

共 7 大題。總分 100 分。

1. [10 points] Show the power set of $XOR(A,B)$ where $A = \{ \{\}, y, x, \{y, x\}, (y, x) \}$ and $B = \{ x, y, \{x, y\}, (x, y) \}$.
2. [15 points] Finite sets A and B have $|A|=a$ and $|B|=b$. What is the number of onto functions from A to B ? What is the number of one-to-one functions from A to B ? What is the number of one-to-one and onto functions from A to B ?
3. [15 points] Use Venn diagram of sets A, B and C where $B \cap C = \{\}$ to demonstrate the calculation of probability $P((A-C)|B)$.
4. [15 points] The probability that our team can win (or lose) any tournament is $2/5$. Show the probability that our team can win and lose the same number of tournaments when playing 6 tournaments.
5. [15 points] How many ways can the standard deck of 52 cards be permuted so that the first 3 cards are from the same suit?
6. [15 points] Prove that, if 5 points are plotted in the interior of an equilateral triangle with sides of length 6, there are at least 2 whose distance apart is strictly less than 3.
7. [15 points] Use a C-like language to write a recursive program to generate all the min-length staircase paths from $(1,1)$ to $(10,10)$ that visit (x_0, y_0) and do not visit (x_1, y_1) .