# COEP Technogical University

Department of Mathematics
(MA- 21001) Probability and Statistics for Engineers
T.Y. B. Tech. Semester V
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## 1 Tutorial: Week 3

1. An experiment consists of flipping a coin and then flipping it a second time if a head occurs. If a tail occurs on the first flip, then a die is tossed once. List the elements of S corresponding to event B that two tails occurred. (Ans: B= null set)

2. (a) How many ways can five people be lined up to get on a bus? (Ans: 5!)
   (b) If a certain two persons refuse to follow each other, how many ways are possible? (Ans: $12 \cdot 3! = 72$)

3. A college freshman must take a science course, a social science course and a mathematics course. If he may select any of three sciences, any of four social studies and any of two mathematics courses, how many ways can he arrange his program? (Ans: 24)

4. In how many different ways can an eight question true-false examination be answered? (Ans: 256)

5. In how many ways can $6$ trees can be planted in a circle? (Ans: 5!)

6. What is the use of harmonic mean in statistics?

7. The average age of 06 persons living in a house is 23.5 years. Three of them are majors and their average age is 42 years. The difference in ages of the three minor children is same. What is the mean of the ages of minor children? (Ans: 5)

8. The mean of 25 observations is 36. The mean of first 13 observations is 32 and that of last 13 observations is 39. What is the value of 13th observation? (Ans: 23)

9. How many numbers are there between 500 and 1000 which have exactly one of their digits as 7? (Ans: 1x9x9 + 4x1x9 + 4x9x1 = 153)

10. In how many different ways can the letters of the word 'OPTICAL' be arranged so that the vowels always come together? (Ans: 5! x 3! = 720)

11. In a group of 6 boys a nd 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there? Ans:209

12. Two dice are rolled, find the probability that the sum is a) equal to 1; b) equal to 4; c) less than 13. (Ans: a) 0; b) 1/12; c) 1.)

13. A die is rolled and a coin is tossed, find the probability that the die shows an odd number and the coin shows a head. (Ans: 0.25)

14. A family has two children. Assuming that boys and girls are equally likely, determine the probability that the family has A) One boy and one girl GIVEN the first child is a boy; B) Two girls GIVEN that at least one is a girl; C) Two girls GIVEN that the older one is a girl.

15. A bag I contains 4 white and 6 black balls while another Bag II contains 4 white and 3 black balls. One ball is drawn at random from one of the bags, and it is found to be black. Find the probability that it was drawn from Bag I. (Ans: $\frac{7}{12}$) Hint: Use Bayes rule.

16. Define: Random Experiment, Sample Space and Event, probability of an event

17. Describe the different types of events and operations on events.

18. The probability of getting, four sixes and another number in five random rolls of a balance die is...
    a) $\frac{4}{7776}$ b) $\frac{3}{7776}$ c) $\frac{5}{7776}$ d) $\frac{2}{7776}$

19. If the probability of getting $10-20,\ 21-30,\ 31-40$, over $40$ cars for service at a day is $0.20,\ 0.35,\ 0.25,\ 0.12$ respectively. Then find the probability of getting at least $21$ cars at that day.

20. A virus has infected $1.8\%$ of a population. A test detects this virus $95\%$ of the time when it is actually present, but it returns a false positive $3\%$ of the time when the virus is not present. If a person at random from this population tests positive for the virus, what is the probability that this person is actually infected? [Round to the nearest percent](Ans: 37 percent) Hint: Use Bayes rule
    a) $37\%$ b) $63\%$
    c) $34\%$ d) $66\%$

21. Interpretation of the following data can be done using a bar chart or a Pie chart or both? 1.Ask 20 students their mother tongue. Interpret a bar chart and a pie chart?2.The pay package given to 50 MBA students are available. Interpret a bar chart and a pie chart? 3.The colour of the shirt worn by 50 students is available. 4.The specializations taken by 40 second year MBA students. 5.The number of students who start their own companies in the last 10 years. 6. Proportion of men and women students in a class 7. Number of different types of defects in manufacturing 8. Number of visits in a website on 5 days in a week 9. Number of journal publications of faculty of a department. 10. Fours and sixes hit by a batsman out of his total career score. 11. Number of customers rating a hotel service as VG, G and poor.

22. Discuss the differences between discrete variables and continuous variables with appropriate examples.

23. How might you convert information captured by continuous variables into categorical variables (grouped variables) for analysis? Explain it with an example.

24. The height (in cm) of 10 people given in ascending order is
$164, 165$,x3, $168$,x5, $172, 173, 175$,x9, $176$. The unique mode of this data is 175cm, the median is 171cm and the average height is 170.5cm. Calculate the absolute median deviation and the standard deviation for this data.

25. A new board game uses an eight-sided die. Suppose the die is rolled once, what is the probability of getting
(a) an even number ?
(b) a number less than or equal to $5$?
(c) an even number greater than $5$?
(d) Write event (c) in term of event (a) and (b)