Name ___Solution___

STAR MAGNITUDES, LUMINOSITIES, AND FLUXES

Sol & Earth

Distant Star

Earth

see star flux $F_\oplus$

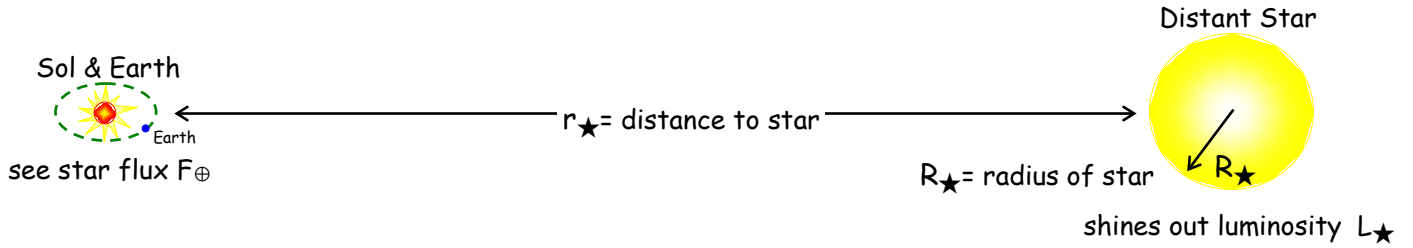$r_\star$ = distance to star

$R_\star$ = radius of star

$R_\star$

shines out luminosity $L_\star$

LUMINOSITY AND MAGNITUDES

The luminosity of a star can be found using that of the sun and their magnitudes: M_{SOL} = ___4.82___

LUMINOSITY IN SOLAR LUMINOSITIES

$$L_{\star,sl} = \left(10^{\left(\frac{M_{SOL} - M_\star}{2.5}\right)}\right) \text{ Solar Luminosities} \quad \text{Eqn. (1)}$$

same

LUMINOSITY IN WATTS

$$L_{\star,W} = L_{\star,sl} \times (3.827 \times 10^{26}) \text{ Watts} \quad \text{Eqn. (2)}$$

WARNING!! USE $\times 10^x$ OR EE KEY (NOT $\times 10^{\wedge}(26)$

THE FLUX OF A STAR AT EARTH

The relationship between the luminosity of a star and the flux received at Earth is given by the inverse square law,

STAR FLUX AT THE EARTH

$$F_\oplus = \frac{L_{\star,W}}{4\pi(r_\star^2)} \quad \frac{\text{Watts}}{(\text{meter})^2} \quad \text{Eqn. (3)}$$

$r_\star$ must be in meters!

using **1 light year = 9.46 $\times$ 10^{15} meters** and **L_{SOL} = 3.827$\times$10^{26} Watts**

STAR	FIELD GUIDE TO THE STARS AND PLANETS APPENDIX A2			CALCULATED			
	V	M_V	r_* (ly)	r_* meters	$L_{\star,sl}$ (Eqn. 1) solar lum's	$L_\star$ (Eqn. 2) Watts	$F_\oplus$ (Eqn. 3) W/m^2
Polaris (α UMi)	2.0	-4.1	431	4.08×10^{18}	3698	1.42×10^{30}	6.78×10^{-9}
Vega (α Lyra)	0.03	0.6	25	2.37×10^{17}	48.8	1.87×10^{28}	2.66×10^{-8}
Deneb (α Cyg)	1.25	-7.5	1467	1.39×10^{19}	84,723	3.24×10^{31}	1.34×10^{-8}
Altair (α Aql)	0.77	2.1	17	1.61×10^{17}	12.2	4.69×10^{27}	1.44×10^{-8}
Betelgeuse (α Ori)	0.5	-5.0	522	4.94×10^{18}	8,472	3.24×10^{30}	1.06×10^{-8}

Which of the Luminosities (compared to Sol) is noteworthy?

Deneb is AWESOME! 85,000 > Sol! And Betelgeuse is no wimp, either!

Should we warn people about starburn and sell "SPF 0.01 Starblock"?

No, the flux of the other stars is not enough to be a threat.