ASSIGNMENT-13

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1) Given an array of [4, -2, 5, 3, 10, -5, 2, 8, -3, 6, 7, -4, 1, 9, -10, -6, -8, 11, -9] integers find the max and min product that can be obtained by multiplying two integers from the array

Solution:-

array is [4, -2, 5, 3, 10, -5, 2, 8, -3, 6, 7, -4, 1, 9, -10, -6, -8, 11, -9]

we need to consider the longest and smallest product that can be formed by selecting two numbers from the array

1) sort the array

sorted array

[-9, -8, -6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]

2) identify possible candidates for maximum product

3) identify possible candidates for minimum product

Calculating maximum product:-

* The two longest positive numbers are 10 and 11

$10 \times 11 = 110$

* The two smallest negative numbers are -9 and -8

$-9 \times -8 = 72$

The maximum product is 110

Calculating minimum product

The longest positive and negative numbers is 11 on -9

$11 \times -9 = -99$

The smaller positive negative numbs are

$-9 * -8 =$

$-9 \times -8 = 72$

-99 is smaller than 72, 50

maximum product = 110 and minimum product = -99.

(8) Demonstrate the primary search method for the key = 23 from the array = {2, 5, 8, 2, 16, 23, 38, 5, 6, 72, 91}.

solution

given key = 23 and array = {2, 5, 8, 2, 16, 23, 38, 56, 72, 91}

1. initialise pointers

loco = 0 and high = 9

calculate

$$mid = \left\lceil \frac{loco + high}{2} \right\rceil = 4 \left\lceil \frac{0+9}{2} \right\rceil = 4$$

compare arr[mid] with key:

arr[4] = 16

Since 16 < 23 update loco = mid + 1 = 5

Calculate $mid = \left\lceil \frac{loco + high}{2} \right\rceil = \left\lceil \frac{5+9}{2} \right\rceil = 7$

compare arr[mid] with key:

arr[7] = 56

Since 56 > 23 update high = mid - 1 = 6

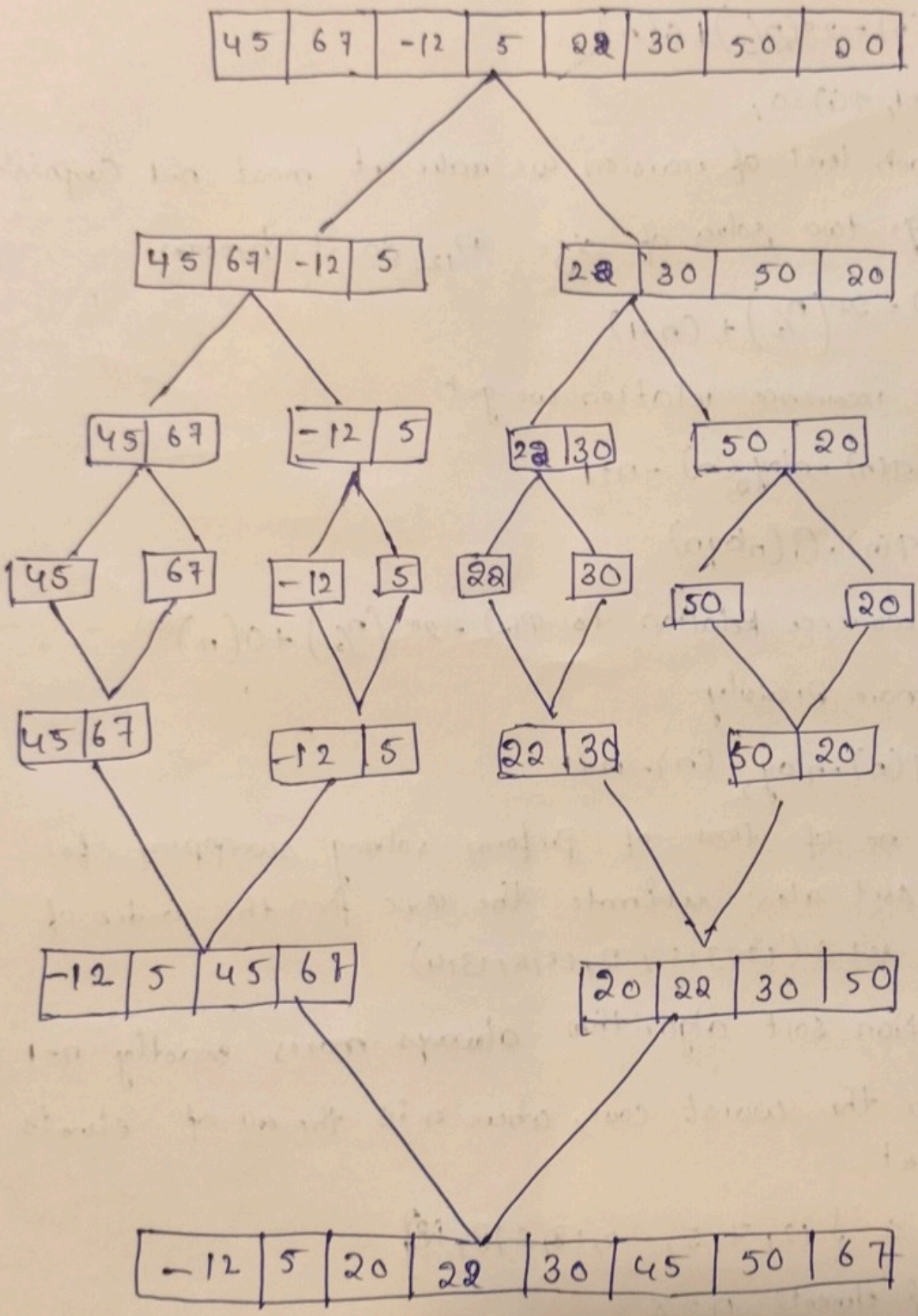
$mid = \left\lceil \frac{5+6}{2} \right\rceil = 5$ arr[mid = arr[5] = 23

