



# **AMERICAN INTERNATIONAL UNIVERSITY - BANGLADESH**

## **DEPARTMENT OF COMPUTER SCIENCE**

### **Freshers' Programming Contest**

**Date: 13 February, 2014**

## A. Alchemy Circle

Edward Elric is world renowned state alchemist also known as the Full Metal Alchemist. Regular alchemist needs transmutation circles to perform alchemy of equivalent exchange. Unlike regular alchemists, Edward has the ability to create alchemical currents in his body simply by connecting his hands. But as a matter of practice, sometimes he uses transmutation circles. One day, you, the great otaku programmer, and Edward Elric were sent to a secret mission and Edward will use transmutation “square-circle” this time to perform alchemy.

A “square-circle” is defined as “largest square inside a circle”. Edward only knows the area of the square, but unable to figure out the area of the circle. As his mission partner, he wants your help.

### Input:

Input starts with an integer **T** not more than 100, represents the number of test cases followed. Each test case includes a non-negative integer **S** less than 1000, represents the area of the square.

### Output:

For each test case, first print the case number then print the area of the circle as “**Case x: C**” without the quotes where **x** is the case number and **C** is the area of the circle. The area of the circle must be printed upto 3 decimal point.

Sample Input	Sample Output
2	Case 1: 7.854
10	Case 2: 9.425
12	

## B. BatMobile

The BatMobile is the automobile of superhero Batman. Batman is testing the acceleration of BatMobile. As his best friend and greatest programmer, Batman wants your help. He gives you the initial and final velocity of the BatMobile in meter per second and time period in seconds. He wants to know the displacement of the BatMobile.

### Input:

Input starts with a positive integer **T** (  $T \leq 100$  ), represents the number of test case. Then each of the next T lines contains three real numbers **u, v, t** (  $0 \leq u, v, t < 100$  ) separated by space, where **u, v** and **t** represents initial velocity, final velocity and time period respectively.

### Output:

For each test case, first print the case number then print the area of the circle as “**Case x: s**” without the quotes where **x** is the case number and **s** is the displacement. Displacement must be printed upto 3 decimal point.

Sample Input	Sample Output
2 4 8 2 3 12 2	Case 1: 12.000 Case 2: 15.000

## C. Car Broker

Shawkat is a service holder in a renowned bank. He is a bit greedy of money. So he became a car broker. He always searches for the car owners who will sell the car and buyers. For each car sell he conducts, he gets the amount of money. This amount depends on the amount of money paid by the buyer and the amount of money owner asked. As the rule of life sometimes he loses too.

Now, you are given a number of data about the cars that have been sold by Shawkat. For each transaction you have to say whether Shawkat gains or loses money and the amount.

### Input:

Input starts with a single non-negative integer  $T$  ( $T \leq 10^3$ ), represents the number of car sell/buy. For each of the car sell/buy, there will be two lines of input. The first line will contain: "**Owner gets: Tk. A** ( $1 \leq A \leq 10^{10}$ )" and the second line will contain: "**Buyer pays: Tk. B** ( $1 \leq B \leq 10^{10}$ )".

### Output:

For each of the transactions you have to print either "**Shawkat gains: Tk. X**" or "**Shawkat loses: Tk. X**" in a single line. There should be one blank line between every two line of output.

Sample Input	Sample Output
2 Owner gets: Tk. 3000 Buyer pays: Tk. 4000  Owner gets: Tk. 10000 Buyer pays: Tk. 11000	Shawkat gains: Tk. 1000  Shawkat gains: Tk. 1000

## D. Discovering Triangle

Diban Jaetmi is a great mathematician who just won the Mathematics Olympiad. But in the Olympiad he was unable to solve a problem where there will be given **N** points in the two dimensional plane (points described in **x** and **y** coordinates) and the problem was to find out how many separate triangles can be made by them. Now Diban wants to know how to solve the problem. So he went to Rim Nayir who is a great scientist to ask for the solution. But Rim Nayir is a very busy scientist. So as you are a very famous programmer and know a lot about geometry, Rim referred you to come to you. Now Diban has come to you and wants you to write a computer where he will input **N** points and the program have to say how many different triangles can be made with those points.

### Input:

The first line of input is the number of times **T** ( $T \leq 100$ ) you have to repeat the operation. Each input set of **T** operations consists of an integer **N** ( $3 \leq N \leq 100$ ) which is the number of points in the 2D plane and after that in every **N** lines you will be given two integers denoting **x** and **y** coordinate of a point. You can assume that no particular point comes twice in the input set and the range of **x** and **y** is  $[-2000, 2000]$ .

### Output:

For each input set you have to print a line saying "**Test C: D**" where **C** represents the test number and **D** represents the number of triangles that can be made. See the sample below for more help.

