



**Sri Lanka Institute of Information Technology**

**Year 02 – Semester II – 2022**

**Probability and Statistics – IT2110**

**Tutorial 05**

- 1) An officer is always late to the office and arrives within the grace period of ten minutes after the start. Let  $X$  be the time that elapses between the start and the time the officer signs in with a probability density function

$$f(x) = \begin{cases} kx^2 & 0 \leq x \leq 10 \\ 0 & \text{otherwise} \end{cases}$$

where  $k > 0$  is a constant.

- Compute the value of  $k$ .
  - Find the cumulative distribution function of  $X$ .
  - Find the probability that he arrives less than 3 minutes after the start of the office.
  - Calculate the mean and variance of  $X$ .
- 2) The time taken to assemble a car in a certain plant is a random variable having a normal distribution of 20 hours and a standard deviation of 2 hours. What is the probability that a car can be assembled at this plant in a period of time,
- Less than 19.5 hours?
  - Between 20 and 22 hours?
- 3) A large group of students took a test in Physics and the final grades have a mean of 70 and a standard deviation of 10. If we can approximate the distribution of these grades by a normal distribution, what percent of the students,
- Scored higher than 80?
  - Should pass the test ( $\text{grades} \geq 60$ )?
  - Should fail the test ( $\text{grades} < 60$ )?

- 4) A radar unit is used to measure speeds of cars on a motorway. The speeds are normally distributed with a mean of 90 *km/hr* and a standard deviation of 10 *km/hr*. What is the probability that a car picked at random is travelling at more than 100 *km/hr*?
- 5) Suppose we know that the birth weights of babies are normally distributed with mean 3500g and standard deviation 500g. What is the probability that a baby is born that weighs less than 3100g?
- 6) Suppose that we are told that the heights of adult males in a particular region of the world are normally distributed with a mean of 70 inches and standard deviation of 2 inches.
  - a) Approximately what proportion of adult males are taller than 73 inches?
  - b) What proportion of adult males are between 72 and 73 inches?
  - c) What height corresponds to the point where 20% of all adult males are greater than this height?
  - d) What height corresponds to the point where 20% of all adult males are less than this height?
- 7) Assume the speed of vehicles along a stretch of a highway has an approximately normal distribution with a mean of 71 mph and a standard deviation of 8 mph.
  - a) The current speed limit is 65 mph. What is the proportion of vehicles less than or equal to this speed limit?
  - b) What proportion of the vehicles would be going less than 50 mph?
  - c) A new speed limit will be initiated such that approximately 10% of vehicles will be over the speed limit. What is the new speed limit based on this criterion?
- 8) The bottom 30% of students failed an end semester examination. The mean for the test was 120 and the standard deviation was 17. What was the passing score?
- 9) Suppose that customers arrive at Banks ATM at the rate 20 per hour. If customer has just arrived, what is the probability that the next customer arrives within 6 minutes?
- 10) The time required to repair a machine is an exponential random variable with rate  $\lambda = 0.5$  downs/hour. What is the probability that a repair time exceeds 2 hours?