ACM ICPC Problem Set 2011

This problem set contains 10 questions (A-J) in 1 pa!es"

Time limit# 10 secon$s
Input# Stanar Input
%utput# Stanar %utput

ACM ICPC Mala&sia %''ice

(ulli&&ah o' In'ormation an$ Communication Technolo!&

International Islamic)ni*ersit& Mala&sia

Problem A

Sum o' %$$ Sequence

+i*en an o$$ inte!er ,- calculate the sum o' all the o$$ inte!ers bet . een 1 an$, inclusi*e"

Input

/irst line o' the input contains T- the number o' test cases" 0ach test case contains a sin!le inte!er ," , is bet . een 1 an$ 100"

Output

/or each test case output the *alue 11213"1 , "

Sample Input	Sample output
10	1
1	
2	6
4	17
5	24
6	27
11	6
12	7
14	81
15	100
16	

Problem 9

Spiral

Consi$er all positi*e inte!ers . ritten in the 'ollo . in! manner (&ou can ima!ine an in'inite spiral)"

```
21  22  23  24  25  26
20   7   8   9  10 ...
19   6   1   2  11 ...
18   5   4   3  12 ...
17  16  15  14  13 ...
```

:our tas; is to $etermine the position (ro . -column) o' a !i*en number ,- assumin! that the center (number 1) has position (0-0)" <o . s are numbere$ 'rom top to bottom- columns are numbere$ 'rom le't to ri!ht ('or e=ample- number **2** is at (1-1)" :our pro!ram shoul$ output a strin! containin! the position o' , in the 'orm (<-C) . here < is the ro . an$ C is the column" < an$ C must not contain an& lea$in! >eroes"

Input

The 'irst line o' the input !i*es an inte!er T- . hich is the number o' test cases" 0ach test case contains an inte!er , (1 ? ,@2**A2**1)"

Output

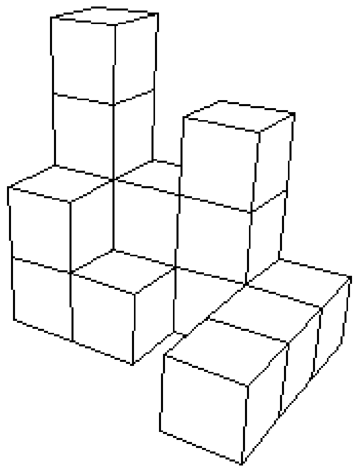
/or each test case- output the position as $escribe$ abo*e" See sample output 'or 'urther clari'ication"

Sample Input	Sample output
7 2 3 7 17 24 830 765409	(0,1) (1,1) (-1,-1) (2,-2) (-2,1) (-14,3) (-437,221)

Problem C

Sur'ace Area

The soli$ in the picture belo . is ma$e up o' 1=1=1 cubes in a **2B !ri$**" In this problem- . e'll limit oursel*es to soli$s that are ma$e up o' columns roote$ on the !roun$ (a column consists o' one or se*eral 1=1=1 cubes stac;e$ on top o' each other)" Such soli$s can be $escribe$ as a matri= o' $i!its- . here each $i!it correspon$s to the hei!ht o' a column in the 2B !ri$ that ma;es up the !roun$" A >ero means there is no column at all in that position"



The correspon$in! matri= 'or the abo*e soli$. ill be

```
4231
2101
0001
```

The *olume o' such a soli$ is simple enou!h to calculate- but . hat . e're intereste$ here in the total sur'ace area inclu$in! the 'loor (that is- the number o' 1=1 DsquaresD non hi$$en on the outer sur'ace)" :ou are !i*en the in'ormation o' the soli$ as a matri=" :our tas; is to compute the sur'ace area o' the !i*en soli$" :ou can assume that the soli$ is al . a&s connecte$- i"e the columns . ill be attache$ to each other in the 'our car$inal $irections"

