CS435DE - Lab 6

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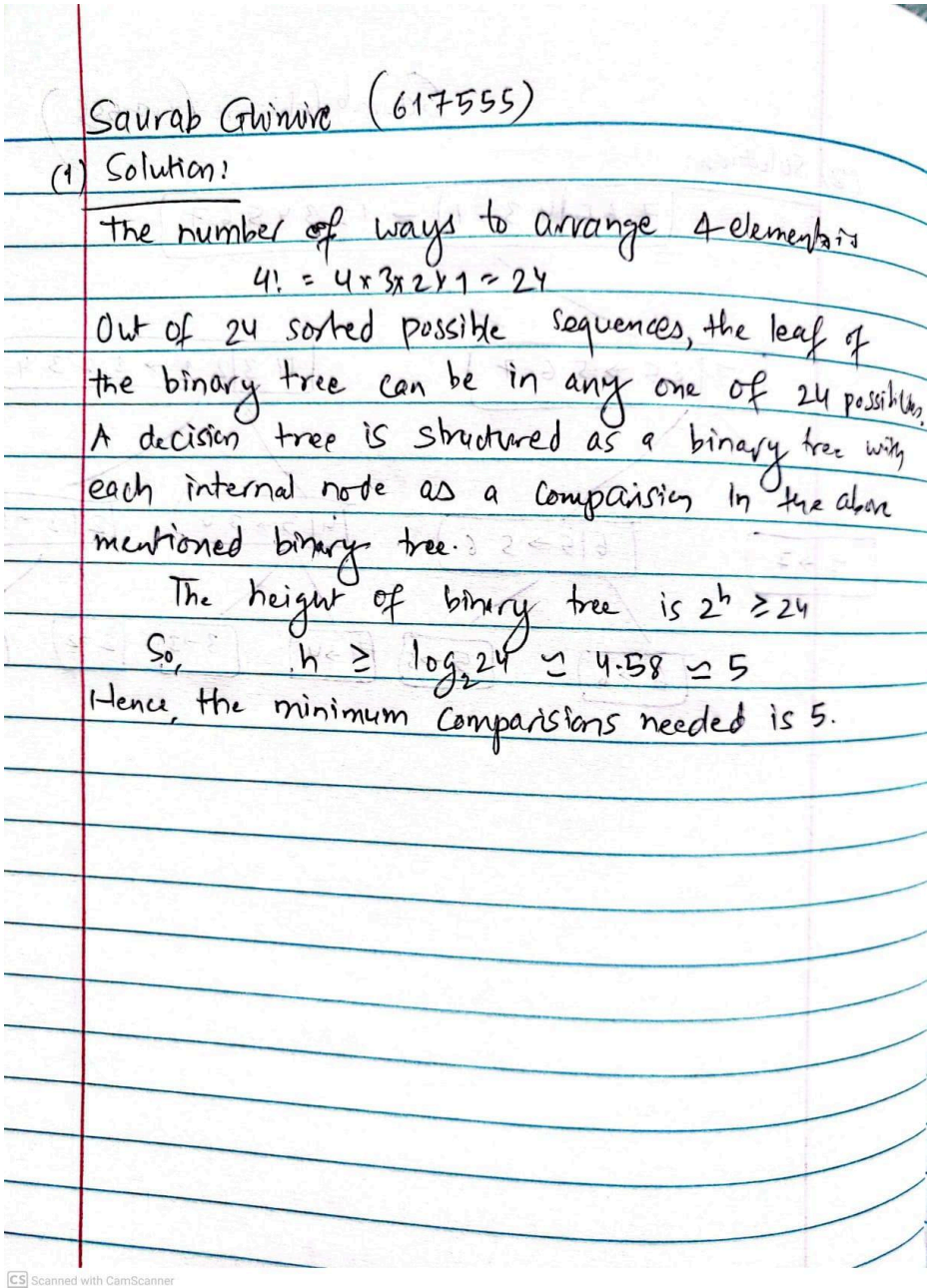
Problem 1: Solution



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(1) Solution:

