Worksheet: The Mass-Luminosity Relation

Q1: Star A has a luminosity 2.92 times that of Star B. Both stars are main sequence stars. Which star is likely to have a greater mass?

A Star B

B Star A

Q2: 4 Sagittarii is a main sequence star with a mass 3.23 times that of the Sun. Is 4 Sagittarii likely to have a lifetime that is shorter than, longer than, or equal to that of the Sun?

A Longer than that of the Sun

B Equal to that of the Sun

C Shorter than that of the Sun

Q3: 6 Equulei is a main sequence star with a luminosity 59 times that of the Sun. Is 6 Equulei's mass greater than, less than, or equal to that of the Sun?

A Greater than that of the Sun

B Equal to that of the Sun

C Less than that of the Sun

Q4: The given table shows the luminosities of five main sequence stars. Which star is likely to have the greatest mass?

Star	Epsilon Apodis	48 Librae	Delta Antliae A	Eta Hydrae	69 Orionis
Luminosity $(L_\odot)$	1,610	1,100	200	2,680	596

A 69 Orionis

B Delta Antliae A

C 48 Librae

D Eta Hydrae

E Epsilon Apodis

Q5: 1 Persei is a binary star system containing two main sequence stars: 1 Persei A and 1 Persei B. 1 Persei A has a luminosity 2,190 times that of the Sun. 1 Persei B has a luminosity 3,310 times that of the Sun. Which of the two stars is likely to have the shortest lifetime?

A 1 Persei A

B 1 Persei B

Q6: Alpha Persei is a main sequence star with a mass 8.5 times that of the Sun. Is Alpha Persei likely to have a higher luminosity than, a lower luminosity than, or the same luminosity as the Sun's?

A A lower luminosity

B A higher luminosity

C The same luminosity

Q7: Star A has a mass 0.8 times that of Star B. Both stars are main sequence stars. Which star is likely to have a higher luminosity?

A Star A

B Star B

Q8: The given table lists the masses of five main sequence stars. Which star is likely to have the lowest luminosity?

Star	53 Aquarii A	8 Draconis	4 Scorpii	57 Persei A	9 Ceti
Mass ($M_\odot$)	1.01	1.56	2.64	1.28	1.09

A 8 Draconis

B 9 Ceti

C 57 Persei A

D 4 Scorpii

E 53 Aquarii A

Q9: The given table lists the masses and luminosities of six main sequence stars.

Star	Luminosity $(L_\odot)$	Mass $(M_\odot)$
Sirius A	25.4	2.06
Procyon A	6.93	1.50
Tau Ceti	0.520	0.783
Beta Arietis	23.0	2.34
Eta Cassiopeiae	1.23	0.970
Epsilon Herculis	64.0	2.60

Which star is most likely to have the shortest lifetime?

A Sirius A

B Epsilon Herculis

C Procyon A

D Eta Cassiopeiae

E Tau Ceti

Which star is most likely to have the longest lifetime?

A Eta Cassiopeiae

B Tau Ceti

C Procyon A

D Beta Arietis

E Epsilon Herculis

Which star has properties most similar to those of the Sun?