23 == 23 (The key is found at index 5.)

∴ The key = 23 is found at index 5.

3) Apply merge sort and other list of 8 elements, Data d: (5, 67, -12, 5, 22, 30, 50, 20) set up a recurrence relation for the no of key comparisons made by merge sort.

04 Mergesort



7) find the no of times to perform swapping for selection sort also estimate the time.

Recursive Relation for comparisions.

$$T(n) = 2T(n/2) + O(n)$$

if $n=1$, $T(1)=0$,

→ At each level of recursion we make at most $n-1$ comparisions to merge two solves of size $n/2$ so it becomes.

$$T(n) = 2T\left(\frac{n}{2}\right) + (n-1)$$

Solve recurrence relation we get

$$T(n) = n\log_2(n) - n + 1$$

$$\therefore T(n) = O(n \log n)$$

∴ The recurrence Relation is $T(n) = 2T\left(\frac{n}{2}\right) + O(n)$

(or) more Precisely

$$T(n) = n\log_2(n) - n + 1$$

5) find the no of tims of perform solving swapping for selection sort also estimate the T.C for the order of notation set S (12, 7, 5, 2, 18, 6, 3, 4)

The slection sort algorithm always mores exactly $n-1$ swaps in the worst case, where n is the no of elements in the list

given $S = \{12, 7, 5, -2, 18, 6, 18, 4\}$

No of elements $n = 8$

No of swaps $= n-1 = 8-1 = 7$

Time complexity :- $O(n^2)$

so the no of swaps is 7, and the T.C is $O(n^2)$.

find the index the target value 10 using binary search from the following list of elements [8, 4, 6, 8, 10, 2, 14, 10, 18, 70]

Given list = {2, 4, 6, 8, 10, 12, 14, 16, 18, 70} and val = 10

low = 0 and high = 9

mid = $\frac{low + high}{2} = \frac{0+9}{2} = 4$

mid = 10 mid = = value

Since 10 = = 10 the target is found at index 4

∴ The target value = 10 is found at index 4.