



Indian Institute of Technology Guwahati

and

Techniche
The Annual Techno-Management Festival
1st - 4th September 2011

present



The International School Championship

TECHNOTHLON

Inspiring Young Minds.....

JUNIOR SQUAD

Duration: 2 Hours

Maximum Marks: 164

TEAM DETAILS

Names of Participants:

1. GAUTAM GUPTA

2. VASUNDHRA KAUL

Team Registration No: [REDACTED]

Name of School: [REDACTED]

State: HARYANA

City: GURGAON

General Instructions

Please read the following very carefully before attempting the paper. Failure to do so could cost you dearly.

1. Candidates must fill the Team Details in the space provided, before starting to attempt the paper.
2. All answers must be written in the space provided at the end of this booklet which has to be submitted at the end of the examination. The Question paper can be taken back home.
3. All answers must be clear and legible. In case of any ambiguity, the decision of the evaluator is final.
4. All questions are correct and no queries will be entertained during the examination.
5. All those teams who have not paid their registration fee must submit it to the invigilators before signing the attendance booklet.
6. No additional sheets will be provided for rough work.
7. Blank papers, clipboards, log tables, slide rulers, calculators, cellular phones, pagers and any other electronic gadgets are NOT allowed.
8. This question paper contains 20 pages and 26 questions.
9. The medium for answering this Paper is English. Answers in any other Language will not be accepted.
10. The maximum marks for this paper is 164.

DISCLAIMER: In any case of any discrepancy, the decision of the Organizers will be deemed final and no further correspondence will be entertained.

Marking Scheme

The following marking schemes will be used for evaluating various questions throughout the paper:

1. PLAIN MARKING SCHEME

This is the standard marking scheme for a section! In the Plain Marking scheme, the total marks you score in a section is a multiple of the number of correct answers you gave in that section.

2. GEOMETRIC MARKING SCHEME

This scheme guarantees bonus marks for more correct answers! In the Geometric Marking scheme, the total marks you score in a section increases exponentially with every correct answer you provide!

3. FIBONACCI MARKING SCHEME

The Fibonacci Marking scheme rewards consistency in answering questions of a section correctly!

If 'n' is the number of questions you answered correctly in the section, then your score would be, a multiple of the 'n+1'th term in the Fibonacci Sequence defined by 1,1,2,3,5,8,13...

4. EULER MARKING SCHEME ($F+V-E=2$)

As the marking scheme for the (Funbit) section, the Euler scheme packs many surprises! You have to clearly plan the number of questions in this section that you must answer - because, there are bonus marks for answering a certain number of questions! Answering more questions might get you a lower score!!

Six

This marking scheme is based on Euler's equation,

$$F - E + V = 2$$

but with a twist! The E, V and F used above have different meanings, as defined below:

E: The number of questions you correctly answer in the section

V: The number of VOWELS in the English spelling of "(E+8)"!

and F = One-third of the marks you will be awarded in that section!

Maybe, that was confusing. We can understand better with the help of an example. Supposing, you answered 8 (EIGHT) questions in that section. Then,

$$E = 8$$

$$V = \text{No. of vowels in } "(8+8)" = \text{number of vowels in } "16"$$
$$= \text{No. of vowels in } "SIXTEEN" = 3 \text{ (I, E and E)}$$

Then,

$$F - 8 + 3 = 2$$

$$\text{Hence, } F = 2 + 8 - 3 = 7$$

Since F = One-third of the marks you will be awarded in that section = 7,
the marks you will be awarded in that section = $3 \times 7 = 21$.

Hence, if you answer 8 questions correctly in the section, according to the Euler scheme, you will score 21 marks in that section!

5. MOMENTUM MARKING SCHEME

In the Momentum marking scheme, a base score of 2 is awarded for a correct answer.

For each correct answer in succession, you will be awarded '1+ (the no. of marks awarded for the previous correct answer)'. However, if you break the momentum (by not answering a question, or answering it wrongly), the score awarded to a correct answer resets to 2 (the base score)!

