Problem 1:

Willblow Clingon has been the leader of the Untied Structs of Amaniacs for a long time now. He has overcome all odds so far with grace and dignity. But Ill winds are suddenly blowing out of the blue. A dangerous time for Clingon has come.

The earth has been attacked! And this time its not the politicians. It is from the evil race of the Stars. The attack is led by their ferocious leader Star Repoitre, who has already taken over the Internet. Along with him a horde of papparazi stars descended upon his capitol city of Wash-A-Ton. His home at Cap-A-Hill is under siege from these bloodthirsty vultures who wait for the tiniest of fleshy news to swoop upon in hordes. Each tyring to out do another.

Star Repoitre has unleashed his most lethal weapon which man has ever seen, upon Clingon. The Weapon -- Xus Acinom. This apparently harmless weapon, can evoke much damage when used in the right way. The weapon has destroyed the capability of all Cap-A-Hill computers to use any of the letters "boj wolb yxes" in their operations. Clingon, to save himself from the trecherous Star, must greet people all over the world to indicate that he is still their leader, and they have faith i n him. To do this he has to print "Hello World Wide Web" 1999 times. But the current state of his computers makes it hard. Your job is to help him out of this mess.

In short:

Write a C program which prints "Hello World Wide Web" 1999 times, each time on a new line. Your program should not contain any of the letters in the string "boj wolb yxes".

Problem 1:

Use recursion.

Problem 2:

Celebrations had not even startted. Our hero Willblow Clingon had not only successfully fended off the attack of Xus Acinom but also captured his arch enemy Studman Hussien. The stars were no longer against him. But little did he know that his worries were not yet over .

Date: July 4, 1999 A.D. Venue: Somewhere in the centre of Utah Desert.

In a small, dark, windowless room seats a short greying man. From his slumped posture and wrinkled face, he seems like a dejected and defeated man who has given up on life. But his eyes have a steely resolve. He is excited. His mind is racing faster than an Pentium II 333MHz. Meet Studman Hussien.

Today is the most important day in his life. He has aquired a new weapon, the Qutub-Ud-Allah. It will destroy the power of Willblow Clingon, and he will reign in supremacy. But there is one hitch. He is currently locked by the AIC up in a lone cell somewhere in the middle of Utah. To use the weapon, he has to be free. Using his intelligent sources, he has found out a way to escape from this place. He has found out the code number of the lock. It is 1.

The watch on his hand beeps. He comes out of his stupor, glances at the watch. It reads 14:30 GMT. Time to leave. He glances around. The AIC guard is sleeping. Rising swiftly on his feet he knocks the guard unconsious, and moves stealthily towards the door. On the door a number is flashing on the LCD display. There are two buttons. As soon as he touches a button, an alarm starts ringing. Studman panics. His time is running out. He soon finds out that one button reverses the number on the display and the other adds seven to it. He knows that somehow he has to get a 1 on the display as soon as possible, to unlock the door of his freedom. You are required to write a program which will help Studman out.

In short:
You are given a number N. You are just allowed two operations : adding 7, and reversing the number. Using only these operations any no. of times, transform N to 1.

The input is given on a single line by itself. The program should read it from the standard input.

The program should output the sequence of numbers which it takes to reach 1. The numbers should printed one per line, and should not include the starting number. 1 should be the last number in the output.

Sample Input:
25
Sample Output:
32
23
30
3
10
1

Algo 1: Add 7 till last digit is 0, and then reverse.
Take care about the no. 7
Algo 2: Repeat: Reverse no. if reversed no. is less than current no.
Add 7.
Until current no. is 1.

Problem 3:

Studman managed to break the lock. His only chance to avenge is now. Clingon
will be caught off guard in his celebrations.

His loyal band of kamakazi soldiers are ready outside the prison for him
to come out. They strike quick and fast. All the prison officials and
AIC agents are taken hostage.

The highly advanced capabilities of Untied Structs of Amaniacs turn ou t
to be a double edged sword. Having taken over the secret prison base,
with a press of a button he triggers off havoc all over USA. All of th e
military might crumbles down. Clingon having survived almost
insurmountable problems in past has a ironic and unexpected end.

Studman Hussien boards a plane full of spies taken as POW's(Prisoner o f
War). The poor spies had come from all over the world to train in the
latest skills.

