Indian Institute of Technology
Guwahati

Techniche
The Annual Techno-Management Festival
3rd - 6th September 2015

presents

Technothlon

the international school championship

.....Inspiring Young minds!

HAUTS SQUAD

Team Details

Time: 2hrs 30min
Maximum Marks : 122
Minimum Marks : -88

Name of the participants:

1. _____

2. _____

Roll Number: _____

School Name: _____

General Instructions

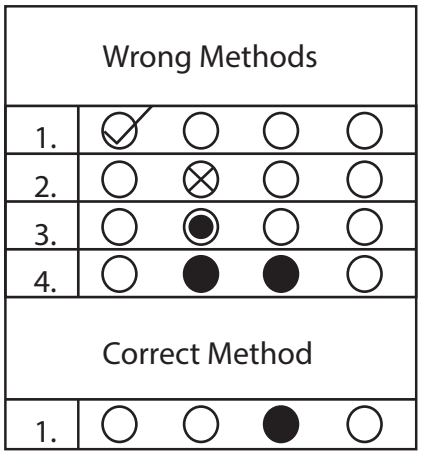
1. Fill the Team Details in the space provided, before starting to attempt the paper.
2. Verify that the question paper contains 27 pages and 29 Questions (24 in Technothlon + 5 in TechnoFin).
3. All the answers must be written in the OMR provided separately which has to be submitted at the end of 2hr 15 min from the start of examination. The next 15min must be spent in attempting TechnoFin. Instructions for TechnoFin are given later in this booklet.
4. The question paper can be taken back home.
5. All answers must be clear and legible. In case of any ambiguity, the decision of evaluator is final.
6. No queries regarding the correctness of the questions shall be entertained.
7. Blank papers, clipboards, log tables, slide rulers, calculators, cellular phones, pagers and any other electronic gadgets are not allowed.
8. No additional sheets will be provided for rough work.

Selection Criteria and Result

1. The ranking will be based on the total marks obtained in all the sections (excluding TechnoFin).
2. The result will be declared on or before August 11, 2015 on our website technothlon.techniche.org
   To check your result, login with roll number and password provided in your admit card.
3. The top 50 teams will be invited to IIT Guwahati for the Mains and will be awarded Gold certificates. The next 200 will be awarded Silver certificates.

OMR Instructions

1. DO NOT TAMPER WITH THE OMR.
2. Darken the bubbles properly with **BLACK** ball point pen only.
3. Fill all the details in the OMR sheet properly.



Question Paper Format (Only for Technothlon and not Technofin)

1. There are 17 single answer type objective questions. You need to bubble the correct option in the OMR.
2. There are 7 integer type questions where you need to bubble the correct integer in the OMR.

MARKING SCHEME

You will begin your exam with 100 marks (coins). In every section you will have to either save your marks or gain some more marks.

Full or Nil (for first section) : Unless and until you answer all the questions of the section correctly, you cannot save your 20 coins i.e., if you solve all questions in section 1 correctly then, you wont lose or gain anything. Else, you will lose 20 marks.

From the second section one of these marking schemes is used:

1. Pay for help : If you are unable to solve any challenge that you face on your journey, you must take the help of the residents of that place in order to solve it and go further on your journey. This will cost you some marks(coins).
   In every section or part of the section where this kind of marking scheme is used, the number of marks you would lose is $(2^{a+1} + 2^{b+2} - 6)$, where 'a' is the number of unattempted questions and 'b' is the number of wrongly answered questions in that particular section or part of the section.

2. Reward : You can also increase the marks(coins) you have. In questions with this marking scheme, your confidence factor is tested and so you have to choose between two of the following marking schemes:

   (C) Confident : You start with base marks(per question) of 4 and with every correct answer your base marks increase by 2. If at any point you break the sequence (by not attempting/ wrongly answering) then 6 marks will be deducted and your base marks fall back to 4.

   (N) Not confident : You start with base marks(per question) of 3 and with every correct answer your base marks increase by 1. If at any point you break the sequence then 3 marks will be deducted and your base marks fall back to 3.

In the OMR, bubble 'Y' if you want to choose Confident else bubble 'N' for Not Confident at the start of every section that includes this marking scheme.

NOTE: Solve the paper in ascending order, starting from Section 1. If the number of coins you have falls below 20 at any stage, you will be disqualified and further marks will not be added. Your journey will remain incomplete.

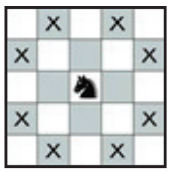
Your friend loves history. He loves reading stories about life in the ancient era, especially Greek civilization. You and your friend plan to go on a trip to Greece after your grandfather gifted you 100 historic gold coins on your last birthday.
While making preparations for the trip, you come across a contest, whose prize would be two free tickets to the heart of the Greek civilization, Athens! You and your friend decide to participate in order to save your money. You face the following 3 questions in the contest:

Chess With A Twist

[Marking Scheme: Full or Nil]

Question 1:
Consider a chessboard of dimensions 4xN. What is the value of N among the following such that, you can start with a knight(horse) at some square of the board, proceed by valid moves, visit each square exactly once and can return to the starting point as the 4N+1st square?

[Note: If the knight is at a position as shown figure, a valid knight move would be any square marked 'X']



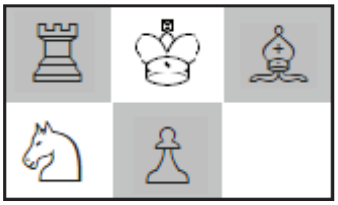
(A) 2
(B) 4
(C) 8
(D) no N exists

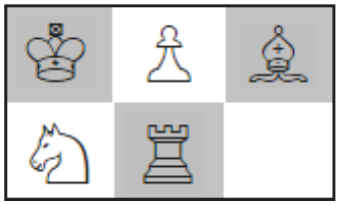
Question 2:
Consider a chessboard of dimensions 4xN. What is the value of N among the following such that, you can start with a knight(horse) at some square of the board, proceed by valid moves, and can visit each square exactly once, with no requirement that we ever return to the starting square?

