

Homework . 7

Haeun kim

HW 7

1(a) Insertion Sort

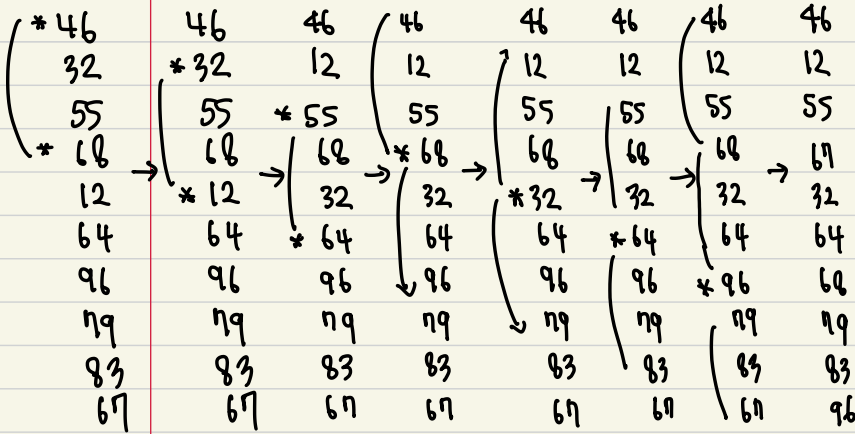
64	32	32	32	32	32	32	32	32	12
*32	64	64	64	64	46	46	46	46	32
79	*79	79	79	67	64	64	55	55	46
83	83	*83	83	79	67	67	64	64	55
67	→ 67	→ 67	→ *67	→ 83	→ 79	→ 79	→ 67	→ 67	→ 64
46	46	46	46	*46	83	83	79	68	67
96	96	96	96	96	*96	96	83	79	68
55	55	55	55	55	55	*55	96	83	79
68	68	68	68	68	68	68	*68	96	83
12	12	12	12	12	12	12	12	*12	96

(b) Shell sort

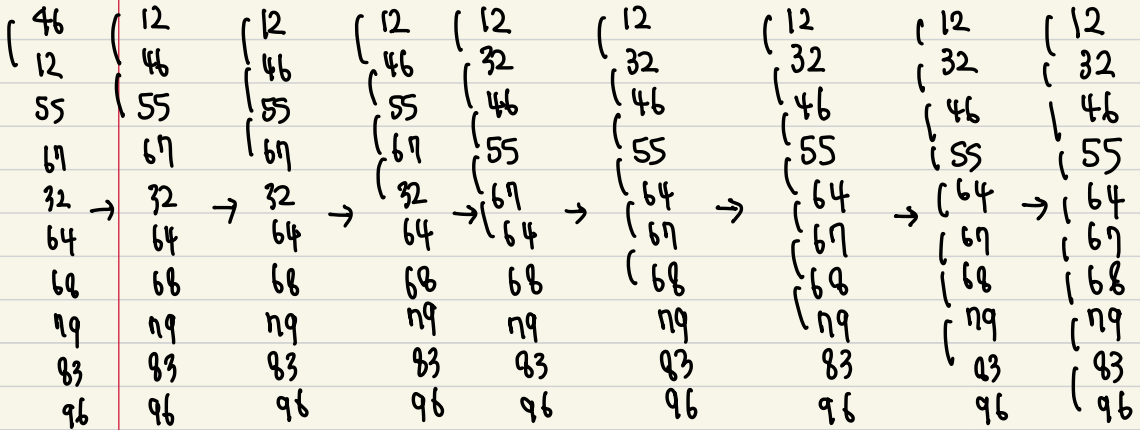
1) sequence 5

*64	46	46	46	46	46
32	*32	32	32	32	32
79	79	*79	55	55	55
83	83	83	*83	68	68
67	→ 67	→ 67	→ 67	→ *67	→ 12
*46	64	64	64	64	64
96	*96	96	96	96	96
55	55	*55	79	79	79
68	68	68	*68	83	83
12	12	12	12	12	67

2) sequence 3



3) sequence 1



→

12

32

46

55

64

67

68

79

83

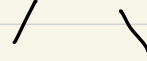
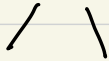
96

