“Introduction to C++ Programming” Online Course

Pretest/Posttest for Class 9

1. This attempt to input the five tax rates for the states in which ACME sells products won’t compile. Why? How can it be repaired so that it works?

```c
int main () {
    double taxrates[5];
    cin >> taxrates;
    ...
}
```

2. This attempt to input the tax rates also does not work properly, though it compiles. Why? How can it be fixed?

```c
int main () {
    double taxrates[5];
    for (int j=1; j<6; j++)
        cin >> taxrates[0];
    ...
}
```

3. This attempt compiles fine, but at run time it crashes. Why? How can it be fixed so that it works properly?

```c
int main () {
    double taxrates[5];
    for (int j=1; j<6; j++)
        cin >> taxrates[j];
    ...
}
```

4. Now that the tax rates have been correctly input, a major design flaw in the program’s usage of the tax rates array surfaced. If the main program inputs a state code, such as 13 (for Illinois), how can the corresponding tax rate from the array of five tax rates be found? As it is defined in the two previous examples, it cannot. Thus, a file was created in which each input line of the `taxrates.txt` file contains the integer state code and its corresponding tax rate. This attempt at making a function to load the arrays fails to work properly. Why? How can it be fixed?

```c
int main () {
    double taxrates[5];
    int    states[5];
    LoadArray (states[], taxrates[5]);
    ...

    void LoadArray (int states[], double taxrates) {
        ifstream infile ("taxrates.txt");
        int j=0;
        while (infile >> states[j] >> taxrates) j++;
        infile.close();
    }
```
5. Since the previous attempt to make the load function failed, the programmer threw the whole thing away and started over. This is the next attempt, also doomed, though the programmer finally got it to nearly compile. Why? How can it be fixed up?

```c
const int MAX = 5
int main () {
    double taxrates[MAX];
    int states[MAX];
    LoadArray (states[MAX], taxrates[MAX], MAX);
    ...
    void LoadArray (int states, double taxrates, int MAX) {
        ifstream infile ("taxrates.txt");
        int j=0;
        while (infile >> states >> taxrates && j < MAX) j++;
        infile.close();
    }
```

6. Undaunted by his previous difficulties, the programmer decided that a `MatchState` function was needed. Here is the first attempt. It compiles but does not work. Why? How can you fix it so that it does work properly?

```c
int MatchState (int states[], int state) {
    int j = 0;
    while (state != states[0]) j++;
    return j;
}
```

7. With the function to match a state code operational, work began on the main calculation loop. This is what the programmer produced. It fails to work properly. Why? How can it be repaired?

```c
int statecodes[5];
double taxrates[5];
double cost;
int quantity;
int statecd;
double tax;
double total;
double grandTotal;
int matchingStateCodeSubscript;
...
while (infile2 >> quantity >> cost >> statecd) {
    total = quantity * cost;
    MatchState (statecodes, statecd);
    tax = total * taxrates[matchingStateCodeSubscript];
    grandTotal = total + tax;
```
8. A programmer was asked to make a program to convert students' final raw grades into a letter grade. The specifications called for the use of arrays. One array holds the lowest possible score for a particular letter grade and the other array holds the corresponding letter grade. The programmer produced the following coding. While it works, his boss immediately ordered a revision and told him to just initialize the arrays not assign them values at run time. How can this be done?

```cpp
int main () {
    int rawScores[5];
    char grades[5];
    rawScores[0] = 90;
    grades[0] = 'A';
    rawScores[1] = 80;
    grades[1] = 'B';
    rawScores[2] = 70;
    grades[2] = 'C';
    rawScores[3] = 60;
    grades[3] = 'D';
    rawScores[4] = 0;
    grades[4] = 'F';
}
```

9. Next, having gotten the two raw scores and corresponding grade arrays loaded properly, the programmer proceeded to write the code to convert students’ raw scores into letter grades. The students complained bitterly about the results. Desk check with a grade of 94.78. What is wrong with this and how can it be fixed to work properly?

```cpp
int main () {
    int rawScores[5];
    char grade[5];
    double rawscore;
    long idNum;
    char grade;
    while (cin >> idNum >> rawscore) {
        for (int j=4; j>=0; j++)
            if (rawscore > rawScores[j]) break;
    }
    grade = grades[j];
    cout << idNum << ' ' << grade << endl;
}
```
10. Hastily the programmer spotted his errors and recoded the program as follows. This is now a “mostly working” program. Far fewer students were complaining about their grades. Can you spot the remaining error? One of the students complaining bitterly about their grade received a raw score of 89.997. How can the program now be fixed?

```c
int main () {
    int rawScores[5]....
    char grade[5]....
    double rawscore;
    long idNum;
    char grade;
    while (cin >> idNum >> rawscore) {
        for (int j=0; j<5; j++)
            if (rawscore >= rawScores[j]) break;
        grade = grades[j];
        cout << idNum << ' ' << grade << endl;
    }
}
```