Studman makes his way to I-ROCK safe and sound but his thirst for
revenge has not yet died down.

He decides to take all his revenge out on the POW's that he has
captured. Nobody came to his rescue when Clingon abused his power and
unilaterally decided to capture Studman. Studman will not spare anyone
.

He wants to lock up all the POW's. But there is a catch. His prison is

N by N cells, some of which are already occupied. He has divided his POW's in 4 groups according to how effectively they can communicate with
each other. Spies from 2 different groups can't talk to each other effectively but those within a group can. Studman wants to distribute them into his prison cell in such a way that no two adjacent cells hav e
spies of the same group. He cannot unlock and relocate prisoners who are
already inside some cell. You must come up with a distribution such that
no two adjacent cells have spies of the same group.

In Short:

Given a N by N grid. Some of its cells assigned a number from 1-4. Output a distribution of numbers in this grid such that no two adjacen t
cells have the same number. Note: Cells already assigned cannot be changed.

Input Format: The number N will be given first on a line by itself. This will be followed by the grid itself. The grid will be given as on e
row per line. For each cell the entry will either be a 0 to indicate that it is empty or the corresponding group no. (ie a value from 1 to 4)
of the spy occupying the cell.

Aim: to fill up the entire grid so that no two adjacent cells have the same number.

Output Format: The grid should be printed one row per line with the value of each cell seperated by 1 space.

BY ADJACENT we mean the cells share a common wall. Diagonally touching cells are *Not* considered adjacent.

Sample Input:
3
0 1 0
2 0 4
0 0 3

Sample output:

4 1 2

2 3 4
1 4 3

[A write up of the algorithm may come here.]

Problem 4.

French Air Base, Somewhere in middle of .

General Chirac de Pawai and his band of loyal hackers are monitoring all the Internet connections running in the globe. Suddenly a red bulb flashes on the keyboard of Colonel Greg Gueju. With immediate attention he records the interesting message that his pet machine Kine has detected. After the passing through the decoder the message reads as follows:

After scratching his head for long, he discovers, that the code is a C program which prints ZYXWVUTSRQPONMLKJIHGFEDCBA. Soon another message follows from the same source. This time the message reads ABCDEFGHIJKLMNOPQRSTUVWXYZ. As Chirac tries to trace the source of this funny message, he realises that this message has come from the Studman himself.

As soon as he realises of the severe implications of this message to the AIC, and also to his own position in the Department, he takes complete charge of the the situation. A high level intelligent team is setup under the command of expert programmer Lieutenant Cosh E.

Their aim to crack the hidden meaning which is implied by the message. They have finally concluded that there is an #include file missing, which holds the key to their success. On using the include file the output of the code will be transformed to the second message which Colonel Greg recieved. Your assignment is to help Lieut. Cosh E. in his mission. That include file is the key to success as it will equalize opposites.

In short:
Make a #include file which when added to the given code transforms the current output ZYXWVUTSRQPONMLKJIHGFEDCBA to the output

ABCDEFGHIJKLMNOPQRSTUVWXYZ.

```
        #define i j
OR      #define j i
OR      #define j j=i
```


Problem 5: Wind Tunnel

The winds of change are blowing fast. Willblow was succeeded by his long standing partner Hillarrow Rottenham Clingon. Hillarrow is slowly rebuilding USA from the ruins Studman hussien left it in. Hussein too is slowly rebuilding is empire. His wounds are healing and he recently started giving out small concessions to the POW's. They are now allowed to have lunch together in a common room. They are not allowed to converse during that time but they can always whisper to each other.

Being highly trained spies they plan to escape from the prison. Being highly skilled they also wish to use as little a time as possible to effectively spread the plans among themselves and to discuss them. The problem is that they are from different regions and not everyone can understand each other. Each spy can speak only 2 languages and no two spies speak the same set of langauges. However if they seat themselves in a certain order on the table it is possible for messages to go from one end to the other. Their is only one straight long table with seating possible on only one side. You have to figure out wether they can be seated in such a way that a message from one end can be transmitted to another.

In short:

You are given N people. Each person speaks exactly 2 languages. Arrange these people in a row such that every two adjacent persons speak the same language.

