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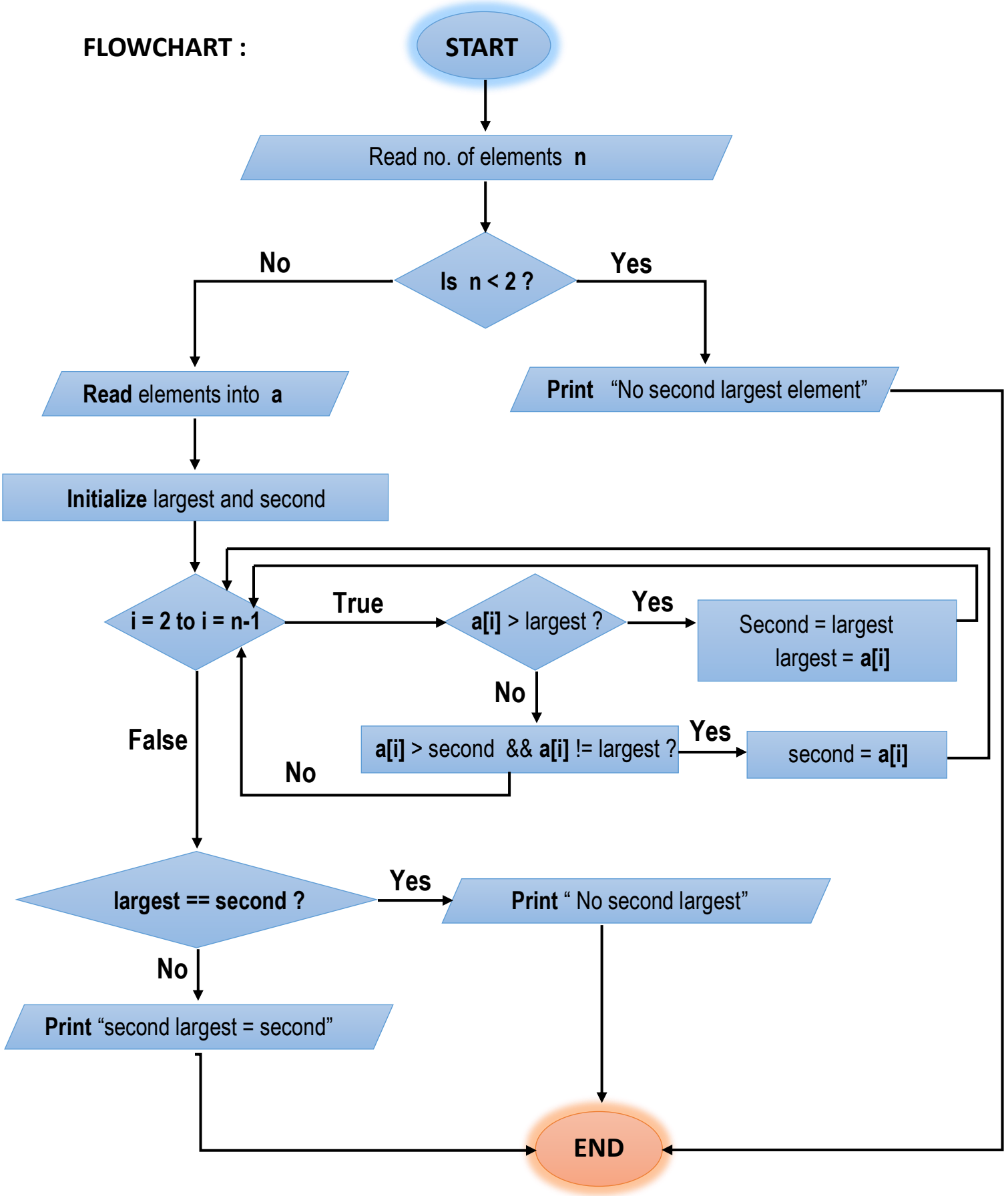
EXPERIMENT 5 : ARRAY

Activity 1: *WAP to read a list of integers and store it in a single dimensional array. Write a C program to print the second largest integer in a list of integers.*

ALGORITHM:

STEP 1: START
STEP 2: Read the no. of elements (n).
STEP 3: If n<2 then print “No second largest element” and go to **STEP8**
else go to **STEP 4**
STEP 4: Read all elements and store them into an array **a** of size **n**
STEP 5: Initialize largest and second using the first two array elements:
if a[0] > a[1] then largest = a[0] & second = a[1] and go to **STEP6**
else largest = a[1] & second = a[0] and go to **STEP6**
STEP 6: Repeat for i = 2 to i = n-1:
if a[i] > largest then set second = largest & largest = a[i]
elseif a[i] > second **AND** a[i] != largest then set second = a [i]
STEP 7: If largest = second then print "No second largest element"
else print "Second largest = second"
STEP 8: END

FLOWCHART :


START
Read no. of elements n
Is n < 2 ?
No
Yes
Read elements into a
Print "No second largest element"
Initialize largest and second
i = 2 to i = n-1
True
a[i] > largest ?
Yes
Second = largest
largest = a[i]
No
a[i] > second && a[i] != largest ?
Yes
second = a[i]
No
False
largest == second ?
Yes
Print " No second largest"
No
Print "second largest = second"
END

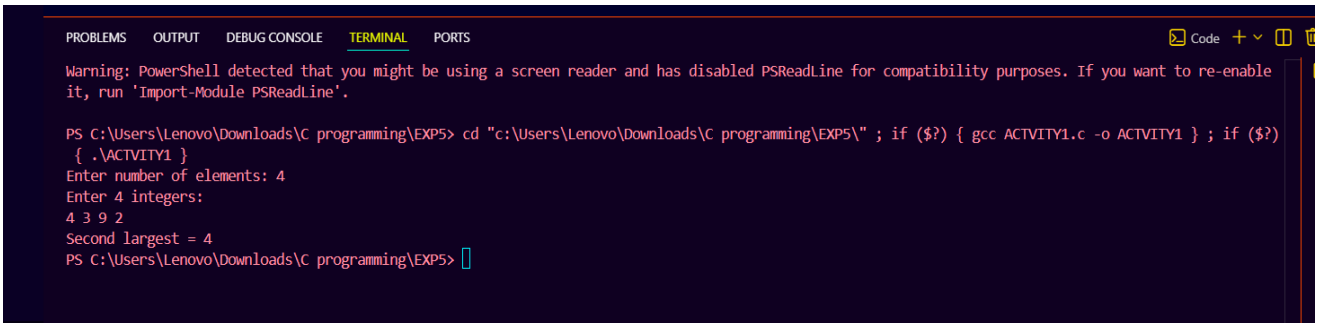
PSEUDOCODE :

```
START
     READ n

    IF n < 2 THEN
        PRINT "No second largest element"
        STOP
    END IF

    READ array a

    IF a[0] > a[1] THEN
        SET largest = a[0]
        SET second = a[1]
    ELSE
        SET largest = a[1]
        SET second = a[0]
    END IF

    SET i = 2
    WHILE i < n DO

        IF a[i] > largest THEN
            SET second = largest
            SET largest = a[i]

        ELSE IF a[i] > second AND a[i] != largest THEN
            SET second = a[i]
        END IF

        SET i = i + 1
    END WHILE

    IF largest = second THEN
        PRINT "No second largest element"
    ELSE
        PRINT "Second largest =", second
    END IF
END
```

CODE :

```c
#include <stdio.h>

int main() {
    int n, i;
    printf("Enter number of elements: ");
    scanf("%d", &n);

    int a[n];
    printf("Enter %d integers:\n", n);
    for(i = 0; i < n; i++) {
        scanf("%d", &a[i]);
    }

    int largest, second;

    if (n < 2) {
        printf("No second largest element.\n");
        return 0;
    }

    if (a[0] > a[1]) {
        largest = a[0];
        second = a[1];
    } else {
        largest = a[1];
        second = a[0];
    }

    for(i = 2; i < n; i++) {
        if(a[i] > largest) {
            second = largest;
            largest = a[i];
        } else if(a[i] > second && a[i] != largest) {
            second = a[i];
        }
    }
    if(largest == second)
        printf("No second largest element.\n");
    else
        printf("Second largest = %d\n", second);

    return 0;
}
```

OUTPUT :



Activity 2 : *WAP to read a list of integers and store it in a single dimensional array. Write a C program to count and display positive, negative, odd, and even numbers in an array.*

ALGORITHM:

STEP 1: START

STEP 2: **Read** the no. of elements (n).

