考 試 科 目	統計學	系 所 別	風險管理與保險學系/管理組	考 試 時 間	2 月 2 日（五）第 3 節

1. A student casts two fair and six-faced dices simultaneously and repeatedly. What is the probability that the student obtains a sum of 4 before she obtains a sum of 7? (10%)

2. Suppose the time (in hours) that students spend on preparing for a particular exam follows the following distribution: less than 10 hours, probability= 0.0004; 10-20 hours, probability= 0.0059; 21-30 hours, probability= 0.0855; more than 30 hours, probability= 0.9082. We further assume that the probability of the exam being flunk given that the preparation time is: less than 10 hours is 0.540; the probability of the exam being flunk given that the preparation time is 10-20 hours is 0.813; the probability of the exam being flunk given that the preparation time is 21-30 hours is 0.379; the probability of the exam being flunk given that the preparation time is more than 30 hours is 0.035. What is the probability of the exam being flunk? (10%)

3. Use the information given in Question 2. Show that the event of spending less than 20 hours in preparation for the exam and the event of the exam being flunk are not independent. (10%)

4. A candidate believes that he can win a county election if he can earn at least 55% of the votes in his precinct. The latest opinion poll shows that half of the county's voters favor him. If 100 voters appear to vote at his precinct, what is the probability that he will receive at least 55% of the votes? Use a normal approximation to the binomial distribution. ($z_{0.1587}= 1$; $z_{0.05}= 1.645$; $z_{0.025}= 1.96$; $z_{0.0228}= 2$) (10%)

5. Assume that the t value is -2.42 based on a sample size of 8. Evaluate the p-value. ($t_{7,\,0.025}= 2.365$; $t_{7,\,0.010}= 2.998$; $t_{8,\,0.025}= 2.306$; $t_{8,\,0.010}= 2.896$) (10%)

6. Suppose X is a random variable which follows a normal distribution. The probability that X is less than 70 is 10.03%; the probability that X is greater than 80 is 5%. Find the standard deviation for the normal distribution. ($z_{0.3085}= 0.5$; $z_{0.1587}= 1$; $z_{0.1003}= 1.28$; $z_{0.05}= 1.645$; $z_{0.025}= 1.96$; $z_{0.0228}= 2$) (10%)

7. Suppose birds' arrivals at a lamppost follow a Poisson distribution. We further assume that one bird arrives at a lamppost during a given 30-minute period. Find the probability that the bird arrives during the last 10 minutes of the 30-minute period. (10%)

8. Suppose $f(x) = \frac{x+2}{5}$, $0 < x < 2$. Find $E[(x + 2)^2]$ (10%)

考 試 科 目	統計學	系 所 別	風險管理與保險學系/管理組	考 試 時 間	2 月 2 日（五）第3節

9. A researcher uses a matched-pair design to compare two different medical treatments, i.e., Treatments A and B, for a particular disease. Patients are matched in terms of their age and gender. One patient of the matched pair is assigned Treatment A, while the other Treatment B. It is expected that patients in a matched pair will respond similarly to the treatments in 70% of matched pairs. For those pairs where there is a difference in response, it is expected that in 2/3 of the pairs the Treatment-A patient will respond, while the Treatment-B patient will not; in 1/3 of the pairs the Treatment-B patient will respond, while the Treatment-A patient will not. How many matched pairs are required to be enrolled in this study to have a 90% chance of finding a significant difference using a two-sided test with a statistical significant level of 0.05? ($z_{0.1}= 1.28$; $z_{0.05}= 1.645$; $z_{0.025}= 1.96$; $z_{0.0228}= 2$)　　　(10%)

10. Describe the desirable statistical properties of an estimator.　　　(10%)
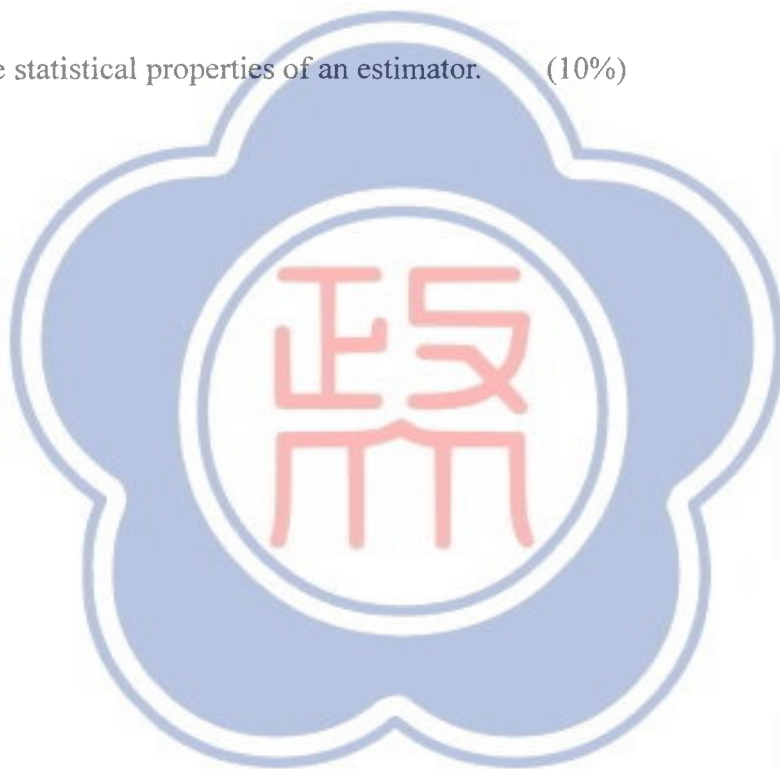
備　　　　註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。