**M6 Butterfly Phenology Assignment**

Using the data provided, complete the following activities and answer the related questions:

1. Data from how many weather stations are compiled in the Temperature Data? *(1 point)*
2. How many butterfly species are in the Butterfly Data? *(1 point)*
3. Where did you find the information to answer questions 1 and 2? *(1 point)*
4. In the Excel File, create a scatterplot of average annual temperature vs. year for British Columbia on the **AnnualTempData sheet**. Make sure your axes are labeled properly. Add a trend line with the equation and r2 value. *(3 points)*

Based on the trend line, how has annual temperature changed over time in British Columbia? *(2 points)*

1. Natural history collections are rich repositories of biodiversity data. We can use information from specimen labels to compile data about phenology. Specifically, the date that a butterfly specimen was collected represents a day during which the butterfly was in flight.

In the Excel File, create a scatterplot of butterfly flight date vs. year on the **ButterflyData sheet**. Make sure your axes are labeled properly. Add a trend line with the equation and r2 value. *(3 points)*

Based on your graph, has the phenology of these butterflies shifted over time? Why or why not? *(2 points)*

1. In the Excel File, create a scatterplot of butterfly flight date vs. mean spring temperature on the **ButterflyData sheet**. Make sure your axes are labeled properly. Add a trend line with the equation and r2 value. *(3 points)*

Follow the same instructions above for graphing mean summer temperature instead of spring (You will have one graph for each season, set up exactly the same way). *(3 points)*

According to your graphs, how does the phenology of butterflies relate to temperatures in each season? *(2 points)*

1. Is the change in temperature the cause of the changes in phenology? Why or why not? *(2 points)*
2. In this exercise, we looked at temperature and butterfly data, but not data about the plants that butterflies rely on for food. Suppose you had a plot of plant phenology vs. temperature to compare to the butterfly phenology vs. temperature plots you created. What patterns would you expect to see when comparing the plant and butterfly data if an ecological mismatch is occurring between the plants and the butterflies? *(2 points)*