CSIT113
Problem Solving

TUTORIAL 3 – FOR UNIT 7
SEARCHING AND SORTING

Lecturer/Tutor: Dr Tan Hee Beng Kuan
(email: hbktan@uow.edu.au)

UNIVERSITY OF WOLLONGONG AUSTRALIA

SIM GLOBAL EDUCATION

Question 1

The following is a sequence of seven numbers:

0	1	2	3	4	5	6
33	28	18	20	26	11	13

Use Insertion Sort to sort the numbers in the sequence into **ascending** order. Show the result of each step by showing the whole sequence in a new line with sorted numbers underlined.

Answer:

	0	1	2	3	4	5	6
STEP 1	28	33	18	20	26	11	13

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STEP 3	18	20	28	33	26	11	13

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STEP 3	18	20	28	33	26	11	13
STEP 4	18	20	26	28	33	11	13

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STEP 2	18	28	33	20	26	11	13
STEP 3	18	20	28	33	26	11	13
STEP 4	18	20	26	28	33	11	13
STEP 5	11	18	20	26	28	33	13

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Answer:

	0	1	2	3	4	5	6
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STEP 2	18	28	33	20	26	11	13
STEP 3	18	20	28	33	26	11	13
STEP 4	18	20	26	28	33	11	13
STEP 5	11	18	20	26	28	33	13
STEP 6	11	13	18	20	26	28	33
Final Result	11	13	18	20	26	28	33

Question 2

The following is a sequence of seven numbers:

0	1	2	3	4	5	6
23	18	8	10	16	1	3

Use Selection Sort to sort the numbers in the sequence into **ascending** order. Show the result of each step by showing the whole sequence in a new line with sorted numbers underlined.

Answer:

	0	1	2	3	4	5	6
STEP 1	1	18	8	10	16	23	3
STEP 2							
STEP 3							
STEP 4							
STEP 5							
STEP 6							
Final Result							

Question 2

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0	1	2	3	4	5	6
23	18	8	10	16	1	3

Use Selection Sort to sort the numbers in the sequence into **ascending** order. Show the result of each step by showing the whole sequence in a new line with sorted numbers underlined.

Answer:

	0	1	2	3	4	5	6
STEP 1	1	18	8	10	16	23	3
STEP 2	1	3	8	10	16	23	18
STEP 3							
STEP 4							
STEP 5							
STEP 6							
Final Result							

Question 2

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0	1	2	3	4	5	6
23	18	8	10	16	1	3

Use Selection Sort to sort the numbers in the sequence into **ascending** order. Show the result of each step by showing the whole sequence in a new line with sorted numbers underlined.

Answer:

	0	1	2	3	4	5	6
STEP 1	1	18	8	10	16	23	3
STEP 2	1	3	8	10	16	23	18
STEP 3	1	3	8	10	16	23	18
STEP 4							
STEP 5							
STEP 6							
Final Result							

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23	18	8	10	16	1	3

Use Selection Sort to sort the numbers in the sequence into **ascending** order. Show the result of each step by showing the whole sequence in a new line with sorted numbers underlined.

Answer:

	0	1	2	3	4	5	6
STEP 1	1	18	8	10	16	23	3
STEP 2	1	3	8	10	16	23	18
STEP 3	1	3	8	10	16	23	18
STEP 4	1	3	8	10	16	23	18
STEP 5							
STEP 6							
Final Result							

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23	18	8	10	16	1	3

Use Selection Sort to sort the numbers in the sequence into **ascending** order. Show the result of each step by showing the whole sequence in a new line with sorted numbers underlined.

Answer:

	0	1	2	3	4	5	6
STEP 1	1	18	8	10	16	23	3
STEP 2	1	3	8	10	16	23	18
STEP 3	1	3	8	10	16	23	18
STEP 4	1	3	8	10	16	23	18
STEP 5	1	3	8	10	16	23	18
STEP 6							
Final Result							

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0	1	2	3	4	5	6
23	18	8	10	16	1	3

Use Selection Sort to sort the numbers in the sequence into **ascending** order. Show the result of each step by showing the whole sequence in a new line with sorted numbers underlined.

