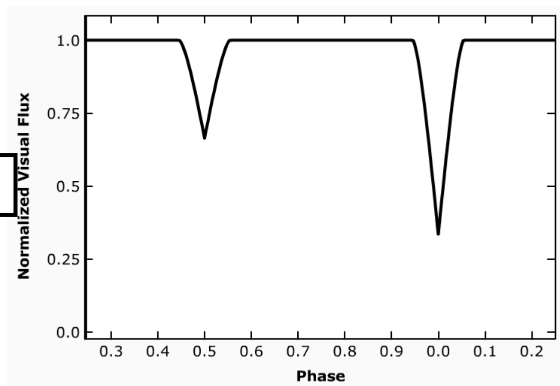
Eclipsing Binary Stars Worksheet

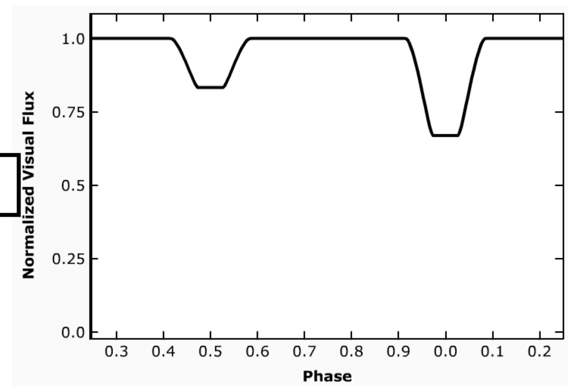
to follow the astronomy demonstration video at
https://www.youtube.com/watch?v=gmzmNDzUHEk

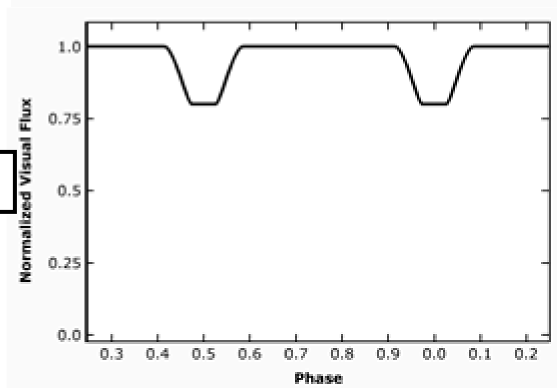
Part 1: The video describes four main representatives of the parameter space for eclipsing binary systems:

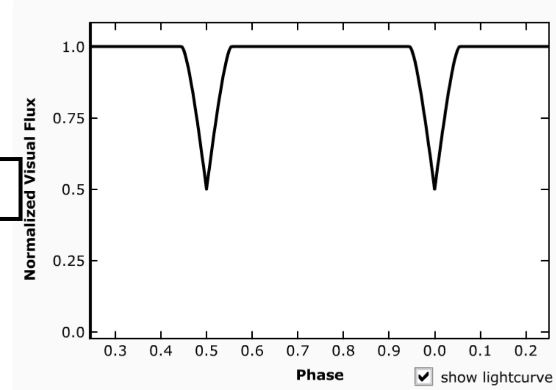
A) Same Temperature, Same Size
B) Same Temperature, Different Size
C) Different Temperature, Same Size
D) Different Temperature, Different Size

Examples of the theoretical light curves for each of these systems are shown below (for stars in circular orbits viewed edge-on i = 90°). Match each of the four lettered systems above to the appropriate light curve below by placing the matching letter in the box next to it.

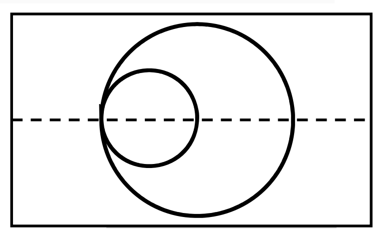




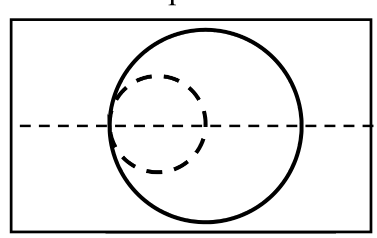




Part 2: Let's explore the *Same Temperature, Different Size* light curve shown above. Note that during Eclipse A, the flux decreases to 0.80 (four-fifths) of the total (five-fifths) – and that is also true during Eclipse B. Use this information to <u>exactly determine the relative sizes of the two stars</u>. Fully explain your thinking.

