Logic GC : Round 2

Math and Physics Club, IIT Bombay

Time: 60 minutes
Hostel:

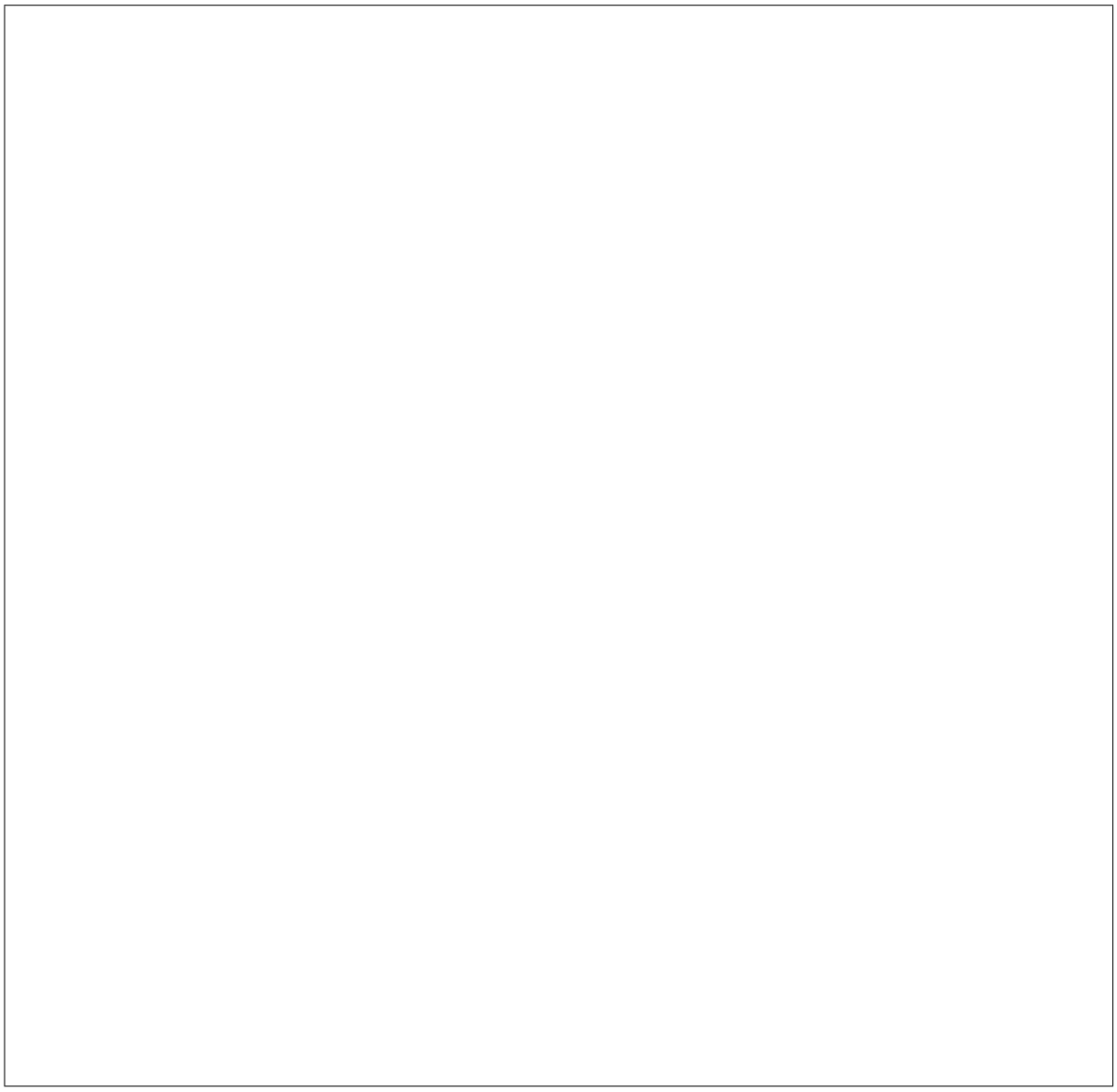
Name 1 :	E-mail 1:
Name 2 :	E-mail 2:
Name 3 :	E-mail 3:

Question	1	2	3	4	5	6	7	8	9	10
Marks										

1. From each cell you can jump horizontally or vertically a specific number of squares from that cell. However, as you move around the maze the size of your jump varies by the offset shown in each cell you land on.
   Start on the 3 in the top left corner. Initially the length of your jump is 3, so from the starting cell you can jump three cells to its right or three cells down. In each case you land on a cell containing +1, so the size of your jumps is now increased to 4. Note that negative jumps aren't allowed.
   Continue in this way and find the shortest series of jumps that will take you to the goal in the bottom right corner.

