



Open book and notes. 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 6 questions. Note that the exam is double sided.

**1.** (15 points) Write definitions for objects to represent the following items. You should select an appropriate name and the *most* appropriate class for each object.

(a) Miles that a car can travel on a gallon of gasoline.

(b) User's SAT score.

(c) User's first initial.

(d) Tiger Woods' most recent golf score.

(e) Percentage of people in Wisconsin whose middle name rhymes with "turnip".

(f) Name of the user's favorite food.

2. (10 points) Use parentheses to indicate the precedence for the operators (the order in which the operations take place) for the following expressions.

(a)  $a / b - c \% d$

(b)  $a + b + c / d * e$

(c)  $a \% b * - c + d$

(d)  $a || b \&\& ! c + d$

(e)  $a + 1 < b * 4 \&\& ! c || d$

3. (10 points) In lab 2, why was it necessary for us to change  $Ctemp = (5/9) * (Ftemp - 32)$ ; to  $Ctemp = (5.0/9) * (Ftemp - 32)$ ;

4. (15 pts) Identify all errors in the following program that would cause a compiler error.

```
// Name: Convenience store owner (conva.cpp)
2 // Version: 1.1 (ANSI C++ version)
  // Purpose: Convert the price of an item in U.S. pennies per
4 //           pound to Canadian dollars per kilogram.

6 #include <iostream>

8 using namespace std;

10 int main()
   {
12   Float theOutput;           // Answer displayed to the user
   Float dollarsPerKg;        // Item's cost in Canadian $ per kilogram
14   const int theInput;        // Input entered by the user
   int penniesPerLb;          // Price in U.S. pennies per lb of an item

16   // Get the input
18   cout << "Enter item's price per pound" // endl;
   cin >> theInput;

20   penniesPerLb = theInput

22   const float LbPerkg = 2.2;           // No. of lbs in a kilogram
24   float dollarsCanPerUS = 1.51;        // No. of Canadian $ per
                                           // U.S. $ (exchange rate
26                                           // as of Noon EST 9-28-98)
   const int penniesPerDollar = 100;     // No. of pennies per U.S. $

28   dollarsPerKg = penniesPerLb*LbPerkg
30                 * dollarsCanPerUS/penniesPerDollar;

32   theOutput = dollarsPerKg;

34   // Display the answer
   cout << theOutput << endl;
36 }
```

5. (20 points) Consider the following C++ program:

```
1 #include <string>
2 #include <iostream>
3
4 using namespace std;
5
6 int main ()
7 {
8     string Phrase1 = "Madness_takes_its_toll...";
9     string Phrase2 = "We_double_checked,_just_to_be_sure.";
10    string Phrase3 = "Making_the_correct_change_in_our_program";
11    int i=10, j=26;
12
13    Phrase3 = Phrase3 + "_can_save_time";
14
15    if(i<j) {
16        cout << Phrase1;
17        cout << Phrase2.substr(Phrase1.size() + 1, i-2);
18        i *= 2;
19    } else {
20        j %= 12;
21        cout << Phrase2 << Phrase3.size() << endl;
22    }
23
24    cout << "\n to have";
25
26    if(j=6) {
27        cout << Phrase3.substr(j,--i) << endl;
28    }
29    return 0;
30 }
```

What would you expect the output of this program to be? (Show your work for partial credit.)



6. (30 points) Write a program that computes the volume of an object. The program should ask the user to input the object's mass and density. The mass should be given in grams, and the density should be given in grams per cubic centimeter. The relationship of the mass, density, and volume of an object is:

$$Density = \frac{Mass}{Volume}$$

Your program should output the volume in cubic centimeters.



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