Stat 121 (Mathematical Statistics I)

Problem Set No. 4

2025-10-24

Instruction: Answer the following as indicated.

1. A starter motor used in a space vehicle has a high rate of reliability and was reputed to start on any given occasion with probability 0.99999. What is the probability of at least one failure in the next 10,000 starts?

2. The number of imperfections in the weave of a certain textile has a Poisson distribution with a mean of 4 per square yard. Find the probability that a

    a. 1-square-yard sample will contain at least one imperfection.

    b. 3-square-yard sample will contain at least one imperfection.

3. An experiment consists of tossing a fair die until a 6 occurs four times. What is the probability that the process ends after exactly ten tosses with a 6 occurring on the ninth and tenth tosses?

4. In an assembly-line production of industrial robots, gear box assemblies can be installed in one minute each if holes have been properly drilled in the boxes and in ten minutes if the holes must be redrilled. Twenty gear boxes are in stock, 2 with improperly drilled holes. Five gearboxes must be selected from the 20 that are available for installation in the next five robots.

    a. Find the probability that all 5 gear boxes will fit properly.

    b. Find the mean, variance, and standard deviation of the time it takes to install these 5 gear boxes.