Midterm of CS 135, v2
Mar 17, 2025

Name:	
EmpID:	

1 (30 points) Answer the following questions.

(1) Given `int arr[] = {3, 7, 1, 2}`, what is arr[2]?

Answer: arr[2] is 1.

(2) Define function header for function **order**, for two double numbers a and b, if a is larger than b, swap them. Return type is void.

Answer: `void order(double& a, double& b);`

(3) Write a statement to generate a random **floating point number** in [0, 3]. No need to include libraries. Hint: you may use rand function, which returns a random integer in `[0, RAND_MAX]`.

Answer: `3.0 * rand() / RAND_MAX`

(4) Given `string greeting = "Glad to meet you";` What is the value for greeting.substr(3, 6)?

Answer: `"d to m"`

(5) What is the value of `2 + 76 % 10`?

Answer: 8

(6) What is the value of foo(5)?

```
int foo(int n) {
    int sum = 0;
    for (int i = 2; i <= n; i += 2)
        sum += i;

    return sum;
}
```

Answer: 6

(7) Suppose double variables a and b are properly declared and initialized. Declare a double variable c and initialize it to be $\frac{\sqrt{a}}{2+b}$. You may use sqrt function, see cheat sheet.

Answer: double c = $sqrt(a)/(2+b)$;

(8) What is the output of the following code?

```cpp
#include <iostream>
using namespace std;

int main() {
    int count = 0;
    for (int i = 8; i >= 0; i -= 2)
        count++;

    cout << count << endl;
    return 0;
}
```

Answer: 5

(9) What is the output of the following code?

```cpp
#include <iostream>
#include <string>
using namespace std;

void foo(int arr[], int size);
int main() {
    int arr[] = {1, 5, 3};
    int size = sizeof(arr) / sizeof(arr[0]);
    foo(arr, size);

    for (int i = 0; i < size; i++)
        cout << arr[i] << " ";

    return 0;
}

void foo(int arr[], int size) {
    for (int j = size-1; j >= 1; j--)
        for (int i = 0; i < j; i++)
            if (arr[i] < arr[i+1])
               swap(arr[i], arr[i+1]);
}
```

Answer: 5 3 1

(10) Write a condition to represent that integer i is less than 0 **or** i is odd. An integer is odd if it cannot be divided by 2.

Answer:

```
(i < 0 || i % 2 != 0)
```

another solution is

```
(i < 0 or i % 2 != 0)
```

2 (20 points) Answer the following questions.

(1) What is the output of the following code?

```
#include <iostream>
using namespace std;

void show(int size);
int main() {
    show(3);
    return 0;
}

void show(int size) {
    for (int row = 0; row < size; row++) {
        for (int col = 0; col < size; col++)
            if (row + col == size-1)
               cout << "-";
            else cout << "*";

        cout << endl;
    }
}
```

Answer:

```
**-
*-*
-**
```

(2) Define function `no_upper`, for a string, return true if **none** of its elements is a uppercase letter, that is, one from 'A' to 'Z', otherwise, return false. For example, `no_upper("abc")` returns true and `no_upper("Ab1")` returns false. **No need to include libraries or define main function.**

Hint: you may use `int isupper(int ch)` to test whether a character is uppercase letter 'A' - 'Z' or not.

Answer:

```
#include <iostream>
#include <string>
#include <cctype> //isupper

using namespace std;

bool no_upper(string str);
```

```cpp

int main() {
    cout << boolalpha << no_upper("ab1") << endl; //true
    cout << boolalpha << no_upper("Ab1") << endl; //false
    return 0;
}

bool no_upper(string str) {
    for (int i = 0; i < str.length(); i++)
        if ( isupper(str[i]) )
           return false;

    return true;
}
```

3 (50 points) Programming exercises

(1) Define function called `percentage`, for an array of ints, its size, and a target, return the percentage of integers that is **less than or equal to** the target to the size of the array.

For example, if the array has elements 3, 2, -1, and target is -1, then there is 1 integer out of 3 elements that is less than or equal to the target, so the percentage is 33.3333%. The return is 33.3333, a floating point number.

Answer:

```
#include <iostream>
#include <string>
using namespace std;

double percentage(int arr[], int size, int target);

int main() {
    int arr[] = {3, 2, -1};
    int size = sizeof(arr) / sizeof(arr[0]);
    int target = -1;
    cout << percentage(arr, size, target) << "%" << endl;
    return 0;
}

double percentage(int arr[], int size, int target) {
    int count = 0;
    for (int i = 0; i < size; i++)
        if (arr[i] <= target)
           count++;

    return 100.0 * count / size;
}
```

In main function, declare array `arr` with values 3, 2, -1. Call the above function on `arr` with appropriate size and target -1. Print out the return. **Just write the statements in main function, no need to include libraries**.

Answer:

```
int arr[] = {3, 2, -1};
int size = sizeof(arr) / sizeof(arr[0]);
int target = -1;
cout << percentage(arr, size, target) << "%" << endl;
```

(2) Write code in main to enter a series of integers until -1 is entered. Find out the number of integers that can be divided by both 2 and 5 at the same time, the number of integers that can be divided by 2 only, and the number of integers that can be divided by 5 only.

Integer num is divided by 5 means the remainder of num divided by 5 is 0.

```
Enter an int (-1 to stop): 5
Enter an int (-1 to stop): 2
Enter an int (-1 to stop): 10
Enter an int (-1 to stop): 7
Enter an int (-1 to stop): 6
Enter an int (-1 to stop): 30
Enter an int (-1 to stop): -1
number can be divided by 2 and 5: 2
number can be divided by 2 only: 2
number can be divided by 5 only: 1
```

Answer:

```cpp
#include <iostream>
#include <string>
using namespace std;

//sample input/output:
//Enter an int (-1 to stop): 5
//Enter an int (-1 to stop): 2
//Enter an int (-1 to stop): 10
//Enter an int (-1 to stop): 7
//Enter an int (-1 to stop): 6
//Enter an int (-1 to stop): 30
//Enter an int (-1 to stop): -1
//number can be divided by 2 and 5: 2
//number can be divided by 2 only: 2
//number can be divided by 5 only: 1

int main() {
    cout << "Enter an int (-1 to stop): ";
    int elm;
    cin >> elm;

    int multiple_10 = 0; //divided by 2 and 5
    int multiple_2 = 0; //divided by 2
    int multiple_5 = 0; //divided by 5
    while (elm != -1) {
        if (elm % 2 == 0 && elm % 5 == 0)
          multiple_10++;
        else if (elm % 2 == 0)
               multiple_2++;
        else if (elm % 5 == 0)
```

```
            multiple_5++;

        cout << "Enter an int (-1 to stop): ";
        cin >> elm;
    }

    cout << "number can be divided by 2 and 5: " << multiple_10 << endl;
    cout << "number can be divided by 2 only: " << multiple_2 << endl;
    cout << "number can be divided by 5 only: " << multiple_5 << endl;
    return 0;
}
```