(A) 2
(B) 4
(C) 8
(D) No N exists

Question 3:

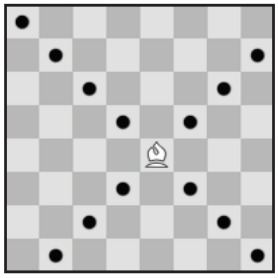
Find out the minimum number of moves required to move from the situation in the left to that in the right if the valid moves for bishop, rook, knight, king and pawn are shown in the figures below respectively.



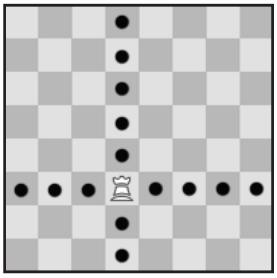


Valid moves of:

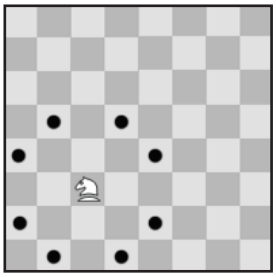
Bishop 



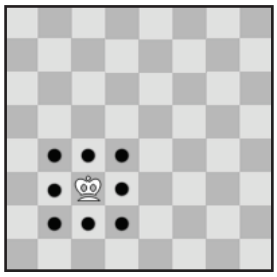
Rook 



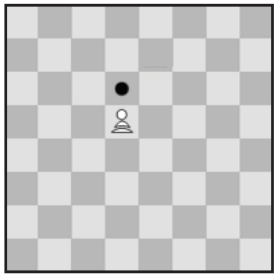
Knight 



King 



Pawn 



(A) 9
(B) 18
(C) 16
(D) 8

You and your friend save as much money as possible by participating in the contest and fly to Athens. Exploring Athens you and all other teams come to Parthenon, the temple of Athena, who is the goddess of wisdom and intelligence. You also see many images of an owl. You learn from the guide that it is the "Athena Noctua", also called the Minerva owl or the little owl. The guide also mentions some interesting stories of Athena's wisdom and cleverness.

Trouble With Flowers

[Marking Scheme: Pay for help]

The tourist guide at Parthenon takes you to an abandoned tunnel. And here you find an inscribed stone and a bowl of colored flowers. Suddenly you hear a deep and ancient gong ringing as you start reading the Stone Of Instructions. The instructions read as follows:

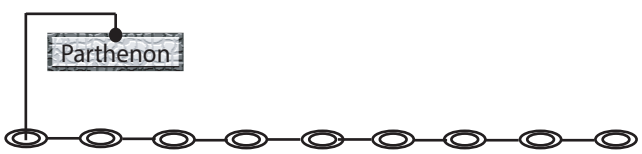
Every person entering the Temple of Athena will be given a bowl with 15 red flowers and 12 yellow flowers. Each time the Gong of Time rings, he/she must do one of two things:
1. Exchange: If he has at least 3 red flowers in his bowl, then he may exchange 3 red flowers for 2 yellow flowers.
2. Swap: He may replace each yellow flower in his bowl with a red flower and replace each red flower in his bowl with a yellow flower. That is, if he starts with i red flowers and j yellow flowers, then after he performs this operation, he will have j red flowers and i yellow flowers.

[You can leave the tunnel only when you make all the combinations (no. of red, no. of yellow) of flowers that are possible].

Question 4:
After how many operations will you have 5 each of red and yellow flowers?
(A) 5
(B) 10
(C) 15
(D) None of the above

Question 5:
What is the number of combinations you need to make to leave the tunnel?
(A) 27
(B) 52
(C) 54
(D) None of the above

The next day, on your way back from Parthenon, you see an owl injured under a large, old tree. You decide to save the owl and fix its wing, so you take it along with you. Later you get to know that owl needs to reach IIT Guwahati, India as soon as possible. Realizing how dangerous it could be for the owl to travel to India, you decide to help the owl reach its destination.



CRACK THE CODE

[Marking Scheme: Pay for help]

Question 6:

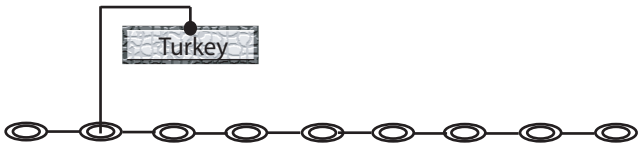
You and your friend along with the owl now reach Turkey. Tired by your journey, you decide to go a bit sightseeing in the town of Istanbul. Inside the Hagia Sophia, while you all are walking, you encounter a weird looking signboard, which reads

"Lay down the letters,
Left it begins,
Right it goes,
Starting a new line".

A trapdoor opens below you and you fall onto a gigantic chessboard. Overhead, you see a clock, which is rotating in the anticlockwise direction. Seeing this, you get puzzled.
Realizing that the only exit is an elevator across the board, you rush to it. There you find a ghost guarding it. When asked about the exit, the ghost replies
"The board is all you have, follow lines, stay away from the edges, and watch the clock as it goes. "

You realize that lift is not the exit and ask the Ghost what is to be done. He then gives you two words "Powder and "Magic" and tells you to enter these words in their secret language following the clues. You decoded "Powder" as "hfvkma" . If this is the right word then what is "Magic" in their secret language?