To clarify this scheme, consider this example:

If you correctly answered the first question, you score 2 marks for it. Also, if you correctly answered the 2nd and 3rd questions, you score 3 and 4 marks, respectively, for the question. Supposing you did not answer the 4th question (or answered it wrongly) - so, you won't be awarded any marks for it. After that, if you answered the 5th question correctly, you will score 2 marks for it, and so on.

- No marks will be awarded for a section with no questions correctly answered.
- There is NO negative marking for any section.



the cube thingy

(Geometric Marking Scheme - $3 \cdot 2^N$
N is the no of correct answers.)

A cube is having four of its faces coloured with red, blue, green and yellow uniformly. Remaining two faces are bicoloured. Half of one is painted with red and half with blue, similarly half of another is painted with green and half with yellow. The line separating the two colours on a face is diagonal. Now this cube is cut into 125 cubes of equal dimensions.

1. At most how many cubes can have more than 3 colours on its surface?

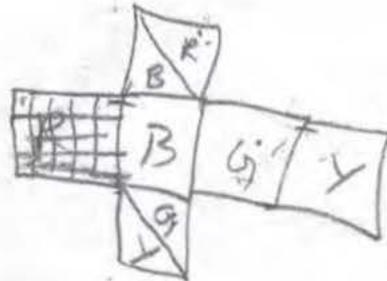
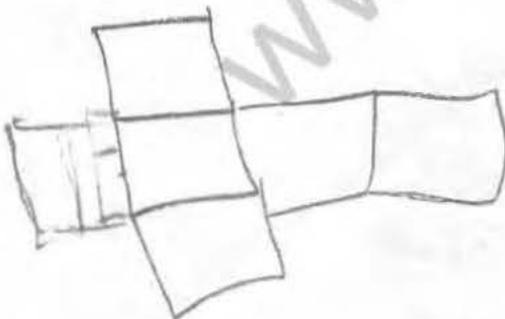
- A) 0 B) 8
C) 4 D) 2

2. At most how many cubes can have either red or green colour on it?

- A) 73 B) 68
C) 6 D) 80

3. At least how many cubes can have blue and yellow colour on it?

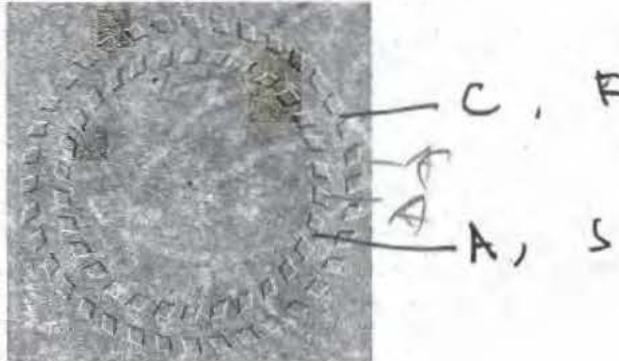
- A) 0 B) 2
C) 5 D) 9



Deception Point

(Geometric Marking Scheme - 3×2^N
N is the no of correct answers.)

If the mirror image of this symbol is taken, such that the mirror is kept on the right edge, then in which sense do the inner and the outer circle rotate, if we move towards the page?



1. If the mirror image of the symbol is taken, such that the mirror is kept on the right edge, then in which sense do the inner and the outer circle rotate, if we move towards the page?

- A) Inner circle rotates in clockwise direction and the outer circle in the counterclockwise direction.
- B) Both the circles rotate in counterclockwise direction.
- C) Inner circle rotate in counterclockwise direction and the outer circle in the clockwise direction.
- D) Both the circles rotate in counterclockwise direction.

