共 9 大題。總分 100 分。

1. [10+10 points] How many ways can {1, 2, … , 8} be permuted so that the first 3 digits are in decreasing order? Use a C-like language to write a procedure to generate these permutations one and only once.
2. [10 points] From the standard deck of 52 cards, how many cards must be chosen so that 3 cards from the same suit will always be included in the selection?
3. [10 points] Determine the number of min-length staircase paths from (1,1) to (100,100) that do not visit (23,45), (45,67) and (67,89) at the same path.
4. [10 points] If 6 couples are seated about a 4x2 rectangular table, how many different circular arrangements are possible?
5. [10 points] Prove that "the set {3, 6, 9, 12, … } is countable". (HINT: by the definition of function)
6. [10 points] Prove that "If m is an odd integer, the m+13 is even". (HINT: by the rule of contradiction)
7. [10 points] Show the inverse of $\forall x\, A(x) \rightarrow B(x) \vee C(x)$.
8. [10 points] Find a formula (using the connectives $\wedge$, $\vee$, $\neg$) that is equivalent to "if A then (if B then C else D) else E".
9. [10 points] Show that, in Selection Sort, any input list of size n makes exactly $n^*(n\text{-}1)/2$ comparisons.

試題隨卷繳回