The number of ways to arrange 4 elements is

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

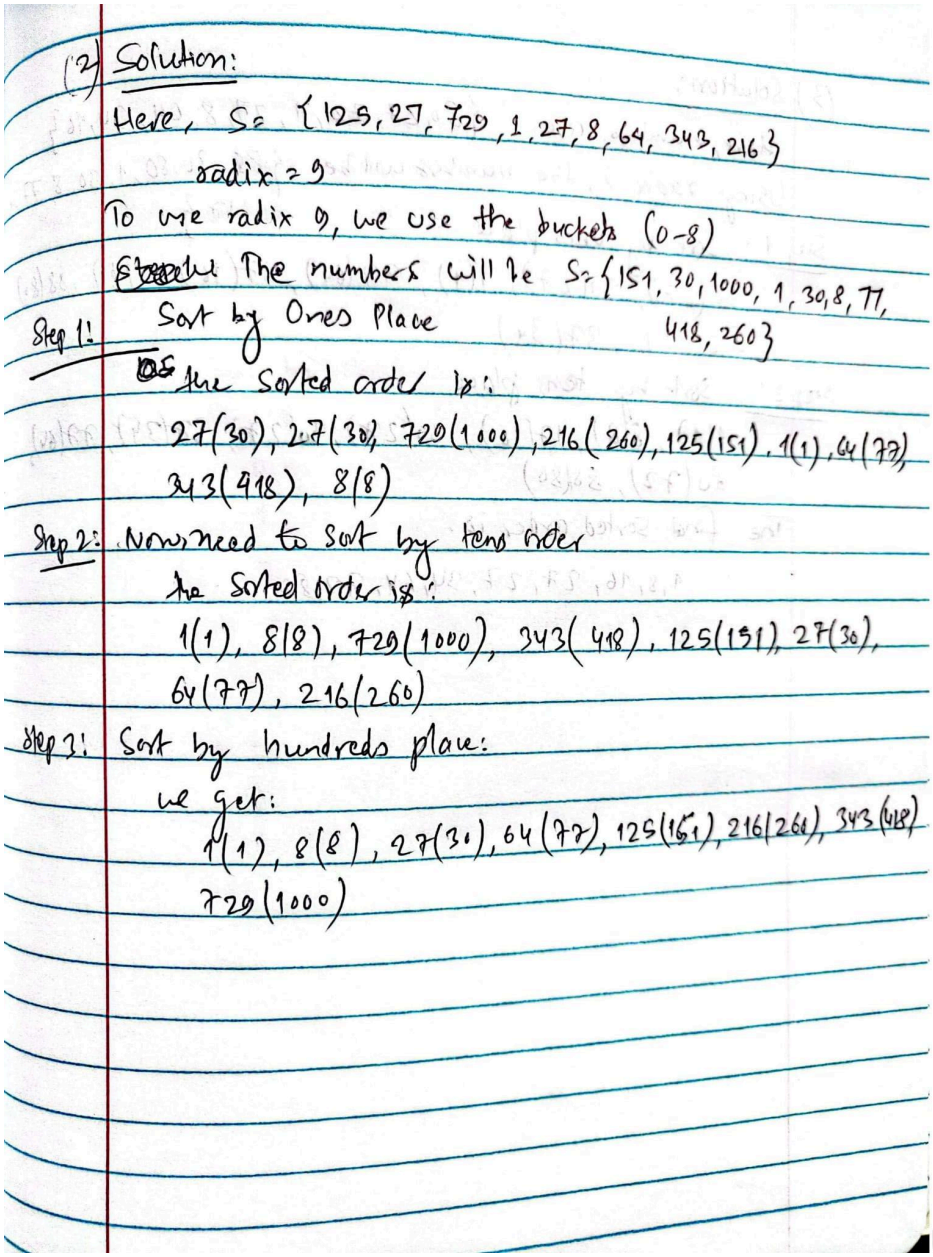
Out of 24 sorted possible sequences, the leaf of the binary tree can be in any one of 24 possibles. A decision tree is structured as a binary tree with each internal node as a comparision in the above mentioned binary tree.

The height of binary tree is $2^h \geq 24$

So, $h \geq \log_2 24 \simeq 4.58 \simeq 5$

Hence, the minimum comparisions needed is 5.

Problem 2: Solution



(2) Solution:

Here, S = {125, 27, 729, 1, 27, 8, 64, 343, 216}

radix = 9

To use radix 9, we use the buckets (0-8)

The numbers will be S = {151, 30, 1000, 1, 30, 8, 77, 418, 260}

Step 1: Sort by Ones Place

The sorted order is:

27(30), 27(30), 729(1000), 216(260), 125(151), 1(1), 64(77), 343(418), 8(8)

Step 2: Now need to sort by tens order

The sorted order is:

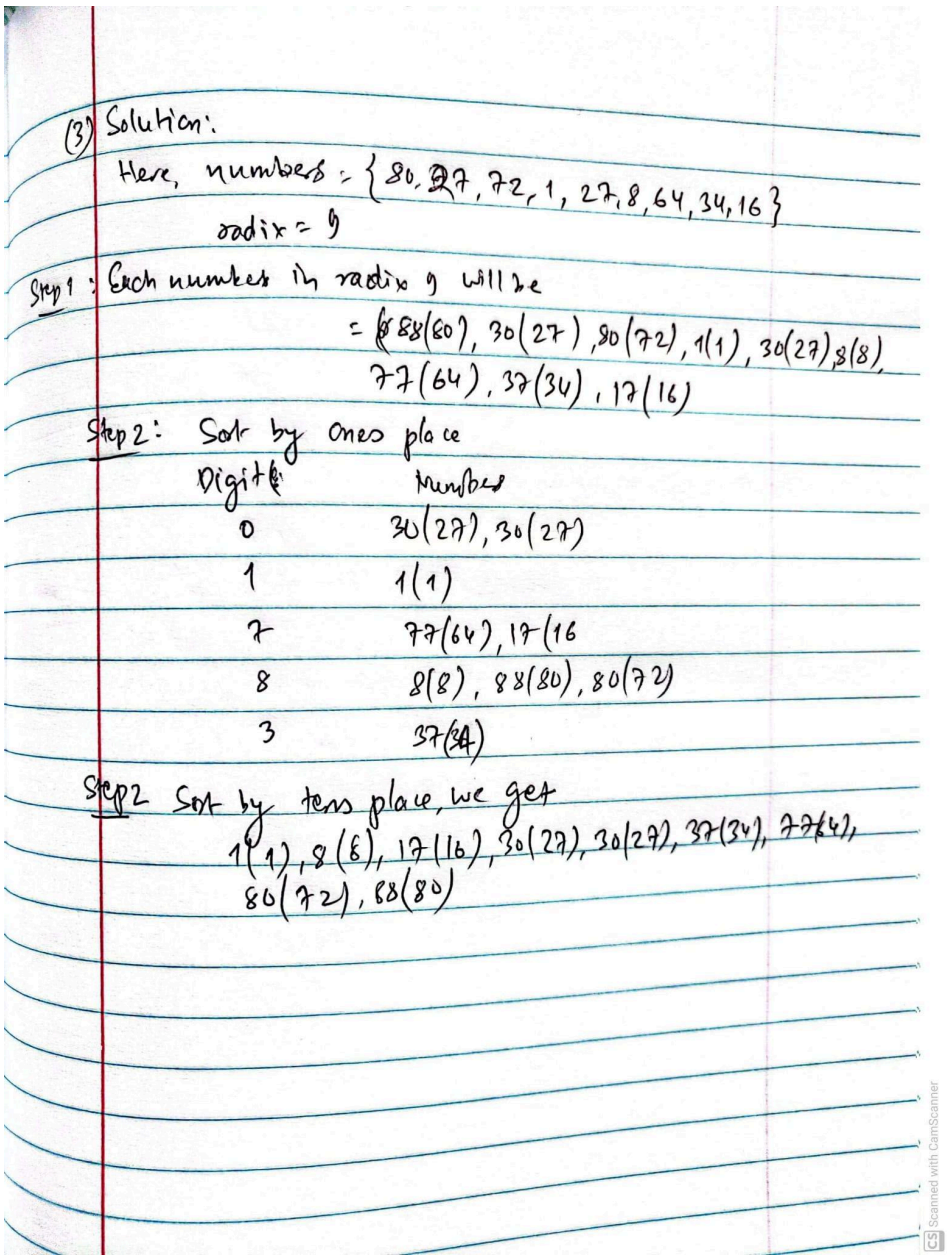
1(1), 8(8), 729(1000), 343(418), 125(151), 27(30), 64(77), 216(260)

Step 3: Sort by hundreds place:

we get:

1(1), 8(8), 27(30), 64(77), 125(151), 216(260), 343(418), 729(1000)

Problem 3: Solution



(3) Solution:

Here, numbers = {80, 27, 72, 1, 27, 8, 64, 34, 16}

radix = 9

Step 1: Each numbers in radix 9 will be

= 88(80), 30(27), 80(72), 1(1), 30(27), 8(8), 77(64), 37(34), 17(16)

Step 2: Sort by ones place

Digits	Numbers
0	30(27), 30(27)
1	1(1)
7	77(64), 17(16
8	8(8), 88(80), 80(72)
3	37(34)

Step 2 Sort by tens place, we get

1(1), 8(8), 17(16), 30(27), 30(27), 37(34), 77(64), 80(72), 88(80)

(2) Solution:

Here, S = {125, 27, 729, 1, 27, 8, 64, 343, 216}

radix = 9

To use radix 9, we use the buckets (0-8)

The numbers will be S = {151, 30, 1000, 1, 30, 8, 77, 418, 260}

Step 1: Sort by Ones Place

The sorted order is:

27(30), 27(30), 729(1000), 216(260), 125(151), 1(1), 64(77), 343(418), 8(8)

Step 2: Now need to sort by tens order

The sorted order is:

1(1), 8(8), 729(1000), 343(418), 125(151), 27(30), 64(77), 216(260)

Step 3: Sort by hundreds place:

we get:

1(1), 8(8), 27(30), 64(77), 125(151), 216(260), 343(418), 729(1000)

(3) Solution:

Here, numbers = {80, 27, 72, 1, 27, 8, 64, 34, 16}

radix = 9

Step 1: Each number in radix 9 will be

= {88(80), 30(27), 80(72), 11(1), 30(27), 8(8), 77(64), 37(34), 17(16)}

Step 2: Sort by ones place

Digits	Numbers
0	30(27), 30(27)
1	1(1)
2	72(64), 17(16)
8	8(8), 88(80), 80(72)
3	37(34)

Step 2 Sort by tens place, we get

1(1), 8(8), 17(16), 30(27), 30(27), 37(34), 72(64), 80(72), 88(80)