

CIS 278 (CS1) Programming Methods: C++

Assignment 3: Functions

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Learning Objectives

After the successful completion of this learning unit, you will be able to:

- Implement syntactically correct C++ functions including function prototypes, function definitions, and function invocations.
- Critically analyze the functional decomposition of a program and determine the best decomposition to meet the objectives of effective programming practice.
- Identify and implement correct parameter passing techniques.

Assignment 3.1 [45 points]

Write a program that plays a number guessing game with a Human user. The Human user will think of a number between 1 and 100, inclusive. The program will make guesses and the user will tell the program to guess higher or lower.

A sample run of the program might look like this:

```
Ready to play (y/n)? y
Think of a number between 1 and 100.
My guess is 50. Enter 'l' if your number is lower, 'h' if it is higher, 'c' if it is correct: h
My guess is 75. Enter 'l' if your number is lower, 'h' if it is higher, 'c' if it is correct: h
My guess is 88. Enter 'l' if your number is lower, 'h' if it is higher, 'c' if it is correct: l
My guess is 81. Enter 'l' if your number is lower, 'h' if it is higher, 'c' if it is correct: c
Great! Do you want to play again (y/n)? y
Think of a number between 1 and 100.
My guess is 50. Enter 'l' if your number is lower, 'h' if it is higher, 'c' if it is correct: l
My guess is 25. Enter 'l' if your number is lower, 'h' if it is higher, 'c' if it is correct: h
My guess is 37. Enter 'l' if your number is lower, 'h' if it is higher, 'c' if it is correct: c
Great! Do you want to play again (y/n)? n
```

The strategy that the program will use to make guesses is patterned after something called a "binary search". (If you don't know what a binary search is, or don't understand its connection here, just ignore it. I'm just mentioning it in case it helps.) The strategy goes like this: Every time the program makes a guess it should guess the midpoint of the remaining possible values. Consider the first example above, in which the user has chosen the number 81:

On the first guess, the possible values are 1 to 100. The midpoint is 50.
The user responds by saying "higher"

On the second guess the possible values are 51 to 100. The midpoint is 75.
The user responds by saying "higher"

On the third guess the possible values are 76 to 100. The midpoint is 88.
The user responds by saying "lower"

On the fourth guess the possible values are 76 to 87. The midpoint is 81.
The user responds "correct"

Additional Requirements

The purpose of the assignment is to practice writing functions. Although it would be possible to write the entire program in the main function, your solution should be heavily structured. Most of the point penalties

given on this assignment will be for not following the instructions below carefully. The main function must look exactly like this. Copy and paste this code into your file, and don't edit it:

```
int main() {
    char response;

    cout << "Ready to play (y/n)? ";
    cin >> response;
    while (response == 'y') {
        playOneGame();
        cout << "Great! Do you want to play again (y/n)? ";
        cin >> response;
    }
}
```

The playOneGame() function should implement a complete guessing game on the range of 1 to 100.

In addition, you should implement the following helper functions to be invoked inside your playOneGame() function:

```
void getUserResponseToGuess(int guess, char& result)
```

The getUserResponseToGuess() function should prompt the user with the phrase "is it <guess> (h/l/c)? " with the value replacing the token <guess>. It should set its "result" parameter equal to either 'h', 'l', or 'c'. It should do this ONE time, and should not do anything else.

```
int getMidpoint(int low, int high)
```

The getMidpoint() function should accept two integers, and it should return the midpoint of the two integers. If there are two values in the middle of the range then you should consistently chose the smaller of the two.

Submit Your Work

Name your source code file according to the assignment number (a1_1.cpp, a4_2.cpp, etc.). Execute the program and copy/paste the output that is produced by your program into the bottom of the source code file, making it into a comment. Use the Assignment Submission link to submit the source file. When you submit your assignment there will be a text field in which you can add a note to me (called a "comment", but don't confuse it with a C++ comment). In this "comments" section of the submission page let me know whether the program works as required.

Keep in mind that if your code does not compile you will receive a 0.