Answer on Question #69694 – Physics – Astronomy | Astrophysics

Calculate the ratio of the surface temperatures of the stars A and B from the following data:

Star	Absolute magnitude	Radius (RQ)
A	2	62
B	6	4

Solution. We have the following formulae for the ratio of star luminosities:

$$\frac{L_A}{L_B} = 10^{0.4(M_B - M_A)},$$

where $M_{A,B}$ are absolute magnitudes of the stars A and B.

Using the Stephan-Boltzmann law $L = 4\pi R^2 \sigma T^4$, we obtain

$$\frac{R_A^2 T_A^4}{R_B^2 T_B^4} = 10^{0.4(M_B - M_A)},$$

or

$$\frac{T_A}{T_B} = \left(\frac{R_B^2}{R_A^2} 10^{0.4(M_B - M_A)} \right)^{\frac{1}{4}} \approx 0.64.$$

Answer: $\frac{T_A}{T_B} \approx 0.64$.

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