Input

/irst line o' the input contains T- the number o' test cases" 0ach test case starts . ith a line containin! < an$ C $enotin! the number o' ro . s an$ columns o' the soli$" 0ach o' the ne=t < lines contains C $i!its" 0ach $i!its are bet . een 0 to 6 inclusi*e" < an$ C . ill be bet . een 1 an$ 40 inclusi*e"

Output

/or each test case- output the total sur'ace area o' the !i*en soli$- inclu$in! the 'loor area"

Sample Input	Sample %utput
4 1 2 11 3 4 4231 2101 0001 3 3 111 101 111 1 1 5	10 54 32 22

Problem B

Table

Eet us consi$er an arra& o' si>e n F m 'ille$ .ith **pair wise different** inte!ers" The 'ollo.in! operations are allo.e$ on the arra&#

1" Interchan!in! t.o ro.s-
2" Interchan!in! t.o columns"

Ge call t.o arra&s ali;e i' one o' them can be obtaine$ 'rom the other b& a sequence o' the abo*e t.o operations" Grite a pro!ram that 'or a !i*en set o' pairs o' arra&s tells .hich pairs are ali;e"

Input

The 'irst line o' the stanar input contains an inte!er t (1@Ht@H10) $enotin! the number o' test cases .hich represent the number o' pairs o' arra&s" The 'irst line o' each test case hol$s t.o inte!ers n an$ m (1 @H n @H 1000 an$ 1 @H m @H 1000)- separate$ b& a sin!le space" n an$ m $enote the number o' ro.s an$ columns o' the arra&s- respecti*el&" The ne=t n lines represent n ro.s o' the 'irst arra& an$ the 'ollo.in! n lines represent n ro.s o' the secon$ arra&" 0ach line hol$s m arra& items .here each *alues bet.een -1000000 an$ 1000000 inclusi*e" All numbers occurrin! in either o' the arra&s are pair .ise $i''erent"

Output

:our pro!ram shoul$ print out t lines to the stanar output" The ;-th o' these shoul$ hol$ one .or$# I:0SI i' the arra&s o' the ;-th pair are ali;e- or I,%I other.ise (in capital letter onl&)"

Sample Input	Sample output
2 4 3 1 2 3 4 5 6 7 8 9 10 11 12 11 10 12 8 7 9 5 4 6 2 1 3 2 2 1 2 3 4 5 6 7 8	YES NO

Problem **0**

Ju**!**e **(**ni**!**ht

:ou ha*****e a chessboar**$** o**'** si>e **,** **=** **,**" The ro**.**s an**$** columns are numbere**$** **'**rom 1 to **,**" In a cell locate**$** at ro**.** **<**1 an**$** column C1**-** a **;**ni**!**ht is startin**!** his Kourne&" The **;**ni**!**ht **.**ants to **!**o to the cell locate**$** at ro**.** **<**2 an**$** column C2" Mo*****e the **;**ni**!**ht **'**rom the startin**!** cell to this **$**estination cell **.**ith minimum number o**'** mo*****es"

As a remin**$**er**-** a **;**ni**!**ht(s Kump mo*****es him 2 cells alon**!** one o**'** the a**=**es**-** an**$** 1 cell alon**!** the other one" In other **.**or**$**s**-** i**'** a **;**ni**!**ht is at (A**-9**)**-** it ma& mo*****e to (A-2**-9** -1)**-** (A-2**-** **91**1)**-** (A**1**2**-** **9**-1)**-** (A**1**2**-** **91**1)**-** (A-1**-** **9**-2)**-** (A**1**1**-9**-2)**-** (A-1**-** **91**2) or (A**1**1**-** **91**2)" **%'** course**-** the **;**ni**!**ht cannot lea*****e the boar**$**"

+i*****en **,-** **<**1**-** C1**-** **<**2 an**$** C2**-** **$**etermine the minimum number o**'** steps necessar& to mo*****e the **;**ni**!**ht **'**rom (**<**1**-** C1) to (**<**2**-** C2)"

