Codeo and Cooliet

-----Official Problem Set-----

PLEASE DO NOT OPEN THIS PACKET UNTIL EXPLICITLY INSTRUCTED TO DO SO

Please note:

- Problems may be completed in any order.
- Read input from the keyboard via System.in
- The problems have differing point values. This means that some will add more points to your overall score than others, that is, if a correct solution is submitted.
- Your submissions should not print extraneous output.
- Good luck!

Or Not

(3 pts)

The famous Shakespeare quote “To be or not to be, that is the question…” comes from the play *Hamlet*. The quote marks the beginning of Hamlet’s monologue as he contemplates whether or not it’s worth it to endure the suffering of life. I don’t know about being or not being, but there are plenty of things and actions that can be contemplated. Let’s write a program to do that contemplation for us.

Input:

On the first line will be an integer K denoting the number of lines to follow. Each of the next K lines will contain a single verb.

Output:

For each verb, use that verb to substitute for “be” in the quote, “To be or not to be.”

Sample Input:

```
3
code
debug
compete
```

Sample Output:

```
To code or not to code.
To debug or not to debug.
To compete or not to compete.
```

Romance

(4 pts)

Oh, to be in love! Codeo and Cooliet, united by their love of computing, wish to express their affections for one another over SMS. Help them to send each other an ascii heart!

Input: NONE

Output:
Exactly print the ascii art of a heart as below.

Sample Output:

```
 _  _
/ \/ \
\    /
 \  /
  \/
```

Odd-thello

(6 pts)

Othello, in *Othello*, faces some troubles. His 2nd-in-command general Iago attempts to convince him that his wife is cheating on him! Before Othello can jump to any conclusions though, he needs to evaluate the evidence. In this problem, an odd number represents evidence that condemns his wife Desdemona, and an even number represents evidence that indicates her faithfulness. Given several numbers, determine whether or not Desdemona is loyal. Adding the odd numbers and subtracting the even numbers, she is faithful if the final sum is zero or positive, and she is unfaithful if the sum is negative. (zero is considered even)

Input:

On the first line will be an integer T, the number of test cases to follow. For each test case, there will a line containing an integer N, the number of evidence numbers for that case with the next N lines each containing an evidence number.

Output:

For each test case, print out “FAITHFUL” if Desdemona is true to Othello and “UNFAITHFUL” if she is not :(

Sample Input:

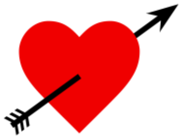
```
2
3
67
344
89
4
45
23
56
19
```

Sample Output:

```
UNFAITHFUL
FAITHFUL
```

Love Notes

(9 pts)



Codeo and Cooliet find themselves in a forbidden relationship. They can rarely meet together and communication is otherwise difficult becaues they must keep their relationship seecret from their families. However, Codeo and Cooliet being computer scientists, believe that they can use encryption to pass along their messages over SMS. They know of a basic encryption cipher called a "shift cipher" in which each character in a message is transformed into another by hopping a certain number of positions down (forward) in the alphabet. Help them write a program to accomplish this.

Input:

There will be several lines of input terminated by an end of file. Each line of input will contain a number indicating how far to shift for the shift cipher followed by the secret message to be encrypted.

Output:

For each message, print out a line with its encrypted form.

Sample Input:

```
3 abcdefg
1 zabc
```

Sample Output:

```
bcdefgh
abcd
```

Oct-thello

(10 pts)

The name of this problem exists to make a necessary pun. However, this problem is about *Hamlet*. Not to spoil any details but *Hamlet* ends in gruesome violence and lots of death. Most people would consider death to be pretty not safe. You know what are safe? Octagons. Stop signs are a universal symbol for safety (at least I'm pretty sure). Okay, so print me some octagons.

Input:

The only line of input will contain an unknown number of positive integers in the range [5,15]. The integers will be separated by a single space.

Output:

For each integer n input, you will print a regular octagon with each side of the octagon having n x's as shown below. Print a blank line after each octagon.

