

國立成功大學

112學年度碩士班招生考試試題

編 號：194

系 所：製造資訊與系統研究所

科 目：統計方法

日 期：0206

節 次：第 1 節

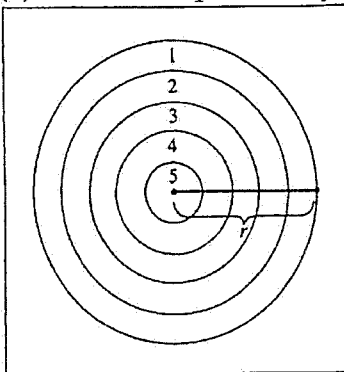
備 註：可使用計算機

※ 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。

計算題 (需列出計算式)

1. (20%) In a recent survey of computer ownership, 73.4% of the respondents indicated they own PC computers, while 21.8% indicated they own both PC and Mac computers, and 80.1% said they own at least one of the two computers.
 - (a) What is the probability that a respondent owns a Mac computer (event M)?
 - (b) Given that a respondent owns a PC (event P), what is the probability that the respondent also owns a Mac?
 - (c) Are events "P" and "M" mutually exclusive? Why or why not? Explain using probabilities.
 - (d) Are the two events "P" and "M" independent? Explain, using probabilities.

2. (20%) The game of darts (射飛鏢遊戲) is played by throwing a dart at a board and receiving a score corresponding to the number assigned to the region in which the dart lands (see following figure). For a novice player, it seems reasonable to assume that the probability of the dart hitting a particular region is proportional to the area of the region. Thus, a bigger region has a higher probability of being hit. Answer the following two questions.
 - (a) Derive the general formula for the probability of scoring i point, e.g., $P(\text{scoring } i \text{ point})$.
 - (b) What is the probability of scoring 1 point?



3. (20%) When coded messages are sent, there are sometimes errors in transmission. In particular, Morse code uses "dots" and "dashes," which are known to occur in the proportion of 3:4. This means that for any given symbol, $P(\text{dot sent})=3/7$ and $P(\text{dash sent})=4/7$. Suppose there is interference on the transmission line, and with probability a dot is mistakenly received as a dash, and vice versa. If we receive a dot, can we be sure that a dot was sent? Using Bayes' Rule, find the probability of correctly receiving a dot.

4. (20%) If X is a random variable with finite variance, then for any constants a and b , proof that $\text{Var}(aX+b)=a^2\text{Var } X$.

5. (20%) Suppose we are interested in finding the probability of obtaining at least one 6 in four rolls of a fair die (骰子). Solve this problem by using a sequence of four Bernoulli trials.