

SUMMER COURSE WORK - EICT IIT Kanpur – May-June 2020

Mathematical Statistics

Topic – Central Tendency & Dispersion:

1. Find the mean, median and mode of the following problem:

Profit per shop	100-200	200-300	300-400	400-500	500-600	600-700	700-800
No. of shops	10	18	20	26	30	28	18

(Ans: Mean=486, Med=503.33, Mode=566.67)

2. Find the median, quartiles and mode of the following data:

Size of items	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Freq.	2	18	30	45	35	20	6	3

(Ans: med.(Q_2) = 36.56,, Q_1 = 26.58, Q_3 = 46.93, mode = 36)

3. Calculate the mean, median and mode of the following data:

X	59	61	63	65	67	69	71	73
f	1	2	9	48	131	102	40	17

(Ans: mean = 67.9, median = 67.75, mode = 67.48)

4. Find the Q_1 , Q_3 , P_{40} and P_{84} for the following data:

Marks	0 - 7	7 - 14	14 - 21	21 - 28	28 - 35	35 - 42	42 - 49
No. of students	3	4	7	11	2	14	9

(Ans: Q_1 = 19.5 , Q_3 = 40.5, P_{40} = 25and P_{84} = 37.5)

5. Compute the mode of the following data: (ans: 13.33)

X	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45
f	20	24	32	28	20	16	37	10	18

6. Following is the table of I.Q. of 100 students. Calculate the mean, median and mode.

C.I.	55 - 64	65 - 74	75 - 84	85 - 94	95 - 104	105- 114	115 - 124	125 - 134	135 - 144
Freq.	1	2	9	22	33	22	8	2	1

(Ans: mean = 99.3, median = 99.34, mode = 99.5)

7. given below are the marks obtained by 50 students appearing for an admission test:

Marks	0-10	10-20	20-30	30-40	40-50
No. of students	6	8	20	9	7

If cut off marks was 34, find the percentage of students scoring more than 34 marks.

(Ans:75.2%)

8. Find the Geometric mean of the following data:

Marks	0-10	10-20	20-30	30-40	40-50
No. of students	4	8	10	6	7

(Ans: 22.06)

9. Find the Harmonic mean of the following data:

Marks	0-10	10-20	20-30	30-40	40-50
No. of students	2	5	11	8	3

(Ans: 39.078)

10. Find the standard deviation and coefficient of variation of the following data:

Values	10	20	30	40	50	60	70	80
Frequency	10	12	15	20	11	6	3	1

(Ans: SD=16.68, CV=46.63)

11. The runs scored by two bats man A and B in different innings of a series is given below:

A	55	48	102	98	23	45	66	32	40	50
B	115	100	98	65	45	75	13	10	20	40

Who is better batsman?

12. Find the mean, Mode, Standard deviation and Karl pearson's coefficient of skewness:

X	15	18	20	24	27	29	30
f	11	15	22	17	10	8	7

(Ans: Mean=22.17, Mode=19.5, SD=3.715, Sk=0.458)

13. Find the Karl Pearson's coefficient of skewness:

X	0-10	10-20	20-30	30-40	40-50
f	8	11	26	9	6

(Ans: - Sk=0.062)

Topic- Probability & Baye's theorem

14. for any two events A and B Prove that (i) $P(\overline{A \cap B}) = 1 + P(A \cap B) - P(A) - P(B)$

$$(ii) P(A \cup B) \leq P(A) + P(B)$$

15. For any two independent events A and B prove that: (i) A and \overline{B} are also independent (ii) \overline{A} and B are also independent

16. State the Baye's theorem.

17. A box has 3 red, 5 black and 7 white balls. If two balls are drawn at random together, then find the probability that both balls are of same colours.

18. A card is drawn at random from a pack of 52 playing cards. Find the probability that the card drawn is neither heart of king?

19. Three cards are drawn from the pack of 52 playing cards one by one without replacement. Find the probability that they are Queen, Jack and king cards

20. A same problem of Maths is given to 3 students who chances of solving are $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$. Find the probability that exactly two of them will solve the problem

21. 'A' can hit a target 3 times in 5 shots, 'B' 4 times in 7 shots and 'C' twice in 3 shots. They fire a volley. What is the probability that at least two shots hit?

