

CS 201 (Intro. to Computing) Fall 2015

Sabanci University

Sample Questions for Midterm 1

- Those questions do not imply any favorite subject or question type for the questions in the actual exam
- Please also review recitation questions, samples covered in the class, homeworks and the questions in the book as well
- The amount of questions here is of course much more than the actual exam.

QUESTIONS

1) Write a function that takes an integer type of parameter and returns its reciprocal. If the parameter is zero, then the function should return 0.

In the main program, first input two integer values. Then find the sum of the reciprocals of all of the numbers between these two inputs. In the main program, you have to use the reciprocal function.

2) Write a function that takes three string values as parameters and displays them in lexicographical order.

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3)

a) Rewrite the following expression using C++ syntax.

$$\frac{c - \frac{a}{b-c}}{\sin\left(\frac{b}{c/a}\right)} \cdot a^3$$

b) What are the results of the following expressions?

`5+3/5+72*(2+5)==12%8*-10`

`(20*1.5/(2*6-8)-7)*11`

c) The range of short unsigned integer is [0 .. 65535]. Why is the upper limit is 65535?

d) Write the statement to display the sum of the digits of a two-digit integer number (call it num).

e) We do not include anything to use int, but we need to include string header file to use string. Why is that?

f) Suppose you are writing a program to convert days into seconds. Assuming you are doing integer arithmetic using unsigned long integers for this purpose, what should be the maximum value of days to avoid any overflow problems?

g) Rewrite using for statement instead of while

```
while (year<=4002)
{
    sum+=year;
    cout << year << endl;
    year+=sum;
}
```

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4) Trace and display the output of the program using the data given below?

```
#include <iostream>
using namespace std;
int main()
{
int cnt , x , y , dif;
cnt=0;
cin>>x;
do
{
cin>>y;
dif=y-x;
if (dif > 1)    while ( x+1 < y)
                { ++x;
                  cout<<"Number= "<<x<<endl;
                }

        x = y;
        ++cnt;
    } while (cnt!=3);
return 0;
}
```

Data input

12
15
16
20

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5) What is the output of the following program?

```
#include <iostream>
using namespace std;
int A(int i);
float B(char c);
void C(float x);

int main()
{
    int    p = 0;
    float q = 0.0;
    char   r = 'D';
    p = A(p);
    q = B(r);
    C(B(r));
    p = A(A(p));
    return 0;
}

int A(int i)
{
    cout << "A" << endl;
    return i+1;
}

float B(char c)
{
    cout << "B" << endl;
    return 7;
}

void C(float x)
{
    cout << "C" << endl;
}
```

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6) There are up to five (5) **syntax** errors of the following program. However, there might be less than five. Find those syntax errors and explain the nature of the error. Give the line numbers of the errors. If your syntax error is not actually a syntax error, that will reduce your grade!

```
1   #include <iostream>
2   using namespace std;
3
4   void desidero (int hulahop)
5   {
6       if (hulahop)
7       {
8           cout << 10;
9       }
10  }
11
12  int main()
13  {
14      cout << "Program is now started";
15      int hokuspokus = 4.6, five;
16      double = hokuspokus/2.0;
17
18      cin >> hulahop >> five;
19      cin >> hokuspokus;
20          if (hokuspokus+72 != five) { cout << "five is "
21              << five;
22          }
23      return 0;
24  }
25
26  void function1
27  {
28      cout <<3 + 5;
29  }
```

Syntax Errors:

- 1) Line: _____
- 2) Line: _____
- 3) Line: _____
- 4) Line: _____
- 5) Line: _____

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7) XCELL telephone company is calculating the cost of a telephone conversation by multiplying the duration (in minutes) with the unit cost. The unit cost depends on the area code of the called telephone number. If the area code is between 200-299, then the unit cost per minute is 100 KTL, else if the area code is between 300 – 499, then the unit cost per minute is 150 KTL, else if the area code is between 500 – 599, then the unit cost per minute is 300 KTL.

