NCPC 2016 Preliminary Editorial

SHIPLU HAWLADER · SUNDAY, FEBRUARY 21, 2016

Problem A: Am I in the Correct Direction?

Problem Setter: Alina Zaman

Special Thanks: Md. Shiplu Hawlader

Category: Giveaway

Correct output of the problem is “East”. Though one can solve the problem without any calculation just by submitting 4 possible output.

Problem B: Day of the Year

Problem Setter: Alina Zaman

Special Thanks: Md. Shiplu Hawlader

Category: Ad-hoc, Giveaway

The limit of this problem is such that you can’t use loop to find the day. You have find an equation to solve the problem.

Find the difference between the days, mod it by 7 and find the next day according to the current.

The most important case of this problem is when Y < X. Many teams suffered for this case.

Problem Setter: Shahriar Manzoor

Special Thanks: Monirul Hasan (Tomal Is-a Tree), Md. Shiplu Hawlader

Category: Ad-hoc

if the (d+1) th digit is zero and all digits after that is zero, the situation is "No change"

else If the (d+1) th digit is 5 and all the digits after that is zero, the situation is ambiguous.

else if (d+1) th digit is greater than or equal to 5, rounding up causes less error.

else if (d+1) th digit is 4 or less, rounding down causes less error.

Problem D: Power from Power

Problem Setter: Ridowan Muhammad

Special Thanks: Bidhan Roy

Category: Mathematics, Number Theory

```
a^b = c^d
```

Suppose **a = p^q**, where **p** is prime number. So we can rewrite the equation as,

```
(p^q)^b
 = p^(b*q)
= p ^r  [let r = b*q]
```

Again let **x** is a divisor of **r** and **y = r / x**. So

```
p^r = (p^x)^y = c^d
So c = p^x and y = d.
```

How many way you can write **p^x** and **y** or we can say how many way we can write **r = x*y**.

So we have to find number of divisor of **r** or **b*q**.

Another case can be like **a = p1^q1 * p2^q2 ... pk^qk**. Here **p1, p2, ... pk** are prime numbers.

Problem E: Friendly Neighborhood

Special Thanks: Anindya Das

Category: Computational Geometry

If you closely look into the equations and conditions, you can easily find out that this is a straight forward Convex Hull problem.

Problem F: Team Selection

Problem Setter: Bidhan Roy

Special Thanks: Ridowan Muhammad

Category: DP, Counting, Probability

This is a DP and Combinatorics problem. To determine the denominator, we have to compute how to take k players from n player which is Binomial Combinatorial function or nCr(n,k). So the main problem remains to determine the numerator.

This can be done by several DP approaches. One way could be first compressing the skills so they have at most 50 different states instead of 10^9. No in the dp, first sort/group the candidates so who have the required skills comes first and same skills candidates are group, non required after them. Take for each required skill at least one candidate and track which is the minimum for L for which each required skill's at least one candidate have <=L skill level. As skills are now compressed, maximum value for L can be 50. After considering required skills candidates, check non required skills candidate. Take only with >L skill level. One extra check is make sure all required skills have been taken. Alternate solution is 50*50*50*2 states DP. (From Ridowan)