**Question:**

This is the year 2050! Aliens have been living peacefully in Lahore ever since the initial manned missions to Mars in 2025 and to the moons of Neptune in 2037. At any given time, the population of Lahore is composed of 2% Tritonians (from Triton, the only populated moon of Neptune discovered so far), 8% Martians, and of course, the rest of them are all POHs (Plain Old Humans). Since the successful trials of cosmetic DNA manipulation in 2039, that initially ensued world-wide violent protests, the three-legged green Martians and seven-legged purple Tritonians all started appearing exactly like POHs in all aspects and there is no way to tell them apart visually. There is one lingering flaw with the cosmetic DNA manipulation process though, that leads to perpetual redness of eyes in some recipients of the treatment. Tritonians are the most affected and 99.5% of them have persistent red eyes. 87.5% of all Martians also depict redness of eyes. And of course, even POHs exhibit temporary redness of eyes as a result of diseases like conjunctivitis. At any given time 20% of all POHs in Lahore also have red eyes.

You are a cop in the inter-planetary force that prevents illegal immigrant aliens. It’s your second day on job. Your task is to screen for Tritonians. You have just met an individual who appears to be a POH and says that his name is M.A.D. Chaudhary. He has red eyes!

In each of the following questions, you must show your work to get credit.

1. Given all the information above, what’s the most probably specie (Tritonian, Martian, POH) of Mr. M.A.D. Chaudhary?
2. What are the exact probabilities of Mr. Chaudhary belonging to each of three species? (Note: Assume that by 2050, there are only three species that can appear POHs)
3. There has been a breakthrough! Our estimates of fractions of aliens in the population of Lahore were all wrong! We have absolutely no clue about the fraction of Tritonians and Martians in the population. Now, given that our suspect has red eyes, what are the new exact probabilities of him belonging to each of the three species and his most probable specie?