(A) erfpk
(B) rfpkd
(C) hfvrp
(D) erfpd



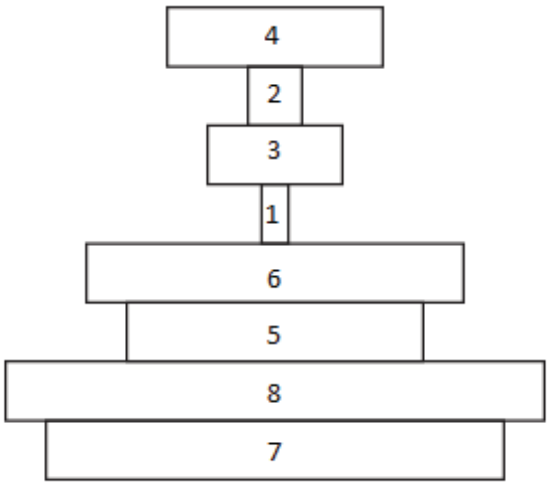
PYRAMID WALLS

[Marking Scheme: Pay for help]

Another break comes in your journey when you encounter a long wall in Aleppo. The wall is made of bricks of different sizes and if you put all the bricks in order of their sizes, you will get a staircase and be able to cross it. So, you have to sort the bricks such that the smallest is on the top and largest at the bottom. To re-order them, you can hold any number of bricks from the top of pile, lift them, invert the pile you are holding and place the inverted pile back on the rest of the bricks below. The move has been explained in the below diagram:

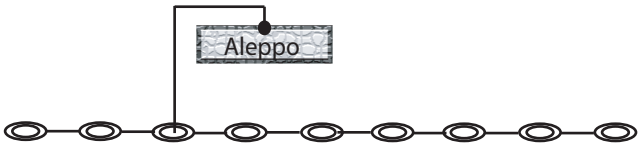
Initial pile of bricks | Top 3 bricks lifted | Lifted bricks flipped | Lifted bricks kept back

The above diagram indicates one move or step. By doing a certain number of appropriate moves, you can bring the entire pile of bricks to suit your need.
The wall stopping your way looks like the figure shown:

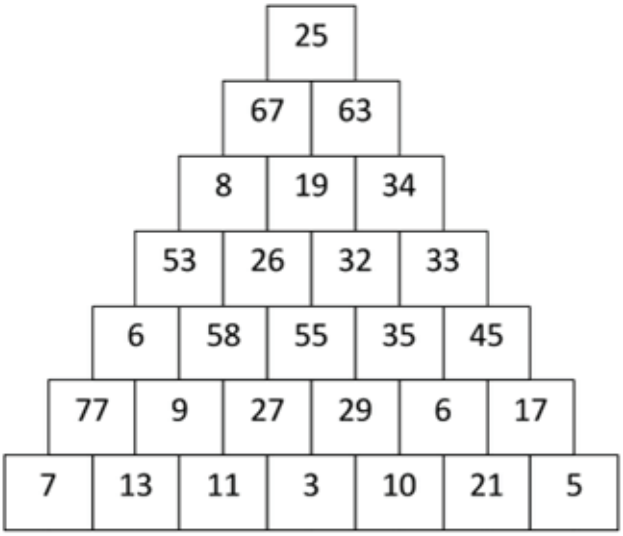


You have to make the staircase by sorting the wall according to the rules explained above. As you are in hurry to complete your journey, you must sort the bricks in minimum possible moves.

Question 7:
What is the minimum no. of moves required?
(A) 10
(B) 9
(C) 8
(D) 12



After crossing the wall, your journey hits another wall (see below), but this time sorted and built of hollow numbered blocks. On reaching the top of it, you see a signboard which says: "From the top block, move down one layer a time to either of the two touching blocks just below the one where you are. At the bottom, you will find a glider which flies for as much time as the sum of the numbers on the blocks through which you pass". As you would want the glider to fly for as much time as possible, you must choose the path which gives you the maximum sum.



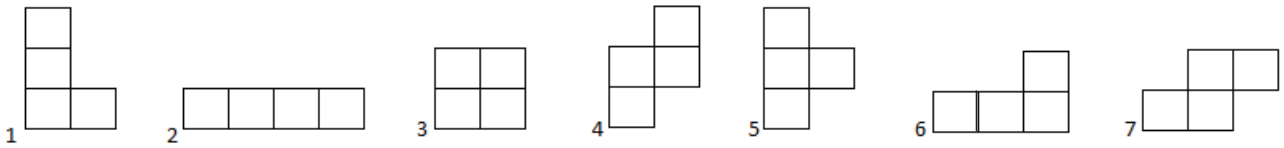
Question 8:
Find the path and give the maximum time for which the glider can be flown.
(A) 248
(B) 335
(C) 249
(D) 250

Question 9:
Can you find how many paths pass through the block '55'?
(A) 48
(B) 12
(C) 24
(D) 10

Fragments

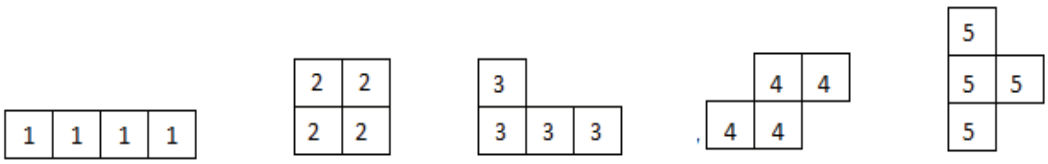
[Marking Scheme: Pay for help]

While travelling through the Syrian Desert, you are in desperate need of water. The owl, still bursting with energy(God knows how) comes flying back to you to tell you that she had located a water faucet nearby. Hearing this, you rush to it, to find a real water cooler. But the problem is, it has seven pieces lying on the ground which have to be fitted to form a rectangle in order to have the faucet working.

