

**National Tsing Hua University
Electrical Engineering Dept.,
Fall Semester, 2019**

EE-2310 計算機程式設計 (Introduction to Programming)

Homework #1 (3 points)

**Due on Oct. 3, 2019 @ the Lab Session
Late Homeworks will NOT be accepted !**

1. Write a C++ program to solve the following temperature conversion problem ($^{\circ}\text{C}$ to $^{\circ}\text{F}$). Demonstrate the result to a TA.

(Problem):

- (1) Ask the user to enter a temperature degree in Celsius ($^{\circ}\text{C}$).
- (2) Convert the given temperature in Celsius into a degree in Fahrenheit ($^{\circ}\text{F}$).
- (3) Display the following test result of your program by entering 38 as the degree in Celsius. Note that you have to show your result in decimal using only 1 significant digit in the fractional part.

(Test results to be displayed on the screen):

Please enter a temperature degree in Celsius: 38

38.0 $^{\circ}\text{C}$ is equivalent to 100.4 $^{\circ}\text{F}$.

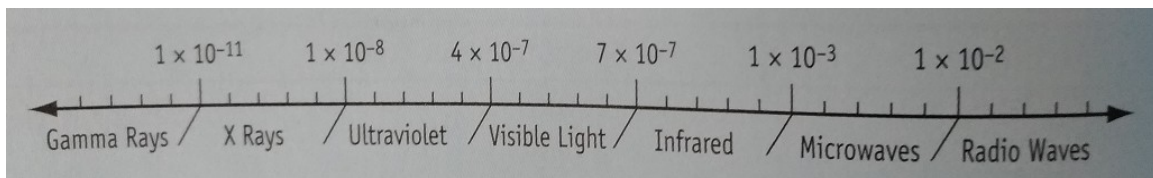
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Homework #2 (3 points)

Due on Oct. 17, 2019 @ the Lab Session
Late Homeworks will NOT be accepted !

1. If a scientist knows the wavelength of an electromagnetic wave, he/she can determine what type of radiation it is. Write a C++ program that asks for the wavelength in meters of an electromagnetic wave and then displays what that wave is, according to the following chart. (For example, a wave with a wavelength of 1E-10 meter would be an X-ray).



(Problem):

- (1) Ask the user to enter the wavelengths of three different electromagnetic waves in meters.
- (2) In your program, calculate the type of each of the three electromagnetic waves.
- (3) Display the following message with your results (as an example):

Please input three wavelengths in meters:

5E-7

0.4

0.003

The first electromagnetic wave with a wavelength of (5.0E-007) meter is a (Visible Light).

The second electromagnetic wave with a wavelength of (0.400) meter is a (Radio wave).

The third electromagnetic wave with a wavelength of (0.003) meter is a (Microwave).

Hint: You can use the following functions as examples to adjust the output format of a floating-point number.

printf("x is %.1e \n", x); // x will be printed in scientific notation, with 1 fractional digit in the significand.

printf("y is %.3f \n", y); // y will be printed in a fixed-point notation, with 3 fractional digits.

```

#include <iostream>
#include <stdio.h>
#include <windows.h> // for Beep()
#include <unistd.h> // for usleep()
#include <conio.h> // for _getch()
// #include <ctype.h>

using namespace std;

int main()
{
    /*--- Musical Notes of Increasing Pitches ---*/
    double pitch[]={
        0, 523.3, 587.3, 659.3, 698.5, 784.0, 880.0, 932.3, 987.8
    };
    int music[] = {5, 3, 3, 0, 0, 0, 4, 2, 2, 0, 0, 0, 1, 2, 3, 4, 5, 5, 5, 0, 0, 0,
        5, 3, 3, 0, 0, 0, 4, 2, 2, 0, 0, 0, 1, 3, 5, 5, 1};

    /*--- play the music defined in music[] automatically ---*/
    for(int t=0; t<39; t++){
        if(music[t]==0) usleep(150000); // sleep for a while without making any sound
        else Beep(pitch2[music[t]], 400); // Beep for a musical note
    }

    /*-----*/
    /*--- Add program segment here to turn your keyboard into a musical instrument ---*/
    /*-----*/

    return 0;
}

```

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Homework #3 (3 points)

Due on Oct. 31, 2019 @ the Lab Session
Late Homeworks will NOT be accepted !

1. Write a C++ program to turn your keyboard into a musical instrument by finishing the incomplete program code segments posted in our iLMS system. (Note you can define your own note when pressing a key in your keyboard, as long as you can play the following musical segment in “numbered musical notations” (簡譜). (Demonstrate it to one of your classmates or friends, and then tell one of our TAs that you are done with this homework, and then you can get the 3 score points).

小 蜜 蜂

| 5 3 3 - | 4 2 2 - | 1 2 3 4 | 5 5 5 - |

嗡嗡嗡嗡 嗡嗡嗡嗡 大家一 起 勤作工

| 5 3 3 - | 4 2 2 - | 1 3 5 5 | 1 - - - |

嗡 嗡嗡 嗡嗡 別做 懶惰 蟲

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Homework #4 (3 points)

Due on Nov. 21, 2019 @ the Lab Session
Late Homeworks will NOT be accepted !

Source: [Online Judge – The Hotel with Infinite Rooms](#)

Problem: The city of **HaluaRuti** has a strange hotel with infinite rooms. The groups that come to this hotel follow the following rules:

- (a) At the same time only members of one group can rent the hotel.
- (b) Each group comes in the morning of the check-in day and leaves the hotel in the evening of the check-out day.
- (c) Another group comes in the very next morning after the previous group has left the hotel.
- (d) A very important property of the incoming group is that it has one more member than its previous group unless it is the starting group. You will be given the no of members of the starting group.
- (e) A group with n members stays for n days in the hotel. For example, if a group of four members comes on 1st August in the morning, it will leave the hotel on 4th August in the evening and the next group of five members will come on 5th August in the morning and stay for five days and so on.

