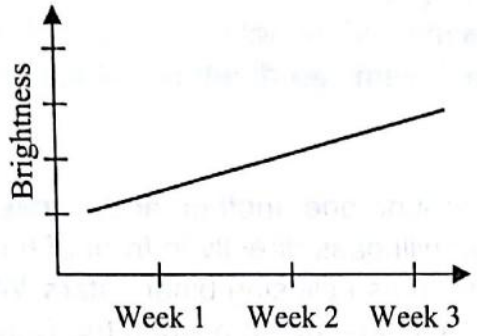
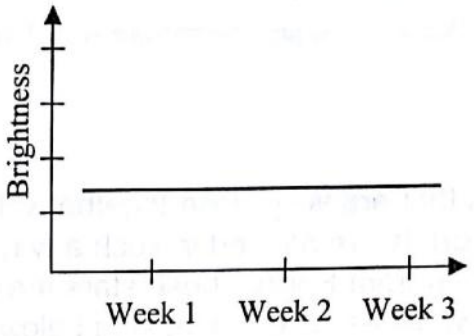
1) Imagine we measured the light emitted by a single, Sun-like main sequence star for several weeks. Which of the graphs below most likely shows how its graph of brightness versus time would look (*circle A or B*)?

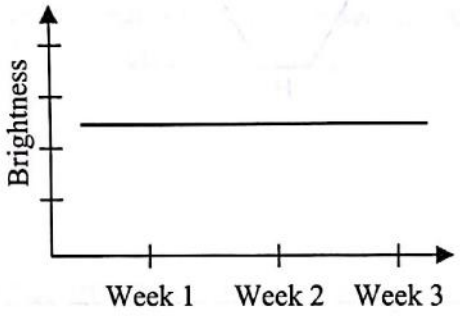


A

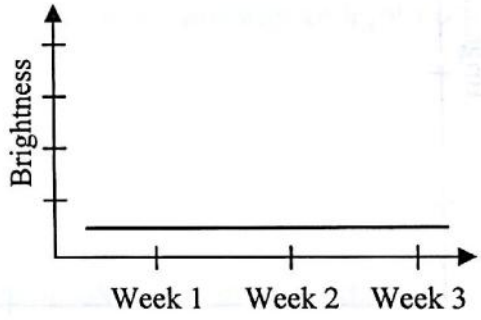


B

2) Imagine instead that we measure the light emitted by a single, white-hot, A-spectral type main sequence star at the same distance as the Sun-like (G-spectral type) star from Question 1 for several weeks. Compared to the graph of the Sun-like star you chose above, which of the graphs below most likely shows how the graph of brightness versus time would look for an A-spectral type star (*circle C or D*)?

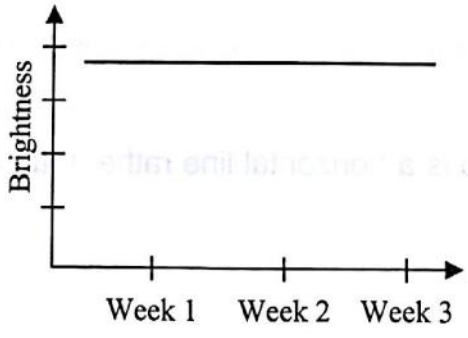


C

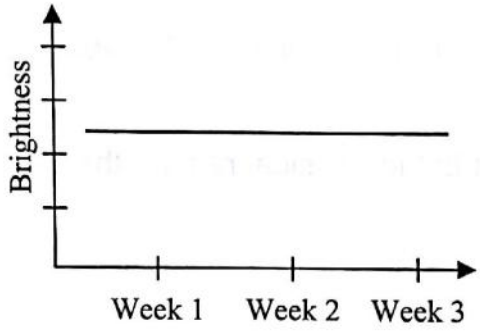


D

3) Imagine that these two stars are actually quite close together such that the total amount of light received from the pair can be shown in a single graph. Compared to the graphs you selected in Questions 1 and 2, which of the graphs below most likely shows how the combined graph of brightness versus time for the two stars would look (*circle E or F*)?