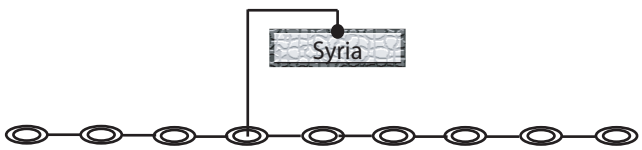


Question 10:
Which of the following statements are correct about the rectangle formed?
(A) The corner four pieces are 1,3,5,7
(B) The corner four pieces are 1,2,5,6
(C) The corner four pieces are 2,4,5,7
(D) Rectangle cannot be formed

Suddenly, the Desert God emerges out of the faucet. He says, "I am pleased with your hard-work, and will reward you with food if you pass my challenge." He gives you infinite number pieces of five different types as shown below with numbers etched on them. He then tells you to use a maximum of 30 of these pieces to make a rectangle such that the sum of the numbers on all of the small squares is maximum. Also, each type should be used at least once.



Question 11:
What is maximum sum of all the numbers that is possible?
(A) 137
(B) 136
(C) 127
(D) Rectangle cannot be formed



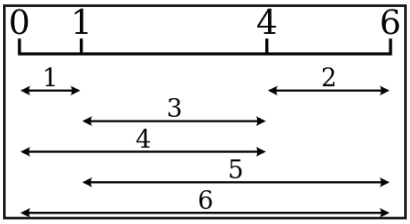
ENIGMATHIC

[Marking Scheme: Reward]

As you reach Iraq, you come across a poster mentioning a contest which could help you earn more money for your trip. So you decide to participate and below are the questions of the contest.

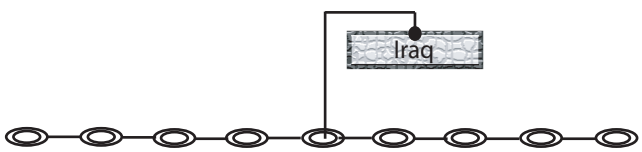
Question 12:
If you want to build a pile of 100 coins (1 and 2 dinars) such that, number of coins between any two '2' dinar coins is not equal to five, then what are the maximum number of 2 dinar coins that can be included in the pile?

Question 13:
Minimum length of ruler required with 4 marks such that every two marks are at a different distance is 6 as shown in the diagram.



Similarly, what is the minimum length of ruler required with 6 marks such that every two marks are at a different distance?

Question 14:
The government of Iraq wants to issue 'd' denominations of coins (in whole numbers of dinars(Iraqi currency)) so that by using no more than 3 coins, citizens can pay any amount from 1 dinar to 36 dinar. Find the value of 'd' and all the 'd' denominations and give the sum of all these 'd' denominations?
(Ex: if d=3 and 3 denominations are {4,5,3}, answer= 4+5+3= 12.)



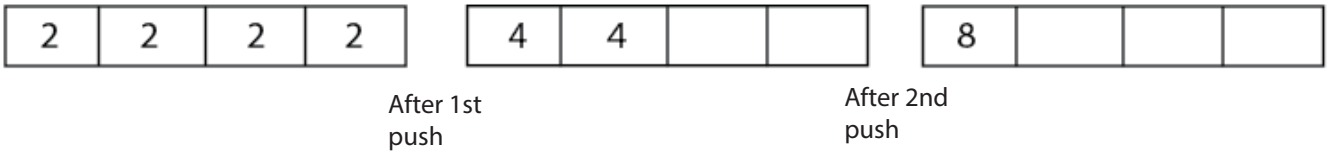
COALESCE

[Marking Scheme: Pay for Help]

As you travel from Iraq towards IIT Guwahati, after a long time you find yourselves on a mountain trail at Tehran, Iran. The mountain trail is difficult and slippery. You suddenly get caught in a landslide and fall into a deep hole. Then the stones of 2 kg weight start falling onto you from above.

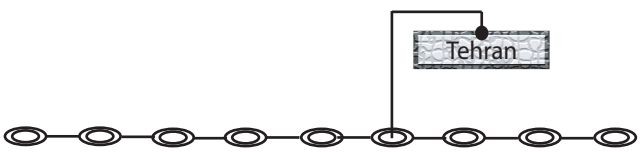
The hole is a 4x4 grid i.e., it is divided into 16 squares. Each square can accommodate only one stone (of any weight). To survive, you need at least one empty square. Owl notices your trouble and gives you the magical power to meld together stones, but only those of the same mass can be mould together. Since the stones are falling very fast, you are only able to push the stones in straight lines (horizontally/vertically).

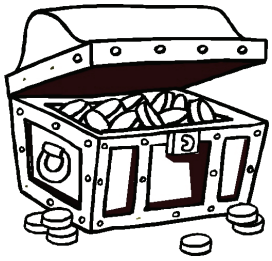
For example, when the arrangement of one of the rows in figure 1 when pushed horizontally to left transforms as shown:



Question 15:
If one stone falls every second, what is the maximum time for which you can survive i.e., when no square is empty and all stones become immovable?
(A) (2^16) -1
(B) (2^17) -1
(C) (2^17) - 2
(D) 2^16

Question 16:
What is the largest stone that you can make if every second, either 2kg stone or 4 kg stones fall?
(A) 2^17
(B) 2^16
(C) (2^16) -1
(D) (2^17)-2





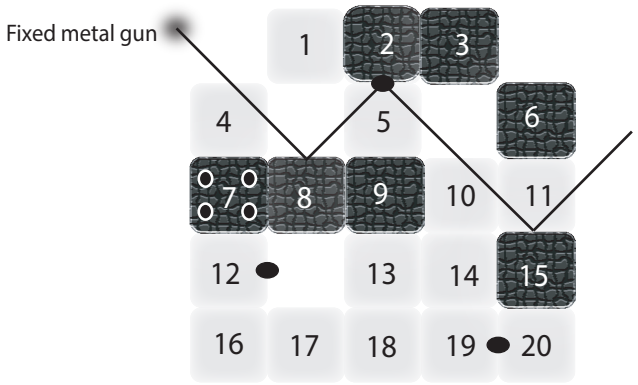
Kabuliwala's Treasure

[Marking Scheme: Pay for Help(for 17) and Reward(for 18)]

After a day filled with adventures in Tehran, you now reach Kandahar. You realize that you are falling short of time and should reach Kabul as early as possible but the problem is that you have lost your map and you can't see anybody nearby. So, you don't know where to head towards. You suddenly see a Kabuliwala, whom you ask for help.