(c) Merge sort

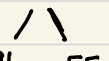
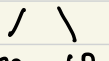
64 32 79 83 67 46 96 55 68 12



64 32 79 83 67 46 96 55 68 12



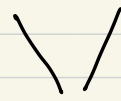
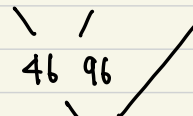
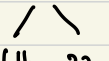
64 32 79 83 67 46 96 55 68 12



64 32 79 83 67

46 96 55

68 12



32 64

67 83

46 55 96

12 68

32 64 119



32 64 67 79 83

12 46 55 68 96



12, 32, 46, 55, 64, 67, 68, 79, 83, 96

(d) Radix Sort

	1st digit		2nd digit	
64	0		0	12
32	1		1	32
79	2	32 12	2	46
83	3	83	3	55
67	4	64	4	64
46	5	55	5	67
96	6	46 96	6	68
55	7	67	7	79
68	8	68	8	83
12	9	79	9	96

2) Quick sort

64 12 68 23 97 38 81 76 55 32 48 29 46

→ 46 12 68 23 97 38 64 76 55 32 48 29 81

→ 46 12 68 23 97 38 29 76 55 32 48 64 81

i j
46 12 68 23 97 38 29 76 55 32 48 64 81
i j

46 12 48 23 97 38 29 76 55 32 68 64 81

i j
46 12 48 23 32 38 29 76 55 97 68 64 81
i j

46 12 48 23 32 38 29 55 76 97 68 64 81
j i

46 12 48 23 32 38 29 55 64 97 68 76 81
i

46 12 48 23 32 38 29 55

23 12 48 46 32 38 29 55

23 12 48 29 32 38 46 55
i j

23 12 48 29 32 38 46 55
i j

23 12 38 29 32 48 46 55
j i

23 12 38 29 32 46 48 55

<u>97</u>	<u>68</u>	76	<u>81</u>	<u>23</u>	12	<u>38</u>	29	<u>32</u>
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68	<u>81</u>	76	97	23	12	<u>32</u>	29	38
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68	76	81	97	23	12	29	32	38
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list size = 3, cutoff

	i	j		
23	12	29	32	38
		j	i	

48 55

list size = 3, \leq cutoff

list size = 3, cutoff

12	23	29	32	38
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→ 12 23 29 32 38 46 48 55 64 68 76 81 97

3) Bucket Sort

✓ 8	0		2
✓ 7	1		2
✓ 4	2	2	4
✓ 2	3		4
✓ 5	4	2	5
✓ 5	5	3	5
✓ 2	6		5
✓ 4	7	2	7
✓ 5	8	2	7
✓ 7	9		8
✓ 8			8



4) External Sort

T₁ 10, 1, 5, 2, 6, 8, 4, 10, 6, 6, 2, 4, 1, 8, 7, 3

T₂

T₃ 1, 2, 5, 10 2, 4, 6, 6

T₄ 4, 6, 8, 10 1, 3, 7, 8

T₁ 1, 2, 4, 5, 6, 8, 10, 10

T₂ 1, 2, 3, 4, 6, 6, 7, 8

T₃ 1, 1, 2, 2, 3, 4, 4, 5, 6, 6, 6, 7, 8, 8, 10, 10

T₄

5) replacement Selection

input	memory	output
10	10	
1	10 1	run 1
5	10 1 5	1
2	10 2 5	2
6	10 6 5	5
8	10 6 8	6
4	10 4* 8	8
10	10 4* 10	10
6	6* 4* 10	10
6	6* 4* 6*	
		Run 2
	6 4 6	4
2	6 2* 6	6
4	6 2* 4*	6
1	1* 2* 4*	
		Run 3
	1 2 4	1
8	8 2 4	2
7	8 7 4	4
	8 7	7
	8	8

6)

$$4! = 4 \times 3 \times 2 \times 1 = 24$$

So, the decision tree has 24 leaves
and $\log(24)$ depth.

So, $\log(N!)$ is $\Omega(N \log N)$, so the number of comparisons required is $\Omega(4 \log 4) = 5$

So, the decision tree is at least 5 comparisons when 4 items are to be compared