A Procyon A

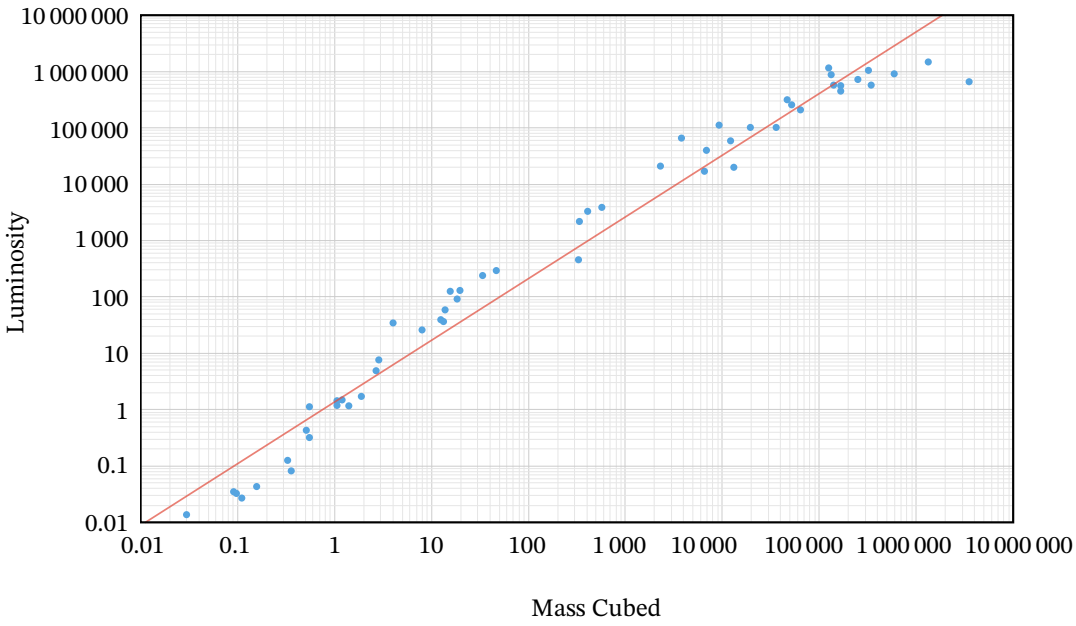
B Eta Cassiopeiae

C Sirius A

D Epsilon Herculis

E Tau Ceti

Q10: The figure shows a graph of the luminosity of a number of main sequence stars against their mass cubed. The red line is a line of best fit, showing how the luminosity of main sequence stars is approximately proportional to their mass cubed.

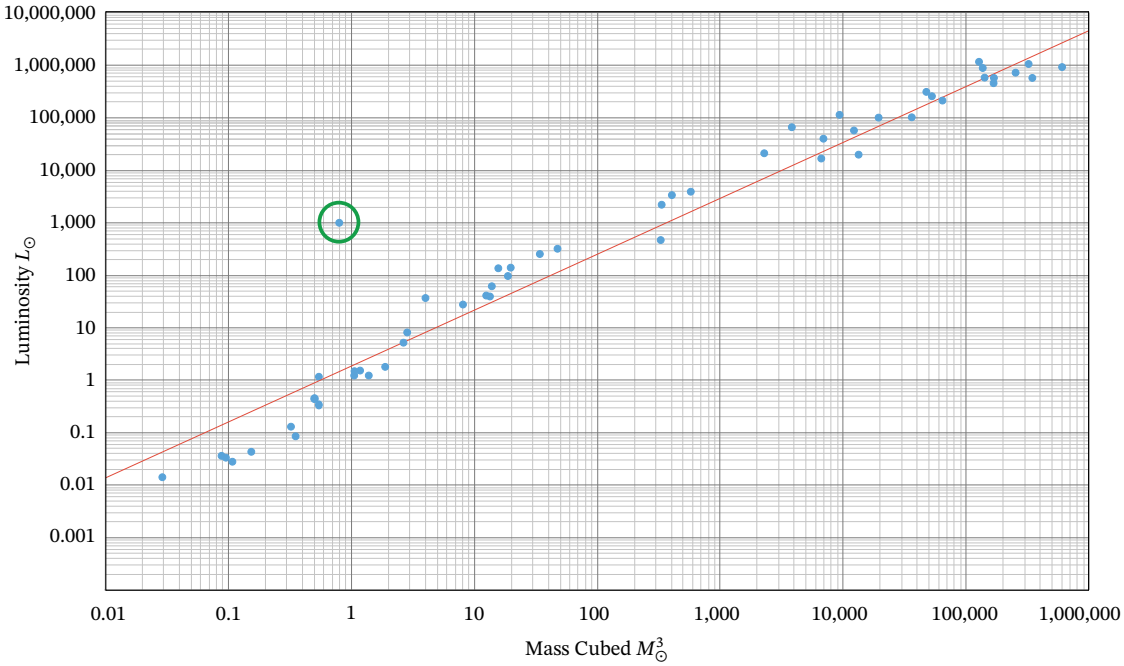


Would a main sequence star that appears in the top right section of the graph have a longer or shorter lifetime than a main sequence star that appears in the bottom left section of the graph?

A A longer lifetime

B A shorter lifetime

Q11: The figure shows a graph of the luminosity of a number of stars against their mass cubed. Most of the data points on the graph represent main sequence stars. The data point marked by the green circle represents a star that is not a main sequence star.



Which of the following statements about the star marked by the green circle are true?

I. The star has a mass less than that of the Sun.

II. The star has a mass greater than that of the Sun.

III. The star has a luminosity more than one million times that of the Sun.

IV. The star has a luminosity more than one thousand times that of the Sun.

V. The star has a luminosity less than that of the Sun.

A I and IV

B II, III, and IV

C I and V

D II and V

E II and III

Which of the following types of stars is the star marked by the green circle likely to be?

A A red giant

B An O-type star

C A neutron star

D A white dwarf

E A brown dwarf