In a full program:

Write a function that takes area code and duration as parameters and display the total cost of the conversation. Area code is assumed to be between 200 and 599 and the duration is assumed to be non-negative in this function (you will make input checks in the main).

In main, input the area code and the duration. First check validity of the input (area code must be between [200 .. 599], duration must be non-negative). If the inputs are valid, use the function to calculate the cost of conversation and display it on the screen, otherwise display an error message showing which input is invalid.

8) Write a function that takes a string parameter and copies it to another string by removing the uppercase letters in it. The copied string must be returned back from the function.

9) Write a program that inputs a numeric month value (between 1 and 12) and a year value. The program should calculate and display the month (again in numeric format) and year after 100 months.

As a variation, instead of 100 use another input. In this way, any amount of months could be added.

10) Write a program that reads a sequence of integers from keyboard and checks whether that sequence is ordered or not; Sentinel value is -1 , i.e., the input entry should finish when -1 is entered and this value should not be considered in the sequence. The program should display a message about the order of the input sequence too.

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11) Write a function that takes a string (let's call it `mystr`) and an integer (let's call it `myint`) as parameters. The function should move last `myint` characters of `mystr` to the beginning and return the resulting string.

For example, if `mystr` is "Bu sinav ne kadar da kolay" and `myint` is 11, then the returned string will be "ar da kolayBu sinav ne kad"

If `myint` is larger than the length of `mystr`, then the function should return `mystr` unchanged.

Remark: You can write this function with or without using loops. Do it in both ways just to practice.

12) Write a function that takes an integer parameter (say N) and displays the positive powers of 2 that are smaller than N . For example if N is 3000, then the function displays

1 2 4 8 16 32 64 128 256 512 1024 2048

13) Use only unsigned integers in this question.

In a program

Write a function that takes a volume value in cubic meters as parameter and displays its equivalent in cubic centimeters (one cubic meter = 1,000,000 cubic centimeters)

In main, input the cubic meter information and call the above function to display this volume in cubic centimeters. Before calling the function, check the input so that the result should not overflow. To perform such a check, first you should calculate the maximum value for the cubic meters input and then enforce the input in that limit.

14) Write a program that reads a string from keyboard and displays the characters between the last two commas of that string. Do not display the commas. If the input string has only one comma, then display all the characters after it. If the string does not have any commas, then display the whole string.

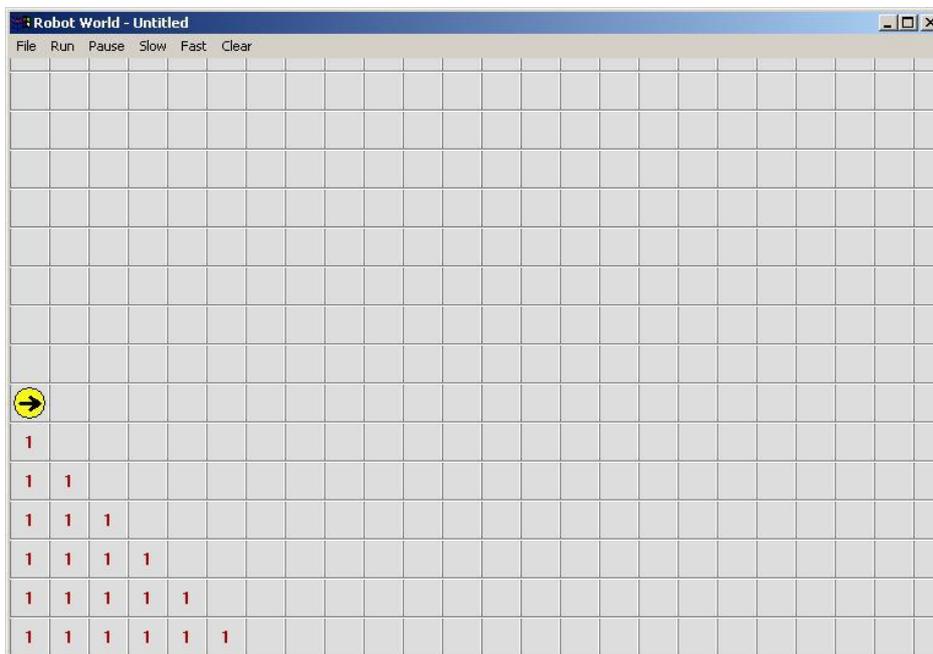
You can write this program with or without loops. Do it in both ways just to practice.