He says, he will show you the way to Kabul only if you help him get his treasure.
Then he takes you to a place which looks similar to a grid, which has some rocks, a fixed metal ball gun and a treasure box at the other end which can be opened only when the metal ball hits the 3 buttons. Now help the Kabuliwala arrange those blocks in order to open the treasure box.

INSTRUCTIONS:-
1. The initial direction of ball cannot be changed. The metal ball once released only travels in straight lines unless and until it hits a rock.
2. Rocks reflect the ball when it hits them.



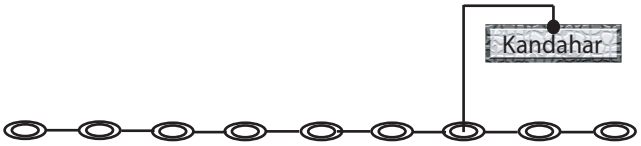
● are buttons.

Rock on 7 is fixed.

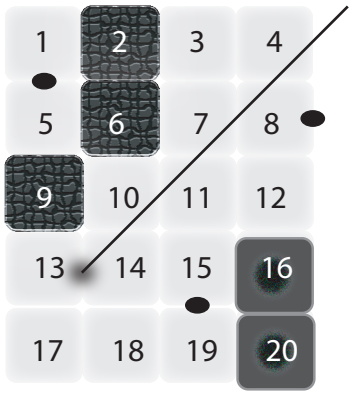
The black line coming out of the metal gun is the path of the ball.

The place where you go looks something like the above figure. For the arrangement shown in the figure, the metal ball could only hit one button. Make appropriate shifts in the positions of rocks so that the ball can hit all the three buttons.

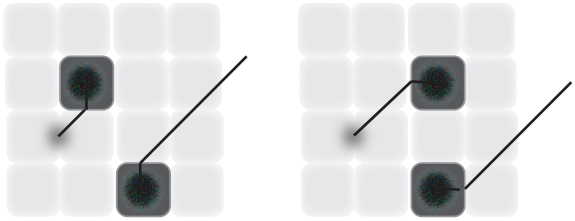
Question 17:
What is the sum of all the positions that have rock (including fixed) on them?
(Two digit integer type)



After the kabuliwala leaves, you find another similar grid. Solve this one to have a treasure for yourself :-



WORMHOLE ROCK :- Acts as a teleport for the ball. How it exactly works is shown in the below 2 figures.



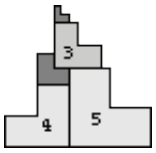
Question 18:
What is the sum of all the positions that have rock (including wormholes) on them?
(Two digit integer type)

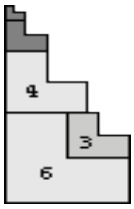
TILING

[Marking Scheme: Pay for Help]

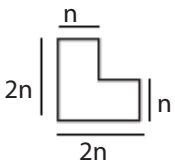
You then head towards Kabul. After reaching there, you come to know that the King's descendant found an ancient-Treasure Box. One of the men of the ancient court discovered that the code that unravels the treasure, is hidden in the below puzzles. Help the descendant and get 10% of the treasure as reward.

PUZZLE 1:
You are given ten 'L' shaped tiles of size 1 through 10. Stack tiles so that each tile is fully supported and also the stack is as high as possible. For example, we can stack L's of side 1 through 5 so that the stack is 18 units high and stack L's of side 1 through 6 so that stack is 26 units high as shown in figures below.
[Note: It is not necessary that all the L's should be present from one to 10]





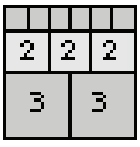
An 'L' of size n means

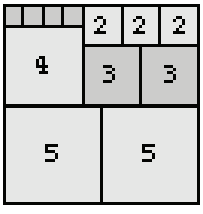


Question 19:
What is the maximum height of the stack formed on stacking tiles of side 1 through 10?

And now, the shape of the stack gives you the shape of the key that unlocks the box but you still don't know the size (in terms of number) of the key, which is hidden in the next puzzle.

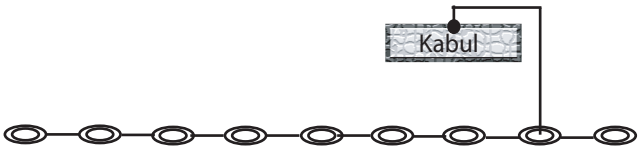
PUZZLE 2:
A large square can be formed by small integer sided squares so that each square either lies on the bottom layer or lies on top of one or more larger squares. Some examples are shown below:





The number on the square is the length of its side.

Question 20:
What is the smallest odd square that can be formed using above method?



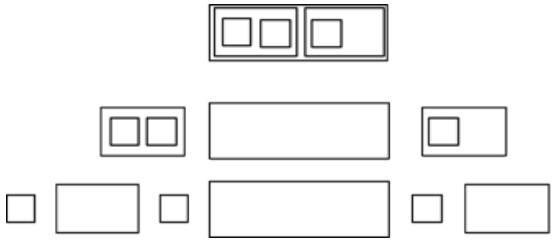
THE FINAL HUNT

[Marking Scheme: Pay for Help]

You are running out of time. You now reach the outskirts of Nepal but have no idea about the route to Assam. You then ask a person nearby for help. He helps you but through a puzzle.

He shows you 12 boxes of different sizes, each having two cavities(right and left) in which smaller boxes can be kept. He then numbers each box and places one inside the other randomly without showing you.The final result is a single box. He says, he will give you the correct map only if you tell which box is in the right cavity of box numbered '2'. If you find out the number of that box you will get the map.

