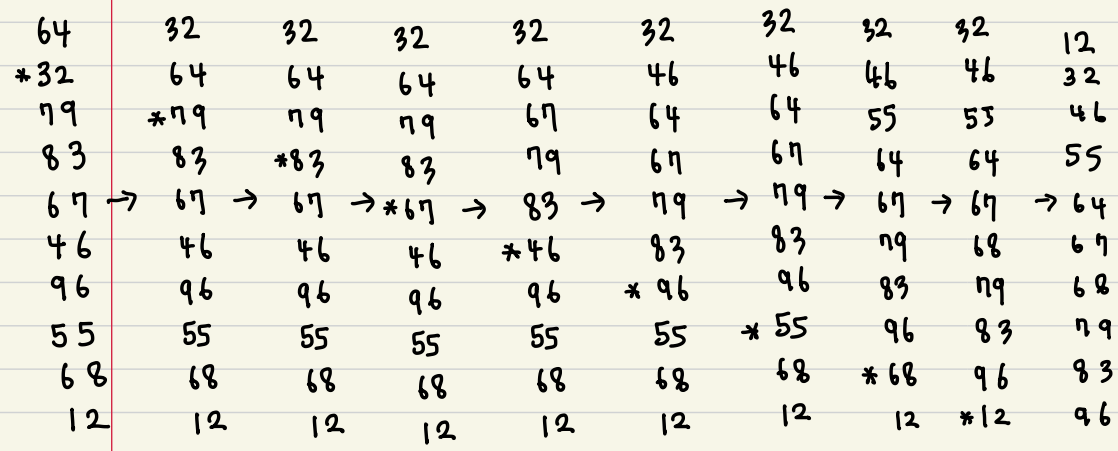
Homework . 7

Haeun kim

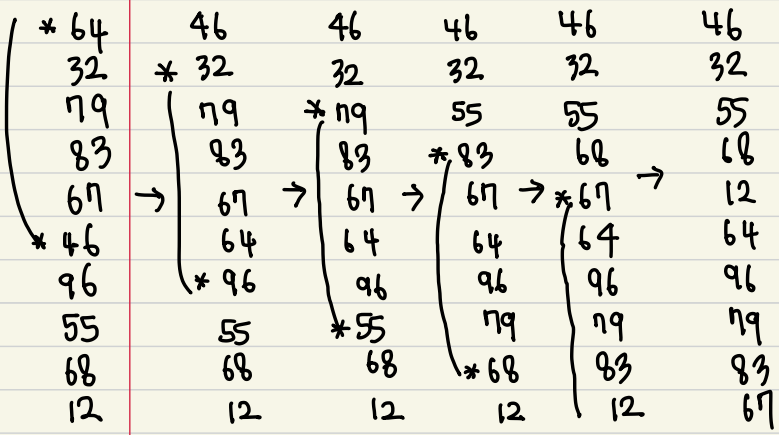
HW 7

1(a) Insertion Sort

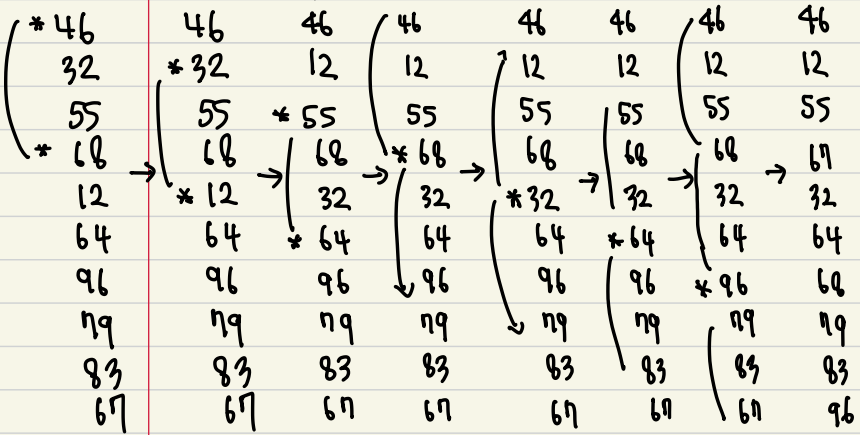


(b) Shell sort

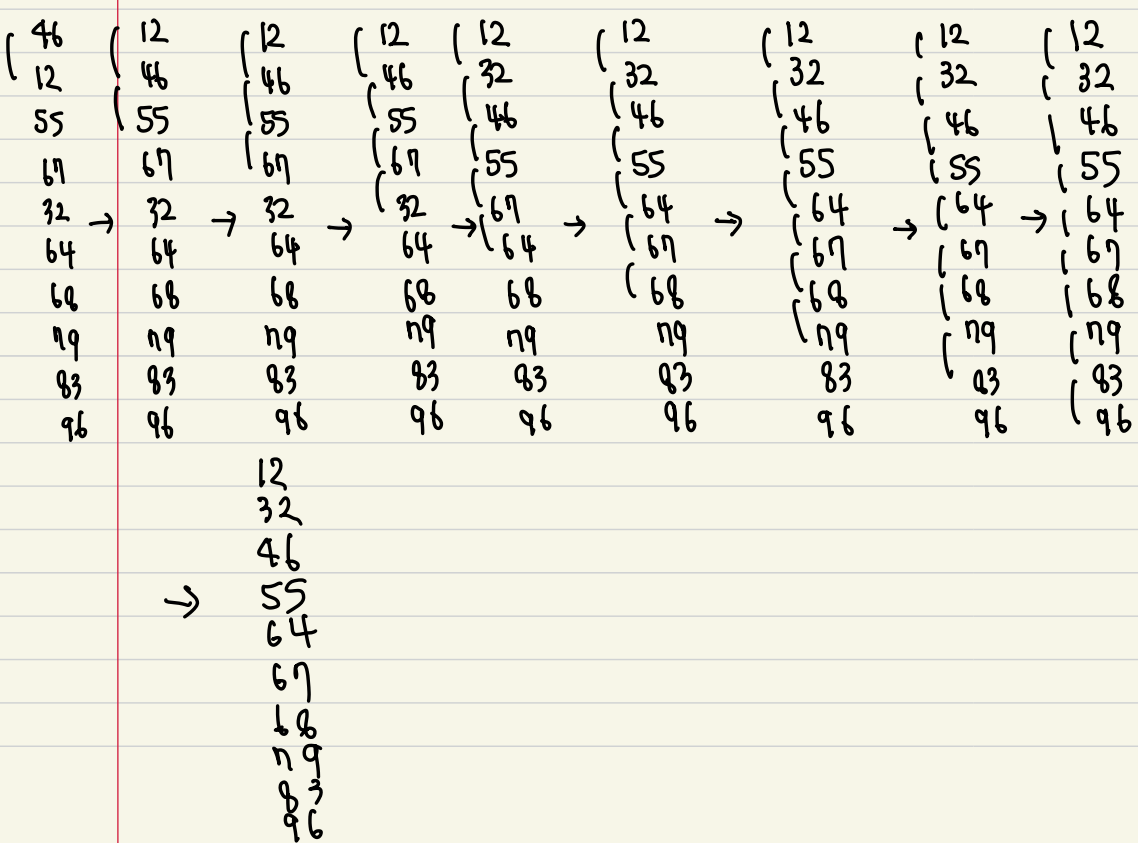
1) sequence 5



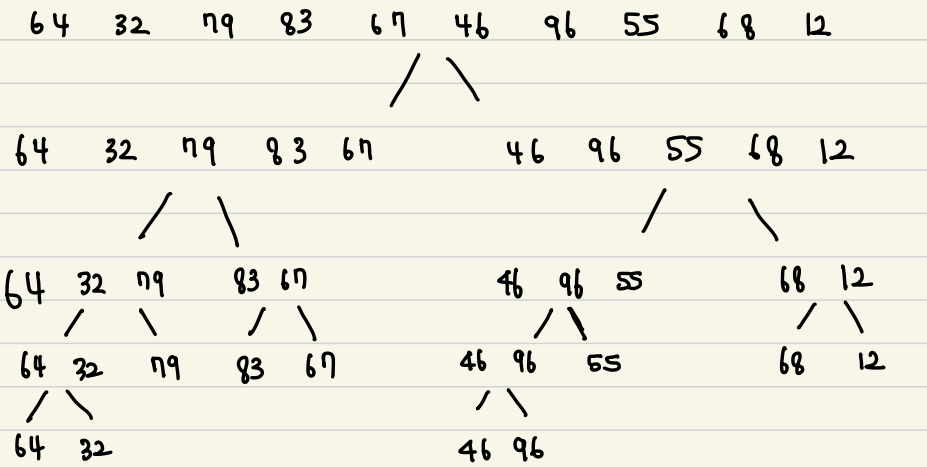
2) sequence 3

