1. Roll a fair 6-sided die twice. What is the probability that we roll (i) two of the *same* numbers, (ii) two *different* numbers ?

2. Willy Wonka issues 7 golden tickets in a supply of n chocolate bars. If I buy k chocolate bars, what is the probability that I find a golden ticket ? Express your answer in terms of k, n and constants.

3. Instead of splitting the room cleaning duties, you and your roommate both roll a die and decide to let the person with the highest die roll clean everything. For example, if you roll a 3 and your friend rolls a 6 then your roommate cleans the room. You, being the bigger person, will clean the room should there be a tie. What is the probability that you clean the room ?

4. Consider a population where 30% of people suffer from a certain disease. There is an imperfect test for detecting the disease. When applied to a person with the disease the test gives a positive result 95% of the time. When applied to a person who does not have the disease, the test gives a negative result 95% of the time. Suppose that the test is positive for a person. What is the probability that the person has the disease ?

5. A motorway bridge uses cameras to read car number plates and charge tolls. If a person has enough funds in their account to pay the toll, this is correctly noted 99% of the time and the charge deducted. Otherwise, the camera correctly detects non-payment 99% of the time and issues a penalty notice. Suppose 1% of the cars passing over the bridge do not have sufficient funds. What is the probability that a person who receives a penalty notice in fact has sufficient funds i.e. that the penalty notice has been sent incorrectly ?

6. Suppose two websites A and B rent books. Site A receives 60% of all orders and site B 40%. Among the orders placed at site A, 75% arrive on time. Among the orders placed at site B, 90% arrive on time. Given that an order arrived on time, what is the probability that the order was placed on site B ?

7. Suppose 1% of the population are gifted with super powers. You have just noticed that you might possess a super power. Assuming you do indeed possess a super power, you correctly observe its effects with probability 0.8, otherwise you mistake its effects as coincidence. Assuming you do not possess a super power, you correctly observe this with probability 0.99. What is the probability that you possess a super power ?