

Assignment:-6

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- 1) Take the elements from the user and sort them in descending order and do the following
 - a) using Binary search from the element and location in the array where the element is asked from user.
 - b) Ask the user to enter any two locations print the sum and product of values at these locations in sorted away.

program:

```
#include <stdio.h>
void sort (int a[], int n)
{
    int i, j, temp;
    for (i = 0; i < n; i++)
    {
        for (j = i + 1; j < n; j++)
        {
            if (a[i] < a[j])
            {
                temp = a[i];
                a[i] = a[j];
                a[j] = temp;
            }
        }
    }
}
```

```
int binary(int a[], int e, int n)
```

```
{
```

```
    int i = 0, j = n - 1, mid;
```

```
    while (i <= j)
```

```
    {
```

```
        mid = (i + j) / 2;
```

```
        if (a[mid] == e)
```

```
            return mid + 1;
```

```
        else
```

```
        {
```

```
            if (e < a[mid])
```

```
                j = mid - 1;
```

```
            else
```

```
                i = mid + 1;
```

```
        }
```

```
    }
```

```
    if (i > j)
```

```
    {
```

```
        return 0;
```

```
    }
```

```
}
```

```
int main()
```

```
{
```

```
    int n, i, a[20], f, e, m1, m2;
```

```
    printf("Enter the no of elements of array");
```

```
    scanf("%d", &n);
```

```
    printf("Enter the elements of array\n");
```

```
    for (i = 0; i < n; i++)
```

```
        scanf("%d", &a[i]);
```

```
    sort(a, n);
```

```

for(i=0; i<n; i++)
    printf("%d", a[i]);
printf("Enter the element to find in array");
scanf("%d", &e);
f = binary(a, e, n);
if(f != 0)
{
    printf("Element is found at %d position", f);
}
else
{
    printf("Element not found\n");
}
printf("Enter the position of array to find sum
and product\n");
scanf("%d %d", &m1, &m2);
m1--;
m2--;
printf("the sum is %d", a[m1] + a[m2]);
}

```

Output:

Enter the no. of elements of array 3

Enter the elements of array

2

3

4

432 Enter the element to find in array 2

Element not found

Enter the position of array to find sum and product 2 3

the sum is 5 the position is 6

2) sort the array using merge sort where elements are taken from the user and find the product of k th elements from the list where k is taken from user.

program:-

```
#include <stdlib.h>
```

```
#include <stdio.h>
```

```
// Merges two subarrays of arr[]
```

```
// First subarray is arr[l..m]
```

```
// second subarray is arr[m+1..r]
```

```
void merge (int arr[], int l, int m, int r)
```

```
{
```

```
    int i, j, k;
```

```
    int n1 = m - l + 1;
```

```
    int n2 = r - m;
```

```
    /* create temp arrays */
```

```
    int L[n1], R[n2];
```

```
    /* copy data to temp arrays L[] and R[] */
```

```
    for (i = 0; i < n1; i++)
```

```
        L[i] = arr[l + i];
```

```
    for (j = 0; j < n2; j++)
```

```
        R[j] = arr[m + 1 + j];
```

```
    /* Merge the temp arrays back into arr[l..r] */
```

```
    i = 0; // Initial index of first subarray
```

```
    j = 0; // Initial index of second subarray
```

```
    k = l; // Initial index of merged subarray
```

```
    while (i < n1 && j < n2)
```

```
{
```

```

if (L[i] <= R[j])
{
    arr[k] = L[i];
    i++;
}
k++;
}

```

/* copy the remaining elements of L[], if there are any */

```

while (i < n1)
{
    arr[k] = L[i];
    i++;
    k++;
}

```

/* copy the remaining elements of R[], if there are any */

```

while (j < n2)
{
    arr[k] = R[j];
    j++;
    k++;
}

```

```

}

/* l is for left index and r is right index
of sub-array of arr to be sorted */
void mergeSort(int arr[], int l, int r)

```



```

{
    if (l < r)
    {
        // same as (l+r)/2, but avoids overflow for
        // large l and h
        int m = l + (r - l) / 2;

        // sort first and second halves
        merge sort (arr, l, m);
        merge sort (arr, m + 1, r);
        merge sort (arr, l, m, r);
    }
}

```

```

}
/* UTILITY FUNCTIONS */
/* Function to print an array */
void print Array (int A[], int size.)

```

```

{
    int i;
    for (i = 0; i < size; i++)
        printf ("%d", A[i]);
    printf ("\n");
}

```

```

/* Driver program to test above functions */

```

```

int main ( )

```

```

{
    int arr[5];
    int i;
    int arr_size = size of (array) / size of (arr[0])
    for (i = 0; i < arr_size; i++) {

```

```

printf("Enter the elements ");
scanf("%d", &arr[i]);
}
printf("Given array is \n");
printArray(arr, arr - size);
mergeSort(arr, 0, arr - size - 1);
printf("Enter the value of k");
printf("\n sorted array is \n");
printArray(arr, arr - size);
int k;
scanf("%d", &k);
int fromFirst = arr[k - 1];
int fromLast = arr[5 - (k)];
printf("%d", fromLast * fromFirst);
return 0;
}

```

Output:

```

Enter the elements 5
Enter the elements 1
Enter the elements 2
Enter the elements 3
Enter the elements 6
Given array is
5 1 2 3 6
sorted array is
1 2 3 5 6
Enter the value of k 3
9

```

3) Discuss Insertion sort and selection sort with examples.

