Math Library Functions

1. POWER

Raising a number to a power requires the use of a library function. Think of a library function as a piece of code that performs a specific operation. One of the many library functions is the pow function which raises a number to a power. For example,

area = pow(4.0, 2.0);

This statement contains a *call* to the pow function. The numbers inside the parentheses are *arguments*. Arguments are data being sent to the function. The pow function raises the first argument to the power of the second argument. In the example, 4 is raised to the power of 2, or 4^2. The result is *returned* from the function and used in the statement where the function call appears. In this case, the value 16 is returned and assigned to the variable area.

To use this and all other math functions discuss below, you need to include the *cmath* library.

#include <cmath>

The math constant π is also available in the <cmath> library. It is M_PI.

2. Math Library Functions

Function	Example	Description
pow	y = pow(x, y);	Returns x^y.
abs	y = abs(x);	Returns the absolute value of the argument.
exp	y = exp(x);	Returns the exponent of the argument.
round	y = round(x);	Returns the value of x rounded to the nearest whole number. If x is 2.8 then it will return 3.
sqrt	y = sqrt(x);	Returns the square root of the argument.
sin	y = sin(x);	Returns the sin of x where x is in radians.
cos	y = cos(x);	Returns the cos of x where x is in radians.

Examples:

cout << "sin(3.1415) = " << sin(3.1415) << endl;

3. Random Numbers

This is a pseudo-random number generator. Not truly random; only statistically random.

You initialize the random number generator with a *seed*. If you use the same seed, you will always get the same sequence of numbers. (Good for debugging.)

```cpp
#include <iostream>
#include <cstdlib>    // for rand and srand
#include <ctime>      // for the time function
using namespace std;

int main () {
    // get the system time to use as the seed
    unsigned int seed = time(0);

    // seed the random number generator
    srand(seed);

    // generate and display three random numbers
    cout << rand() << endl;
    cout << rand() << endl;
    cout << rand() << endl;

    return 0;
}
```

4. *Exercises* (Problems with an asterisk are more difficult)

In all of the following questions, you need to write the function and the main program to test out the function.