Computer Programming
Monsoon Semester 2012
Assignment - 2

[Note: The number of test cases, T, will be indicated by a single integer in the first line for all questions]

1. Program: Multiplication table of a given number (Level: Very Easy)

Write a program to display the multiplication table of a given number.

Input:
1
4
Output: (No spaces)
4*1=4
4*2=8
4*3=12
4*4=16
4*5=20
4*6=24
4*7=28
4*8=32
4*9=36
4*10=40

2. Program: Pyramid construction (Level: Medium)

Write a program to display a pyramid structure for a given number as follows

Input:
2
3
5
Output:
```
    0
  1 0 1
2 1 0 1 2

        0
      1 0 1
    2 1 0 1 2
  3 2 1 0 1 2 3
4 3 2 1 0 1 2 3 4
```

3. Program: Diamond structure (Level : Medium)

Write a code to print diamond using symbol (*) for a given number as follows

Input:
2

3
5
Output:

```
  *
 ***
*****
 ***
  *
    *
   ***
  *****
 *******
*********
 *******
  *****
   ***
    *
```

4. Capitals (Level : Easy)

Write a program that takes a string as an input (upto new line character) and prints the output string in capital letters

Input:
3
This is a SIMPLE example.
Are you going outside ?
Take an “apple” every day !!

Output:
THIS IS A SIMPLE EXAMPLE.
ARE YOU GOING OUTSIDE ?
TAKE AN “APPLE” EVERY DAY !!

5. Simple Calculator (Level: Easy)
Write a program which do simple calculations using the four basic math operations given two numbers
Operations: addition/subtraction/multiplication/division

Input - real numbers
Output - print up to 2 values after decimal point (round to nearest value)

Input:
3
12*10
18/5
12.3466 + 32.43
Output:

120.00
3.60
44.78

6. Butterfly structure (Level: Difficult)
Write a program to print the butterfly for a given odd number as follows:

Input:
2
5
13
Output:

```
1       1
1 0   1 0
1 0 1 0 1
1 0   1 0
1       1

1                       1
1 0                   1 0
1 0 1               1 0 1
1 0 1 0           1 0 1 0
1 0 1 0 1       1 0 1 0 1
1 0 1 0 1 0   1 0 1 0 1 0
1 0 1 0 1 0 1 0 1 0 1 0 1
1 0 1 0 1 0   1 0 1 0 1 0
1 0 1 0 1       1 0 1 0 1
1 0 1 0           1 0 1 0
1 0 1               1 0 1
1 0                   1 0
1                       1
```

7. Calculation of e^x (Level: Easy)

Write a program to calculate e^x up to four decimal precision

Input:
2
3
5
Output:
20.0855
148.4131

8. Program: Representation of n in base b (Level: Medium)
Given two numbers n and b, print the representation of n in base b without any leading zeroes.
The digits are to space separated.
The number of test cases, T, will be indicated by a single integer in the first line.
Each of the next T lines will contain two space separated integers.

1<=T<=100
2<=b,n<=10**9
Time Limit: 1 second

Input:
2
4001 15
17 5

Output:
1 2 11 11
3 2

Explanation for first test case: (15^0 * 11 + 15^1 * 11 + 15^2 * 2 + 15^3 * 1) = 4001

9. Program: Polynomial function (Level: Medium)
Given two numbers x and y and a polynomial function of degree n,
f(x)=ax**(n) + bx**(n-1) + … + rx+s
find (f(x)+f(y))%1000000007

The number of test cases, T, will be indicated by a single integer in the first line.
The next line contains two space separated integers, x and y.
Each of the next T lines will begin with an integer n, the degree of the polynomial followed by (n+1) integers, each between 0 and 10**9. The coefficient of the highest degree term is given first.
0<=x,y<=10**9
1<=T<=100
0<=n<=1000
Time limit: 1 second
Input:
1
3 2
2 2 5 7

Output:
65
Explanation: f(x)=2*x*x+5*x+7

10. Program: Set bits in a number (Level : Easy)
Write a program to count number of set bits(1's) in a number

Input:
2
10
15

Output:
2
4

Explanation for first test case: 10 = 1010 => number of 1's = 2