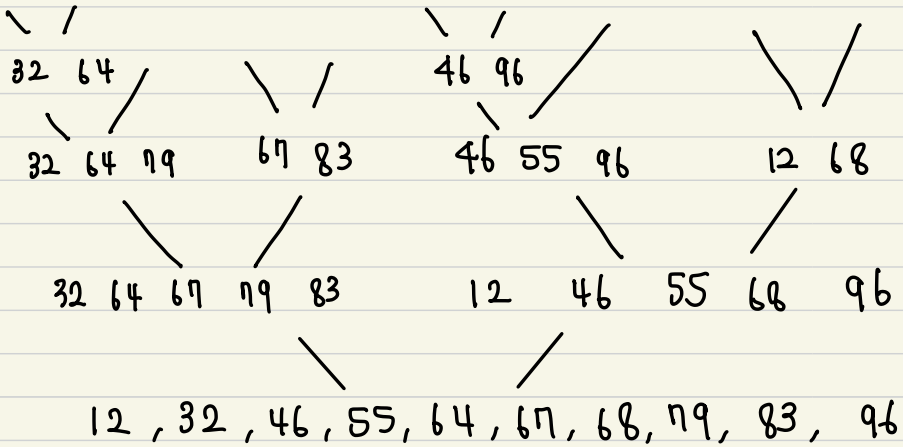


3) sequence 1



(c) Merge sort

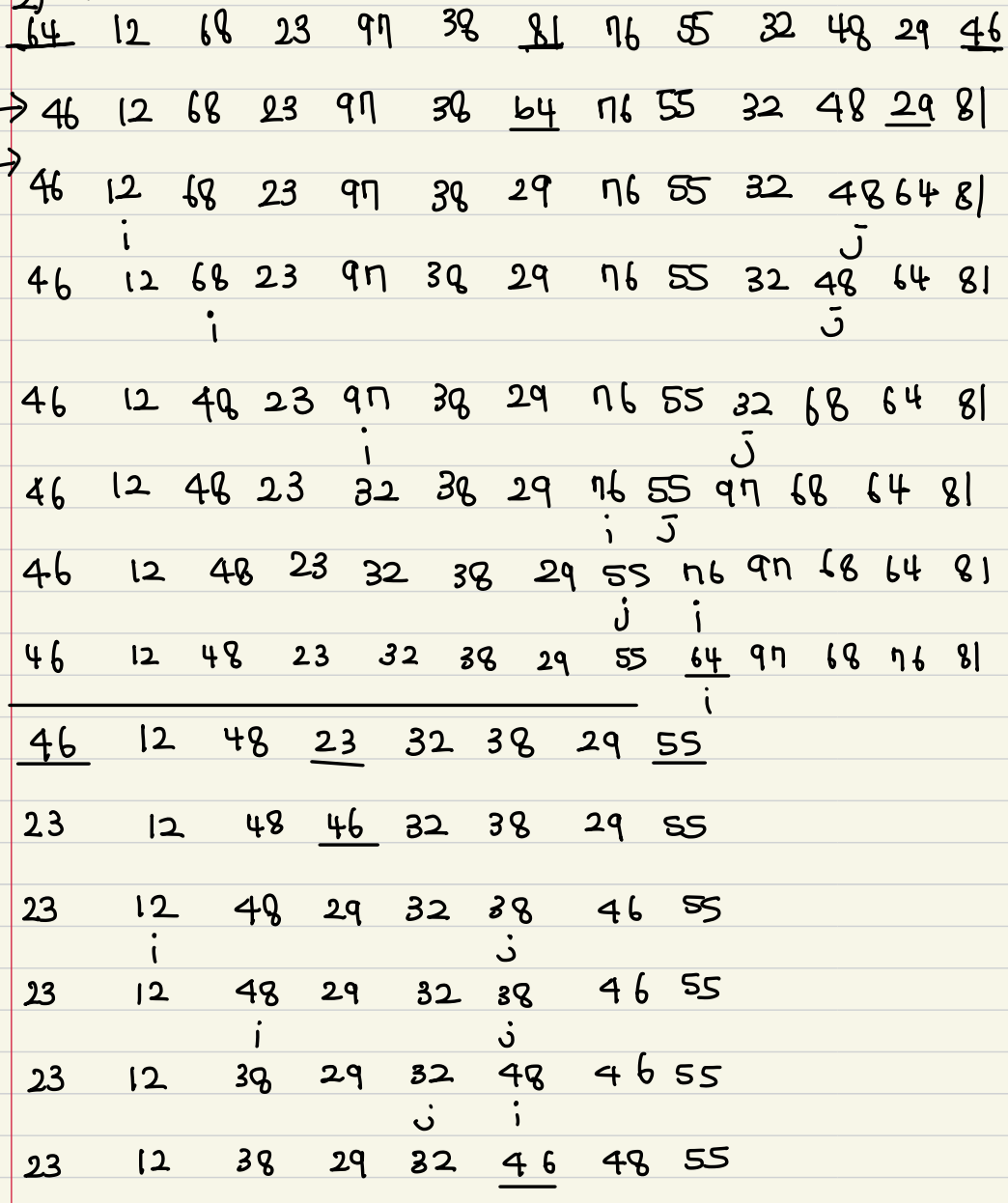

64 32 79 83 67 46 96 55 68 12
64 32 79 83 67
46 96 55 68 12
64 32 79
83 67
46 96 55
68 12
64 32
79
83
67
46 96
55
68
12
64
32
46
96


32 64
46 96
32 64 79
67 83
46 55 96
12 68
