Problems – Day 3

1. Two elements $A[i]$ and $A[j]$ of an array A are said to form an *inversion pair* if $A[i] > A[j]$ but $i < j$. Write a program to count the number of inversion pairs in a list A containing distinct integers.
   Note that, for the array $A = \{8, 4, 2, 1\}$, the *inversion pairs* are (8, 4), (4, 2), (8, 2), (8, 1), (4, 1) and (2, 1).
2. Dynamically allocate memories to store a matrix received from the user. If the matrix is not *invertible* return `SINGULAR`. Otherwise, return its inverse matrix without using any new matrix.
3. Let there be a pair of sorted arrays, A and B, and an index k such that $0 \leq k < |A| + |B|)$ given as user inputs. Find the k^{th} smallest element in $A \cup B$ without merging the two arrays.

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4. Suppose complex numbers are stored using structure variables representing the real and imaginary parts separately. If x and y are two such variables then write logical conditions that evaluate to TRUE if and only if:
   - $x + y$ is an imaginary number without any real component.
   - $x - y$ is a real number without any imaginary component.
   - x and y are complex conjugate.
   - Both x and y are real numbers.
5. Write a program that uses pointer to structure pointers to assign values to the pointed structure variables by taking inputs from the user. You are free to choose your own problem to use the said constructs.