

# ASSIGNMENT #7

①

SUBMITTED BY :

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1) Given List,

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

Sort :									
<u>P=1</u>		<u>P=2</u>		<u>P=3</u>		<u>P=4</u>		<u>P=5</u>	
64	32	32	32	64	64	64	46	46	46
32	64	64	64	79	79	67	64	64	55
79	79	79	79	83	83	79	67	67	64
83	83	83	83	67	67	83	79	79	67
67	67	67	67	46	46	83	83	83	68
46	46	46	46	96	96	96	96	79	79
96	96	96	96	55	55	55	55	96	83
55	55	55	55	68	68	68	68	68	96
68	68	68	68	12	12	12	12	12	12
12	12	12	12						

N=10, requires 9 passes (i.e., N-1)

Done.

b) Shell Sort : (5, 3, 1)

Here we are 5-sorting the list

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

→ 5-sorted

Here we are 3-sorting the list.

5-sorted list

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

→ 3-sorted

(2)

Here we are 1-sorting the list

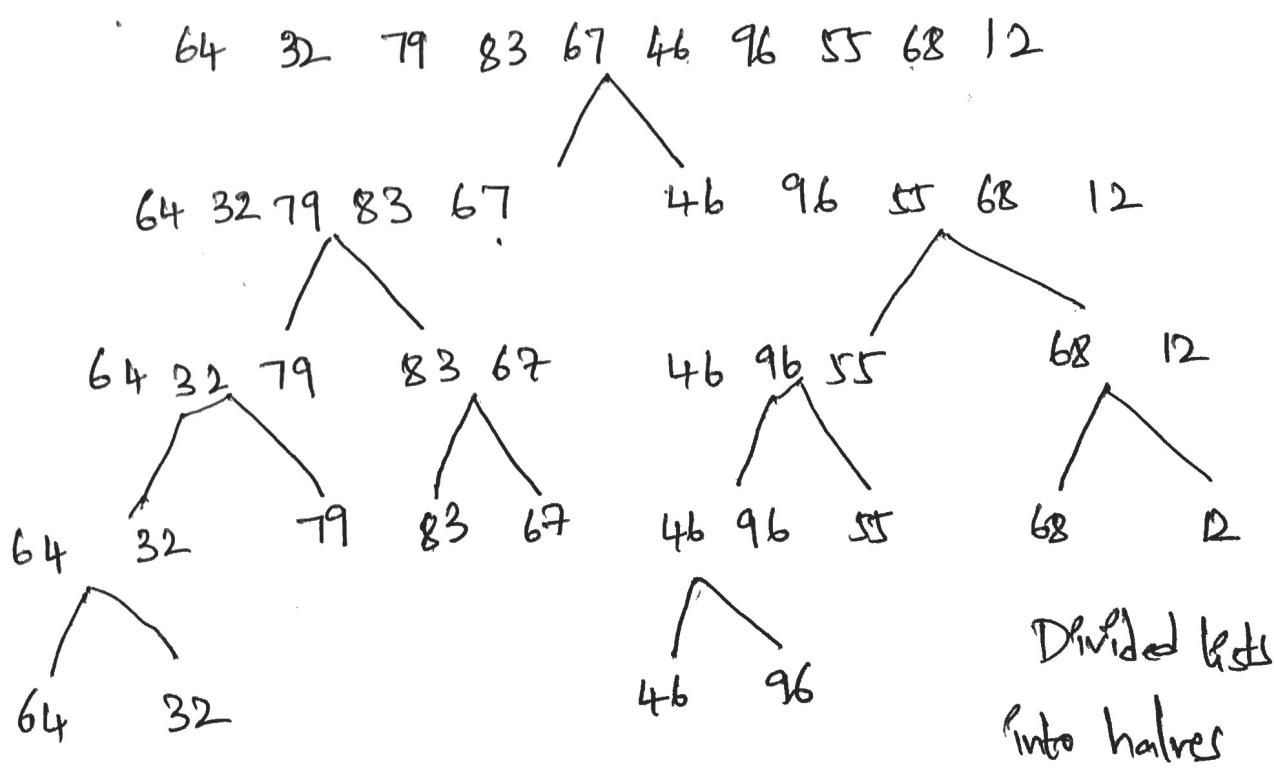
### 3-sorted list

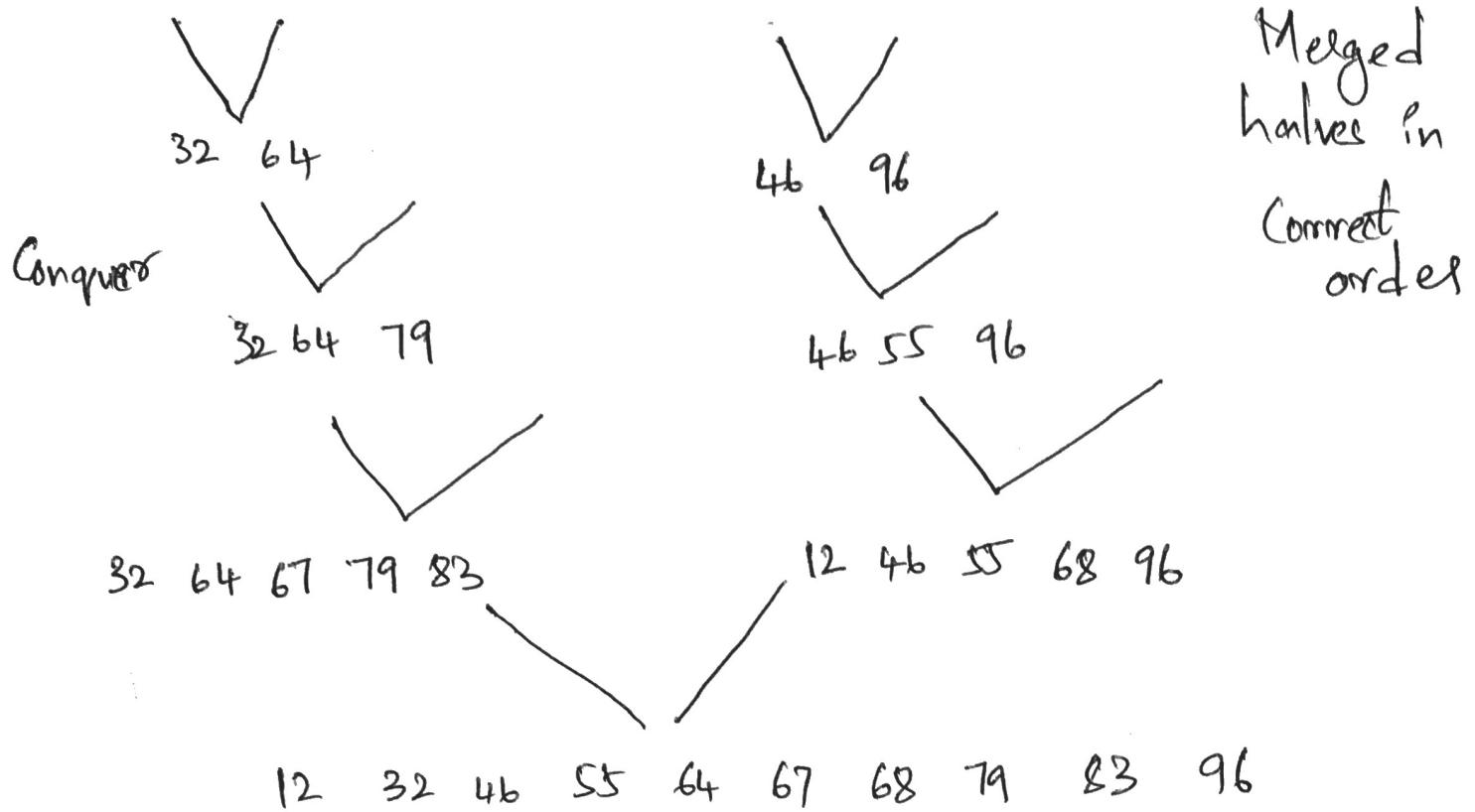
(	46	12	12	12	12	12	12	12	12	)
12	(	46	{	46	{	32	{	32	{	32
55	55	{	55	{	46	{	46	{	46	{
67	67	{	67	{	55	{	55	{	55	{
32	32	32	{	67	{	64	{	64	{	64
64	64	64	64	{	64	{	67	{	67	{
68	68	68	68	68	{	68	{	68	{	68
79	79	79	79	79	79	{	79	{	79	{
83	83	83	83	83	83	83	{	83	{	83
96	96	96	96	96	96	96	96	{	96	{

