Heavenly Mathematics
Problems for class
March 31, 2022

(1) The summer solstice is the longest day of the year.
  (a) How much daylight is there at Deep Springs on the summer solstice?
  (b) Where along the horizon will the sun rise and set at Deep Springs on the summer solstice?
  (c) Seattle's latitude is approximate 10 degrees more than Deep Springs. How much more daylight is there in Seattle on the summer solstice? Where does the sun rise on Seattle's horizon during the summer solstice?

(2) Same questions as above except for the winter solstice.

(3) The star Arcturus, part of the constellation Bootes, is the brightest star in the northern hemisphere of the celestial sphere.
  (a) How long is Arcturus visible in the sky each day? Does it change?
  (b) When will Arcturs appear on the horizon relative to sunset today?

(4) The star Mizor is in the Ursa Major (Big Dipper) constellation. What happens if you try to calculate the ortive amplitude or equation of daylight of Mizor using the spherical trig identities? Why?

(5) Which direction is your home town from Deep Springs?

(6) (Bonus, optional) Which direction is Mecca from Deep Springs?

(7) (Bonus, optional) Make up your own problem and solution requiring spherical trig identities to solve, whether with stars, on the earth, etc.