MATH CLUB: SOME PROBABILITY PROBLEMS

JAN 21, 2018

1. My neighbors have two children.
   (a) What is the probaility that one of them is a boy and the other, a girl?
   (b) I know one of their children is a boy (because my son is in the same class with him). What is the probability that the other one is a girl?

2. The Monty Hall problem is named for its similarity to the *Let's Make a Deal* television game show hosted by Monty Hall. The problem is stated as follows. Assume that a room is equipped with three doors. Behind two are goats, and behind the third is a shiny new car. You are asked to pick a door, and will win whatever is behind it. Let's say you pick door 1. Before the door is opened, however, someone who knows what's behind the doors (Monty Hall) opens one of the other two doors, revealing a goat (he will never open a door with the car behind it), and asks you if you wish to change your selection to the third door (i.e., the door which neither you picked nor he opened).

   Should you change your selection??

3. You are given 2 envelopes containing money. It is known that one contains 10 times as much money as the other.

   You are allowed to choose one envelope, open it, and then either keep the money or take the money form the other envelope.

   You choose an envelope, open it, and find $30 inside.

   What should you do?

4. A test for some rare desease has 2% false positive rate (i.e., for a healthy person with 1% probabilty it will give a positive answer) and 1% false negative rate.

   If you taken the test and tested positive, what is the chance you are really sick? [If it helps you, the desease is rather rare – on average, one in 100,000 people have it.]