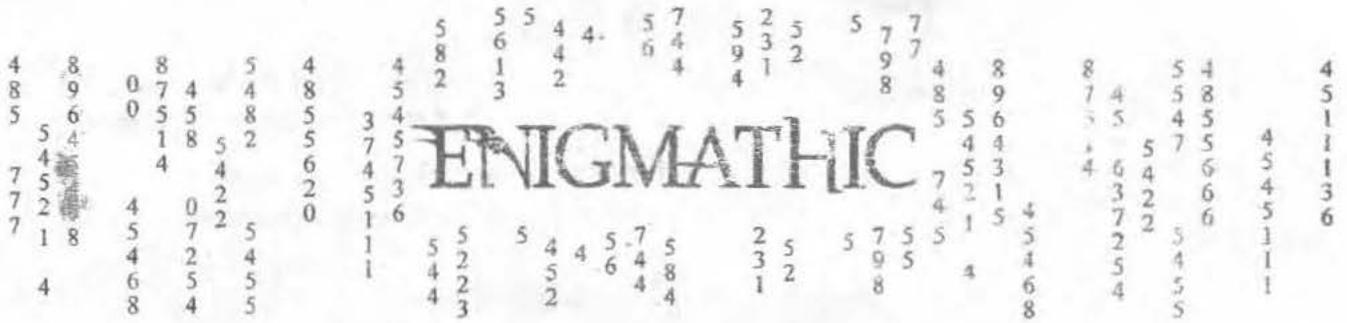
2. Which circle rotates fast, if we move away from the page?

- A) The inner circle rotates fast.
- B) The outer circle rotates fast.
- C) Both the circles rotate with same speed but in opposite direction.
- D) Both the circles rotate with same speed in same direction.



3. Which circle first completes one rotation?

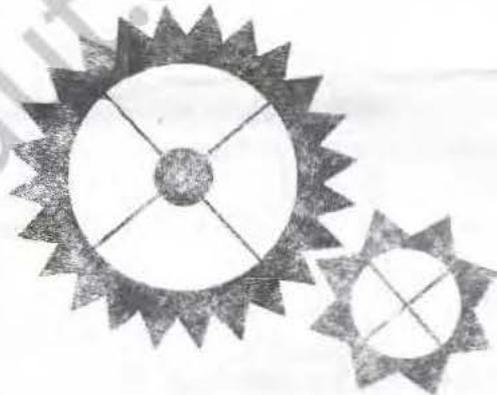
- A) The inner circle.
- B) The outer circle.
- C) Both circles complete the rotation, simultaneously.
- D) Cannot be determined.



(Fibonacci Marking Scheme - $4 * \text{fibonacci}(N+1)$
 N is the no of correct answers.)

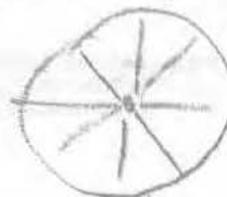
- The numbers 112, 121, 123, 153, 243, 313, and 322 are among the rows, columns, and diagonals of a 3 X 3 square grid of digits (rows and diagonals read left-to-right, and columns read top-to-bottom). What 3-digit number completes the list?
- A cog wheel with 8 teeth is coupled with a cog wheel of 24 teeth which is fixed. How many rotations will the small cog wheel have made when it circles the bigger one once?

- A) 3 B) 3.5
 C) 4 D) 2



- Lalit wakes up in the early morning and looks at the clock. He realizes that he is late for his appointment with the dentist that is due half an hour from then. He gets ready hastily in 15 mins, and drives as quickly as possible to clinic. He drives all the way at a fixed speed, and he knows the distance between his home and hospital. When he arrives, he figures out that he must be 25 minutes late for the appointment. He gets out of his car and rushes to the clinic. However, when he looks at the clock, he is astonished. The clock tells him that he is an hour and five minutes early for the appointment. He checks the time with a news channel on tv and finds that it is correct. Astonished for a while, he realizes afterwards that he had foolishly looked at the mirror image of the clock while leaving home.

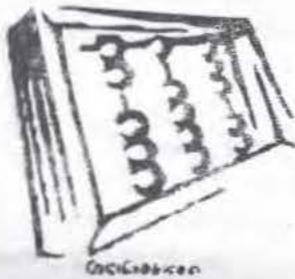
What was the actual time when Lalit left home?



