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PROBLEM SHEET # 10

Problem 1: Severe earthquakes occur according to a Poisson process with intensity $\lambda = 0.2$/year in a certain geographical region.

a) What is the expected time between two successive severe earthquakes?

b) Compute the probability that there will be no severe earthquake during the next 10 years.

Problem 2: One of the items used in a car repair shop (araba tamircisi) is a certain type of windshield (ön cam). The repair shop needs an average of 2 units of this windshield per month. We assume that demand in different months is independent.

a) Why is it reasonable to consider $N =$ *monthly demand of this windshield* a random variable?

b) Explain why we can assume that $N \sim \text{Po}(\lambda)$. — What is the value of λ in this case?

c) Write the expression, with the correct parameter, for the probability that no unit will be needed during a month, that is: $P(N = 0)$.

d) Write the expression, with the correct parameter, for the probability that more than three units will be needed during a month, that is: $P(N > 3)$.

e) Let $X =$ length of the time interval (in days) between two successive requirements of the windshield. Find the distribution of X.

f) Let $M =$ required number of units of the windshield in a year. Find the expectation and the variance of M.

g) Demand for the windshield was above average in December. What does this mean for demand in January? Discuss briefly.

h) Why is it useful to analyze windshield demand in car repair shops? Discuss briefly.