Sample Input	Sample Output
2 4 -5 -2 0 4 1298 500 19 -53 3 0 0 1 0 1 1	Test 1: 4 Test 2: 1

## E. Exchange of Numbers

For a long time people are trying to go to Mars, the fourth planet in our solar system. After long hard work our space agency finally reached there in Mars. There they meet the aliens who look exactly like the humans. So the people of earth talked with them for a long time to know about them. When they were talking about the number system of each other people of earth came to know some strange thing. The aliens always use number of base 14 in their number system and another strange thing is that they always read the numbers reversely. As example, if we want to represent a decimal number **518062** of our world to the number of the aliens, at first we have to convert it to a base 14 number which is **D6B26** and then we have to reverse the number which is **62B6D**.

Now, as you are a great programmer, you have got the great job to write a program which will convert our numbers to theirs. For your information, base 14 digits are **0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C and D**.

### Input:

The first line of input is the number of times **T** ( $T \leq 1000000$ ) you have to repeat the operation. In the next each **T** lines you will get a decimal number **N** ( $N \leq 1000000000$ ) which you have to convert to the number of Mars.

### Output:

For each input you have to print a output which represents the number converted in Mars number system. See the sample below for more help.

Sample Input	Sample Output
3	62B6D
518062	21
16	002
392	

## F. Feven or Fodd

Badhon is very curious about numbers. He always asks his teacher about big numbers, whether they are even or odd. One day Badhon's teacher got angry on him. So, he started thinking to give him a wired problem about even and odd.

Suddenly Badhon's teacher got an idea. He called him and told a complicated rule of finding the even and odd characteristic of a number. He described such that, Badhon should add all the digits of the given number repeatedly till the sum of digits becomes less than 10. Finally if the repeated sum of the digits is even he should tell "feven" and if the sum of digit is odd he should tell "fodd". So, Badhon fell into a great problem and finds you, the greatest programmer the world could imagine till now.

Now, Badhon will give you several numbers and you have to tell whether it is "feven" or "fodd" according to the rule described by the teacher. (Explanation is given at the end)

### Input:

Input starts with a single non-negative integer  $T$  ( $T \leq 10^3$ ), represents the number of times Badhon will get a number. Each of the next  $T$  lines will contain the number  $N$  ( $1 \leq N \leq 10^{10}$ ) given to Badhon.

### Output:

For each of the input you have to print "**Test X: feven**" or "**Test X: fodd**" as the problem description in a single line where  $X$  represents the serial number of the tests given to Badhon.

Sample Input	Sample Output
2 6666 9999	Test 1: feven Test 2: fodd

### Explanation:

Let the given numbers are 8484 and 1495. The sequence of operations will be –

- $8484 \rightarrow (8 + 4 + 8 + 4) = 24 \rightarrow (2 + 4) = 6$   
Since,  $6 < 10$  and even, output will be "feven".
- $1495 \rightarrow (1 + 4 + 9 + 5) = 19 \rightarrow (1 + 9) = 10 \rightarrow (1 + 0) = 1$   
Since,  $1 < 10$  and odd, output will be "fodd".

## G. Get Expanded

FBI (Football Bureau of Investigation) has revealed a secret that Chelsea manager Jose Mourinho punishes Juan Mata in a different way. Mourinho knew that Mata is very bad at math. So Mourinho wanted to punish him with his nightmare math. After each match of Chelsea, Mata had to expand an algebraic expression of large degree and say the coefficient of a definite term if he failed to play good.

Now a days Mata can't score in almost every matches and after the tiring match he has to solve the problem given by his manager. Mata has to expand the expression  $(a + b)^n$  where Mourinho gives the value of  $n$  and another value  $k$ .

Now, he came to know about you that you are a very good programmer. He wants you to write a code which will generate the coefficients of the terms of the expanded expression and show the coefficient of a desired term when the value of  $n$  and  $k$  will be given as input. Please, keep in mind that the terms of the expanded expression is indexed starting from 1.

### Input:

The first line of input will be an integer  $t$  ( $1 \leq t \leq 10^3$ ). Each of the next  $t$  lines will contain two non-negative integer  $n$  ( $n \leq 50$ ) and  $k$  ( $1 \leq k$ ).

### Output:

For each  $n$ , print a lines containing "**Case x: y**" without the quotes, where  $x$  is the case number and  $y$  is the coefficient of the  $k^{\text{th}}$  term of the expanded expression. If there is no  $k^{\text{th}}$  term, print "**Mata :)**" without the quotes replacing  $y$  in the output. Check the samples and explanation for clarity.

Sample Input	Sample Output
2	Case 1: 2
2 2	Case 2: 3
3 3	