4. Consider the number 6135246. Jai can change this number in the following way. He can select atleast one digit and at most six digits (which need not necessarily be consecutive) from this number, and shift them to the rightmost in their respective order. For example- If he has 97361, he selects 7, 3 and 1, and the number becomes 96731. What is the minimum number of steps he takes to convert 6135246 to 1234566 ? 2

5. Kanchan lives on planet Eureka, where 12 Earth hours are equivalent to 20 Eureka hours. Besides, there are 10 minutes in each hour. The Eureka clock can be visualized as identical to the circular analog clocks on Earth, only with different increments. Can you find out what will be the smaller angle between the minutes hand and hours hand when the Kanchan's Eureka clock reads 4:06 ??

90°



| | | |
|-----|-----|-----|
| 112 | 121 | 123 |
| 153 | 243 | 313 |
| 322 | | |

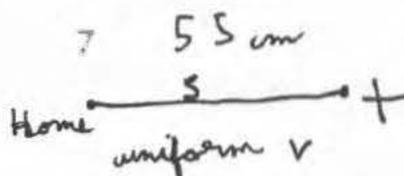
6135246
 1 2

www.Caut.am

25
 1:25

get up $x:0$
 exp. aht. $x:30$
 exp. ready $x:15$

exp. arrive $x:55$
 rel. arrive $x:25$
 8:25
 9:30





(Plain Marking Scheme - $5 \cdot N$
 N is the no of correct answers.)

Rohit just brought 40 new marbles out of which 20 are blue, 20 are red. He arranged them symmetrically on a rectangular grid of dimensions 4×10 . When he left for the school, his brother took them out for playing and again placed them back on the grid. When Rohit returned, he observed the asymmetry and got angry. He asked his brother to restore symmetry by a sequence of swap, each involving only adjacent marbles.

If he starts with the following pattern, answer the following questions:

| | a | b | c | d | e | f | g | h | i | j |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | R | B | R | R | B | B | B | R | R | B |
| 2 | R | R | B | R | R | R | B | B | B | R |
| 3 | B | B | R | B | B | B | R | B | B | B |
| 4 | R | R | B | B | R | R | R | R | B | R |

T. Find the minimum number of adjacent pairs of marbles that Rohit's brother has to swap to restore the symmetry.

18

2. If columns are labeled a,b,c,d and rows as 1,2,3, etc. then what will be the final position of marble f1? *f1*
3. Which marble will take the position (c,3)? *R* *F - 6 + 2*
F = 4



1. One morning Harsh is leaving on business trip and finds he left some paperwork at his office. He runs into his office to get it and the night watchman stops him and says, "Sir, don't get on the plane. I had a dream last night that the plane crashes and everyone dies!". Harsh takes his word and cancels his trip. Sure enough the plane crashes and everyone dies. The next morning the Harsh gives the watchman a note of ₹ 1,000 for saving his life and then fires him. Why did Harsh fire the watchman that saved his life?
2. Ten candles stand burning in a dining room. A strong breeze blows in through an open window and extinguishes two of them. Checking back in on the candles later, Alpana sees that one more candle has gone out. To make sure no more flames go out, she shuts the window. Assuming the wind doesn't extinguish any more candles, how many candles does Alpana have left in the end? *10*
3. A computer program is a function that takes in 4 bits for input, where each bit is either a 0 or a 1, and outputs TRUE or FALSE. How many computer programs are there? *1*

K B
G | G
R

4. Three men, Mr. Red, Mr. Blue and Mr. Green were having tea together. One of them was wearing a red sweater, another was wearing a blue one and the third man was wearing a green sweater. The man with the blue sweater says- "How strange it is that none of us is wearing a sweater of the same colour as our name." Mr Red replies, "Yes. That's certainly true!". Who is wearing what coloured sweater?

5. Shrishti went to the computer centre to register for Technothlon but could not log in to the computer terminal successfully. Her password didn't work despite trying twice. She suddenly remembered that the passwords are reset every month for security purposes. So she called the technician and said,

Shrishti: "Hello sir, can you help me? I cannot login to the computer terminal. My password was invalid!"

Technician: "Yes, that's right. The password has changed and is different. I am sure, you can figure out the new one. Your new password has two letters more than your old password and only three of the letters are the same."

