Seatwork (Counting Principles)

Show your solutions

1. If a procedure can be broken down into n tasks, where each task i can be performed t_i ways. Prove via induction that the procedure P_n can be performed $t_1 t_2 \cdots t_n$ ways.
2. How many 4-element DNA sequences

   a) do not contain the base T?

   b) contain all four bases A, T, C, and G?

   c) contain exactly three of the four bases A, T, C, and G?
3. A palindrome is a string whose reversal is identical to the string. How many bit strings of length n are palindromes?
4. Suppose there is a sequence of 40 positive integers. The sum of these integers does not exceed 57. Show that there exists at least one contiguous subsequence where the sum of the elements of the sequence is 22.
5. If a file is n bit long, then there are 2^n possible files. Show that there cannot be a lossless conversion that compresses all n bit long files to less than n bit long files. (clue: injections and inverses)