Brain Teasers

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Problem 0.1: (CarTalk)

You're placed on a medication regime in which you are to take daily one tablet of A and one of B. So, you have two little pill containers. One says "Pill A," and one says "Pill B." You must be careful. Taking two or more B's can have unpleasant side effects or can even be fatal. In order for the B to be effective it must be accompanied by the A pill. So, you open up the A bottle and you, as people do, you tap the bottle, and one A pill jumps out into your palm. You open the B bottle, and you accidentally get two Bs falling out of the bottle. But here's the problem. They look exactly the same. They're both blue, they're the same size, they're the same weight, with no markings on the pills. And as soon as they fell into your hand, they got mixed up, so now you have three pills, but you can't tell what the heck you have. Now, of course, you could just throw these pills away. But the pills cost a hundred bucks apiece! So how can you make sure that you get your daily dose of A and B without wasting any of the pills?

Solution 0.1: Get another A and then cut the four pills in half.

Problem 0.2

Three points are randomly chosen on a circle. What is the probability that the triangle determined by these three points contains the center of the circle?

Solution 0.2: $\frac{1}{4}$

Problem 0.3

Three points are randomly chosen on the surface of a sphere. What is the probability that these three points lie in the same hemisphere?

Solution 0.3: 1

Problem 0.4

A car is on a circular road that has several gas stations. The gas stations are running low on gas and the total amount of gas at the stations and in the car is exactly enough for the car to drive around the road once. Is it true that there is a place on the road where the car can start driving, stopping to refuel at each station, so that the car completes a full circle without running out of gas?

Solution 0.4: Yes.

Problem 0.5

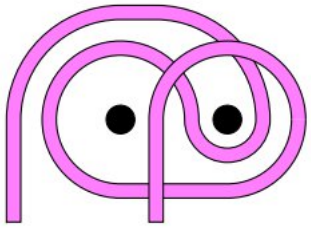
There are 3 white hats and 2 black hats. The hatman gives a different hat to each of 3 prisoners. Each prisoner is only allowed to see the hat color of the other prisoners. The first person to correctly identify their hat color and explain their logic behind it is set free. The prisoners looked at each other for 25 minutes. Then, one of the prisoners gave a correct answer with an explanation. What was his/her hat color and how did he/she know?

Solution 0.5: The hat was black.

Problem 0.6

Is it possible to hang a picture on two nails such that if either nail is removed the picture falls?

Solution 0.6:



Problem 0.7

A 2020×2020 board is divided into unit squares. In every square there is an arrow that points up, down, left or right. The board square is surrounded by a wall, except for the right side of the top right corner square. An insect is placed in one of the squares. Each second, the insect moves one unit in the direction of the arrow in its square. When the insect moves, the arrow of the square it was in moves 90 degrees clockwise. If the indicated movement cannot be done, the insect does not move that second, but the arrow in its squares does move. Is it possible that the insect never leaves the board?

Solution 0.7: The insect will be able to leave the board.