where R is the radius of the star and T is the temperature of the same. We can set this up as a ratio:

$$\frac{L_A}{L_\odot} = \left(\frac{R_A}{R_\odot}\right)^2 \left(\frac{T_A}{T_\odot}\right)^4$$

We know the Son is half as big as the Sun, so $R_A/R_\odot = 1/2$, and the temperature ratio is $T_A/T_\odot$ =4000K/6000K=2/3. Plugging both of these into the problem yields the ratio of the luminosities:

$$\frac{L_A}{L_\odot} = \left(\frac{1}{2}\right)^2 \left(\frac{2}{3}\right)^4 = \frac{4}{81} \approx 0.05$$

So, Astra gives out roughly 5% the light that the sun does.

4. *If the distance of Astra from its Son is half an AU (our units), how much energy does Astra receive compared to us (per cm² at its surface, i.e. how much bringther/fainter does the Son look compared to our Sun?*

   No problem set in Astro 10 would be complete without the use of the inverse square law. There are two competeing effects here: Astra is closer to the Son than earth is to the sun so the light is less diluted; but the Son is dimmer than the sun overall, so there is less light. Which effect wins? Only math will tell us! We begin with the inverse square law:

$$b \propto \frac{L}{d^2}$$

   Here b is the apparent brightness, L is the luminosity of the star (the total wattage) and d is the distance from the planet to the star. We need to use the power of ratios in order to determine the answer to our question. Rewriting the formula in terms of ratios of observed quantites yields:

$$\frac{b_A}{b_\odot} = \frac{L_A/L_\odot}{(d_A/d_\odot)^2}$$

   Now, $L_A/L_\odot$ was determined way back in problem 3 to be 4/81. This problem tells us $d_A = 1/2$ AU, so $d_A/d_\odot = \frac{1/2}{1} = \frac{1}{2}$. Plugging in these