POISSON DISTRIBUTION

STATISTICS 2

Topic: Poisson Distribution
Duration: 1 hour

INSTRUCTIONS

- Carry out every instruction in each task.
- Answer **all** questions.
- Use a black or dark blue pen.
- You may use an HB pencil for any diagram, graphs or rough working.
- **Calculator Allowed**.
- Show your workings if relevant.

INFORMATION

- The total marks for this paper is **35**.
- The number of marks for each question or part question is shown in brackets [ ].

bishaltwr@gmail.com

1. The water from a pond is tested and is found to contain an average of 4 bacteria per milliliter.

(a) What is the probability that a 5-milliliter sample of water from the pond will contain 3 or fewer bacteria? [2]

A larger sample of ten milliliter of water is collected.

(b) What is the probability that the sample will contain less than forty but no less than thirty-five bacteria.? [3]

2. A d.r.v X has Poisson distribution with mean λ.

Given that P(X=8) = P(X=9),

(a) Determine the value of $P(4 < X \leq 10)$. [5]

3. The number of errors per 1000 lines of code in a computer program has a Poisson distribution with mean 10.

(a) State two conditions, for a Poisson distribution to be a good model for the number of errors per 1000 lines of code in the computer program. [2]

(b) Find the probability that a randomly selected block of code with 250 lines of code will contain no errors at all. [2]

Lex typed 10000 lines of code.

(c) Use a distribution to approximate the probability that Lex made at most 100 errors. [3]

4. The number of customers who enter a shop in a given hour has a Poisson distribution with a rate of 1 per 4 minutes.

(a) Find the smallest value of n, such that the probability that n customers enter the shop in a given 1 hour period is less than 0.01. [3]

(b) Determine the smallest value of hours h, such that the probability that there is no customer in the shop in a given h hours is less than 0.02. [3]

(c) Find the probability that for 3 consecutive 4 minutes periods, there will be only one 4 minutes period without any customers. [3]

On a particular day, the shop had to close after 8 minutes due to an emergency.

If probability of getting more than 5 customers in 4 minutes is negligible.

(d) Find the probability that there were 3 more customers in the first 4 minutes than in the second 4 minutes. [3]

5. If X follows a Poisson distribution with mean 2.5, Y follows a Poisson distribution with mean 3, and Z follows a Poisson distribution with mean 0.8.

If one value each of X, Y and Z is selected at random.

(a) Find probability that sum of X, Y and Z is less than 5. [3]

(b) Find mode of each distribution and mode of the sum of X, Y and Z. [3]