E

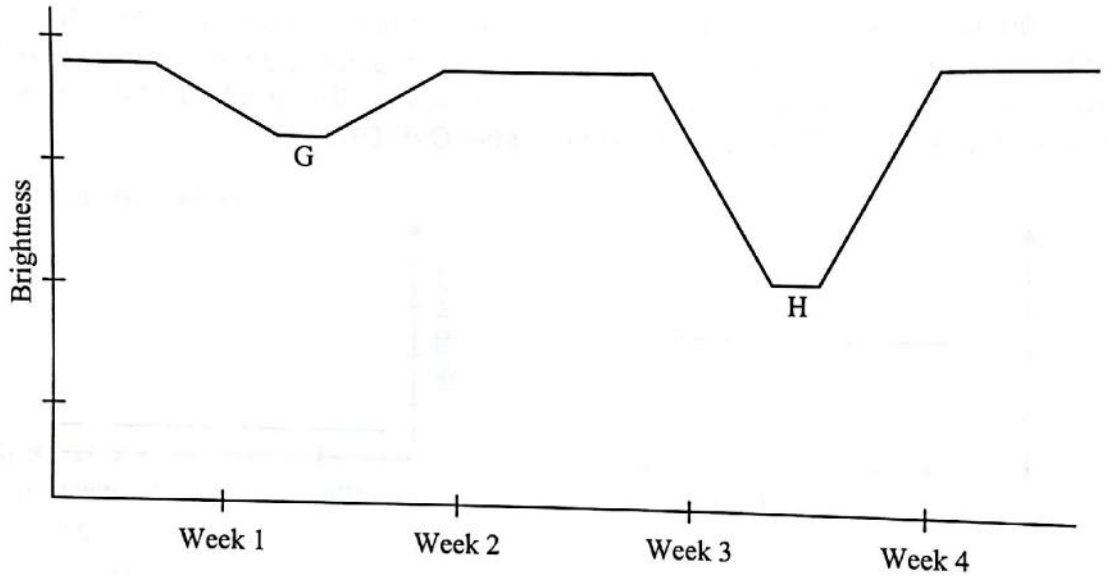


F

Binary Stars

4) Imagine that the objects shown at the right represent the Sun-like and A-spectral type stars from the previous questions. Label which object would best represent the Sun-like star and which object would best represent the A-spectral type star.

5) Stars that are very close together will often orbit around one another, and, occasionally, their orbits are aligned in such a way that one star will pass directly in front of the other as seen from Earth. These stars are often referred to as eclipsing binary stars. Which of the two times (G or H) labeled below most likely indicates the time when the Sun-like star was passing **in front** of the A-spectral type star from the previous questions. (*circle G or H*)?



Explain your reasoning.

6) What is the physical reason the bottom of the dip is a horizontal line rather than a point?

7) Imagine that you are watching a binary star system containing an M-spectral type main sequence star and a B-spectral type main sequence star as they each complete one full orbit. During this time, you are able to see the stars entirely separate from one another. At another time, you see the B-spectral type star in front of the M-spectral type star and, at an entirely different time, you see that the B-spectral type star has moved behind the M-spectral type star. In the space below, draw three sketches showing what the stars would look like at the three times described.

8) At which of the times you drew would you measure the greatest amount of light coming to you? Explain your reasoning.

9) At which of the times you drew would you measure the least amount of light coming to you? Explain your reasoning.

10) Two students are talking about how the light curve would appear when observing the eclipsing binary star system described in Question 7.

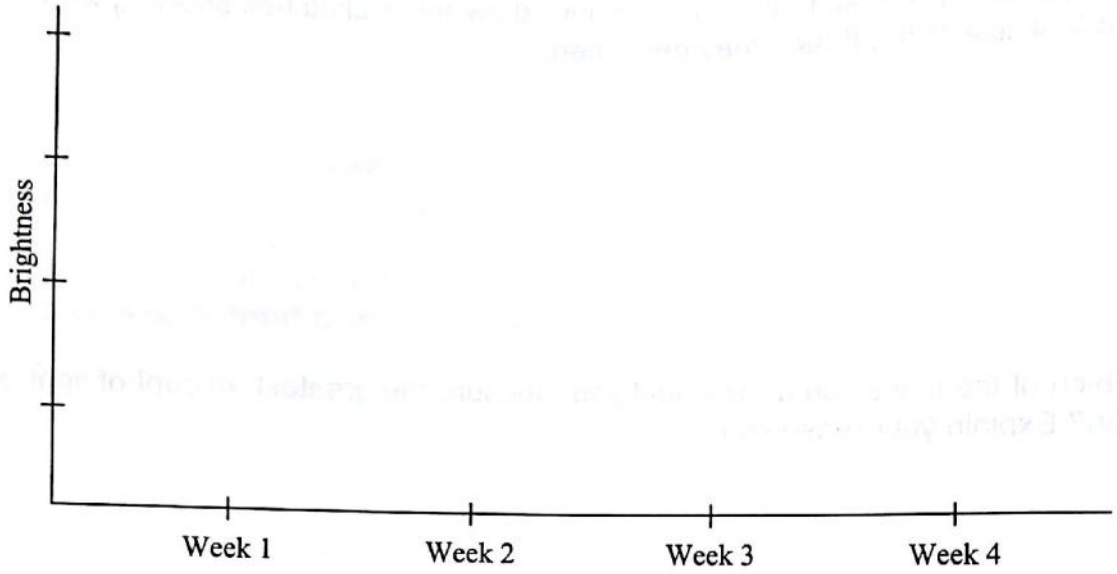
Student 1: *I think the dip in the graph is deepest when the blue star passes in front of the red star. Since the blue star is so much bigger, it will block off all of the light from the red star.*

Student 2: *I disagree, a hot star emits way more light from each part of its surface than a cold star does. So I think the deepest dip will happen when the cold star blocks the light from the hot star.*

Do you agree or disagree with either or both of the students? Explain your reasoning.

Binary Stars

11) In the graph below, draw a line to illustrate the amount of light an Earth observer would detect from an eclipsing binary star system which contains a Sun-like star and a red giant (with an orbital period of four weeks). Clearly label the dips as to which star is in front and which is behind.



Explain your reasoning.