SLIIT UNI
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IT2120 - Probability and Statistics

Department of Information Technology, Faculty of Computing

Year 2 semester 1 (2025)

Tutorial 04

1. The discrete random variable X has probability function given by P(X=x) = cX2 where, X= 1,2,3,4. Find c and E(X).

X	1	2	3	4
P(X=x)	c	4c	9c	16c

2. The random variable X has a binomial distribution with parameters n=100 and p=0.8. Find the mean and the variance of X.

3. A manufacturing process produces components which are free from any faults with probability p. Find the probability that in a sample of size 50 from a large batch there are fewer than 4 faulty components when p = 0.95. Find the probability that in a sample of size 50 there are fewer than 10 faulty when p = 0.75.

4. Use the table to give a suitable approximation to the probability that $X \geq 5$ where X is binomial random variable with parameters p = 0.05 and n = 400.

5. A car-pooling study shows that the number of passengers, X in a car (excluding the driver) is likely to assume the values 0,1,2,3 and 4 with probabilities given by the table.

X	0	1	2	3	4
P(X=x)	0.7	0.1	0.1	0.05	0.05

   (a) Determine the probability of at least two passengers in a car.

   (b) Find the cumulative distribution function of X and sketch it.

   (c) Calculate,

      i. $E(X)$
      ii. $E(X^2)$
      iii. $V(X)$
      iv. $E(3X - 2)$
      v. $\text{Var}(2X + 6)$

6. From a sack of fruit containing 3 oranges, 2 apples and 3 bananas, a random sample of 4 pieces of fruit is selected. If X is the number of oranges and Y is the number of apples in the sample, find the joint probability distribution of X and Y.

7. A multiple-choice test has four possible answers to each of 16 questions. A student guesses the answer to each question, i.e., the probability of getting a correct answer on any given question is 0.25. What is the probability that at least 14 questions be correct?

8. Suppose that 20% of applicants to UOM engineering degree are women. An admission committee reviews applications in groups of 100. Find the probability that number of women in the next group is between 16 and 26 inclusively.

9. A small life insurance company has determined that on the average it receives 6 death claims per day. Find the probability that the company receives at least seven death claims on a randomly selected day.

10. The number of traffic accidents that occur on a particular stretch of road during a month follows a Poisson distribution with a mean of 9.4. Find the probability that less than two accidents will occur on this stretch of road during a randomly selected month.

11. Suppose that in late summer, the Fremantle Surf Life Saving club makes an average of two surf rescues per day. Use the Poisson probability distribution to determine the probability that

    (a) More than two rescues are made on a particular day.

    (b) Five surf rescues are made in a 3-day period.

12. An inventory study determines that, on average, demands for a particular item at a warehouse are made 5 times per day. What is the probability that on a given day this item is requested,

    (a) More than 5 times?

    (b) Not at all?

    [Extracted from Probability & Statistics for Engineers & Scientists – Ninth Edition by Walpole R. E. , Myers R. H. , Myers S. L. and Ye K.]

13. On average, 3 traffic accidents per month occur at a certain intersection. What is the probability that in any given month at this intersection

    (a) Exactly 5 accidents will occur?

    (b) Fewer than 3 accidents will occur?

    (c) At least 2 accidents will occur?

    [Extracted from Probability & Statistics for Engineers & Scientists – Ninth Edition by Walpole R. E. , Myers R. H. , Myers S. L. and Ye K.]

14. The probability that a car has defective gearbox is 0.02. If I check the gearboxes of 140 cars what is the probability that I find,

    (a) Two defectives?

    (b) More than 5 defectives?

    (c) Fewer than 4 defectives?