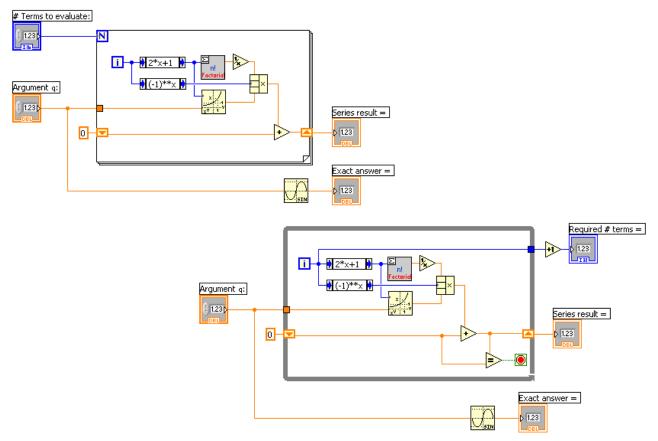# Worked Example: The Infinite Series for Sine

Like many functions, sine is evaluated in the computer by use of its infinite series expansion:

$$sin(\theta) = \sum_{i=0}^{\infty} (-1)^i \cdot \frac{\theta^{2i+1}}{(2i+1)!}$$

The argument $\theta$ is in radians, and $i$ is a simple counter variable. It is neither practical nor necessary to actually evaluate the series for an infinite number of terms. Usually less than 50 terms are required to converge to all available decimal places for double precision representation. It is a relatively simple matter to program the sine series using a loop structure, with two variations:

- Using an **iterated loop**, a specified number of terms is selected for evaluation. This is the simplest approach, but requires trial-and-error to arrive at an optimal number of terms to use.

- Using a **while loop**, the optimal number of terms is automatically selected. To do so, the loop must be configured to stop iterating when the individual terms become so small that they do not affect the sum.