Sciensation'12

That's when science gets addictive

Registration Number:

School:

Question1

You have the Kohinoor diamond and it needs to be transported to your friend in the USA. You have boxes, locks and a key. The courier (only one) guy will have to give the box to your friend and the box can be opened only with the key. How would you ensure that the courier guy doesn't steal the diamond. Can you do this without transporting the key.

Question2

Arjun needs to tell a secret to his friend Chary. However, Bobby can listen and he must not know Arjun's password.

So, Arjun says I shall replace all the "a"s in the password with "b"s and vice-versa(This is secret). Now, if Arjun transmits "bvblbnche", the actual password is recovered as "avalanche" and so Chary gets the correct password. Bobby will believe that the password is "bvblbnche".

Recover the message in the first paragraph. Exactly four pairs of letters were interchanged.

Ong huts nos juts do tubtsisusion. Frgaugncy of lgssgrt could bg utgd so brgqk smg hgttqeg, auisg gqtily. mowgvgr, smit it hqdg pottiblg only if smg lgnesm of smg hgttqeg it tufficignsly miem. You nggd so eugtt q fgw wordt corrgcsly qnd qfsgr smqs you will rgcovgr smg wmolg hgttqeg.

You wgrg nos qtkgd so srqntlqsg smit. smit it bgine eivgn so you, juts to smqs you egs horg wordt so work wism. You tmould obtgrvgd smg frgaugncy of smg qnd smqs tmould mqvg mglpgd you. By now you tmould mqvg undgrtsood wmy smit tors of codine it nos tqfg. smit it vgry prihisivg forh of codine qnd wqt utgd durine smg firts world wqr. If smit hucm lgnesm it nos gnouem, wg qrg torry. Wg nggd smg codg so bg rgqtonqbly cmqllgneine.

Clues: Frequency of words in english language(Ignore the numbers, e is usually most frequent)

E	T	A	O	I	N	S	H	R	D	L	U	C
12.7	9.1	8.2	7.5	7.0	6.7	6.3	6.1	6.0	4.3	4.0	2.8	2.8
M	**W**	**F**	**Y**	**G**	**P**	**B**	**V**	**K**	**X**	**J**	**Q**	**Z**
2.4	2.4	2.2	2.0	2.0	1.9	1.5	1.0	0.8	0.2	0.2	0.1	0.1
Common pairs	TH, EA, OF, TO, IN, IT, IS, BE, AS, AT, SO, WE, HE, BY, OR, ON, DO, IF, ME, MY, UP											
Common repeated letters	SS, EE, TT, FF, LL, MM and OO											
Common triplets	THE, EST, FOR, AND, HIS, ENT or THA											

Question3:

The following graph describes the distance between Raju and a railway station. You can read information from the graph as follows: at time t=10seconds, Raju was 15m away from the railway station.

Q1: Did Raju stop moving, at some time instant?

Q2: How much distance did Raju travel between 5th and 6th seconds and how much did he travel between 2nd second and 3rd second? So, in which time interval was he faster?

Q3: At which time instant was Raju faster

Q4: Raju is replaced by Rajnikanth and he is allowed to be at two places parallely. At what time instant is Rajni is "farthest" from the other Rajni.

Q5: During which time interval is Rajni moving away from Rajni with fastest speed(amongst the whole journey)

Question4:

During Diwali, everybody bursts crackers and as you know it leads to air pollution.

	Bursting Crackers	**Not burst Crackers**
Many people burst Crackers	Enjoyment Pollution	No Enjoyment Pollution
Few people burst Crackers	Enjoyment Clean	No Enjoyment Clean

If a lot of people burst crackers, we are better off bursting crackers since environment will get polluted anyway. If a few people burst crackers, burst crackers as it will be clean anyway.

This selfish thinking destroys the environment. This is called as “Tragedy of the Commons” (Look up “Prisoner's Dilemma” for more interesting information).

INTERNET PROTOCOL: Servers can handle upto a certain number of requests at a time. If there are more requests, it will lead to congestion. A simple protocol followed is "If you wait, you will get preference once the congestion is cleared". In simple words, to clear a traffic jam, the constable can tell “those who wait will get preference once the jam is cleared”.

This tends to kill the selfish mentality. Such a simple rule solves such a big problem of internet congestion. **What do you think the difference is, between both the scenarios?**

Comments: How do you handle corruption, what is "fair", what is gambling and many more such questions can be pursued using game theory. This was advertisement of game theory :).

Question5

Water is a universal solvent. The structure of water, ammonia and hydrogen flouride are given below. Negative and positive charges attract each other (attraction is more if amount of charge is high). Suppose I introduce one more such molecule(with charge), water develops higher force than what ammonia or hydrogen fluoride can. Explain.

Question6: India’s run-rate in the final over of a match is 7.63, the score reads 227/4. What could be the total number of overs per side.

Question7: The attendances of students in a class are: 97.4359,94.87179,89.74359,79.48718 & 74.35897. What could be the total number of classes?

The **Alan Turing Year 2012** is being celebrated on the occasion of the centenary of his birth on 23 June 1912. Turing made important contributions to code-breaking during the Second World War.

Sciensation is a team of undergraduate students interested in popular science actitivies. We aim at (i) making science interesting (ii)concept based science education (iii) networking kids with scientists and experts.

Sciensation aims at building a community of enthusiastic school kids, undergraduate students and scientists. This is to ensure that kids get information about possible experiments/reading/fun.

We hope to forward some of the entries of this programme to experts in respective areas(game theory, chemistry, cryptography etc)

Those interested in reading more about any of these or new fascinating sciensational objects, are free to contact us.

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