

國立成功大學

113學年度碩士班招生考試試題

編 號：279

系 所：環境醫學研究所

科 目：生物統計

日 期：0202

節 次：第 2 節

備 註：可使用計算機

※ 考生請注意：本試題可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

Please provide complete and detailed calculations. If only answers are provided, then no credits are to be given.

**A. (20% with 10% each)**

It is known that 5% of the books bound at a certain bindery have defective binding. Find the probability that 2 of 100 books bound by this bindery will have defective bindings, using

1. the formula for the binomial distribution;
2. the Poisson approximation to the binomial distribution.

**B. (20% with 10% each)**

If the amount of cosmic radiation to which a person is exposed while flying by jet airplane across the United States is a random variable having the normal distribution with mean 4.35 mrem and standard deviation 0.59 mrem, find the probabilities that the amount of cosmic radiation to which a person will be exposed on such a flight is:

1. between 4.00 and 5.00 mrem;
2. at least 5.50 mrem.

**C. (20% with 10% each)**

Let  $X_1, X_2, X_3, \dots, X_{20}$  be independent and let each have the same marginal distribution with mean 10 and variance 3. Find

1.  $E(X_1 + X_2 + X_3 + \dots + X_{20})$ ;
2.  $\text{Var}(X_1 + X_2 + X_3 + \dots + X_{20})$ .

**D. (10%)**

Suppose a hospital has observed 1 case of a rare cancer every 2 years over a long time period. It suddenly gets 3 cases in one year. How unlikely is this, or more specifically, what is the probability of obtaining at least 3 cases in 1 year?

**E. (20% with 10% each)**

Suppose the annual number of traffic fatalities at a given intersection follows a Poisson distribution with parameter  $\mu = 10$ .

1. What is the probability of observing exactly 25 traffic fatalities over the 2-year period from January 1, 1990, to December 31, 1991?
2. Suppose that the traffic intersection is redesigned with better lighting, and 12 traffic fatalities are observed over the next 2 years. Is this rate a meaningful improvement over the previous rate of traffic fatalities?

**F. (10%)**

Suppose we identify a group of 100 people with a particular type of color blindness. The expected probability to identify the correct quadrant of the color plate is 0.25. We give each person the color plate test once and find that 32 people identify the correct quadrant of the color plate. Are they doing significantly better than random?