Tutorial 2: Probability and Statistics (MAL403/IC105)

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1. A box contains 3 marbles, 1 red, 1 green, and 1 blue. Consider an experiment that consists of taking 1 marble from the box, then replacing it in the box and drawing a second marble from the box. Describe the sample space. Repeat when the second marble is drawn without replacing the first marble.

2. A total of 28 percent of American males smoke cigarettes, 7 percent smoke cigars, and 5 percent smoke both cigars and cigarettes. (a) What percentage of males smokes neither cigars nor cigarettes? (b) What percentage smoke cigars but not cigarettes?

3. If two dice are rolled, what is the probability that the sum of the upturned faces will equal 7?

4. There are 30 psychiatrists and 24 psychologists attending a certain conference. Three of these 54 people are randomly chosen to take part in a panel discussion. What is the probability that at least one psychologist is chosen?

5. If 3 balls are randomly drawn from a bowl containing 6 white and 5 black balls, what is the probability that one of the drawn balls is white and the other two black?

6. From a deck of 52 cards, we draw 13. What is the probability that we have 5 spades in our hand?

7. A committee of 5 is to be selected from a group of 6 men and 9 women. If the selection is made randomly, what is the probability that the committee consists of 3 men and 2 women?

8. Suppose n unrelated people are gathered together and that each person has an equal probability of being born on any day of the calendar year. Assuming that a calendar year has 365 days, what is the probability that we will find two or more people in the gathering with the same birthday?

9. A pair of fair dice is rolled. What is the probability that the second die lands on a higher value than does the first?

10. Two fair dice are rolled. What is the conditional probability that at least one lands on 6 given that the dice land on different numbers?

11. If two fair dice are rolled, what is the conditional probability that the first one lands on 6 given that the sum of the dice is i . Compute these probability for all possible values of i .

12. Consider 3 urns. Urn A contains 2 white and 4 red balls, urn B contains 8 white and 4 red balls, and urn C contains 1 white and 3 red balls. If 1 ball is selected from each urn, what is the probability that the ball chosen from urn B was white given that exactly 2 white balls were selected?

13. Ninety-eight percent of all babies survive delivery. However, 15 percent of all births involve Cesarean (C) sections, and when a C section is performed the baby survives 96 percent of the time. If a randomly chosen pregnant woman does not have a C section, what is the probability that her baby survives?

14. A total of 46 percent of the voters in a certain city classify themselves as Independents, whereas 30 percent classify themselves as Liberals and 24 percent as Conservatives. In a recent local election, 35 percent of the Independents, 62 percent of the Liberals, and 58 percent of the Conservatives voted. A voter is chosen at random. Given that this person voted in the local election, what is the probability that he or she is (a) an Independent; (b) a Liberal; (c) a Conservative?

15. There are 3 coins in a box. One is a two-headed coin, another is a fair coin, and the third is a biased coin that comes up heads 75 percent of the time. When one of the 3 coins is selected at random and flipped, it shows heads. What is the probability that it was the two-headed coin?

16. Suppose that an insurance company classifies people into one of three classes: good risks, average risks, and bad risks. The company's records indicate that the probabilities that good-risk, average-risk, and bad-risk persons will be involved in an accident over a 1-year span are, respectively, 0.05, 0.15, and 0.30. If 20 percent of the population is a good risk, 50 percent an average risk, and 30 percent a bad risk, what proportion of people have accidents in a fixed year? If policyholder A had no accidents in 1997, what is the probability that he or she is a good or average risk?

17. Suppose a fair die tossed three times independently and the outcomes are recorded as numbers a, b, c. What is the probability that the roots of the equation $ax^2 + bx + c = 0$ are real?