

The Astrophysics of Stellar Observations

(I promise it *sounds* much more painful than it actually is)

1. How many degrees are in a circle? How many radians are in a circle? How many degrees are in a radian? Using the small angle (triangulation) formula, calculate how far away (in km) you would have to place a dime (diameter 1 cm) so that it had an apparent angular diameter of 1 arcsec. There are 206,265 arcsec in a radian.

What would be the parallax of a star which is one light year away (none are actually that close)?

2. Let's say you wanted to directly image a planet around another star in the infrared at 2.2 micrometers with a telescope whose diameter is 8.2 m. In order to resolve both the planet and its host star (assuming the telescope is working at its diffraction limit), what must be the angular separation between them (in arcsec)?

Suppose the planet and star are just barely spatially resolved, and you know the distance to this system is 230 lightyears. How far away, then, is the planet from its host star? Give your answer in AU. 1 ly = 63,236 AU.

3. If you want to make a star twice as luminous, would you increase or decrease the temperature? By how much? If you want to make a star half as luminous, would you increase or decrease its radius? By how much?

Two stars have the same luminosity, but one of them is 16 times larger in radius. How can this be (give an explanation with calculated numbers)? If one of them is 5 times closer to us, how much brighter will it look to us?