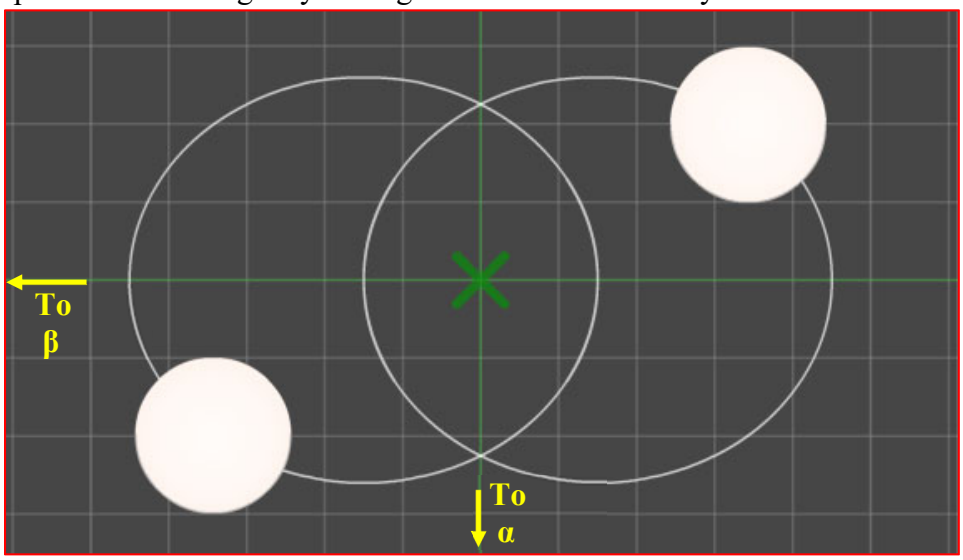


Eclipse A

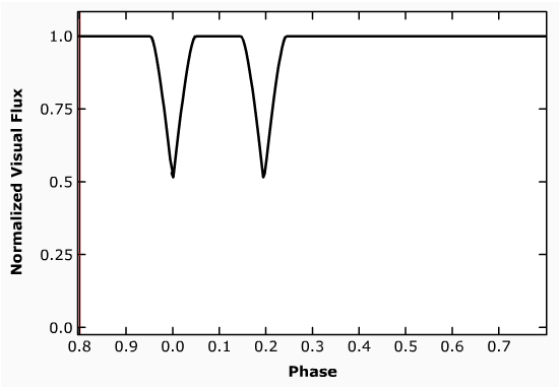


Eclipse B

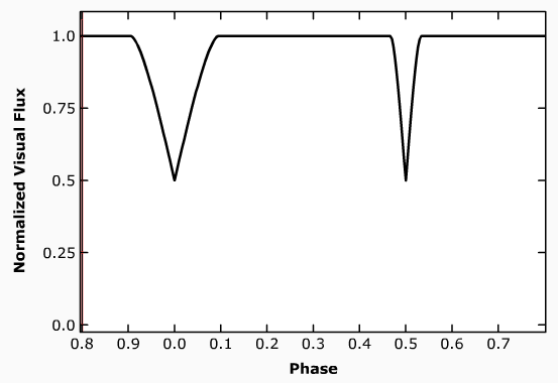
Part 3 (Advanced Exploration): This section will use the *Same Temperature, Same Size* system to explore the large numbers of possible light curves. This system is shown below with an eccentric e = 0.5 orbit from an inclination of 0°. Light curves are provided below for this orbit from distant perspectives in the i=90° plane and with a smaller value of i. You are asked to provide an explanation detailing why this light curve "looks the way it does".



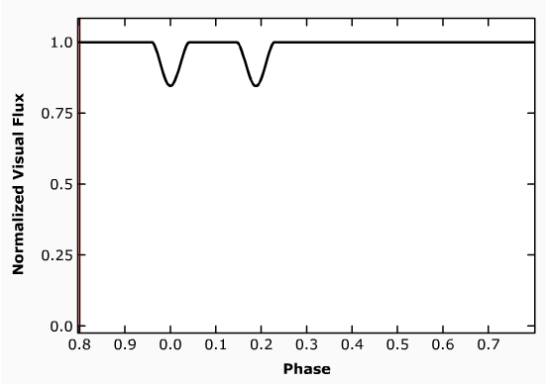
A) From perspective **α** with an inclination i of 90°.



B) From perspective **β** with an inclination i of 90°.



C) From perspective **α**, then tilted to an inclination i of 75°.



D) From perspective **β**, then tilted to an inclination i of 75°.