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	12	32	
79	2	32 12	2		46	
83	3	83	3	32	55	
67	4	64	4	46	64	
46 →	5	55 →	5	55 →	67	
96	6	46 96	6	64 67 68	68	
55	7	67	7	79	79	
68	8	68	8	83	83	
12	9	79	9	96	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

97 68 76 81

68 81 76 97

68 76 81 97

list size = 3, cutoff

48 55

list size = 3, cutoff

23 12 38 29 32

23 12 32 29 38

23 12 29 32 38

i j

23 12 29 32 38

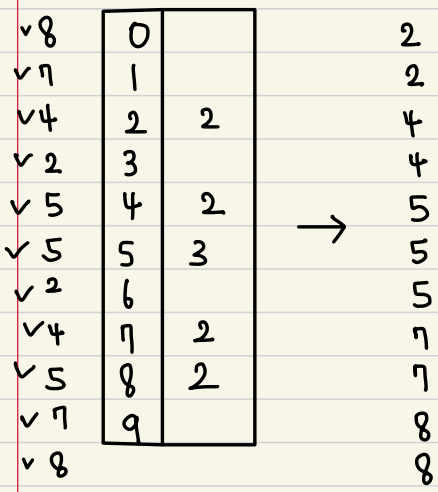
j i

list size = 3, ≤ cut off

12 23 29 32 38

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

3) Bucket Sort



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