

### 6-1: User Defined Functions I

The C++ `cmath` library contains several math-related functions. For a general listing of functions contained within this library, review your text or visit [Cplusplus.com](http://www.cplusplus.com/reference/clibrary/cmath/) (<http://www.cplusplus.com/reference/clibrary/cmath/>).

If you had the option to redesign the math library, what other functions would you add to it? For example, do you think a max function or average function might be useful? Give a list of at least three functions you think are worth adding to the math collection. Provide a description of each new additional function, including what it does, what parameters it takes, and its return value.

### 6-2: Passing Data to a Function

When a programmer writes a function, the programmer has the option of accepting a copy of the data (pass by value) or receiving the location of the data in memory which it may then directly manipulated by the function (pass by reference.)

Research these two methods of passing data to a function. List the advantages and disadvantages of each method.

### 6-3: Calculating the Length of the Hypotenuse

Create a function called `calc_hypotenuse` that accepts the length of the two sides of a right triangle. The function should return the length of the hypotenuse. You determine appropriate data types for the parameters and return type.

### 6-4: The Weighted Grading Scheme

In an earlier assignment, we encountered a professor who used a weighted grading scheme.

Grade Components	Weight
Midterm	25%
Final Exam	25%
Research Paper	20%
Group Project	20%
Participation	10%

### Part A

Write a program that includes a `calc_grade` function that takes each of the five component scores and returns the student's numeric class grade. Test your program in main by calling your function with the appropriate arguments and printing the answer returned by the function.

### Part B

Create a file of student records. Each line (that is, each record) contains a three-digit student id number, midterm grade, final exam grade, research paper grade, group project grade, and participation grade. For example, a single data record might look like 101 90 85.2 87.5 93 100.

Write a program that reads in a record, calls the `calc_grade` function to calculate the student's grade, and outputs the record on the screen. For each record the program reads in, it should output the student's id number and their class grade.

### Part C

Imagine what further steps you could take to enhance this program. Would error checking be handy in case a grade component value was unreasonable? What should the program do if it encounters a final exam grade of -20? Might you also display the letter grade the student earned in addition to the score? What summary data (counters, accumulators, averages, max scores, minimum scores) might the instructor find useful? Implement at least two of your improvements to the program.

## 6-5: Overloaded Functions

A company employs three categories of workers: hourly, commissioned, and piece work. An hourly employee is paid based on a flat pay rate and his or her hours worked. Overtime is paid at time and a half. A commissioned employee is paid a base amount plus a percentage of his or her sales. A piece work employee is paid based on number of units produced with extra earnings if he or she reaches a certain production level.

For example:

Arguments/Parameters		Return value
Employee 1	Hours worked: 40 Hourly Rate: 12.50/hour	400.00
Employee 2	Base pay: 300 Sales: 125,000 Commission Rate: 2%	2800.00
Employee 3	Items Produced: 375 Initial Pay Rate: 2.00 Items Produced to reach next level: 200 Secondary Pay Rate: 3.50	1012.50

Write a set of three overloaded functions with the name `calc_pay`. Use the number of arguments sent to determine the type of employee and how pay should be calculated. Use your main function to demonstrate calling each of the three functions.