



You may use one side of one 8.5×11 inch sheet of paper with notes on it for this exam. 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 six questions. Note: The exam is double-sided.

1. (10 points) List any reasons you can think of for the C++ language requiring that variables be declared with a type. For example, we must do `double number = 8.34;` instead of `number = 8.34;`

2. (10 points) Describe the difference between the pre and post forms of the ++ and – operators.



3. (15 points) Write a short code segment (you need not write the whole program) that will set will double the size of A if A is between 20 and 45 (not including 20 and 45).



4. (25 points) Write a program that asks the user to enter a word (may consist of upper and lower case letters and numerals) and displays the word in all lower case letters (numerals should be left alone). For example,

User enters

=====

JouRnaL

Program displays

=====

journal



5. (15 points) Change the previous program so that it displays only the upper case letters. For example,

User enters	Program displays
=====	=====
JouRnaL	JRL

Identify which lines of code would need to change in your solution to the previous problem. Write the modified lines below.

6. (25 points) The value of π can be approximated by the series

$$4\left(1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots\right)$$

Using this formula, write a program that calculates and displays the value of π using the first i terms of the series where i is entered by the user of the program.

For example, if the user enters 2, the program should display 2.6667 ($2.66667 = 8/3 = 4(1-1/3)$).



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