Discussion Questions

Where would you place an origin (0,0) in the date-daylight plane to make it as simple as possible to fit a sine curve to the data? That is, what date and what number of hours of daylight would give the most convenient starting point for your fitted function? Explain your answer.
If we leave the origin and scale where they are -- 0 date on January 1, with time measured in days or months (your choice), and daylight measured in hours from 0 -- we are likely to find a sinusoidal function of the form

$$f(x) = A \sin [B (x - C)] + D.$$

Explain how A, B, C, and D are related (in some order) to the lengths of longest and shortest days, the average length over a year, the period, and your choice of where to put the origin.

Use these answers to estimate the variables. That is, write a specific sinusoidal function that you think will match the data.

From Part 1, you have estimates of the coefficients A, B, C, and D of a function of the form
$f(x) = A \sin [B (x - C)] + D.$
that should fit this data. Refine these estimates if necessary -- now that you know some of the numbers -- and plot your sinusoidal function on the data. How good is the fit? Adjust the coefficients as necessary to make the fit as good as you can.

Choose either the sunrise or sunset data, and find a sinusoidal approximation to the data. How good can you make the fit? Does this confirm or contradict your answer in Part 1 about which curves looked sinusoidal?