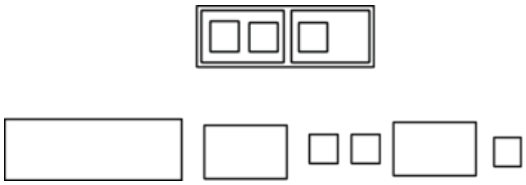
Here are your clues:
1. If he unpacks all the boxes and arrange them in a line in the following way,



The figure is a sample arrangment of boxes that explain the first method used to unpack all of them into individual boxes.

then the final numbering of boxes in which the boxes are arranged would be
5 11 4 2 7 6 1 8 10 3 12 9

2. If he unpacks all the boxes and arrange them in a line in the following way,



The figure is a sample arrangment of boxes that explain the second method used to unpack all of them into individual boxes.

then the final numbering of boxes in which the boxes are arranged would be
1 2 4 5 11 6 7 3 8 10 9 12

Question 21:
Which box is in the right cavity of '2'?
(A) 11 (B) 6 (C) 7 (D) 5

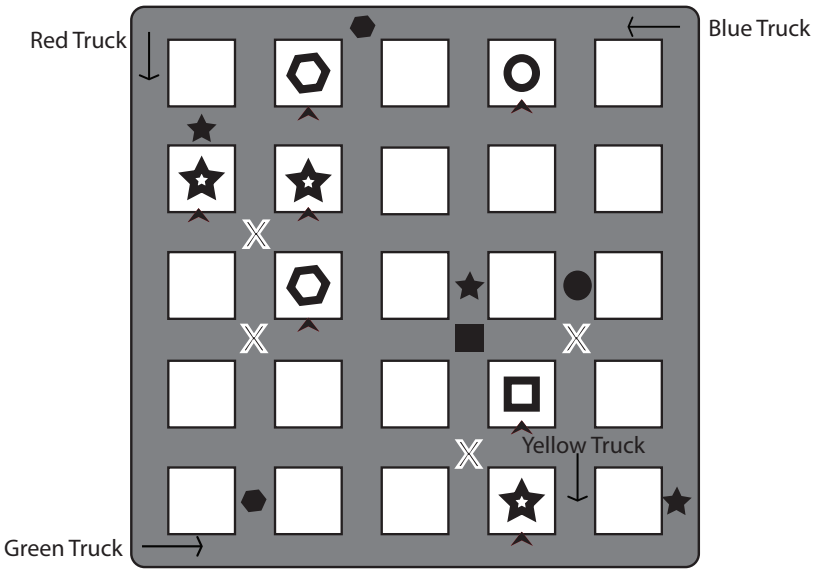
Question 22:
If you found out the right box then also tell how many boxes of smallest size did he show you initially?
(A) 2 (B) 3 (C) 4 (D) 5

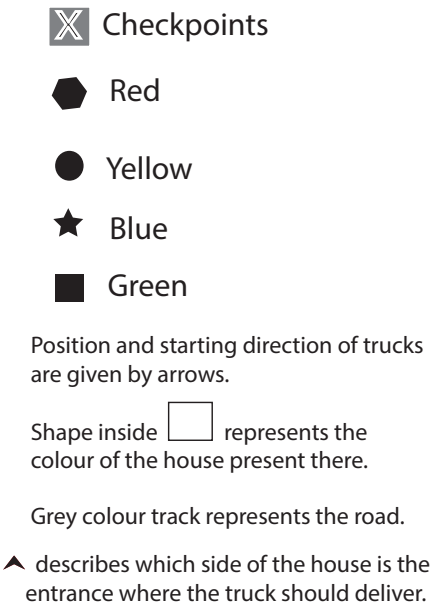
Nepal

The unfolding of the map came as a complete surprise. It was not the whole map but just a part of it. The instructions below will tell you how to get the other parts.

The rest of the parts are hidden in the houses shown in the figure below. You will get the parts of the map only on delivering the right article(one per house) to all the houses.

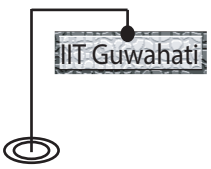
(i) An 'X' coloured ARTICLE should be delivered to an 'X' coloured HOUSE only by using an 'X' coloured TRUCK.
(ii) A truck can also carry other coloured articles so that it can place them at any of the CHECKPOINTS from where other truck can later carry it to the destination.
(iii) Trucks can carry any number of articles at a time.
(iv) The main objective is to start all the trucks at the same time, with same speed and deliver the articles without collision of trucks. Also, a truck picks up every article that comes on its way.
(v) Last and the most importantly, the PATHS of the trucks should not overlap at any point other than junctions. At junctions, the paths can though cross each other (but both trucks should not reach that junction at same time which leads to collision). The trucks can move only forward.





Question 23:
Draw the final path of all the trucks and give the number of turns taken by the blue truck.
(A) 8 (B) 7 (C) 6 (D) None of the above

Question 24:
Give the total number of articles carried by the red truck on it's way.
(A) 1 (B) 2 (C) 3 (D) 4



You come to the end of the journey and the owl in your arms flutters its wings and flies above your head to face you. A light glow fills the air around it as it speaks:
"Athena Noctua I am called. Sent by the goddess of Wisdom herself to help you on this and select the best members on the earth to fulfill the ancient prophecy of Athena. The good you've collected on your way will decide your fate. Till we meet again! " and the owl you held so dear to you for so long flies off leaving you waiting for the results.

A word from organizers of Technothlon 2015

Congratulations!

You just attempted a paper which has been argued as one of the most competitive examinations conducted for the school students in India and abroad. As you sat behind your desks, scratching your pens and brains, spending your last two and half hours attempting the paper in front of you, along with lakhs of your peers all over the globe, hundreds of thoughts might have crossed your minds. We too while making this paper had our own set of apprehensions and doubts. Often during the course of preparation of the paper, we did ask ourselves a few questions: "Is the paper too tough? Will the students find it interesting to solve the paper? Are the questions too arbitrary?"

