Sri Lanka Institute of Information Technology

Year 02 – Semester II – 2020

Probability and Statistics – IT2110

Tutorial 05

1) An officer is always late to the office and arrives within the grace period 0f 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

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

where $k > 0$ is a constant.

   a) Compute the value of k.
   b) Find the cumulative distribution function of X.
   c) Find the probability that the he arrives less than 3 minutes after the start of the office.
   d) 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,

   a) Less than 19.5 hours?
   b) 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,

   a) Scored higher than 80?
   b) Should pass the test (grades≥60)?
   c) Should fail the test (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?