ABC B

Shrishti: "Thanks sir."

With that Shrishti was able to login to the terminal without any trouble. Can you tell what her passwords were (both new and old)?

6. Mehul decides to buy a nice horse. He pays ₹ 500 for it, and he is very content with this strong animal. After a year, the value of the horse has increased to ₹ 700 and he decides to sell the horse. But already a few days later he regrets his decision to sell the beautiful horse, and he buys it again. Unfortunately he has to pay ₹ 800 to get it back, so he loses ₹ 100. After another year of owning the horse, he finally decides to sell the horse for ₹ 900.

- 600
- 800
+ 700
+ 900
+ 200

What is the overall profit or loss that Mehul makes?

7. This odd little puzzle occurred the other day at an archery meeting. Urwashi, who carried off the first prize scored exactly one hundred points. Can you figure out how many arrows she must have used to accomplish the feat?

→ 4



invalid

celebrating innovation

(Momentum Marking Scheme)

1. Text me No balance...!!!

C O N S O N A N T S L E F T T O R I G H T
_{3 3 2 4 3 2 2 2 4 3 2 3 3 8 8+6 7 3 3 2 2}
 $2+6+6+7+6+6+2+6+8+7 \quad 5+3+3+8 \quad 8+6 \quad 7+4+4+4+8$
V O W E L S S T A T I C I N
_{3 3 2 3 4 4 3 3 3 2}
 $8+6+9+3+5+7 \quad 7+8+2+8+4+2 \quad 4+6$
E V E R Y W O R D
_{2 3 2 3 3 3 3}
 $3+8+3+7+9 \quad 9+6+7+3$



GA

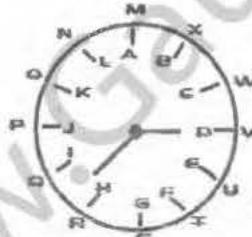
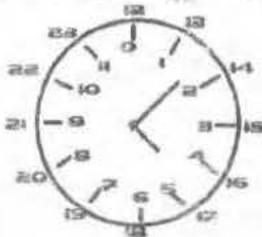
2. celpare houtrf sverioup atbhapel in eyerv atbhapel

Eg- g=c

3. vitpegi r^{xl} pixxiv jvsq wxevx fc r^{xl} pixxiv jvsq irh

4. vzxS ksizhv szh gdl ovggvih

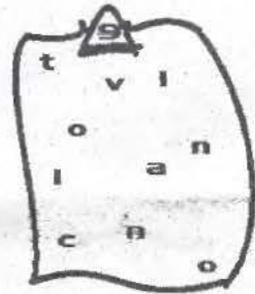
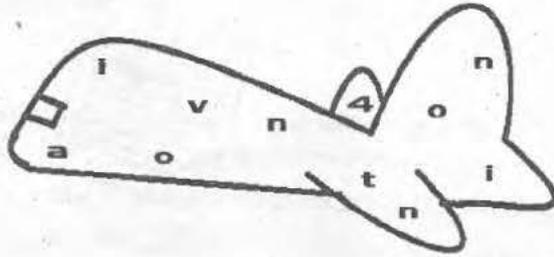
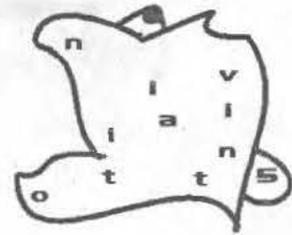
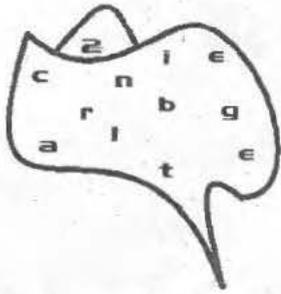
522V VASIZH h25



0-12»AM & 13-23»PM

- A) 21:08
120° anticlockwise from 02:00(AM)
- C) 150° clockwise past 23(PM)
12:01
04:19
30° anticlockwise from 04:00(AM)

- B) 30° from 01:00 anticlockwise (AM)
06:18
- D) 30° anticlockwise from 04:00(PM)
04:23



HINT: TECHNICHE SPEAKS...



