S.A. Computer Olympiad
Second Round 2003

Q1. Tree

Prepared by Donald Cook

Description

Trees are common place but this one is indigenous to the forests of Timber-Crazy and is called the HashTree

Task

Your task is to write a program that will draw a timber hash tree of any size. The tree as shown in the figure has a slightly flat top and the height is exactly half of the width at the base. It is characterised by the short trunk that is the same size as the flat top, and its dot-like (**.**) leaves.
A tree of size 8:

```
   ##                <- Flat top
  #..#
 #....#
########             <- Width (size)
   ##                <- Short trunk
```

Constraints

The top and trunk are always 2 hashes wide. The height is half of the width at the base. The size is always described by an even number.

Input

Enter an even number for the size: 12

Output

```
      ##
     #..#
    #....#
   #......#
  #........#
############
      ##
```

Test your program with

a. 6	b. 20

Q2. Vowels

Prepared by: Bruce Merry (Gold Medalist)

Description

A simple way of shortening a word is to remove all the vowels. So for example, "The quick brown fox jumps over the lazy dog" becomes "Th qck brwn fx jmps vr th lzy dg".

This technique is often used in telephone directories.

Task

You must write a program that will take as input a string (of up to 255 characters) and print out the same string with the vowels removed. Vowels are A, E, I, O and U (do not count Y). You must remove both upper-case and lower-case vowels, without changing the case of the remaining characters. Do not change the spacing or punctuation of the output (e.g. if you remove the word "a" there will be a double space in the output which you must leave as is).

Example:

Enter a sentence: This is a test sentence.

Output

Ths s tst sntnc.

Test your program with:

(Be sure to include the punctuation, as otherwise your answer will be wrong).

a.	b.
`The quick brown fox jumps over the lazy dog.`	`Old McDonald had a farm, E-I-E-O-U.`

Q3. Tomato

Prepared By: Graham Poulter (Bronze Medalist)

Description

An interesting fact is that if one places some red tomatoes amongst unripe tomatoes, adjacent unripe tomatoes will start reddening.

Task

Suppose you have a row of N tomatoes, of which R are red. After each day, the unripe neighbours of each red tomato become red. Write a program that determines the number of red tomatoes after D days.

Contraints

1 <= N <= 200; 1 <=R <= 20; 1 <= D <= 30

Example

First the program reads the number of tomatoes N=10, the number that are ripe R=3, the number of days D=2 and then the positions (in the range 1...10 in ascending order) of the tomatoes that are red to begin with.

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Input

```
Enter number of tomatoes N: 10
Enter number of Ripe Tomatoes R: 3
Enter number of days D: 2
Enter position of Tomatoes in
ascending order: 1 8 9

What we calculate
```

1	2	3	4	5	6	7	8	9	10	positions
										original
R	x	x	x	x	x	x	R	R	x	Red tomatoes
R	R	x	x	x	x	R	R	R	R	After 1 day
R	R	R	x	x	R	R	R	R	R	After 2 days

Output

8

Test your program with

a. N=30 R=5 D=4
4 13 23 24 30

b. N=200 R=10 D=20
3 71 72 79 140 142
145 172

Q4. Fibonacci

Prepared by: Bruce Merry (Gold Medalist)

Description

The Fibonacci sequence is 1, 1, 2, 3, 5, 8, 13, ..., where each number
is the sum of the previous two. They occur in many unexpected places in nature, such as the patterns on pineapples and sunflowers.

Task

You must write a program that will calculate the last digit of the Nth Fibonacci number. For example, the 7th Fibonacci number is 13, so given an input of 7 your program must output the digit 3.

Example

Input

Enter N: 7

Output

The last digit of the Nth Fibonacci number is 3.

Test your program with

a. N = 8

b. N = 10000

Q5. Anagram

Prepared by: Bruce Merry (Gold Medalist)

Description

Alice and Bob are having fun with permuting the letters of words. A permutation is a rearrangement of the letters (also known as an anagram). For example 'computer' can be rearranged to form 'tpercumo' or 'ructpmeo'. Since there are so many ways that the letter can be rearranged, they have decided to make an alphabetical list:

1. cemoprtu
2. cemoprut
3. cemoptru
4. cemoptur
…
40318. utrpoemc
40319. utrpomce
40320. utrpomec

Task

While reading the list, Alice notices something interesting about one of the permutations, and writes down the number of the permutation. Later she wants to look at this permutation again, but realises that she has lent the list to Bob. Help Alice to determine which word went with the number she wrote down.

Take as input to your program the original word that Alice and Bob started with, and the number that Alice wrote down. The original word will be in lowercase and have no repeated letters.

Example

Input

Enter a word to use: computer
Enter Alice's number: 4

Output

Alice's permutation was cemoptur

Test your program with the following data

a. computer
12345

b. flowcharting
345678901