STEP 3: Read all elements and store them into an array **a** of size **n**

STEP 4: Initialize counters: pos, negative, odd, even.

STEP 5: Repeat for i = 0 to i = n:

if a[i] > 0 then increment positive by 1

elseif a[i] < 0 then increment negative by 1

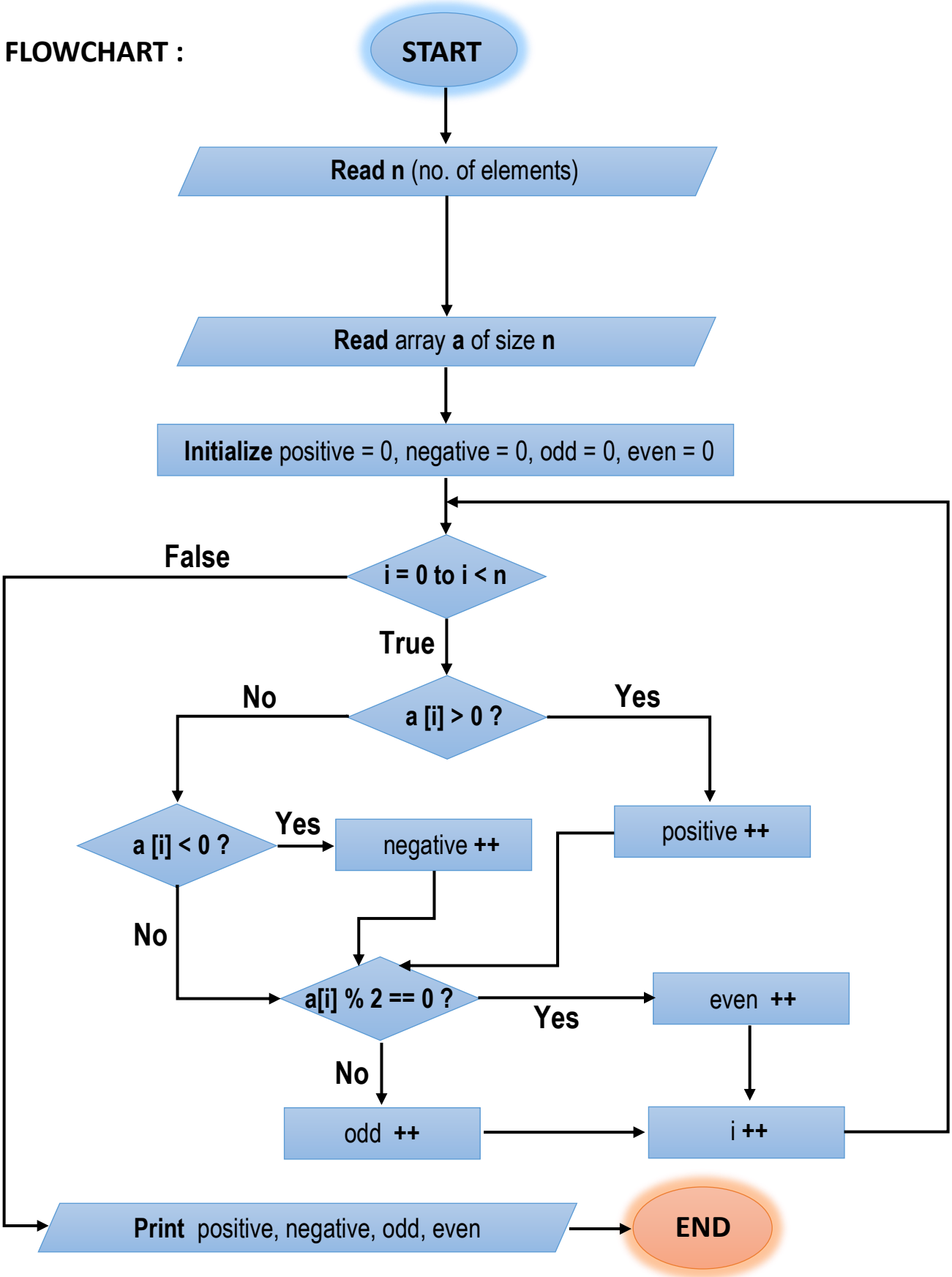
if a[i] % 2 == 0 then increment even by 1

else increment odd by 1

STEP 6: Print positive, negative, even, odd.