However, finally when the question paper reached into its final stage as is before you, all our anxieties got wiped off. The paper has been so designed that you along with your partner can solve all the questions within the stipulated time. Also, you do not need to be the alter ego of Albert Einstein to solve the paper. Our motto is to inspire all the young minds who write the paper and with that sole intention do we frame the questions so that we can select the best and the brightest buddies of our nation. Having a long experience of inspiring young minds worldwide, this twelfth edition of Technothlon prelims comes close to testing the mental prowess that a student requires to become a world leader and in turn inspire as many young minds as he/she can.

Making it through the preliminary round definitely adds another feather to your hat. However, don't lose hope if you somehow don't manage to make it to the top notch because one sheet of paper cannot decide your future. As has been aptly quoted by Conrad Hilton, "Success seems to be connected with action. Successful people keep moving. They make mistakes, but they don't quit". We do hope that you will positively take up this challenge, again come back next year and clear one of the most competitive exam.

This paper which lies in front of you is the fruit of the countless number of hours of effort put in by our team members. Technothlon team members have worked so diligently day and night and put in their heart and soul to make the question paper right from scratch to its present form. As you might see, they have done a commendable task! We do hope that you will enjoy solving the paper as much as we did while preparing it!

Good luck for your future ahead!

An open invitation for a lifelong association with Technothlon

Before you feel like you have reached the end of a sensation, we should remind you that this is merely the beginning! The Technothlon 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 is our means of reaching out to the student community. Be connected, stay updated!

We are eager to help through counselling 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 Technothlon thrives on for improvement.

Chief Organizing Team

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Like a picturesque canvas has the most precise blend of colours, patterns and brush strokes, Techniche year after year promises to be a perfect blend of ideas, innovation and enthrallment. It has stayed true to its vision of motivating the youth of our nation to think out of the box, expand their horizons and reach the zenith of success in all techno-management spheres. Techniche brings forth a kaleidoscope of events, be it the astounding keynotes delivered by globally admired personalities in The Lecture Series or the opportunity to interact with eminent industrialists in The Industrial Conclave. Rediscover your inclination towards the literary aspect of life challenging Literary Events and a chance to perfect your art of diplomacy through IIT Guwahati's Model United Nations. From thrilling Robotic competitions to the enriching Workshops, every bit promises to be a fulfilling experience. With innovative ideas like Technothlon - The International School Championship, The Guwahati Half Marathon as well as other life inspiring initiatives, Techniche has left no stone unturned and now takes pride in being one of the premiere techno-management festivals of the nation.

LECTURE SERIES

The Lecture Series serves as a platform to inspire and motivate thousands of young minds across the world by connecting them with the pioneers in various fields. Students and professors, participants and school children alike, all clamour into the auditorium to interact with illustrious figures from all walks of life who come under one roof and share their experiences and ideas. It brings you an opportunity to interact with such personalities who are at the helm of changing our world today. Previous speakers who have graced the lecture series include the likes of John C. Mather (The 2006 Physics Nobel Laureate), Lyn Evans (Project Leader, Large Hadron Collider, CERN), Pranav Mistry (The Inventor of 6th Sense Technology), Stephen P. Morse (Chief Architect, Intel 8086 Microprocessor), Richard Stallman (Founder, Free Software Movement), Walter Bender (Ex-Director, MIT Media Labs), etc. Having gained immense popularity over the past few years, it is widely recognized as the biggest and the best lecture series in the entire nation.

INDUSTRIAL CONCLAVE

Industrial Conclave, has been, and forges ahead as an ideal interface between the industry and the students to inspire, motivate and train them for the battle for success in life. In this 3 day long, high profile event, eminent personalities from various spheres share their invaluable experiences which helps the young minds understand the internal dynamics of the ever growing industry.The past editions saw the likes of Mr. Marten Pieters (MD and CEO, Vodafone India), Ms. Vinita Bali (Former CEO and MD, Britannia Industries Ltd), Mr. Arun Iyer (National Creative Director, Lowe Lintas India) among others, the Conclave has ceaselessly grown bigger and better, every year. So, ladies and gentlemen, register now, and witness all the action, here at the Industrial Conclave 2015.

MODEL UNITED NATIONS

Born with the aim to bring out the best in every individual, the concept of IITG MUN is guided by a set of values and goals that seeks to provide every individual "hands down" idea of the intricacies of the decision making process at international level, in an effort to provide holistic development of society as a unit.

ROBOTICS

The Robotics module of Techniche 2015 provides you a platform to bring forth new ideas and produce novel technologies in the quest to build the perfect machine. So, put your thinking caps on and let the creative juices flow. From autonomous to manual robotics, there is going to be something for everybody.

And much more....

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SCRAP SHEET

SCRAP SHEET

Technofin

a financial literacy initiative

Perturbed by the inadequate and below par financial literacy among school students in our nation, The Finance and Economics Club, IIT Guwahati introduces its initiative, TechnoFin in association with Technothlon to foster the financial literacy.

With the intention of catalysing the proliferation of financial literacy among indian youth, TechnoFin aims to acquaint the school-going students with basic economic and financial concepts and terminology which, in turn, will hand over to them the required tools to cope up with the complex financial world outside and to manage their personal finances as well.

Please read the instructions carefully

General Instructions:

1. Verify that there are 5 questions under Technofin.
2. Write the answers in the separate OMR given for TechnoFin.
3. Submit the OMR to the invigilator within 15min.
4. The question paper can be taken back home.
5. All answers must be clear and legible. In case of any ambiguity, the decision of evaluator is final.
6. No queries regarding the correctness of the questions shall be entertained.
7. It is not compulsory to attempt Technofin.