→ Sorted

### Merge Sort

Divide





d) Radix Sort

	1 <sup>st</sup> Digit Sort
64	0
32	1
79	2
83	3
67	4
46	5
96	6
55	7
68	8
12	9

	2 <sup>nd</sup> Digit Sort	Sorted
0		12
1	12	32
2		46
3	32	55
4	46	64
5	55	67
6	64, 67, 68	68
7	79	79
8	83	83
9	96	96

## 3) Quick Sort

(3)

~~64 32 79 83 67 46 96 55 68 72~~

Partitioning with median-of-3

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  
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

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

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

i > j or i < j

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

Step 2

46 12 48 23 32 38 55 97 68 76 81

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

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

23 12 48 29 32 38 46 55      list size  $\leq 3$   
i                                  j

23 12 38 29 32 48 46 55  
j      i ( $i < j$ ) swap( $a, i, j$ )

23 12 38 29 32 46 48 55  
j      i

23 12 38 29 32      46 48 55  
—      P                            list  $\leq 3$

23 12 32 29 38      46 48 55

23 12 29 32\* 38  
i      j      29      32\*  
+ 23 — 12 29 32\* 38 \*  
      1      j, i      (scratched)

23 12 29 32 38  
1      j      i ( $i < j$ )

list size  $\leq 3$

12 23 29 32 38