PUZZLES



(Geometric Marking Scheme - 3*2
N is the no of correct answers.)

Battle ships

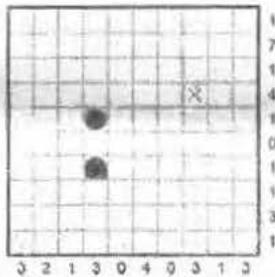
Welcome on board, Captain!

A Battleships puzzle represents an ocean with a hidden fleet of ships. The objective is to discover where all ships are located!

These ships may be oriented horizontally or vertically within the grid such that:

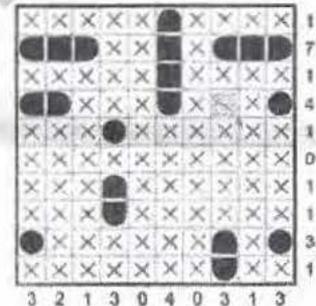
1. No ship touches another, not even diagonally.
2. The numbers on the right and on the bottom of the grid show how many squares in the corresponding row and column are occupied by ship segments.

Example

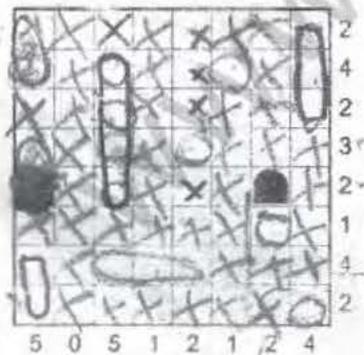


battleship
 Cruisers
 Destroyers
 Submarines

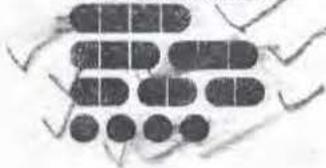
Solution



Solve:



SHIPS TO BE UNCOVERED:



SKYSCRAPERS

Skyscrapers!

Imagine yourself to be in a city of towering skyscrapers.

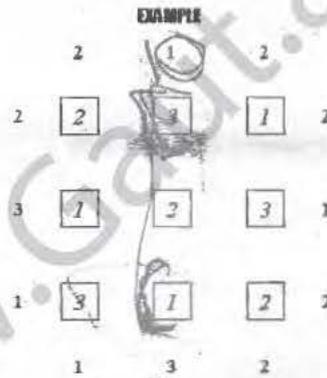
Suppose that you want to find out the arrangement of skyscrapers in a part of the city. This part of the city is represented by a grid such as the one shown below:

To determine the arrangement, you must follow these rules:

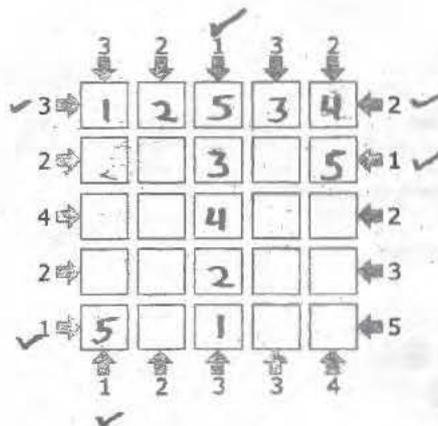
1. Every square contains a skyscraper (of height 1, 2, 3 or 4).
2. Complete the grid such that every row and every column contains the numbers 1, 2, 3 and 4.
3. In a row (or column), no repeating skyscraper number occurs.
4. The numbers around the grid tell you how many skyscrapers you can see from that point along up/down or left/right directions.
5. You can't see a shorter skyscraper behind a taller one.

What are the numbers around the edges?

Imagine standing around the edge; these numbers tell you how many skyscrapers you can see. (You might be able to see any number from 1 up to 5)



Solve:



Hashi

Let us now explore a wild archipelago.

