

Statistics Day-2 Activities – Probability theory

1. Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5?
2. What is the probability of a randomly selected leap year will contain 53 Sundays?
3. The probability that a Ramesh passes a Math test is $\frac{2}{3}$ and the probability that he passes both Math and English test is $\frac{14}{45}$. The probability that he passes at least one test is $\frac{4}{5}$. What is the probability that he passes the English test?
4. The joint probability distribution of two random variables X and Y is given by:
 $P(X = 0, Y = 1) = \frac{1}{3}$, $P(X = 1, Y = -1) = \frac{1}{3}$, $P(X = 1, Y = 1) = \frac{1}{3}$.

Find the below probabilities:

- (i) Marginal distribution of X and Y.
 - (ii) Conditional probability distribution of X given Y=1.
5. In a region during a 1-year period, there were 1000 deaths. It was observed that 321 people died of a renal failure and 460 people had at least one parent with renal failure. Of these 460 people, 115 died of renal failure.
 - (i) Calculate the Probability that a person dies of Renal Failure in the population if you pick him at random
 - (ii) If you pick a person at random from the population, calculate the Probability that a person dies of Renal Failure and at least one of his parents died due to a Renal Failure
 - (iii) Calculate the probability that a patient dies of renal failure if neither of his parents had a renal failure
 6. The probability that you park in a no-parking zone and get a parking ticket is 0.06. The probability that you must park in a no-parking zone (as you cannot find a legal parking space) is 0.20. Today, you arrive at INSOFE and must park in a no-parking zone. What is the probability that you will get a parking ticket?
 7. Half a percent of the population of an area are affected by a particular disease. A test is developed for identification of it. This test gives a false positive 3% of the time and false negative 2% of the time.
 - (i) Draw the tree diagram for this problem.
 - (ii) What is the probability that Joe (a random person) tests positive?

(iii) If Joe's test turns out to be positive, what is the probability that Joe actually have the disease?

8. Consider all families with two children and assume that each child is equally likely to be a girl or a boy. If such a family is picked at random and found to have a boy, then what is the probability that it has another boy?

9. Below is a table of graduates and post graduates

	Graduate	Post Graduate	Total
Male	19	41	60
Female	12	28	40
Total	31	69	100

- a) What is the probability that a randomly selected individual is a male and a graduate? What kind of probability is it (Marginal/ Joint/Conditional)
- b) What is the probability that a randomly selected individual is a male
- c) What is the probability of a randomly selected individual being a graduate? What kind of probability is this?
- d) What is the probability that a randomly selected person is a female given that the selected person is a post graduate? What kind of probability is this?