3. Implement Johnson Trotter algorithm to generate permutations.

Code:

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

#define left_to_right true
#define right_to_left false

int getPosOfMobile(int a[], int n, int mobile) {
   for (int i = 0; i < n; i++) {
      if (a[i] == mobile)
         return i + 1;
   }
   return 0;
}

int getMobile(int a[], bool dir[], int n) {
   int mobile_prev = 0, mobile = 0;
   for (int i = 0; i < n; i++) {
      // direction 0 represents RIGHT TO LEFT.
      if (dir[a[i] - 1] == right_to_left && i != 0) {
         if (a[i] > a[i - 1] && a[i] > mobile_prev) {
            mobile = a[i];
            mobile_prev = mobile;
         }
      }

      // direction 1 represents LEFT TO RIGHT.
      if (dir[a[i] - 1] == left_to_right && i != n - 1) {
         if (a[i] > a[i + 1] && a[i] > mobile_prev) {
            mobile = a[i];
            mobile_prev = mobile;
         }
      }
   }

   if (mobile == 0 && mobile_prev == 0)
      return 0;
   else
      return mobile;
}
```

```
void produceOnePermutation(int a[], bool dir[], int n) {
    int mobile = getMobile(a, dir, n);
    int pos = getPosOfMobile(a, n, mobile);


    if (dir[a[pos - 1] - 1] == right_to_left) {
        int temp = a[pos - 1];
        a[pos - 1] = a[pos - 2];
        a[pos - 2] = temp;
    } else if (dir[a[pos - 1] - 1] == left_to_right) {
        int temp = a[pos];
        a[pos] = a[pos - 1];
        a[pos - 1] = temp;
    }

    // changing the directions for elements
    // greater than largest mobile integer.
    for (int i = 0; i < n; i++) {
        if (a[i] > mobile) {
            if (dir[a[i] - 1] == left_to_right)
                dir[a[i] - 1] = right_to_left;
            else if (dir[a[i] - 1] == right_to_left)
                dir[a[i] - 1] = left_to_right;
        }
    }

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


int fact(int n)
{
    int result=1;
    for(int i=1;i<=n;i++)
    {
        result*=i;
    }
    return result;
}

void producePermutation(int n) {
```

```
    // To store the current permutation
    int a[n];

    // To store the current directions
    bool dir[n];

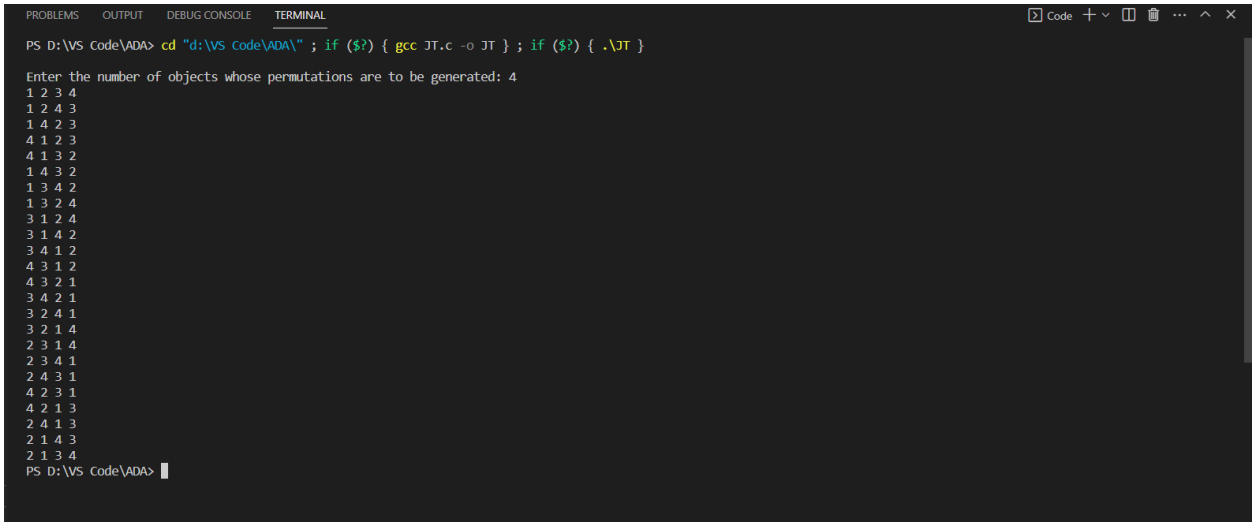
    // Storing the elements from 1 to n and
    // printing the first permutation.
    for (int i = 0; i < n; i++) {
        a[i] = i + 1;
        printf("%d ", a[i]);
    }
    printf("\n");