Input

The **'**irst input line contains a positi*****e inte**!**er**-**T**-** in**$**icatin**!** the number o**'** test cases" **0**ach case consists o**'** a line containin**!** **'**i*****e inte**!**ers **N(3≤N≤10**^{15}**)-** **<**1**-** C1**-** **<**2 an**$** C2 are bet**.**een 1 an**$** **,** inclusi*****e"

Output

/or each test case**-** output the minimum number o**'** steps nee**$**e**$** to mo*****e the **;**ni**!**ht **'**rom (**<**1**-** C1) to (**<**2**-** C2)" Assume that there **.**ill al**.**a&s be a solution**-** i"e"**-** itLs possible to mo*****e the **;**ni**!**ht **'**rom its startin**!** cell to its **$**estination cell"

Sample Input	Sample output
2 5 1 1 2 3 5 1 1 2 2	1

Problem /

Matri= Trans'ormation

:ou ha*e an inte!er matri= A- .ith < ro.s an$ C columns"That means it has < ro.s .ith each ro. containin! C inte!ers" T.o inte!ers are a$(acent i' their container cells share an e$!e" /or e=ample- in the 'ollo.in! !ri$

0	1	2
2		**4**
7	**5**	**8**

(0-1)- (-4)- (1-)- (4-2)are a$(acent but (0-)- (2-7)- (4-5) are not a$(acent"

:ou are allo.e$ to $o onl& one ;in$ o' operation in the matri=" In each step &ou .ill select t.o a$(acent cells an$ increase or $ecrease those t.o a$(acent *alues b& 1- i"e"- both *alues are increase$ b& 1 or both *alues are $ecrease$ b& 1" +i*en a matri=- $etermine .hether it is possible to trans'orm it to a >ero matri= b& appl&in! the allo.e$ operations" A >ero matri= is the one .here each o' its entries is >ero"

Input

The 'irst input line contains a positi*e inte!er-*n*- in$icatin! the number o' matrices (test cases)" 0ach matri= starts .ith a line containin! <(2?<?20) an$ C(2?C?20) separate$ b& a sin!le space" 0ach o' the ne=t < lines contains C inte!ers" 0ach o' these inte!ers is bet.een -20 an$ 120 inclusi*e" Assume that each input matri= .ill ha*e at least one non->ero *alue"

Output

/or each test case output M:0SI i' &ou can trans'orm it to a >ero matri= or M,%I other.ise (capital letter onl&)"

Sample Input	Sample output
6 3 3 -2 2 2 1 1 0 2 -2 -2 3 3 -1 0 1 -2 -1 1 0 1 2 3 3 -1 0 1 0 2 -1 -1 1 2 3 3 -1 2 1 -1 -1 -3 1 1 -1 2 3 0 -2 3 1 3 1 2 3 3 1 1 2 0 1	YES NO NO YES NO YES

Problem +

9i-colorin!

+i*en a !raph $etermine ho. man& .a&s &ou can color the !raph .ith at most t.o colors" There cannot be an e$!e containin! t.o *ertices o' the same color"

Input

/irst line o' the input contains T the number o' test cases" 0ach test case starts .ith a line containin! t.o inte!ers N(1?N?20) an$ 0(0?0?1000)" 0ach o' the ne=t 0 line contains t.o inte!ers a- b (0?a?N-1- 0?b?N-1) $enotin! that there is a bi$irectional e$!e bet.een a an$ b" There .ill not be an& sel' loop or $uplicate e$!es" The last line o' the input .ill be a blan;"

Output

/or each test case- output the number o' .a&s &ou can color the !raph .ith onl& t.o colors" I' &ou cannot color the !raph .ith at most t.o colors output -1"

Sample Input	Sample output
4	2
5 5	-1
0 1	2
0 4	4
1 2	
2 3	
3 0	
3 3	
0 1	
1 2	
2 0	
6 7	
0 1	
1 2	
2 3	
3 0	
4 0	
4 5	
5 1	
2 0	

Problem J

Sortin!

We have an array and we want to sort it in non-decreasing order. The only allowable operation is to move one element of the array into any other place (before all elements, after all elements or between any two adjacent elements). The cost of the single operation is equal to the value of the moved element. We want to minimize the total cost of sorting the array. You are to write a program that will find the minimum cost to sort such an array.