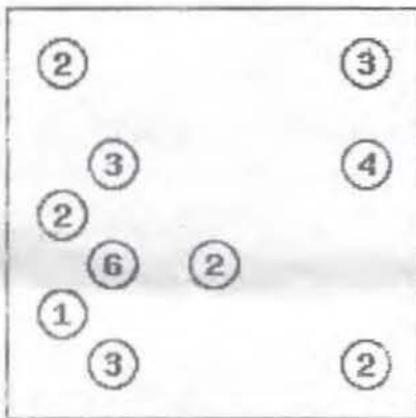
A Hashi puzzle is based on a rectangular arrangement of islands (which are each denoted by a circle).

The number in each island tells how many bridges are connected to it. Your objective in this puzzle is to connect all islands according to the number of bridges!

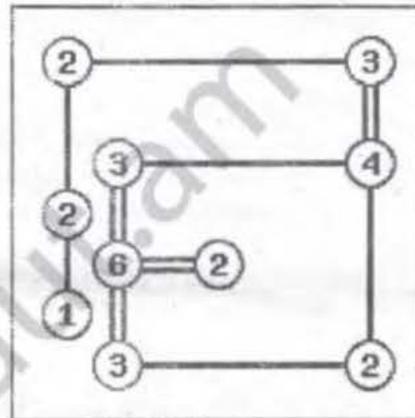
However, you must ensure that

1. There are no more than two bridges connecting two islands, and
2. There is a continuous path connecting all islands together.
3. Bridges can only be vertical or horizontal and are not allowed to cross islands or other bridges.

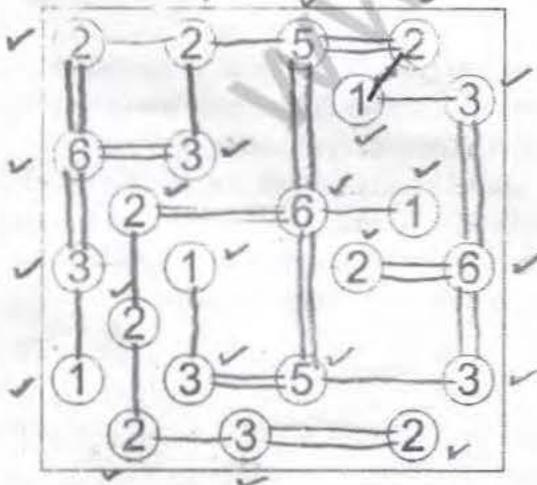
EXAMPLE



SOLUTION



Solve:



A word from the Organisers of Technothon 2011

The question paper

As our team sat together to prepare the question paper that you attempted during the course of the last two hours, a few thoughts often crossed our minds:

'Is the paper too tough? Will the students be able to enjoy it? Should we make it easier?'

Well, we contemplated long and hard on this, and the answer we came up with was:

The paper has been designed such that you've got to be awesome to solve all of the questions within the stipulated time. We stressed on this fact during our team's meetings. Our intention was to select the best and the brightest minds from across the country, through a paper that would uniformly inspire all young minds that wrote it.

The preliminary round of Technothon 2011, in our opinion, comes close to testing the mental prowess that a student requires to become a world leader. Most definitely, it is wonderful to clear the preliminary round. However - don't be disheartened if you don't manage to clear it!

"Success is not final, and failure is not fatal. It's the courage to continue that counts.", as Winston Churchill famously put it. We hope that you will positively take up the challenge of returning here next year and attempt to clear what is arguably, one of the most competitive examinations conducted for school students in India.

On a side note, you might have noticed that the question paper was peppered with names of various people. We would like to point out that these are the names of members of Team Technothon who were involved with the preparation of the Question paper. They've spent long hours in building from scratch a question paper that students all over the nation could solve, and as you might probably agree, they have done a pretty good job! We really do hope that you had as good a time solving the questions as we did while preparing them!

Indian Institute of Technology Guwahati

Presenting the body that brought Technothon 2011 to you - IIT Guwahati! Established in 1994 as the sixth member of the IIT Fraternity, IIT Guwahati is one of the premier institutions for engineering, science and technology in the country. IIT Guwahati functions completely in a state-of-the-art and generously endowed campus both in infrastructure and natural beauty. Spread across 700 acres with the majestic Brahmaputra on one side, and hillocks and lakes on the other, this campus with its natural beauty provides an ideal setting for learning and innovation. We, as IITians, strive for excellence in all walks of life. Because, excellence and innovation are two words that aptly define the 3000-odd students who live on this campus.