Answer:

	0	1	2	3	4	5	6
STEP 1	1	18	8	10	16	23	3
STEP 2	1	3	8	10	16	23	18
STEP 3	1	3	8	10	16	23	18
STEP 4	1	3	8	10	16	23	18
STEP 5	1	3	8	10	16	23	18
STEP 6	1	3	8	10	16	18	23
Final Result	1	3	8	10	16	18	23

Question 3

The following is a sequence of six numbers:

0	1	2	3	4	5
34	91	72	45	56	37

Use Selection Sort to sort the numbers in the sequence into **descending** order. Show the result of each step by showing the whole sequence in a new line with sorted numbers underlined.

Answer:

	0	1	2	3	4	5
STEP 1	91	34	72	45	56	37
STEP 2						
STEP 3						
STEP 4						
STEP 5						
Final Result						

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0	1	2	3	4	5
34	91	72	45	56	37

Use Selection Sort to sort the numbers in the sequence into **descending** order. Show the result of each step by showing the whole sequence in a new line with sorted numbers underlined.

Answer:

	0	1	2	3	4	5
STEP 1	91	34	72	45	56	37
STEP 2	91	72	34	45	56	37
STEP 3						
STEP 4						
STEP 5						
Final Result						

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Answer:

	0	1	2	3	4	5
STEP 1	91	34	72	45	56	37
STEP 2	91	72	34	45	56	37
STEP 3	91	72	56	45	34	37
STEP 4						
STEP 5						
Final Result						

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The following is a sequence of six numbers:

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Answer:

	0	1	2	3	4	5
STEP 1	91	34	72	45	56	37
STEP 2	91	72	34	45	56	37
STEP 3	91	72	56	45	34	37
STEP 4	91	72	56	45	34	37
STEP 5						
Final Result						

Question 3

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0	1	2	3	4	5
34	91	72	45	56	37

Use Selection Sort to sort the numbers in the sequence into **descending** order. Show the result of each step by showing the whole sequence in a new line with sorted numbers underlined.

Answer:

	0	1	2	3	4	5
STEP 1	91	34	72	45	56	37
STEP 2	91	72	34	45	56	37
STEP 3	91	72	56	45	34	37
STEP 4	91	72	56	45	34	37
STEP 5	91	72	56	45	37	34
Final Result	91	72	56	45	37	34

Question 4

The following is a sequence of five numbers:

0	1	2	3	4
50	40	30	20	10

Use Bubble Sort to sort the numbers in the sequence into **ascending** order. Show the result of each pass by showing the whole sequence in a new line with sorted numbers underlined.

Answer:

	0	1	2	3	4
PASS 1	40	30	20	10	50
PASS 2					
PASS 3					
PASS 4					
Final Result					

1st Pass

	0	1	2	3	4
1st comp	40	50	30	20	10
2nd comp	40	30	50	20	10
3rd comp	40	30	20	50	10
4th comp	40	30	20	10	50

swap = "yes"

Question 4

The following is a sequence of five numbers:

0	1	2	3	4
50	40	30	20	10

Use Bubble Sort to sort the numbers in the sequence into **ascending** order. Show the result of each pass by showing the whole sequence in a new line with sorted numbers underlined.

Answer:

	0	1	2	3	4
PASS 1	40	30	20	10	50
PASS 2	30	20	10	40	50
PASS 3					
PASS 4					
Final Result					

2nd Pass

	0	1	2	3	4
1st comp	30	40	20	10	50
2nd comp	30	20	40	10	50
3rd comp	30	20	10	40	50

swap = "yes"

Question 4

The following is a sequence of five numbers:

0	1	2	3	4
50	40	30	20	10

Use Bubble Sort to sort the numbers in the sequence into **ascending** order. Show the result of each pass by showing the whole sequence in a new line with sorted numbers underlined.

