



One side of one  $8.5 \times 11$  inch sheet of paper. Show all of your work clearly in the space provided or on the additional page at the end of the exam. If the additional page is used, be sure to clearly label the content for each problem. Be sure to *read each problem carefully*. You should answer all five questions. Note: The exam is double-sided.

1. (11 points) Briefly explain what the `srand()` function in the `cstdlib` library is for and give an example of how it could be used (on C++ statement).



2. (12 points) Precisely and concisely describe what happens when a parameter is passed to a function by value.

3. (12 points) Precisely and concisely describe what happens when a parameter is passed to a function by reference.



4. Suppose you have been told that

$$1^n + 5^n + 10^n + 18^n + 23^n + 27^n = 2^n + 3^n + 13^n + 15^n + 25^n + 26^n$$

For all integer values of  $n \geq 0$ . In this problem you will write two functions and a program to verify (or disprove) that what you have been told is true. One function should take in the value  $n$  and return the result (as a `double`) of the calculation on the left side of the equal sign and the other function should calculate the value on the right side of the equal sign.

(a) (10 points) Write a complete header file (called `funcs.h` for the two functions.



**(b)** (15 points) Implement one of the functions (you pick). Be sure to include all that is necessary for the file to compile.



(c) (20 points) Write a program to verify or disprove that

$$1^n + 5^n + 10^n + 18^n + 23^n + 27^n = 2^n + 3^n + 13^n + 15^n + 25^n + 26^n$$

for  $0 \leq n \leq 10$ . Be sure to include all that is necessary for the file to compile.



5. (20 points) Write a program that asks the user to enter a word that is between five and twelve characters long. If the user enters a word with a length in the range specified, the program should create a file called `word.txt`, write the length of the word and the word itself into the file, and then exit. Otherwise, the program should prompt the user again to enter a word with the specified length. The program should continue prompting the user for the word until they enter a word with the correct length.



Additional work area for any problem. Clearly identify to which problem the work on this page is related.



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