    // Initially all directions are set
    // to RIGHT TO LEFT i.e. 0.
    for (int i = 0; i < n; i++)
        dir[i] = right_to_left;

    // For generating permutations in order.
    for (int i = 1; i < fact(n); i++)
        produceOnePermutation(a, dir, n);
}


void main()
{
    int n;
    printf("\nEnter the number of objects whose permutations are to be generated: ");
    scanf("%d",&n);
    producePermutation(n);
}
```

Output:



Observation:

13-07-23

Q) Implement Johnson Trotter algorithm to generate permutations.

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#define left_to_right true
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int getPosOfMobile(int a[], int n, int mobile) {
    for(int i=0; i<n; i++) {
        if(a[i]==mobile)
            return i+1;
    }
    return 0;
}

int getMobile(int a[], bool dir[], int n) {
    int mobile_prev=0, mobile=0;
    for(int i=0; i<n; i++) {
        if(dir[a[i]-1]==right_to_left && i!=0) {
            if(a[i]>a[i-1] && a[i]>mobile_prev) {
                mobile=a[i];
                mobile_prev=mobile;
            }
        }
        if(dir[a[i]-1]==left_to_right && i!=n-1) {
            if(a[i]>a[i+1] && a[i]>mobile_prev) {
                mobile=a[i];
                mobile_prev=mobile;
            }
        }
    }
    if(mobile==0 && mobile_prev==0)
        return 0;
    else
        return mobile;
}

void produceOnePermutation(int a[], bool dir[], int n) {
    int mobile = getMobile(a, dir, n);
    int pos = getPosOfMobile(a, n, mobile);
    if(dir[a[pos-1]-1]==right_to_left) {
        int temp=a[pos-1];
        a[pos-1]=a[pos-2];
        a[pos-2]=temp;
    }
    else if(dir[a[pos-1]-1]==left_to_right) {
        int temp=a[pos];
        a[pos]=a[pos-1];
        a[pos-1]=temp;
    }
```

```
for(i=0; i<n; i
    if(a[i]>mobi
        if(dir[a[
            dir[a[i]
        else if(di
            dir[a[
}
for(i=0; i<n; i+
    printf("%d
printf("\n");
int fact(int n)
{ int result =
    for(i=1; i<=
        result
    return resu
}
void produce Permuta
    int
    bool
    for(i=
        a[i-
        print
}
```

3
3
2 3
2 1

```
for(i=0; i<n; i++) {
  if(a[i] > mobile).
    if(dir[a[i]-1] == left_to_right)
      dir[a[i]-1] = right_to_left;
    else if (dir[a[i]-1] == right_to_left.)
      dir[a[i]-1] = left_to_right;
  }
}
for(i=0; i<n; i++)
  printf("%d ", a[i]);
printf("\n");
int fact(int n)
{ int result = 1;
  for(i=1; i<=n; i++)
    result *= i;
  return result;
}
void producePermutation(int n){.
  int a[n];
  bool dir[n];
  for(i=0; i<n; i++){
    a[i] = i+1;
    printf("%d ", a[i]);
  }
  for(i=0; i<n; i++)
    dir[i] = right_to_left;
  for(i=1; i< fact(n); i++)
    produceOnePermutation(a, dir, n);
}
void main()
{ int n;
  printf("\n Enter no. of objects whose permutation to be generated \n");
  scanf("%d", &n);
  producePermutation(n);
}
```

Output:

Enter the number of objects whose permutations to be generated: 3

1 2 3
1 3 2
3 1 2
3 2 1
2 3 1
2 1 3