Techniche

Techniche is the annual techno-management festival of IIT Guwahati. Every year, the IIT-G student community organises Techniche which draws an immense participation from around the world. Techniche is conducted with a vision to foster the spirit of science and technology among the youth of India and has successfully completed 11 editions. Eminent personalities, Nobel laureates, and world leaders have graced the stage during Techniche in its past editions. With 'Celebrating Innovation' as the tag line for the coming-up 2011 edition of Techniche, you just know that the techno-management extravaganza is going to get much bigger. Technothon - The International School Championship is the module of Techniche devoted exclusively to school students across India!

An open invitation for a lifelong association with Technothon

Before you feel like you have reached the end of a sensation, we should remind you that this is merely the beginning! The Technothon community has been growing at a phenomenal rate, and we invite YOU, the future leaders of the country, to be a part of it. Regardless of whether you make it through to the final round or not, we cherish the opportunity to interact with every one of you. Facebook, Twitter, Wordpress and Flickr are our means of reaching out to the student community - Be connected, stay updated!

We are eager to help through counseling of any kind required in any sphere by utilizing the experienced pool of IITians and highly qualified faculty of IIT Guwahati. And finally, we would be glad to receive any constructive feedback about the question-paper or any general issue that you would like to discuss with us. After all, your feedback is what Technothon thrives on for improvement. :)

Chief Organising Team

Shreyas H. Nangalia
Siddhartha Nambiar

Anand Kulkarni
Ashwin TK

Samir Noorani
K Pavan Chandra

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Orkut
Technothon

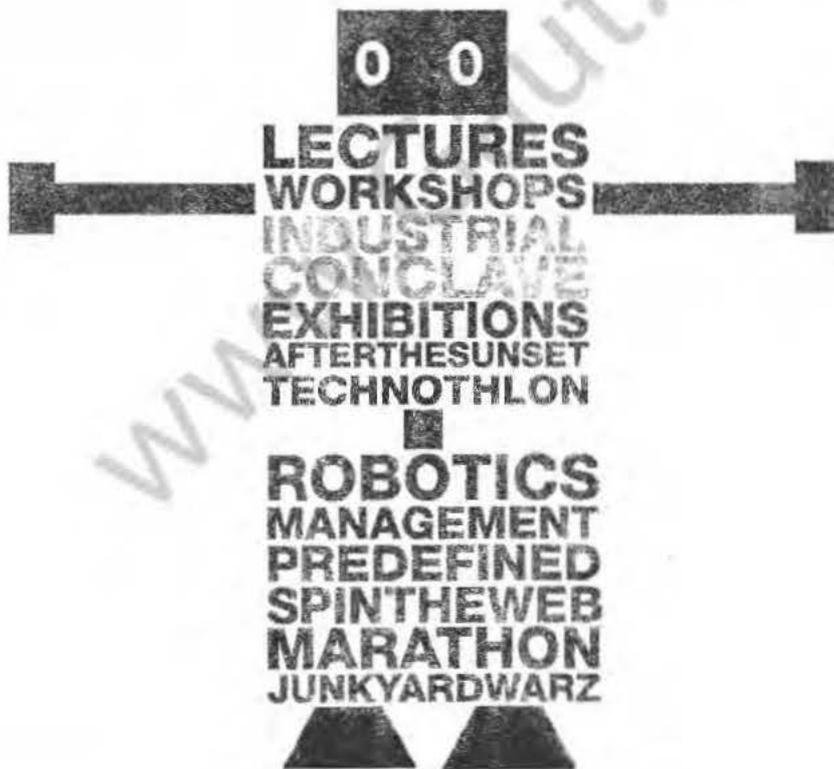


12
34 September

**celebrating
innovation**

Techniche

the annual
techno-management
festival **2011**



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