**Lab W2D2**

**Question 1**

**A diagram of a flowchart

Description automatically generated**

**Question 2**

Algorithm: sortFourElements(A)

Input: sequence A of 4 elements

Output: A in sorted order

**Algorithm to Sort 4 elements with 5 Comparisons**

4 Elements are A, B, C and D

Steps:

1. If A> B, swap A and B. It becomes A <= B
2. If C> D, swap C and D. It becomes C <= D
3. If A > C, swap A and C. It becomes A <= C
4. If B > D, swap B and D. It becomes B <= D
5. If B > C, swap B and C.

The algorithm uses only 5 comparisons, it does not violate the theoretical lower bound for general comparison-based sorting algorithms, since we are comparing asymptotic time complexity with actual value.

**Question 3**

Step 1. Sort the items --- O (n log n)

Step 2. Place the items used for loop. --- O(n)

Total time complexity is O (n log n)

This is optimal since it matches the theoretical lower bound.