

TEST 3, CS 101, MONDAY, APRIL 19, 2004

(1) What is the output?

```
#include<iostream.h>
void print(int[] [3]);
void print_opp(int[] [3]);
void main(){
    int a[2][3], i, j;
    for (i=0; i<2; i++)
        for (j=0; j<3; j++)
            a[i][j] = (i+1)*(j+2);
    print(a);
    cout << endl;
    print_opp(a);
}
void print(int b[] [3]){
    for (int i=0; i<2; i++){
        for (int j=0; j<3; j++)
            cout << b[i][j] << " ";
        cout << endl;
    }
}
void print_opp(int b[] [3]){
    for (int i=1; i>=0; i--){
        for (int j=2; j>=0; j--)
            cout << b[i][j] << " ";
        cout << endl;
    }
}
```

Output:

**2 3 4**  
**4 6 8**

**8 6 4**  
**4 3 2**

- (2) For each integer  $n$ ,  $a_n$  is defined to be 1 if  $n \leq 1$ , and is defined by the formula  $a_n = 1 + 2a_{n-2}$  for  $n > 1$ . Write a function `int a(int n)` whose output is  $a_n$ . To implement this function, YOU MUST USE A RECURSIVE FUNCTION CALL.

```
int a(int n){
    if (n<=1)
        return 1;
    else
        return 1 + 2*a(n-2);
}
```

- (3) What is the output of the following program?

```
#include <iostream.h>
void main(){
    int a[10]={1,6,4,3,2,7,9,10,3,8};
    for (int i=1; i<5; i++) cout << a[i-1]+1 << endl;
    for (int i=0; i<5; i++) a[i] = a[i+1] + a[2*i];
    for (int i=0; i<5; i++) cout << a[i+1] << endl;
}
```

Output:

```
2
7
5
4
8
5
11
10
7
```

(4) What is the output?

```
#include<iostream.h>
void main(){
    int a[]={4,6,9,-2,3,5,
            10,7,13,31}, *b;
    b=&a[0];
    b += 2;
    for (int i=0; i<5; i++)
        cout << b[i] << endl;
}
```

Output:

```
9
-2
3
5
10
```

(5) Write a function

`double average(double s[], int n)`  
that returns the average value of `s[0]`, `s[1]`, ..., `s[n-1]`. Hint:  
Remember the average value is given by the math formula  
 $(s[0] + s[1] + \dots + s[n-1])/n$ .

```
double average(double s[], int n){
    double sum=0;
    for (int i=0; i<n; i++)
        sum += s[i];
    return sum/n;
}
```

- (6) Use bubble sort to sort the following array. Indicate all the swaps that are made, and write out the array following each swap.

```
6 5 1
5 6 1 (swap 6 and 5)
5 1 6 (swap 6 and 1)
1 5 6 (swap 5 and 1)
```

- (7) Write a program that reads from the file `input.dat` to the end of file, and then prints the number of times the character 'u' (lowercase u) appeared in the input.

```
#include<fstream.h>
#include<iostream.h>
void main(){
    int num_u=0;
    ifstream infile("input.dat");
    char c;
    infile >> c;
    while(!infile.eof()){
        if (c=='u') num_u++;
        infile >> c;
    }
    cout << "u appears " << num_u << " times in input.dat.\n";
}
```

- (8) Consider the following class header file `myclass.h`:

```
#include<iostream.h>
class myclass{
private: char x, y;
public: void init(char, char);
        void move();
        void print();
};
// Implementation
void myclass::init(char m, char n)
    {x=m; y=n;}
void myclass::move()
    {x++; y--;}
void myclass::print()
{cout<<"["<<x<<" "<<y<<"]"<<endl;}
```

- (a) List the private members of the class `myclass`.

**x, y**

- (b) This class is used by the following program. Give the output of the program in the space provided:

```
#include "myclass.h"
void main(){
    myclass p, q;
    p.init('A', 'x'); q.init('Q', 'n');
    p.print(); q.print();
    p.move(); q.move(); p.move();
    p.print(); q.print();
}
```

Output: [A,x] [Q,n] [C,v] [R,m]
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