Input format: The number of spies is given on the first line by

itself.
 Then the languages spoken by each guy is given in order. Hence each line
 will have 2 numbers seperated by a blank representing the two languages
 that the corresponding guy can speak. Note: The numbering of spies start
 from 1 and *Not* 0
 The spies are in order.

 Output format : If there is a solution then you should print the order
 in which the spies should be seated. you should output their number
 seperated by a blank. Note: The numbering of spies is from 1 and *Not*
0

 If there is no solution then simply print "no" on a line by itself as
 the output.

 Sample input:
 5
 1 2
 2 4
 5 3
 3 1
 4 5

 One possible output: 1 2 5 3 4

 sample input 2 :
 4
 1 2
 2 4
 3 6
 7 8

 output: no

Our Algorithm:
        This is an NP-Hard problem. So our algorithm doesnt work for all
        cases, but works on 90% of the test cases.

        Convert the problem to a graph as follows:
        Let each "language" be a vertex, and there exists an edge between
        two vertices iff there exists a person speaking both those languages.
        The problem of finding a "wind tunnel" reduces to the problem

of
finding a dominating trail in this graph. A dominating trail i
n
a
graph is defined to be a trail on which every edge in the grap
h
is
incident. It is easy to see that a dominating trail will give
us a
solution as each edge not in the trail can be inserted at the
point
where it is incident.

Our algorithm is a simple backtracking algorithm that tries to

find
a dominating trail in a graph. You can bound the no. of levels

to be
investigated to bound the algorithm to a finite time for "no
solution" problems.

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Problem 6:
After the news of escape of the prisoners of war slowly sinks
in, a surge of excitement sweeps through the people. Banking on this
new
found confidence, Hillarrow decides to seek revenge. She has resolved
to destroy Studman from the base.
But after discussion with the her military commanders, she
learnt that the military capability of her country was reduced to
almost
nil. But they had valuable intelligence data which was brought in by
the
escaped prisoners of war.
This data consisted of military target points in I-Rock. But t
o
her dissapointment Hillarrow discovered that they could bomb only thre
e
of the targets. But if they used SS3 missiles they could destroy the
whole triangle enclosed by targets.
But since only 3 targets can be bombed they want to cause
maximum damage to the I-Rock by destroying the most area. But they hav
e
very little time since Studman has been alerted.

So the challenge is to find the three points which form the max area.

In short:
given co-ordinates of N points , find the 3 points which form the max area triangle.

Input Format: The Number N on a line by itself. After that are specified
the co-ordinates of the N points in x y format (one per line). The co-ordinates have integer values.

Output: The value of the max area.

Epilogue: After all this action, earth was hit by a comet named Shumankaren and
was blown away to pieces.

Please note: the area of a triangle (x1,y1),(x2,y2),(x3,y3) is given by
A = 1/2 * |x1*y2 - x2*y1 + x2*y3 - x3*y2 + x3*y1 - x1*y3|
Many people used Heron's Formula (Semi-perimeter formula), which
requires longer time for computation, and hence even their brute
force algorithms timed out.

Naive Algorithm: O(n^3) algorithm by searching through all triangles.

Winner 1's Algorithm: First find convex hull and then do a brute first search on the convex hull.

Winner 2's Algorithm: Brute force search through all triangles, optimizing
by reducing 1 multiplication.

Winner 3's Algorithm: Same as above.

Most surprising entry: Submitted by
He optimized the multiplications so well to take the advantage of the cache, that he got all the testcases right.

Our Algorithm: O(n^2 log n). First find the convex hull -- O(n log n).
The convex hull is stored in a clockwise sorted order.
For each line segment on the convex hull binary search through

the hull for the maximum area. O(n^2) edges, for each edge binary
search takes O(log n) time, hence order of algorithm = O(n^2 log n).

Best Algorithm we recieved (Submitted by O(n^2)
First find convex hull -- O(n log n). For each point x on the

convex
hull keep two pointers a & b. Rotate b clockwise along the convex
hull, rotate a, clockwise along the convex hull s.t. area of triangle xab is maximum, and pointer a will always remain behind
pointer b. Total no. of points O(n), and for each point b makes
atmost 1 rotation about the hull, (hence so also does a). So no.
of iterations for each point is O(n). Hence order of algorithm --
O(n^2).