Answer:

	0	1	2	3	4
PASS 1	40	30	20	10	50
PASS 2	30	20	10	40	50
PASS 3	20	10	30	40	50
PASS 4					
Final Result					

3rd Pass

	0	1	2	3	4
1st comp	20	30	10	40	50
2nd comp	20	10	30	40	50

swap = "yes"

Question 4

The following is a sequence of five numbers:

0	1	2	3	4
50	40	30	20	10

Use Bubble Sort to sort the numbers in the sequence into **ascending** order. Show the result of each pass by showing the whole sequence in a new line with sorted numbers underlined.

Answer:

	0	1	2	3	4
PASS 1	40	30	20	10	50
PASS 2	30	20	10	40	50
PASS 3	20	10	30	40	50
PASS 4	10	20	30	40	50
Final Result	10	20	30	40	50

4th Pass

	0	1	2	3	4
1st comp	10	20	30	40	50

swap = "yes"
No of passes = No of numbers in the sequence – 1 = 4

Question 5

The following is a sequence of five numbers:

0	1	2	3	4
10	20	30	40	50

Use Bubble Sort to sort the numbers in the sequence into **ascending** order. Show the result of each pass by showing the whole sequence in a new line with sorted numbers underlined.

Answer:

	0	1	2	3	4
PASS 1	10	20	30	40	50
Final Result	10	20	30	40	50

1st Pass

	0	1	2	3	4
1st comp	10	20	30	40	50
2nd comp	10	20	30	40	50
3rd comp	10	20	30	40	50
4th comp	10	20	30	40	50

swap = "no"

Question 6

a sequence T in which the elements are sorted in ascending order is given below:

Index	0	1	2	3	4	5
T	3	6	9	12	15	18

Perform a binary search to find each of the following targets and state clearly the values of "first", "mid", "last" and the comparison made for each step:

(i) 15
(ii) 13

Answer:

(i) Step 1: f = 0, *l* = 5, hence, mid = $\frac{0+5}{2} = 2$

As target 15 > T[2] = 9, hence, f of step 2 = 2 + 1 =3, and l of step 2 =5

Step 2: f = 3, *l* = 5, hence, mid = $\frac{f+l}{2} = \frac{3+5}{2} = 4$

As target 15 = T[4] = 15, hence, the target found, its index is 4

Question 6

Index	0	1	2	3	4	5
T	**3**	**6**	**9**	**12**	**15**	**18**

Answer ((ii) search 13):

(ii) Step 1: f = 0, *l* = 5, hence, mid = $\frac{0+5}{2}$ = 2

As target 13 > T[2] = 9, hence, f of step 2 = 2 + 1 =3, and *l* of step 2 =5

Step 2: f = 3, *l* = 5, hence, mid = $\frac{f+l}{2} = \frac{3+5}{2}$ = 4

As target 13 < T[4] = 15, hence, f of step 3 = 3, and *l* of step 3 = 4 – 1 = 3

Step 3: f = 3, *l* = 3, hence, mid = $\frac{3+3}{2}$ = 3

As target 13 > T[3] = 12, hence, f of step 4 = 3 + 1 = 4, and *l* of step 4 = 3

Step 4: f = 4, *l* = 3, as f > *l*, there is no such sub-sequence. Hence, 13 (target) cannot be found.

Question 7

The following is a sequence of eight numbers:

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

Use QuickSort to sort the numbers in the sequence into **ascending** order. Show the result of each step by showing the whole sequence in a new line with sorted numbers underlined.

Answer:

	0	1	2	3	4	5	6	7
STEP 1	4	2	5	3	6	1	7	8
STEP 2	3	2	1	4	6	5	7	8
STEP 3	1	2	3	4	6	5	7	8
STEP 4	1	2	3	4	6	5	7	8
STEP 5	1	2	3	4	6	5	7	8
STEP 6	1	2	3	4	5	6	7	8
STEP 7	1	2	3	4	5	6	7	8
STEP 8	1	2	3	4	5	6	7	8