Eclipses and Motion of the Sun

Name_____

Purpose:
- To provide you with necessary skills to understand the conditions necessary to produce lunar and solar eclipses
- To give you practice using Stellarium

Estimated Completion Time: 50 minutes

Questions

1. Some Stellarium stuff…
   a. How do you speed up or slow down the rate at which Stellarium animates the motion of the heavens? L = speed up J = slow down K = sidereal rate
   b. How do you advance or go back by 1 hour? Ctrl ±
   c. How do you advance or go back by one week? Ctrl +] or [
   d. How can you set both the location and any time in Stellarium? Use LHS window tool
   e. How do you turn on the ecliptic line and the azimuthal grid? comma Z
   f. How do you "lock on" to an object so that it stays centred at all times? mouse click on object followed by space-bar

use LHS menu ? Help

2. Set up Stellarium to re-produce the August 21, 2017 eclipse as seen from Idaho Falls, Idaho, US. When does totality begin and end? What was the total duration of the event? Try to be accurate to the nearest second!

   Complete (totality) at 11:33:31
   End of totality at 11:35:44

   Totality was only about $2^m 13^s$!

3. Now – open the location menu and see how far south or north of this location you can go and still have a **total** solar eclipse. To assist you also open the time menu and notice that you can step by minutes or even seconds. Run the sun back and forth relative to the moon. Remember – if you can see even a sliver of the sun the eclipse is not total. Estimate the width of the path of totality in km. (Hint: 1 degree of latitude = 126 km)

   at 44° 20′ N – no eclipse ≡ Northern boundary
   at 43° 17′ N – no eclipse ≡ Southern boundary
   1° 3′ = width = 126 km + $(\frac{3}{60})$126 km = 132 km

   Path is about 132 km wide

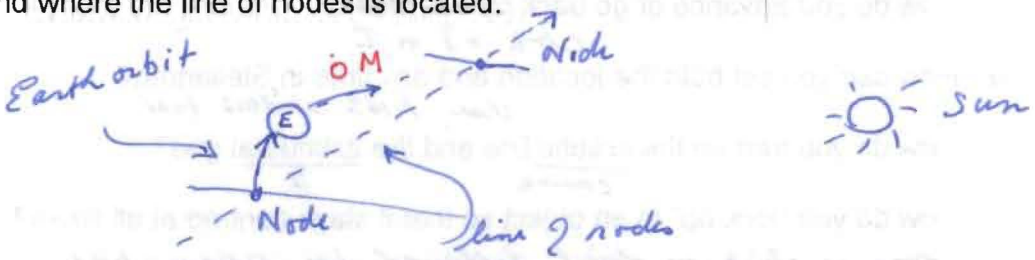
July 23 August 21 Sept 19

see here

4. Sketch the location of the moon and sun 1 lunar month before, during and 1 lunar month after the eclipse. Why do you use a lunar month?

There are several ways to do this - easiest just to use Stellarium and note position of the moon & sun in the sky. Use a lunar month because it is the time between full phases

5. Sketch a configuration in which the moon is new and a solar eclipse does not occur. Be sure to indicate both the earth-moon orbit as well as the earth-sun orbital plane and where the line of nodes is located.



6. The "Super Moon" lunar eclipse of September 27, 2015 will repeat in approximately 1 Saros. Use Stellarium to find when this event will occur and at what time and what part of the sky it will appear in as seen from Edmonton. How is this related to the Saros?

1 Saros = $18^y 11^d 1/3$
to add this to Sept 27, 2015 you should see a total lunar eclipse in 2033, October 8 at about 4:00 am in Edmonton. It is all part of the same cycle of lunar and solar alignments necessary for an eclipse - it - a Saros.