Problem set 5. Probabilistic models

Exercise 1. A batch of 100 of manufactured items is subjected to random inspection. The entire batch is rejected if at least one defective item is found among the five inspected items. What is the probability of rejecting a given batch if it contains 5% of defective items?

Exercise 2. In the exam there are five questions accompanied with three possible answers but only one answer is correct. The student choose the answers to the questions at random. What is the probability that four answers will be correct?

Exercise 3. Three numbers x, y, z were chosen independently from the interval $[0, 1]$ regarding to the uniform distribution. What is the probability that their sum is greater then 1?

Exercise 4. Suppose that the probability that both twins are boys is α, and that both are girls β; suppose also that when the twins are of different sexes the probability of the first born being a girl is $1/2$. If the first born of twins is a girl, what is the probability that the second is also a girl?

Exercise 5. Three marksmen hit the target with probabilities $1/2$, $2/3$, $3/4$, respectively. They shoot simultaneously and there are two hits. Who missed? Find the probabilities.

Exercise 6. On a flight from Urbana to Paris my luggage did not arrive with me. It had been transferred three times and the probabilities that the transfer was not done in time were estimated to be $4/10$, $2/10$, $1/10$, respectively, in the order of transfer. What is the probability that the first airline goofed?

Exercise 7. Sales of cars and light trucks. Motor vehicles sold to individuals are classified as either cars or light trucks (including SUVs) and as either domestic or imported. In a recent year, 69% of vehicles sold were light trucks, 78% were domestic, and 55% were domestic light trucks. Let A be the event that a vehicle is a car and B the event that it is imported.
Write each of the following events in set notation and give its probability.

(a) The vehicle is a light truck.
(b) The vehicle is an imported car.

	cars	light trucks	Total
domestic		55%	78%
imported			
Total		69%	

Exercise 8. Two dice are rolled, one die is red and the other is white. What is the probability of getting six spots on the red die and one spot on the white die if we are given that the sum of spots on the both dice is even.

Exercise 9. Two numbers x and y are chosen randomly and independently from the interval $[-1, 1]$. What is the probability that $x^2 + y^2 < 1$ if we are given that $x^2 + y^2 > 0.25$.