15) Write a function that takes three string parameters (let's call them `s1`, `s2` and `s3`) and replaces all of the occurrences of `s2` in `s1` with `s3`. The function should return the resulting string. For example, if `s1` is "hatasiz sinav olmaz, hatamla sev beni", `s2` is "hata" and `s3` is "kopya", then the function returns "kopyasiz sinav olmaz, kopyamla sev beni".

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16) Write a program that creates two robots at locations (0,0) and (0,1) respectively. Then set the color of the first robot to red and second one to yellow (you can't use other colors, otherwise you'll get zero from this question ☺). After that, the robots should move up to (10,10) and (10,11) in harmony. During this journey, the robots should (i) remain at most one cell apart, (ii) follow the diagonal as much as possible. That means, the robots should make a sequence of single steps of moving up and right. You may assume that there are no walls other than world boundaries, but, of course, the robots should not hit into each other.

17) In this program you will draw a triangle using robot class and its "things". Read an input value to determine the bottom line length of the triangle. Start from (0,0), then draw triangle by putting only one thing on each cell. The example output is below, for the given number = 6. Of course, your program should work for any input value, not only for 6. Do not forget to deposit necessary amount of things into the robot's bag while creating it; if the robot's bag is empty, it cannot put a thing in a cell.



18) (This question is a bit long for being an exam question but do it just to practice)
Write a program using robot class. In this program there is a robot which travels all around the robot world to find a bomb designated with a thing. The bomb can be anywhere, which is put by the user of the program using a mouse click. Once the bomb is found, your program should display a message and quit. The robot will sense the bomb when it is on the cell with the bomb.

Robot will be created at (0,0).

You can implement several search routines for the robot to find the bomb. However, your search algorithm should guarantee finding it. That means you should use an algorithm that eventually visits all the cells. Since the east and north sides of the robot world is unbounded, this is not an easy task. An algorithm is given below.

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Assuming the robot is initially at 0,0 and facing east:

```
k = 1
while (bomb is not found)
{
    Move 1 step and check
    Turn Left
    Move k steps and check at each step
    Turn Left
    Move k steps and check at each step
    Turn Right
    Move 1 step and check
    Turn Right
    Move k +1 steps and check at each step
    Turn Right
    Move k +1 steps and check at each step
    Turn Left
    k=k+2
}
```

19) Write a function, called findPVvalue, to calculate and return the $p(x,n,p)$ given below. x is a parameter of type double, n and p are parameters of type int.

$$p(x, n, p) = \prod_{i=3}^n x * \left(\sum_{j=i}^p |x - j^2| \right)^i$$

20) Write a program that reads a 200 integer numbers and counts the total number of positive numbers among them.

21) Write a program that reads a string from keyboard and displays the alphabetically largest uppercase letter in it.

22) We have seen a palindrome check function in class. Rewrite the palindrome check function, but this time without reversing the parameter string.

Hint: in a loop, check the letter pairs that must be the same to be a palindrome.

23) Write a program in which first create a robot at 0,0 position facing east and empty bag. Then move the robot diagonally to (1,1), (2,2), (3,3) ... Since there is no diagonal move function in Robot class, you have to move one step up and then one step right for a single diagonal move. While moving, the robot should pick everything only on the diagonal cells.

The robot should stop on the cell in which the total number things picked starting from the beginning of the journey exceeds 100.