3	+0	+1	+1	−2	+1
+1	−1	+1	+0	+1	+2
+1	+1	−1	−1	+2	+1
+1	−1	+0	+2	−2	+1
+0	−1	+3	−3	+2	0

2. Natasha and Naomi are performing their favorite magic trick for some friends. In front of them is a standard deck of 52 facedown cards. They invite a friend (who is not "in" on the trick) to shuffle the deck and then select five cards to give to Naomi. Naomi looks at the five cards, chooses one (which she puts facedown in front of her), then arranges the remaining four cards in any order she wants (all face down) and hands them to Natasha. Natasha looks at the four cards and then correctly names Naomi's card. Can you figure out how the two girls performed the trick?

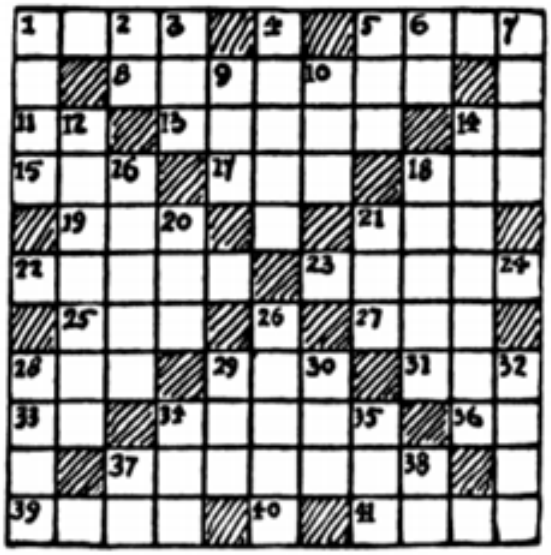


3. The puzzle is to place numbers in the spaces across and down, so as to satisfy the following conditions:

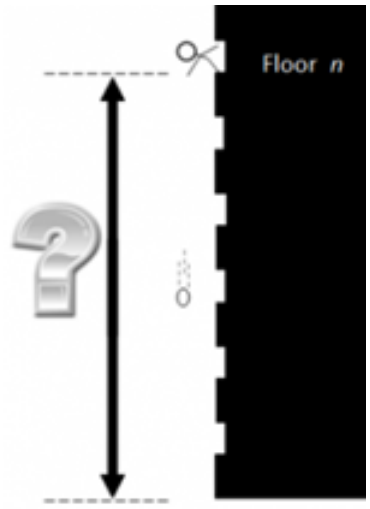
Across- 1. a square number;
4. a square number;
5. a square number;
8. the digits sum to 35;
11. square root of 39 across;
13. a square number;
14. a square number;
15. square of 36 across;
17. square of half 11 across;
18. three similar figures;
19. product of 4 across and 33 across;
21. a square number;
22. five times 5 across;
23. all digits alike, except the central one;
25. square of 2 down;
27. see 20 down;
28. a fourth power;
29. sum of 18 across and 31 across;
31. a triangular number;
33. one more than 4 times 36 across;
34. digits sum to 18, and the three middle numbers are 3;
36. an odd number;
37. all digits even except one, and their sum is 29;
39. a fourth power;
40. a cube number;
41. twice a square.

Down- 1. reads both ways alike;
2. square root of 28 across;
3. sum of 17 across and 21 across;
4. digits sum to 19;
5. digits sum to 26;
6. sum of 14 across and 33 across;
7. a cube number;
9. a cube number;
10. a square number;
12. digits sum to 30;
14. all similar figures;
16. sum of digits is 2 down;
18. all similar digits except the first, which is 1;
20. sum of 17 across and 27 across;
21. a multiple of 19;
22. a square number;
24. a square number;
26. square of 18 across;
28. a fourth power of 4 across;
29. twice 15 across;
30. a triangular number;
32. digits sum to 20 and end with 8;
34. six times 21 across;
35. a cube number;
37. a square number;
38. a cube number.

