

Tutorial Set-3

Subject: Statistical Methods & Data Analysis (MA 231)

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1. Suppose that an airplane engine will fail, when in flight, with probability $1 - p$ independently from engine to engine; suppose that the airplane will make a successful flight if at least 50 percent of its engines remain operative. For what values of p is a four-engine plane preferable to a two-engine plane?
2. A box contains 100 cellphones, 20 of which are defective. 10 cellphones are selected for inspection. Find the probability that (i) at least one is defective, (ii) at the most three are defective, (iii) all the 10 are defective, (iv) none of the ten is defective.
3. Let X be the number of births in a hospital until the first girl is born. Determine the probability and the distribution function of X . Assume the probability that the baby born is a girl is $\frac{1}{2}$.
4. Cotton linters used in the production of rocket propellant are subjected to a nitration process that enables the cotton fibers to go into solution. The process is 90% effective in that the material produced can be shaped as desired in a later processing stage with probability .9. What is the probability that exactly 20 lots will be produced in order to obtain the third defective lot?
5. Suppose it has been observed that, on average, 180 cars per hour pass a specified point on a particular road in the morning rush hour. Due to impending roadworks it is estimated that congestion will occur closer to the city centre if more than 5 cars pass the point in any one minute. What is the probability of congestion occurring?
6. A council is considering whether to base a recovery vehicle on a stretch of road to help clear incidents as quickly as possible. The road concerned carries over 5000 vehicles during the peak rush hour period. Records show that, on average, the number of incidents during the morning rush is 5. The Council won't base a vehicle on the road if the probability of having more than 5 incidents in any one morning is less than 30%. Based on this information should the Council provide a vehicle?
7. If the probability that a person suffers from a disease is 0.001, find the probability that out of 3000 persons, (i) exactly 4, (ii) more than 2 persons will suffer from the disease.