Input

/irst line o' the input contains T the number o' test cases" /or each test case the 'irst line contains an inte!er , (1 ? , ? 100)" The secon$ line contains , positi*e inte!ers separate$ b& spaces" These inte!ers $enote the arra&" 0ach o' these inte!ers is bet . een 1 an$ 1000 inclusi*e"

Output

/or each case- the output contains an inte!er $enotin! the minimum cost to sort the arra&"

Sample Input	Sample output
3 4 7 1 2 3 4 7 1 2 5 6 8 2 6 5 1 4	**7** **5** 1**8**

Problem I

Sum o' Po . ers Nersion I

+i*en , an$ (- compute$\left(\sum_{i=1}^{i=N} i^k\right)$ $\boldsymbol{mod}$ **1000000007**"

Input

The 'irst line o' the input !i*es an inte!er T- . hich is the number o' test cases" 0ach test case consists o' a line containin! , (1? , ?1-000-000-000) an$ ((1?(?)"

Output

/or each test case output$\left(\sum_{i=1}^{i=N} i^k\right)$ $\boldsymbol{mod}$ **1000000007**"

Sample Input	Sample output
5 5 1 4 2 1000000000 1 1000000000 2 1000000000 3	15 30 21 999999916 441

Problem J

Ourban 2011

Ourban is an Islamic practice that in*ol*es the sacri'ice o' certain li*estoc;" **O**urban is $one onl& on the 10-12 PulhiKKah- .hich is the last month in the Islamic calen$ar" Ei*estoc;to be slau!htere$ (an$ sacri'ice$) are limite$ to camels- cattle- bu''aloes- sheep or !oats" The meat 'rom each slau!htere$ camel- cattle- or bu''alo can be $i*i$e$ into **5** equal parts to be share$ b& **5** persons" Since !oats an$ sheep are small in si>e compare$ to the other li*estoc;- there'ore one !oat or sheep is equi*alent to one part o' the pre*ious three pre*ious li*estoc;" A person can re!ister to sacri'ice more than one part"

In or$er to !et the correct number o' li*estoc; to be slau!htere$- one has to ensure that all **5** parts is accounte$ 'or in or$er to slau!hter one bu''alo" I' not- there .ill be a cost liabilit& to the person inchar!e$" In a situation .hen a person re!isters 'or more than **5** parts- 'or e=ample **8** parts o' a bu''alo- the remain$er o' one part has to be combine$ .ith parts sacri'ice$ b& other persons"

,ormall&- the bu''aloesan$ sheep are supplie$ b& 'armer- an$ the location 'or slau!hterin! is $one at $i''erent places$epen$in! on the customers" There is onl& one truc; that can transport either the bu''aloesor the sheep" The truc; can transport a ma=imum o' **2** bu''aloesor **7** sheep at one time"

+i*en a list o' or$ers 'or qurban- calculate the minimum number o' trip to transport the bu''aloesan$ sheep to be slau!htere$"

Input

The input consists o' a 'e. lines o' $ata" The 'irst line is an inte!er T- .hich represents thenumber o' test $ata" It is 'ollo.e$ b& T lines o' $ata" 0ach o' these lines be!ins .ith an inte!er m- .hich represents the number o' or$er- 'ollo.e$ b& a sin!le space an$ a set o' or$ers" The or$ers are in the 'ollo.in! 'ormat# t.o characters .here the 'irst is either character 'b' (represents parts o' a bu''alo) or 's' (represents a sheep)" This is 'ollo.e$ b& an inte!er that represents the number o' or$ers 'or the respecti*e parts o' co. or sheep" 0ach or$er is separate$ b& a sin!le space"

Output

The output is the minimum number o' trip to transport the bu''aloesan$ sheep to be slau!htere$"

Sample Input	Sample Output
3 4 b3 s1 b9 b4 2 s3 b7 5 b1 b1 b2 b2 b1	2 2 1