

Algorithm Analysis and Data Structures

CS 5343.001: Homework #7

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Problem 1

Part (a)

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

Part (b)

Step 1

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

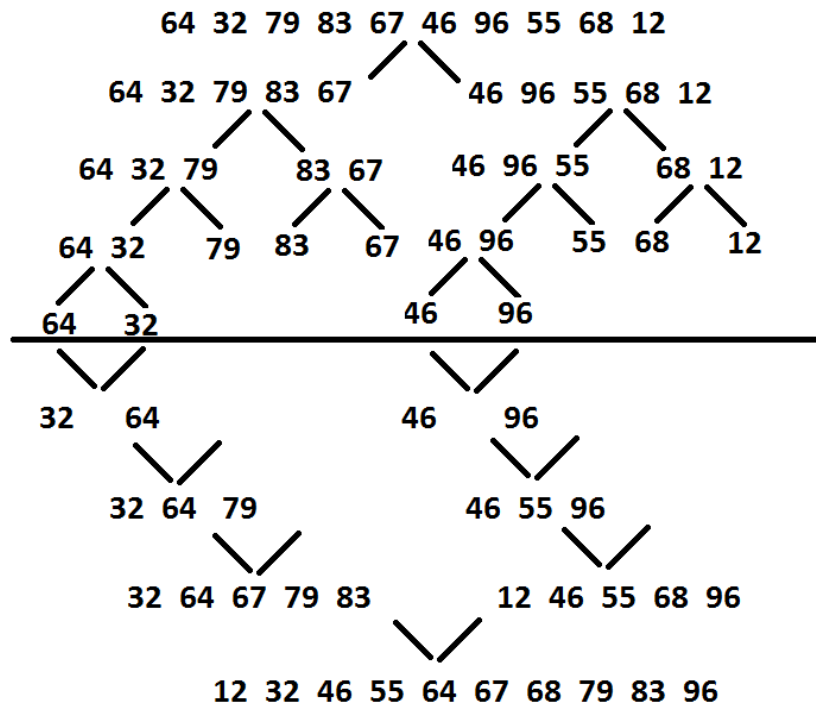
Step 2

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

Step 3

[illegible]

Part (c)



Part (d)

64	0	0	12
32	1	1 12	32
79	2 12 32	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

Problem 2

Step 1

```

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
      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
      j i

```

Step 2

```

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
      j i

list size > 3

23 12 38 29 32
23 12 32 29 38
23 12 32 29 38
      i j
23 12 32 29 38
      j i
23 12 29 32 38
      j i

list size < = 3

12 23 29 32 38

```

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

Problem 3

original			sorted		
8	0	<div style="border: 1px solid black; display: inline-block; width: 20px; height: 100px; vertical-align: middle;"></div>	2		
7	1		2		
4	2		4		
2	3		4		
5	4		5		
5	5		5		
2	6		5		
4	7		7		
5	8		7		
7			8		
8			8		

Problem 4

External sort, run size = 4

10 1 5 2 | 6 8 4 10 | 6 6 2 4 | 1 8 7 3

T1 1 2 5 10 2 4 6 6

T2 4 6 8 10 1 3 7 8

T3 1 2 4 5 6 8 10 10

T4 1 2 3 4 6 6 7 8

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

T2

Problem 5

Input	Memory(holds 3)	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	4*2* 6	6
1	4*2* 1*	
		Run 3
	4 2 1	1
8	4 2 8	2
7	4 7 8	4
	7 8	7
	8	8

Problem 6

4 items have $4!$ possible arrangements. this leads to a tree with $4! = 24$ leaves, thus $\log(4!)$ depth, and therefore $\log(4!)$ comparisons. therefore the number of comparisons required is 5.