# 13 Modeling temperatures project

Try this worksheet after you have completed section 13.7

This extension uses sine and cosine curves to model average temperatures for a chosen city. This project will allow you to demonstrate your understanding of the different transformations of the graphs of sine and cosine functions, and the relationships these two functions have with each other.

You could present this project as a written paper or a class presentation.

- Choose a city you would like to research. It might be a city you have visited, read about, or are interested in for any reason.
- Use the internet to research average monthly temperatures for your city. There are many websites where you can find this information.
- Follow these steps to create a model for the cycle of the average monthly temperatures for one year.
  - Provide a table of the values you will be using. Remember to reference the source of your data.
  - Plot the data as points on a graph using a graphing program or your GDC.
  - Use these points to make a cosine (or sine) curve that you feel best fits the points.
  - Develop a 'first guess' equation, fully explaining how you got your estimated values for amplitude, period, and horizontal and vertical translations.
  - Draw a graph of your 'first guess' function, then fully explain how and why you might need to change this equation to best fit the points. Make as many adjustments as you like, until you have a function that you think is a 'best fit' for your temperature data.
  - Once you have a cosine (or sine) curve, you can come up with a sine (or cosine) curve that is also a 'best fit' for the points. This should be easier than finding your first equation, since you are not starting from scratch. You will only need to make minor adjustments to your first 'best fit' equation. Your cosine curve and your sine curve should be **identical** when graphed. Explain why this is so.
  - Using the original temperature data, use the regression feature on your GDC, and compare the calculator's 'best fit' function to your 'best fit' function. Which do you think is a better model? Why?
- Assuming that your first 'January' temperature represents January of this year, use your model to predict the average temperatures for March 2050, and for July 2090.
  Do you think these predictions will be accurate?
  What might affect the accuracy of your model?
  What changes might you need make to your models? Explain fully.