ABACUS Tesseract 2013 – Set #9

Question #1:

One fine morning, a worker of a clock-tower in a village A founds that the battery of the clock had died down during the last-night. He has a new battery to start the clock but doesn't know the correct time to set in the clock.

The nearest availability of correct time is only at the clock-tower in a nearby village B (i.e. no other clocks in the village). There is no means of communication with other village and to know the current time, this worker will have to travel to village B. Only issue is the worker of clock-tower of village B is this person's brother and if he goes there he will have to stay there for at least some time (say over a meal).

What strategy will this person put to set his clock at correct time by a single visit to village B and using only the time from the clock-tower in Village B. Assume that time of travel to and fro is same between A and B.?

Question #2:

A professor by-mistake forgot to write the multiplication sign between 2 three-digit numbers (So he wrote a six-digit number on the board).

He asks his students to find the initial 2 three-digit numbers but gave a hint that the written six-digit number interestingly was seven-times bigger than the actual product of those 3-digit numbers.

Help students in finding the initial three-digit numbers.

Question #3: The Monty Hall Problem (asked in a DB interview)

You are in a game show. There are three doors. You know that there is a prize behind one of them, and nothing behind the other two. The game show host tells you that you shall receive whatever is behind the door of your choice. After you make the choice, the host opens one of the other two doors to reveal that it is empty. He will then give you the option to switch your choice. e.g. You choose Door 3. He opens Door 2 and reveals that it is empty. You now know that the prize lies behind either Door 3 or Door 1. Should you switch your choice to Door 1? Assume that the host knows what lies behind each of the doors.

SOLUTIONS

Solution 1:

Trick is for worker to start running clock A (at some random time) and leave for Village B. After reaching Village B, using time of clock B, he can find his total stay at his brother's place (say time Y minutes). Also he notes the time at which he leave Village B (Say HH:MM:SS).

Coming back to Village A, he can find the difference between his starting time from A and coming back time to A (say this is X minutes). So time for travel each side is = (X-Y)/2.

So the current time is HH:MM:SS + (X-Y)/2 minutes.

Solution 2:

Suppose the numbers are x and y such that $100 < x, y < 999$

Now $7xy = 1000x + y$ ---- [1]

or $7y = 1000 + (y/x)$ ---- [2]

Since $100 < x, y < 999$, => $0 < y/x < 10$

By substituting in equation [2]

=> $1000 < 7y < 1010$ => y = 143 or y = 144

Substitute y value in equation 1 to get corresponding x value

If y = 144 => x = 18: which is not a solution as X should be a 3-digit number

If y = 143 => x = 143. Therefore the initial 3 digit numbers are 143 and 143.

Solution 3:

You might have solved this problem before using conditional probability. Let us look at an elegant solution.

Suppose you repeat the experiment for a large number of times, say 999.

333 of the times you would choose a door behind which there is a prize. In each of these 333 times, if you choose to switch after the game show host opens one of the other two doors to reveal that it is empty, you would win nothing.

666 of the times you would choose a door behind which there is nothing. In each of these 666 times, if you choose to switch after the game show host opens one of the other two doors to reveal that it is empty, you would win the prize. So, 666 of the times, it makes sense to switch.

This suggests that the chance to win the prize is greater if you switch.