CSCI 131-- Techniques of Programming
College of the Holy Cross, Spring 2014

Solutions to Exam 2 Review Problems

The following problems are intended to help you study for the exam.

1) Given the following enumeration:

        enum Colors {RED, BLUE, GREEN, YELLOW, PURPLE};
        int colorRating[5] = {3, 1, 2, 5, 4};

a) What is the value of the expression: colorRating[BLUE] ?

Answer: 1

b) Write a loop, using the enumeration Colors as indices, to print out the colorRating for each color.

Answer:

```
Colors color;
for (color = RED; color <= PURPLE; color = Colors(color + 1))
{
      cout << colorRating[color];
}
```

2) A function, SomeFunc, has two formal parameters, alpha and beta, of type int. The data flow for alpha is one-way, into the function. The data flow for beta is two-way, into and out of the function. Write an appropriate heading for the function, SomeFunc (SomeFunc() does not return a value).

Answer:
```
void SomeFunc(int alpha, int& beta)
```

3) Consider the function definition:
```
void Demo(int& intVal, float floatVal) {
       intVal = intVal *2;
       floatVal = float(intVal) + 3.5;
       return;
}
```

 Suppose the caller has variables myInt and myFloat whose values are 20 and 4.8 respectively. What are the values of myInt and myFloat after return from the following function call?
        Demo(myInt, myFloat);

Answer:

```
myInt == 40
myFloat == 4.8
```

4) Given the function definition:
```
int Mystery( float someVal) {
        if (someVal > 2.0) {
                return 3 * int(someVal);
        } else {
                return 0;
        }
}
```

What is the value of the expression Mystery (4.2)?

Answer: 12

5) a)Write a function,
       float TenToThePower(int n)
that returns 10.0 raised to the integer power specified by n. Do **not** use the math.h library function, pow( ).

Answer:
```
float TenToThePower(int n) {
        float result = 1.0;
        for (int i = 0; i < n; i++) {
                result *= 10.0;
        }
        return result;
}
```

b) Write a C++ statement to compute 10.0 to the power of 3 and store the answer in the variable, tenCubed.

Answer:
```
tenCubed = TenToThePower(3);
```

6) a)Write a nested for loop to produce the following output:

```
1
1 2
1 2 3
1 2 3 4
```

Answer:
```
for (int i = 1; i <= 4; i++) {
    for (j = 1; j <= i; j++) {
        cout << j << " ";
    }
    cout << endl;
}
```

b) Write a function:
        void Triangle (int n)
That produces a triangle like that above, with n rows. The first row prints out 1, the last row prints out the integers from 1 to n.

Answer:

```
void Triangle(int n) {
    for (int i = 1; i <= n; i++) {
        for (j = 1; j <= i; j++) {
            cout << j << " ";
        }
        cout << endl;
    }
}
```

7) Given the following declarations:
        struct ItemType {
                char description[40];
                int idNumber;
        };
        ItemType listOfProducts[10];

a) Write an expression that denotes the description of the third item in the list of products.

Answer:
```
listOfProducts[2].description
```

b) Write an expression that denotes the first character of the description of the tenth item in the list of products:

Answer:
```
listOfProducts[9].description[0]
```

c) If the char type takes up 1 byte of memory, and the int type takes 2 bytes of memory, how many bytes of memory are allocated for the array, listOfProducts?
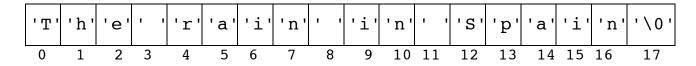
Answer: 420 bytes

d) Write a C++ program fragment that will input (from standard input) the idNumbers for the entire list of products (don't forget to prompt the user).

Answer:
```
for (int i = 0; i < 10; i++) {
        cout << "Enter the ID number for product " << i << ": ";
        cin >> listOfProducts[i].idNumber;
}
```

8) Consider the following string: "The rain in Spain".
a)Draw a diagram to show how this string would be stored in C++ memory.

'T'	'h'	'e'	' '	'r'	'a'	'i'	'n'	' '	'i'	'n'	' '	'S'	'p'	'a'	'i'	'n'	'\0'
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

b) What is the minimum length of the array needed to store this string?

Answer: 18

9) Given the declaration
        int checkers[8][8];
a)Write a statement that will store the number, 5, in the 2nd row and 3rd column of the array.

Answer:
```
checkers[1][2] = 5;
```

b) Write C++ code to store the numbers 1-8 in the first row, 9-16 in the second row, 17-24 in the third row, and so on.

Answer:

```cpp
for (int i = 0; i < 8; i++) {
    for (int j = 0; j < 8; j++) {
        checkers[i][j] = i * 8 + j + 1;
    }
}
```

10) Write a function to insert an integer element into a list of integers at a given index. The list of integers is stored in an array, but there are fewer integers in the list than the length of the array. The function should take 4 parameters: The array, the length of the list, the item to be inserted and the index where the item should be inserted. Assume that enough memory has been allocated so that the new length of the list will still fit into the allocated memory for the array (i.e. if the length parameter is 5, then at least 6 elements have been allocated for the array in memory).

Answer:

```cpp
void insert(int myArray[], int& length, int item, int index)
{
    for (int i = length; i > index; i--) {
        myArray[i] = myArray[i-1];
    }
    myArray[index] = item;
    length += 1;
}
```

11) Consider the following input data (from standard input):

One small step
 for a man

Given the following declarations:
        char string1[20];
        char string2[20];
        char someChar;

a) Write code that will input the first line into string1 and the second line into string 2.

Answer:
```cpp
cin.get(string1, 20);
cin.get(someChar);
cin.get(string2, 20);
```

```
            OR

      cin.get(string1, 20);
      cin.ignore(100, '\n');
      cin.get(string2, 20);
```

b) Write code that would input the first word into string1 and the second word into string2.

Answer:
```
      cin >> string1 >> string2;
```

12) Consider the following declarations:

```
      struct DateType {
              int month;
              int day;
              int year;
      };
      struct TimeType {
              int hours;
              int minutes;
              int seconds;
      };
      struct ShowTime {
              DateType showDate;
              TimeType curtainTime;
      };
      ShowTime myShowTime;
```

a) Write the C++ code to assign the appropriate values to myShowTime for a show that starts at 09:30:00 on the date 11/25/00.

Answer:
```
      myShowTime.showDate.month = 11;
      myShowTime.showDate.day = 25;
      myShowTime.showDate.year = 0;
      myShowTime.curtainTime.hours = 9;
      myShowTime.curtainTime.minutes = 30;
      myShowTime.curtainTime.seconds = 0;
```

b) Suppose there is a function, GetDate(DateType& theDate), that will read in the date from standard input and store it in the parameter, theDate. Write the function call for GetDate that will read in the date for myShowTime.

Answer:
```
      GetDate(myShowTime.showDate);
```