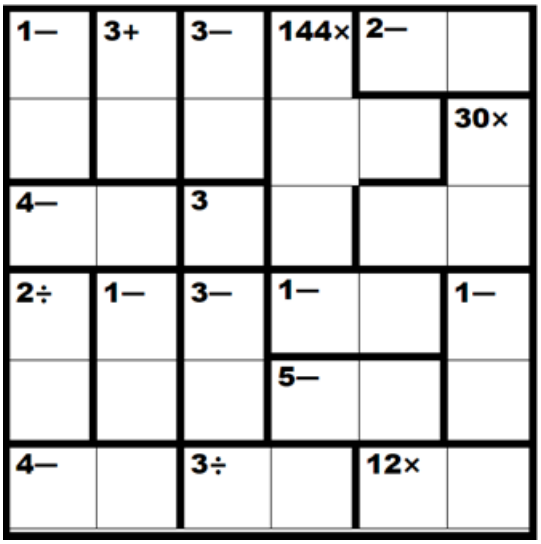
* a triangular number is any of the series of numbers (1, 3, 6, 10, etc.) obtained by continued summation of the natural numbers 1, 2, 3, 4, etc.



4. You are given 2 eggs. You have access to a 100-storey building. Eggs can be very hard or very fragile means it may break if dropped from the first floor or may not even break if dropped from 100 th floor.Both eggs are identical. You need to figure out the highest floor of a 100-storey building an egg can be dropped without breaking.
   Now the question is how many drops you need to make. You are allowed to break 2 eggs in the process.

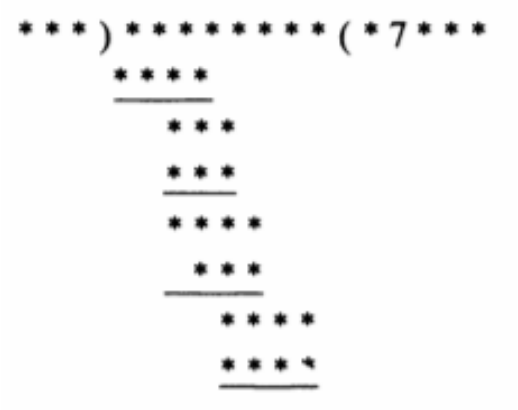


5. Fill the grid with numbers 1-6. No numbers may appear more than once in any row or column. (That is, all required numbers must appear in every row and column). Each "cage" (region bounded by a heavy border) contains a "target number." If there's more than one cell in the cage, the target is also accompanied by an arithmetic operation. You must fill the cage with numbers that produce the target number, using only the specified arithmetic operation. Numbers may be repeated within a cage, if necessary, as long as they do not repeat within a single row or column.



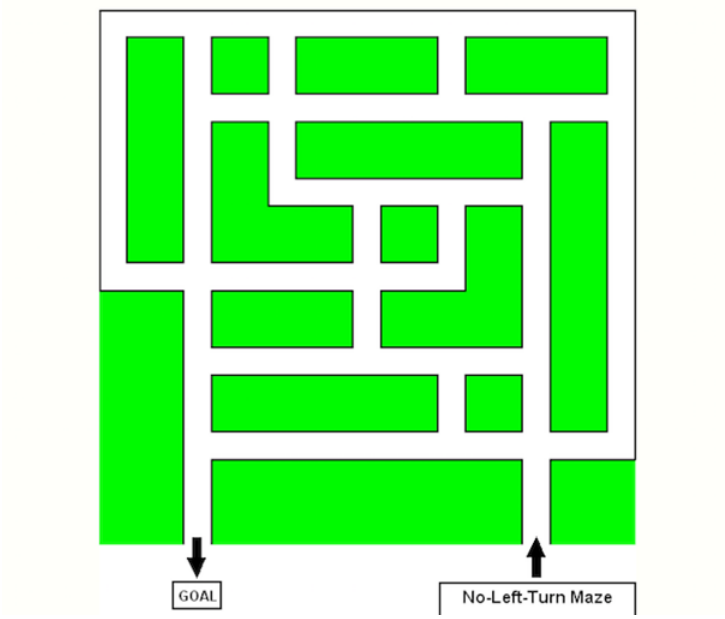
6. 3+5+6=151872
   5+5+6=253094
   5+6+7=303585
   5+5+3=251573
   then 9+4+7=?

7.



Replace the stars with digits 0-9. There's only one solution.

8. Without turning left, how do you travel from the start to the finish line?



9. For which day of the week (Sunday, Monday, etc.) is the probability of the 13th of an arbitrary month in an arbitrary year falling on that day largest? Is this probability for each day of the week the same?

10. Three gods A, B, and C are called, in no particular order, True, False, and Random. True always speaks truly, False always speaks falsely, but whether Random speaks truly or falsely is a completely random matter. Your task is to determine the identities of A, B, and C by asking three yes-no questions; each question must be put to exactly one god. The gods understand English, but will answer all questions in their own language, in which the words for yes and no are da and ja, in some order. You do not know which word means which. What 3 questions will you ask? Explain.