Sample Input:

```
6 7
```

Sample Output:

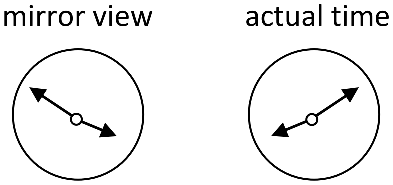
```
     xxxxxx
    x      x
   x        x
  x          x
 x            x
x              x
x              x
x              x
x              x
x              x
x              x
 x            x
  x          x
   x        x
    x      x
     xxxxxx

      xxxxxxx
     x       x
    x         x
   x           x
  x             x
 x               x
x                 x
x                 x
x                 x
x                 x
x                 x
x                 x
x                 x
 x               x
  x             x
   x           x
    x         x
     x       x
      xxxxxxx
```

Mirror Mirror

(13 pts)

Our dear Codeo and Cooliet are seeking to meet up somewhere in secret as they often do. They have agreed to meet in the garden at a certain time, and Cooliet cannot bear to be late. However, Cooliet doesn't actually have a clock in her bedroom. There does happen to be a clock at a weird angle outside of her bedroom window, but the only way to read it is by holding up a mirror and reading the time that way. You can imagine that with our happy couple's secret dates, it can get tedious having to read a clock in a mirror. Cooliet has to mentally flip the clock to even read it. Take this example: In the mirror, when the clock looks like it is 3:48, the actual time is 8:12.



Write a program to help Cooliet translate her mirror view of a clock into the actual time, so that she can be punctual when meeting her beloved Codeo!

Input:

The first line of input will contain a single integer N that indicates the number of mirror times to follow. Each of the following N lines will contain a time in the form hh:mm as seen in the mirror (leading zeros in hour time will be omitted).

Output:

For each mirror time input, print the actual time in the form hh:mm with no leading zeros for hours.

Sample Input:

```
5
3:48
8:27
10:30
1:23
5:00
```

Sample Output:

```
8:12
3:33
1:30
10:37
7:00
```

Taming

(13 pts)

In Shakespeare's *The Taming of the Shrew*, Petruchio must "tame" his stubborn and disagreeable wife Katherina. In order to better understand Petruchio's struggle, let's compare *The Taming of the Shrew* to "the taming of the math equation". Surely we all remember being faced with long mathematical equations in school and being forced to use our knowledge of the order of operations in order to drudge our way through the calculations. Now let's take that memory and make it even worse by writing a program to automate that process for us. Evaluate a mathematical expression based upon the PEMDAS order of operations that states that multiplication/division happens before subtraction/addition.

Input:

The first line of input will contain a single integer Q that indicates the number of expressions to follow. The next Q lines will each contain a mathematical expression consisting of integers separated by operators (+ or – or * or /)

Output:

Output the integer answer for each expression.

Sample Input:

```
3
5 + 2 * 7 - 31
12 / 3 * 8 + 1
27 - 6 + 2 * 11 - 19
```

Sample Output:

```
-12
33
24
```

Family Ties

(16 pts)

Imagine that Codeo and Cooliet aren't the tragically doomed characters that we know them to be. Rather, this time they get to live out a happy ending. Codeo and Cooliet elope and then eventually move back to their hometown of Verona where they would like to live close to all of their Montague and Capulet relatives. They would like to minimize the total distance to all of their relatives when deciding which street they would like to live on. Please write a program to help them decide where to live.

Input:

The first line contains the number of test cases. For each test case there will be a single line. On that line, the first integer R will indicate the number of relatives. Followed by that, there will be R number of integers, each indicating the street number S_i where a relative lives.

Output:

For each test case your program must write the minimal sum of distances from the optimal Codeo and Cooliet's new house to each one of their relatives. The distance between two street numbers $|S_j - S_k|$.

Sample Input:

```
2
2 2 4
3 2 4 6
```

Sample Output:

```
2
4
```

Dream Castle

(23 pts)

Continuing with the idea that Codeo and Cooliet aren't tragically doomed, let's imagine that the future married couple wants to build their dream home of a castle. They are looking at different architectural designs for this dream castle, but the most important thing to Codeo and Cooliet about their home is that the rooms in it have lots of space. Write a program to determine the volume of a room in their home, given the 3d plan for the home and a given point in the castle which gives the room we're standing in.

Input:

The first line contains the number of test cases. For each test case, there will be line containing R, C, and D, each respectively representing rows, columns, and depth. Following that line will be D different R by C grids. Each of the D grids will have R rows and C columns, each of which will contain either a "." or a "#". That was the house blueprint. Following that will be three integers, X, Y, and Z which will denote the starting location by row, column, and depth. For these numbers, indexes start from 0 and the house blueprint is also giving starting from a 0 index in all of its axis. The starting location will always be located on a ".".

Output:

For each test case, output the size of room containing the starting location. A "." indicates open space whereas a "#" indicates a wall. A room is terminated by surrounding walls. Walls cannot be bypassed diagonally.

Sample Input:

```
1
4 4 3
####
#...
#..#
####
###.
#..#
...#
####
..##
..##
####
##..
2 1 0
```

Sample Output:

```
14
```