

INTRODUCTORY STATISTICS: TEST NUMBER 3

Question 1: (25 points)

The probability that an airplane engine will fail is denoted by π . Failures of engines on multi-engine planes are independent events. A two engine plane will crash only if both of its engines fail. A four engine plane can remain airborne with two or more engines in operation. If $\pi = 0$ or $\pi = 1$, a traveler will clearly be indifferent between planes with two or four engines. What are the values of π that make a two engine plane safer than a four engine plane?

Question 2: (35 points)

In a military trial it takes at least 10 votes from a 12-member jury to convict a defendant. Suppose that the probability that a juror votes a guilty person innocent is 20 percent whereas the probability that a juror votes an innocent person guilty is 10 percent. Assume that each juror acts independently and that 65 percent of defendants are guilty. Calculate the proportion of defendants that are convicted.

Question 3: (15 points)

The number of customers waiting in line at an instant teller follows a Poisson distribution with a mean of 3 customers per minute. Assume customers come to the instant teller independently. In the next two minutes, what is the probability that there are less than 3 customers in each minute?

Question 4: (15 points)

The rated capacity for an elevator at the CN Tower is 2500 kilograms. If this capacity is exceeded the elevator cable will snap and will plummet to the ground. Varsity football players have weights that are normally distributed with a mean of 120 kilograms and a standard deviation of 80 kilograms. Saturday night the team goes disco dancing at the CN Tower. After closing, 25 drunken football players get on the elevator. What is the likelihood that the elevator cable will snap?

Question 5: (10 points)

Assume that a proposed tunnel across the St. Lawrence River between Ontario and the State of New York will be 4 miles long. A traffic accident is equally likely to occur at any place in the tunnel. Given that an accident occurs, what is the probability it will occur in the first mile of the tunnel? What is the probability that it will occur at the mid-point of the tunnel?