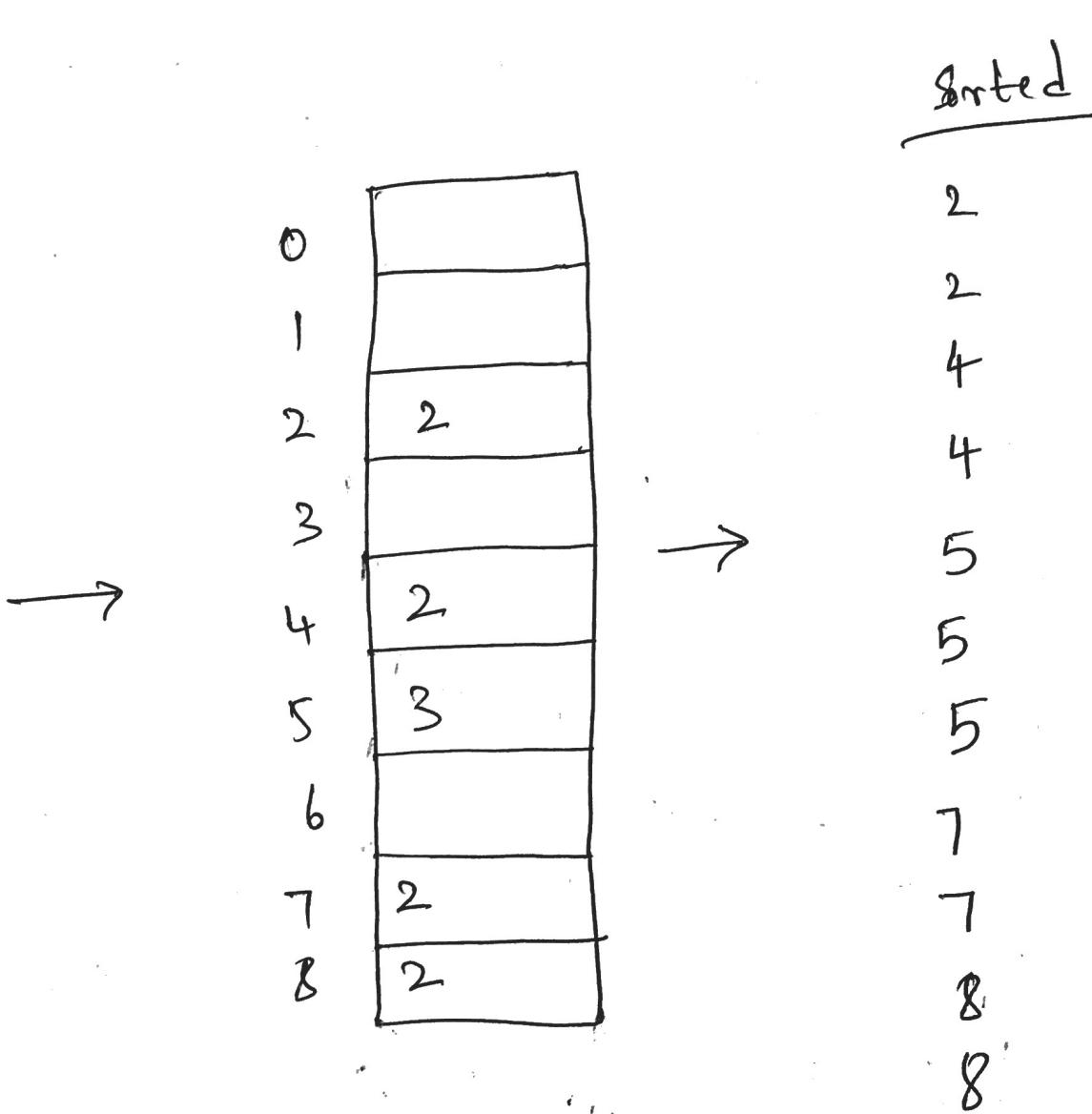
Sorted list

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

3) Given list,

(4)

8, 7, 4, 2, 5, 5, 2, 4, 5, 7, 8



④ External sort

Run size = 4

T<sub>1</sub> has the input data to sort

T<sub>1</sub>    10 1 5 2    6 8 4 10    6 6 2 4    18 7 3

T<sub>2</sub>

T<sub>3</sub> { 1 2 5 10 }

T<sub>4</sub> { 4 6 8 10 }

Now merging  
corresponding  
runs

T<sub>1</sub> { 1 2 4 5 6 8 10 10 }

T<sub>2</sub> { 1 2 3 4 6 6 7 8 }

and continue  
merging until  
everything is in  
one list.

T<sub>3</sub> 1 1 2 2 3 4 4 5 6 6 6 7 8 8 10 10

⑤ Replacement Selection, Given  $M=3$

<u>Input</u>	<u>Memory (holes 3)</u>	<u>Output</u>
10	10	<u>Run 1</u>
1	10 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*	
2	6 4 6	<u>Run 2</u>
4	6 2* 6	4
4*	2* 6	6
1	4* 2* 1*	6

Run 3

1

2

4

7

8

4 2 1

4 2 8

4 7 8

7 8

8

⑥ A list of  $N$  items has  $N!$  possible arrangements. This leads to a tree with  $N!$  leaves, thus  $\log(N!)$  depth, and therefore  $\log(N!)$  comparisons.

Given 4 items, i.e.,  $N = 4$

$$\begin{aligned}\text{Number of leaves} &= N! = 4! \\ &= 24 \text{ leaves.}\end{aligned}$$

It takes  $\log(N!)$  comparisons,

$$\Rightarrow \log(4!) = \log(24) \approx 3.5.$$

Therefore, the number of comparisons required is 5.