Insertion sort :-

Insertion sort is a simple sorting algorithm that works the way we sort playing cards in our hands

Algorithm

// sort an arr[] of size n

insertion sort (arr, n)

loop from $i=1$ to $n-1$

a) pick element $arr[i]$ and insert it into sorted sequence $arr[0 \dots i-1]$

Example : 12, 11, 13, 5, 6

let us loop for $i=1$ (second element of the array) to 4 (last element of array)

$i=1$ since 11 is smaller than 12, move 12 and insert 11 before 12

11, 12, 13, 5, 6

$i=2$. 13 will remain at its position as all elements in $arr[0 \dots i-1]$ are smaller than 13

11, 12, 13, 5, 6

$i=3$. 5 will move to the beginning and all other elements from 11 to 13 will move one position ahead of their current position.

5, 11, 12, 13, 6

$i=4$. 6 will move to position after 5, and elements from 11 to 13 will move one position ahead of their current position.

5, 6, 11, 12, 13

Selection sort :

The selection sort algorithm sorts by an array by repeatedly finding the minimum element from unsorted part and putting it into the beginning. The algorithm maintains two subarrays in given array.

- 1) The subarray which is already sorted
- 2) Remaining subarray which is unsorted

In every iteration of selection sort, the minimum element from the unsorted subarray is picked and moved to the sorted subarray.

Example:-

arr[] = 64 25 12 22 11

// find the minimum element in arr[0...4]

// and place it at beginning

// 25 12 22 64 11

// find the minimum element in arr[1...4]

// and place it at beginning of arr[1...4]

// 12 25 22 64 11

// find the minimum element in arr[2...4]

// and place it at beginning of arr[2...4]

// 12 22 25 64 11

// find the minimum element in arr[3...4]

// and place it at beginning of arr[3...4]

// 12 22 25 64 11

4) sort the array using bubble sort where elements are taken from the user and display the elements.

- i) In alternate order
- ii) sum of elements in odd positions and product of elements in even positions
- iii) Element which are divisible by m where m is taken from user.

program:-

```
// include <stdio.h>
void main ( )
{
    int a[100], n, i, j, temp, sum = 0, prod = 1, m;
    printf ("enter number of elements\n");
    scanf ("%d", &n);
    printf ("enter %d integers\n", n);
    for (i = 0; i < n; i++)
    {
        scanf ("%d", &a[i]);
    }
    for (i = 0; i < n - 1; i++)
    {
        for (j = 0; j < n - i - 1; j++)
        {
            if (a[j] > a[j + 1])
            {
                temp = a[j];
                a[j] = a[j + 1];
                a[j + 1] = temp;
            }
        }
    }
}
```

```

printf("\n sorted list in ascending order :\n");
for (i=0; i<n; i++)
{
    printf("%d\n", a[i]);
}
printf("The alternate order is ");
for (i=0; i<n; i++)
{
    if (i%2 == 0)
    {
        printf("%d", a[i]);
    }
}
for (i=0; i<n; i++)
{
    if (i%2 != 0)
    {
        sumo = sumo + a[i];
    }
}
printf("\n sum of odd index is %d", sumo);
for (i=0; i<n; i++)
{
    if (i%2 == 0)
    {
        prod = prod * a[i];
    }
}
printf("\n product of odd index is %d", prod);
printf("\n product the value of m\n");
scanf("%d", &m);
for (i=0; i<n; i++)

```

```

    {
        if(a[i] % m == 0)
        {
            printf("%d ", a[i]);
        }
    }
}

```

output:-

Enter number of elements

4

Enter 4 integers

1

2

3

4

sorted list in ascending order:

1

2

3

4

sum of odd index is 6

product of odd index is 3

enter the value of m

2

24

5. write a recursive program to implement binary search.

```
#include <stdio.h>
```

```
int recursiveBinarySearch(int array[], int start_
                           index, int end_index, int element) {
```

```
    if(end_index >= start_index) {
```

```
        int middle = start_index + (end_index - start_
                                     index) / 2;
```



```

    if (array[middle] == element)
        return middle;
    if (array[middle] > element)
        return recursive Binary Search(array, start -
                                         index, middle - 1, element);
    return recursive Binary search (array, middle + 1,
                                     end - index, element);
}
return -1;
}
int main(void) {
    int array[] = {1, 4, 7, 9, 16, 56, 70};
    int n = 7;
    int element = 9;
    int found-index = recursive Binary search
                      (array, 0, n - 1, element);
    if (found-index == -1) {
        printf("Element not found in the array");
    }
    else {
        printf("Element found at index : %.2d",
              found-index);
    }
    return 0;
}

```

output :-

Element found at index: 3