). MKS/cgs prefixes are also be used with this unit (i.e. Mpc - Megaparsec means 1 million parsecs). Calculate: (1) how many cm there are in a parsec (4 sig. digits), (2) how many light years there are in a parsec (3 sig. digits), and (3) how many AU there are in a parsec (6 sig. digits).
- (c) Hmm – look at your answer for the number of AU in a parsec and the number of arcsecond in a radian. Explain why these are the same number using geometry and the small angle approximation.
- (d) The closest star system, Alpha Centauri (1.34 pc), is actually a binary with a mean separation of $17.6''$. What is their projected separation in AU? Make this calc simple using what you’ve learned in part c. Which planet in our Solar System is closest to that distance from the Sun?