

1. Given two uniformly distributed random variables X and Y with ranges $R_X = \{1, 2, 3, 4, 5, 6\}$ and $R_Y = \{H, T\}$, calculate the probabilities of the following events:

$$\begin{array}{ll}
 (a) \Pr[X = 6] & (b) \Pr[Y = H] \\
 (c) \Pr[X = 6, Y = H] & (d) \Pr[X = 6 \mid Y = H] \\
 (e) \Pr[X = 5 \text{ or } X = 6] & (f) \Pr[X = 6 \text{ or } Y = H]
 \end{array}$$

2. Consider a class of 30 students, and it is known that 17 of them are exchange students. All the students were given a test, and the results show that 4 exchange students and 5 non-exchange students got an "A". What is the probability that a student selected uniformly at random will be an exchange student or one of the students who got an "A"?
3. 18% of all students play football and basketball, and 32% of all students play football. What is the probability that a student selected uniformly at random plays basketball given that this student plays football?
4. In order to fly, an airplane needs at least half of its engines to be functioning. Suppose that during any given flight engines fail independently with some probability p . What is the probability that an airplane will be able to complete its trip?
5. A car is considered impaired if at least one of the tires in service are lost. The probability that a tire will fail is p . Calculate probability of a car successfully completing a trip. Next, consider the same car, but with one spare tire. What is the probability of successful trip completion in this case?
6. Determine if the salary rate influences the color of one's car, based on the data illustrated in Table 1.

Table 1: Salary rate vs car color

	red color	other color
low salary	28	252
high salary	7	63

7. Assume you are standing in a line to a football match and see someone with a long hair. You have no idea if it is a man or a woman. Since it is a line to a football match, we expect to meet men more likely than women. We believe that on average, out of 100 people there are 98 men and 2 women, 94 men have short hair, 4 men have long hair. Among 2 women, we believe that 1 has short hair, and 1 has long hair. Determine, if the person is front of us more likely to be a man or a woman.
8. A drug test produces 99% true positive results and 90% true negative results. We believe that 0.5% of people are drug users. What is the probability that a randomly selected person is a drug user, given that the drug test was positive?