Computing π

The German mathematician Leibniz discovered the rather remarkable fact that the mathematical constant π can be computed using the following mathematical relationship:

$$\pi/4 = 1 - (1 / 3) + (1 / 5) - (1 / 7) + (1 / 9) - (1 / 11) + \cdots$$

The formula to the right of the equal sign represents an infinite series; each fraction represents a term in that series. If you start with 1, subtract one-third, add one-fifth, and so on, for each of the odd integers, you get a number that gets closer and closer to the value of π/4 as you go along.

For this computer assignment, you are to write a C++ program to get an approximate value for π for a given number of N >= 1 terms in the above series. Your program should prompt and get the value of N from the stdin. Your program is supposed to work for any given value of N, but for a final run, use N = 1,000,000.

In addition to the main() routine, add the following subroutine in your program: double add_terms (unsigned n): This routine adds the first N terms of the above series and returns the computed sum to the main ( ) routine.

Programming Notes:

- You are not allowed to use any I/O functions from the C library, such as scanf or printf. Instead, use the I/O functions from the C++ library, such as cin or cout.

- Name your source file as prog1.cc and your header file as prog1.h

- Guard the statements in your header file using the following format. (This is necessary because you don't want the statements in your header file are processed more than once.)

```
#ifndef H_PROG1 // should not be defined any place else

#define H_PROG1 // same const value as for ifndef directive above

// put all statements for your header file here

#endif
```

- Include all system header files that you need in your program in your header file. For example, to gain access the iostream library, which defines a set of I/O operations, insert the line: #include in your header file, and at the top of your file, insert your header file by the following line: #include "prog1.h".