Given the initial group size you will have to find the group size staying in the hotel on a specific day.

Input

The input contains round numbers S ($1 < S < 10000$) and D ($1 < D < 10^{15}$) in every line. S denotes the initial size of the group and D denotes that you will have to find the group size staying in the hotel on D -th day (starting from 1). All the input and output integers will be less than 1015. A group size S means that on the first day a group of S members come to the hotel and stays for S days then comes a group of $S + 1$ members according to the previously described rules and so on.

Output

For each line of input, print on a single line the size of the group staying in the hotel on the D -th day.

Sample Input

1 6
3 10
3 14
[20 10000](#)

Sample Output

3
5
6

[\(display the result of your program here for the input of <20, 10000>\)](#)

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Homework #5 (3 points)

Due on Dec. 5, 2019 @ the Lab Session
Late Homeworks will NOT be accepted !

Source: [Online Judge – Decode the Mad Man](#)

Problem: Once in BUET, an old professor had gone completely mad. He started talking with some peculiar words. Nobody could realize his speech and lectures. Finally the BUET authority fall in great trouble. There was no way left to keep that man working in university. Suddenly a student (definitely he was a registered author at UVA ACM Chapter and hold a good rank on 24 hour-Online Judge) created a program that was able to decode that professor's speech. After his invention, everyone got comfort again and that old teacher started his everyday works as before. So, if you ever visit BUET and see a teacher talking with a microphone, which is connected to a IBM computer equipped with a voice recognition software and students are taking their lecture from the computer screen, don't get thundered! Because now your job is to write the same program which can decode that mad teacher's speech!

Input

The input file will contain only one test case i.e. the encoded message. The test case consists of one or more words.

Output

For the given test case, print a line containing the decoded words. However, it is not so hard task to replace each letter or punctuation symbol by "the two immediately to its left" alphabet on your standard keyboard. (Note that **circular shifting in the same row** will be applied when there is an out-of-boundary situation. For example, letter 'a' will be replaced by 'z', and letter 's' will be replaced by 'r').

Sample Input

k[r dyt I[o
zubiteqw iwudw;bbyvd y' stv

Sample Output

how are you
(Display the decoded words by your program here)

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Homework #6 (3 points)

Due on Dec. 19, 2019 @ the Lab Session

Late Homeworks will NOT be accepted !

1. Write a C++ program to find the **median element** in an array of complex numbers in terms of their **magnitudes**. Note that the magnitude of a complex number ($a + jb$) is represented by the distance from the origin in an Argand diagram (<http://mathworld.wolfram.com/ArgandDiagram.html>).

- Define a **class of complex number** with the following attributes, and define whatever public member functions you feel appropriate.

```
class complex_number {  
    private:  
        double re, img;  
    public:  
        // Define whatever member functions you feel appropriate  
};
```

- Try to assign the following 7 complex numbers into an array, say A[7], using some member function of the class of “complex_number”.
2+j7 4+j0 9+j4 8+j8 2+j4 5+j5 3+j2
- Apply your program to produce the following outcome on the computer screen.

Original Array of Complex Numbers:

2+j7 4+j0 9+j4 8+j8 2+j4 5+j5 3+j2

The Median Element of the Array is: 5+j5

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Homework #7 (3 points)

Due on Jan. 2, 2020 @ the Lab Session
Late Homeworks will NOT be accepted !

1. Write a C++ program to **find out the top 10 words in terms of number of appearances in a given file, named “*picasso.txt*”**. The data file is to be downloaded from iLMS system (<http://lms.nthu.edu.tw>). (Hint: The most efficient way to handle this problem is to build a **word dictionary** using class **map** in STL (Standard Template Library) if you know how to do it. On the other hand, without using **map**, it is still possible to solve this problem using only class **vector** in STL.)
(Demonstrate it to one of your classmates, and then tell one of our TAs that you are done with this homework, and then you can get the 3 score points).

(Results to be reported)

Total no. of lines: 11

The total number of words in “*picasso.txt*”: 674

The 0-th frequent word is (the) with no. of appearances (87)

The 1-th frequent word is (of) with no. of appearances (61)

The 2-th frequent word is (and) with no. of appearances (48)

The 3-th frequent word is (in) with no. of appearances (45)

The 4-th frequent word is (a) with no. of appearances (38)

The 5-th frequent word is (to) with no. of appearances (28)

The 6-th frequent word is (Picasso) with no. of appearances (18)

The 7-th frequent word is (was) with no. of appearances (17)

The 8-th frequent word is (by) with no. of appearances (16)

The 9-th frequent word is (is) with no. of appearances (15)

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Homework #8 (3 points)

**Due on Jan. 16, 2020 @ the Lab Session
Late Homeworks will NOT be accepted !**

1. Write a C++ program to solve the following multiple-input Greatest Common Divisor problem.
(Problem)
 - (1) Specify five integer numbers {102, 340, 153, 187, 425} in an integer array, say A[5].
 - (2) Develop a **recursive function** to find the GCD (Great Common Divisor) of two given integer numbers.
 - (3) Use the above recursive function iteratively to find the GCD of the above five integer numbers in A[5].

(Results to be displayed on the screen):

Hello world!

The Final GCD of {102, 340, 153, 187, 425} is: <u>display your result here