22. The probability that a contractor will get a plumbing contract is $\frac{2}{3}$ and an electric contract is $\frac{4}{9}$. If the probability of getting at least one contract is $\frac{4}{5}$, find the probability that he will get both the contracts
23. Three candidates A, B, C attempt a problem in mathematics independently. The odds in favour of A is 2:5, for B is 5:8 and odds against for C is 1:7. Find the probability that problem will be solved
24. A candidate is selected for interview of management trainees for 3 companies. For the first company there are 14 candidates, for the second company there are 16 candidates and for the third company there are 12 candidates. Find the probability that he is selected in at least one of the companies.
25. Four Businessmen start same project together, in which their probabilities of success are $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{5}$ respectively. Find the probability that exactly one of them will be successful
26. In a town of 9000 people, 1800 are over 50 years old and 3000 are female. It is known that 30% of the female are over 50 years. What is the probability that randomly chosen individual from the town is either female or over 50 years?
27. The probability that a boy will pass the MBA exam is $\frac{2}{5}$ and that a girl will not pass is $\frac{4}{5}$. If they both sit in the exam then find the probability that at least one of them will pass the MBA exam
28. If three cards are drawn at random from the pack of 52 playing cards, then find the probability that,
- (i) All are ace
 - (ii) Two ace and one jack
 - (iii) All red cards
29. (a) what is addition and multiplication theorem of probability?
(b) There two bags. Bag I contains 3 red and 5 white balls. Bag II contains 6 red and 4 white balls. one white ball is drawn from one of the bags. Find the chance that it came from (a) bag I, (b) bag II?
30. A candidate is selected for interview of management trainees for 3 companies. For the first company there are 14 candidates, for the second company there are 16 candidates and for the third company there are 12 candidates. Find the probability that he is selected in at least one of the companies
31. In a bolt factory machines A, B and C manufactures respectively 25%, 35% and 40% of the total production. Of their output 5%, 4% and 2% are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it was manufactured by machine A.
32. An insurance company insured 2000 scooters drivers, 4000 car drivers and 6000 truck drivers. The probability of an accident involving a scooter driver, car driver and a truck driver is 0.01, 0.01 and 0.15 respectively. One of the insured driver meets with an accident, what is the probability that he is a car driver
33. An insurance company insured 4000 doctors, 8000 teachers and 12000 engineers. The probability of a doctor, a teacher and an engineer dying before the age of 58 are 0.01, 0.03 and 0.05 respectively. If one of the insured people dies before the age of 58 years, find the probability that he is an engineer?
34. For the position of the principal in a college, three candidates C_1 , C_2 & C_3 are in the contest. The chances of their selection are in the proportion 4 : 2 : 3 respectively. The probability that C_1 , if selected, will introduce co-education in the college is 0.3. The probabilities of C_2 & C_3 doing the same are respectively, 0.5 & 0.8. What is the probability that there will be the co-education in the college? Also find the probability that Principal C_2 introduced co-education in the college?

35. A firm produces bulbs in three plants A, B and C with daily production of 500, 1000 and 2000 units respectively. It is known that fractions of defective outputs produced by the three plants are respectively 0.005, 0.008 and 0.010. A bulb is selected at random from a day's total production and found to be defective. What is the probability that it comes from the second plant?
36. The probability that the Principal of a college is in good mood is 0.6 and the probability that he agrees to the suggestions of a professor, when in good mood, is 0.4. If he is not in good mood, the probability of agreeing to suggestions is 0.1. On certain day when the principal agrees to the suggestions of a professor, what is the probability that he was in good mood?
37. A firm produces CFLs in three plants A, B and C with daily production of 700, 1200 and 2800 units respectively. It is known that fractions of defective outputs produced by the three plants are respectively 0.007, 0.018 and 0.019. A CFL is selected at random from a day's total production and found to be defective. What is the probability that it comes from the third plant?
38. There are three factories in Agra, Delhi and in Mumbai with daily production of 1300, 2500 and 2700 units respectively. It is known that fractions of defective outputs produced by the three factories are respectively 0.008, 0.022 and 0.004. A product is selected at random from a day's total production and found to be defective. What is the probability that it comes from the Mumbai?
39. Two groups are competing for the position of board of directors of a corporation. The probabilities that the first and the second group groups will win, are 0.6 and 0.4 respectively. Further if first group wins, the probability of introducing a new product is 0.7 and the corresponding probability is 0.3, if second group wins. Find the probability that the new product ifs introduced by the second group.
40. A laboratory blood test is 99% effective in detecting a certain disease when it is, infect present. However the test also yield a false positive result for 0.5% of the healthy person tested (i.e. if a healthy person is tested, then, with probability 0.005, the test will imply he has the disease). If 0.1% of the population actually has the disease, what is the probability that a person has the disease given that his test result is positive?