NO MARKS AWARDED FOR TECHNOFIN WILL BE INCLUDED IN TECHNOTHLON. EVERY TEAM ATTEMPTING TECHNOFIN WILL GET AN E-CERTIFICATE FROM **THE FINANCE AND ECONOMICS CLUB, IIT GUWAHATI**.

Marking Scheme:

Marks for ith question is the compound interest for the ith year on Rs 10 at 10% per annum.

Time value of money is one of the most core concepts of finance. Simply put ₹100 in hand today is worth more than ₹100 in hand a year later. The reason being ₹100 of today can be invested to yield more than ₹100 in 1 year. But the question arises, by how much is it worth more. That depends on the rate existing in the market. If the rate of return in the market is 10% annually, ₹100 in 2015 becomes ₹110 in 2016. Looking at the equivalence backwards, ₹110 in 2016 is equivalent to ₹100 in 2015.

Have a look at the cash flows for a project of the toy making company ABCD.

Year	Cash Flow
2016	-100
2017	-110
2018	242

(Cash flows occur at the beginning of each year, '-'sign refers to an investment by the ABCD and '+' sign refers to the cash the ABCD received.
Considering the fact that the value of money is linked with time, financial decisions can be taken only when all cash flows are brought back to the present time when the decision is taken.
Here comes the concept of NPV, where all cash flows are brought back to their present equivalent and added to give the NPV of a project.

Positive NPV	Value generated by project
Negative NPV	Value destroyed by the project

Another important aspect lies in the fact that value generation is always relative. For Example, If the average profit a banana seller makes is ₹100 a day and I make a profit of ₹90 a day selling bananas (in the same industry- banana selling), my value generation is -₹10.

Question 1:
You are the chief financial officer (CFO) of ABCD. Your products division approaches you with the idea of a project of 3 years for a new product. The cash flows of the project are predicted as in Table above. Considering an average return of 10% in the industry in the case of such products. What is the NPV of this project and will you approve it?
(A) +10, Yes (B) -10, No (C) 0,Yes (D) 0, No

Question 2:
Being the respected CFO that you are, you are approached daily with multiple projects with various NPV's. What inference flashes through your mind when you see a project with negative NPV?
(A) Loss is made through the project, hence project should be abandoned.
(B) Loss is made according to the cash flow forecast and hence no value creation occurs.
(C) Projects does not create as much value as equivalent projects in the industry and hence makes a loss to the company.
(D) Projects does not create as much value as equivalent projects in the industry but it may be making a profit to the company.

"Sensex, Nifty at 8-month lows as Sensex goes down by 470 points, Nifty goes below 8,000" made headlines on 11th June 2015.
India has two major stock exchanges: BSE(Bombay Stock Exchange) and NSE(National Stock Exchange) accounting for massive trade of stock(A share in the ownership of a corporation) of public companies.
Sensex and Nifty are indicators of the market sentiment. They give us a general idea about whether most of the stocks have gone up or most of the stocks have gone down in the stock market.
SENSEX-(or SENSitve indEX) was introduced by the Bombay stock exchange. It comprises of 30 financial sound companies representative of various industrial sectors of the Indian economy.
Nifty was introduced by the National Stock Exchange as indicator of 50 major Indian companies that are listed in the NSE.
They are calculated by means of weighted market capitalization method. Market capitalization of a company is nothing but the shares in the market multiplied by the price of each share. The change in the total market capitalization of all the companies used to compute an index is what drives the index either up or down. If the market capitalization rises by 10% then so does the index.

Question 3:
Assume a stock index computed using stocks of 2 companies: A and B (unlike 30 in the case of Sensex and 50 in the case of NIFTY). Company A has 100,000 shares outstanding and B has 200,000 shares outstanding.Yesterday, A is traded at Rs. 200 and the second stock 'B' traded at Rs.150. Today, the price of A hits 260 (30% increase in price) and the price of B hits 135. (10% drop in price) what will be change in the stock index if the index yesterday was 100 points?
(A) 6 points increase
(B) 10 points increase
(C) No change
(D) Insufficient information in the question.

Question 4:
Foreign direct Investment(FDI) simply means foreign companies investing in local businesses actively. This might involve either creation of new factory and new businesses as in the case of ford setting up it's factory in Chennai or buying existing local businesses for the purpose of growing it as in the case of Vodaphone buying Hutch.
Congratulations!!!.. You have taken up office as the Union Finance minister and you are determined to create India as a good investment location for foreign investors. To start with you intend to make the retail industry more open to FDI, so as to create more jobs, infrastructure and to have more foreign cash flow in the country. However you are strongly opposed by the retail shopkeeper's Union. Their leader says- "Bringing in Foreign retail giants is injustice to all the local store owners.. We wont let you steal our bread". Given the situation you have called a press conference to justify your initiative. Which arguments will you put in the press conference?
1. FDI in retails would promote the collaboration of the local shopkeepers and the retail giants thus ultimately help the shopkeepers in the long run.
2. The FDI would help consumers as local businessmen providing bad quality services would need to improve to match up with international counterparts.
3. The FDI would help bring newer technologies and organised business practices to the country.
4. The FDI would help benefit Indian Farmers, as international agricultural retail giants will promote organised supply methods and infrastructure which would help reducing the huge number of crops that perish every year.

(A)1,2,3 (B) 1,2,4 (C) 1,3,4 (D) 2,3,4

Question 5:

A newspaper headline in leading newspaper reads- "Inflation in India reaches -2.06%". What inference do you draw from that?

1) The cost of general goods are going down
2) The country and its citizens are definitely going to prosper now.
3) There might be a need to boost the economic growth and an unemployment situation may arise in the country.

(A) 1 & 2 (B) 2 & 3 (C) 1 & 3 (D) 1,2 & 3