**WIA1002/WIB1002/WXES1117 Data Structures**

**Tutorial : Sorting and searching**

1. Compare between linear search and binary search algorithms by searching for the numbers 45 and 54 in the following list :

**3 8 12 34 54 85 61 110**

**Answer:**

Linear search

**3 8 12 34 54 85 61 110**

(0) (1) (2) (3) (4) (5) (6) (7)

* Search sequentially from 0,1,2,3,4,5,6,7
* 54 found at index 4.
* 45 not found in list.

Binary search

**3 8 12 34 54 85 61 110**

(0) (1) (2) (3) (4) (5) (6) (7)

* Search starts in middle at index 3, **34**
* 34 not target value, but 45 is larger, so move to right side, **85,** can’t find 45 in list, not in list
* Search starts in middle at index 3, **34**
* Index 5, 85, not target, move lower
* Index 2, 12, not target, move upper
* Index 4, 54 found.

1. Describe the technique for each sort algorithm below. Given the following list:

**90 8 7 56 125 237 9 1 653**

Show a trace of execution for:

* 1. Selection sort
  2. Insertion sort
  3. Bubble sort
  4. Merge sort

**Answer:**

1. Selection sort

**90 8 7 56 125 237 9 1 653**

(0) (1) (2) (3) (4) (5) (6) (7) (8)

**1 8 7 56 125 237 9 90 653**

(0) (1) (2) (3) (4) (5) (6) (7) (8)

**1 7 8 56 125 237 9 90 653**

(0) (1) (2) (3) (4) (5) (6) (7) (8)

**1 7 8 56 125 237 9 90 653**

(0) (1) (2) (3) (4) (5) (6) (7) (8)

…..

1. Insertion sort

**90 8 7 56 125 237 9 1 653**

**(0) (1)** (2) (3) (4) (5) (6) (7) (8)

**8 90 7 56 125 237 9 1 653**

**(0) (1)** (2) (3) (4) (5) (6) (7) (8)

**7 8 90 56 125 237 9 1 653**

**(0) (1) (2)** (3) (4) (5) (6) (7) (8)

…..

1. Bubble sort

90 8 7 56 125 237 9 1 653

(0) (1) (2) (3) (4) (5) (6) (7) (8)

8 90 7 56 125 237 9 1 653

(0) (1) (2) (3) (4) (5) (6) (7) (8)

8 7 90 56 125 237 9 1 653

(0) (1) (2) (3) (4) (5) (6) (7) (8)

……

1. Merge sort

90 8 7 **56** 125 237 9 1 653

(0) (1) (2) (3) **(4)** (5) (6) (7) (8)

90 8 7 56 125 237 9 1 653

(0) (1) (2) (3) (4) (5) (6) (7) (8)

8 7 90 56 125 237 9 1 653

(0) (1) (2) (3) (4) (5) (6) (7) (8)

……