> Complete assignment individually. Use your notes and ask any questions of your teacher. Please note, you will have to do some research in order to complete the assignment.

Name:_____

1. (25 points) In this assignment we are going to be modelling the hours of daylight in a given city throughout a year. It turns out this can be modelled using a sinusoidal function.

   (a) (1 point) Choose a city (one that is not too obscure, and different from any classmates) that is not too close to the equator.

   (b) (4 points) Find the maximum hours of daylight (in either June or December, depending on whether your city is in the northern or southern hemisphere) and minimum hours of daylight and which day they occurred in any year you choose. Also record the hours of daylight for both the Spring and Autumn equinox, and on which days they occurred.

   (c) (2 points) We are going to use the information above to model the number of hours of daylight in your city throughout the year as a sinusoidal function. What will the amplitude of your function be?

   (d) (1 point) What will the vertical displacement of your function be?

   (e) (2 points) What will the period of your function be (you can assume it is not a leap year)? What will your b value be if this is the case?

(f) (1 point) Before figuring out the phase shift, we need to decide if we are going to use sine, or cosine and if it will be positive or negative. Choose one.

(g) (2 points) The year begins on January 1st. This means the beginning of your function should also start at January 1st. Given this information what will your phase shift be based what you chose in the previous part.

(h) (2 points) Write the full equation for modelling the hours of daylight in the form $d(t) = a \sin b\,(t - c) + d$ or $d(t) = a \cos b\,(t - c) + d$ where d is the daylight in hours and t is the time in days from the beginning of the year in your city.

(i) (6 points) Solve your equation for hours of daylight on May 1 (hint: you need to know which day of the year May 1st is) and then compare it to the the actual value by doing some research. State each result and the difference. State the error as a percentage: $\dfrac{difference}{actual} \times 100$

(j) (4 points) Finally, graph this function on an attached piece of graph paper. Please give the graph a clear title and label the axes.