STEP 7: END

FLOWCHART :


START
Read n (no. of elements)
Read array a of size n
Initialize positive = 0, negative = 0, odd = 0, even = 0
i = 0 to i < n
False
True
a [i] > 0 ?
No
Yes
a [i] < 0 ?
Yes
negative ++
positive ++
No
a[i] % 2 == 0 ?
Yes
even ++
No
odd ++
i ++
Print positive, negative, odd, even
END

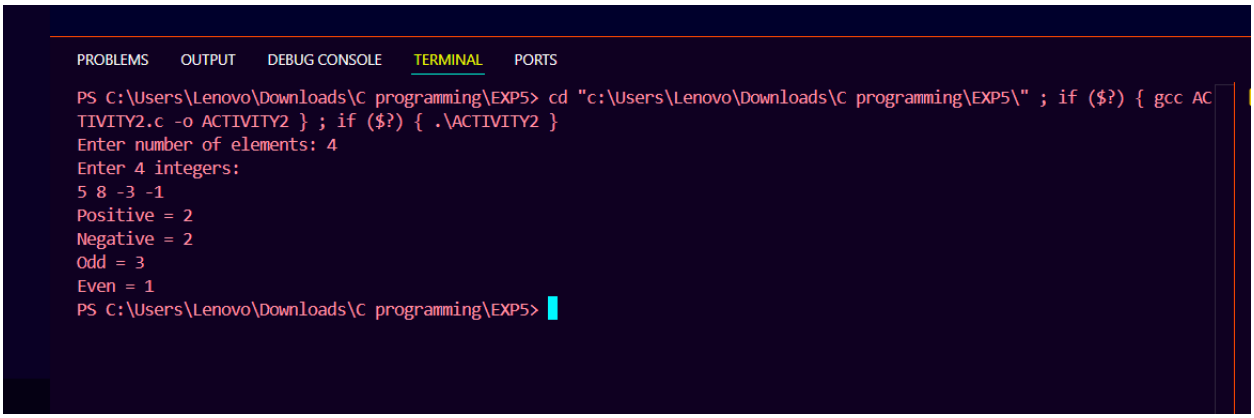
PSEUDOCODE :

```
START
    INPUT n

    IF n < 2 THEN
        PRINT "No second largest element"
        STOP
    END IF

    READ array a of size n

    IF a[0] > a[1] THEN
        SET largest = a[0]
        SET second = a[1]
    ELSE
        SET largest = a[1]
        SET second = a[0]
    END IF

    SET i = 2
    WHILE i < n DO

        IF a[i] > largest THEN
            SET second = largest
            SET largest = a[i]

        ELSE IF a[i] > second AND a[i] ≠ largest THEN
            SET second = a[i]
        END IF

        SET i = i + 1
    END WHILE

    IF largest = second THEN
        PRINT "No second largest element"
    ELSE
        PRINT "Second largest =", second
    END IF
END
```

CODE :

```c
#include <stdio.h>

int main() {
    int n, i;
    printf("Enter number of elements: ");
    scanf("%d", &n);

    int a[n];
    printf("Enter %d integers:\n", n);
    for(i = 0; i < n; i++) {
        scanf("%d", &a[i]);
    }

    int positive = 0, negative = 0, odd = 0, even = 0;

    for(i = 0; i < n; i++) {
        if(a[i] > 0)
            positive++;
        else if(a[i] < 0)
            negative++;

        if(a[i] % 2 == 0)
            even++;
        else
            odd++;
    }

    printf("Positive = %d\n", positive);
    printf("Negative = %d\n", negative);
    printf("Odd = %d\n", odd);
    printf("Even = %d\n", even);

    return 0;
}
```

OUTPUT :



Activity 3 : *WAP to read a list of integers and store it in a single dimensional array. Write a C program to find the frequency of a particular number in a list of integers.*

ALGORITHM:

STEP 1: START

STEP 2: **Read** the no. of elements (n).

STEP 3: Read all elements and store them into an array **a** of size **n**

STEP 4: Read the number key whose frequency is to be found.

STEP 5: Initialize count = 0

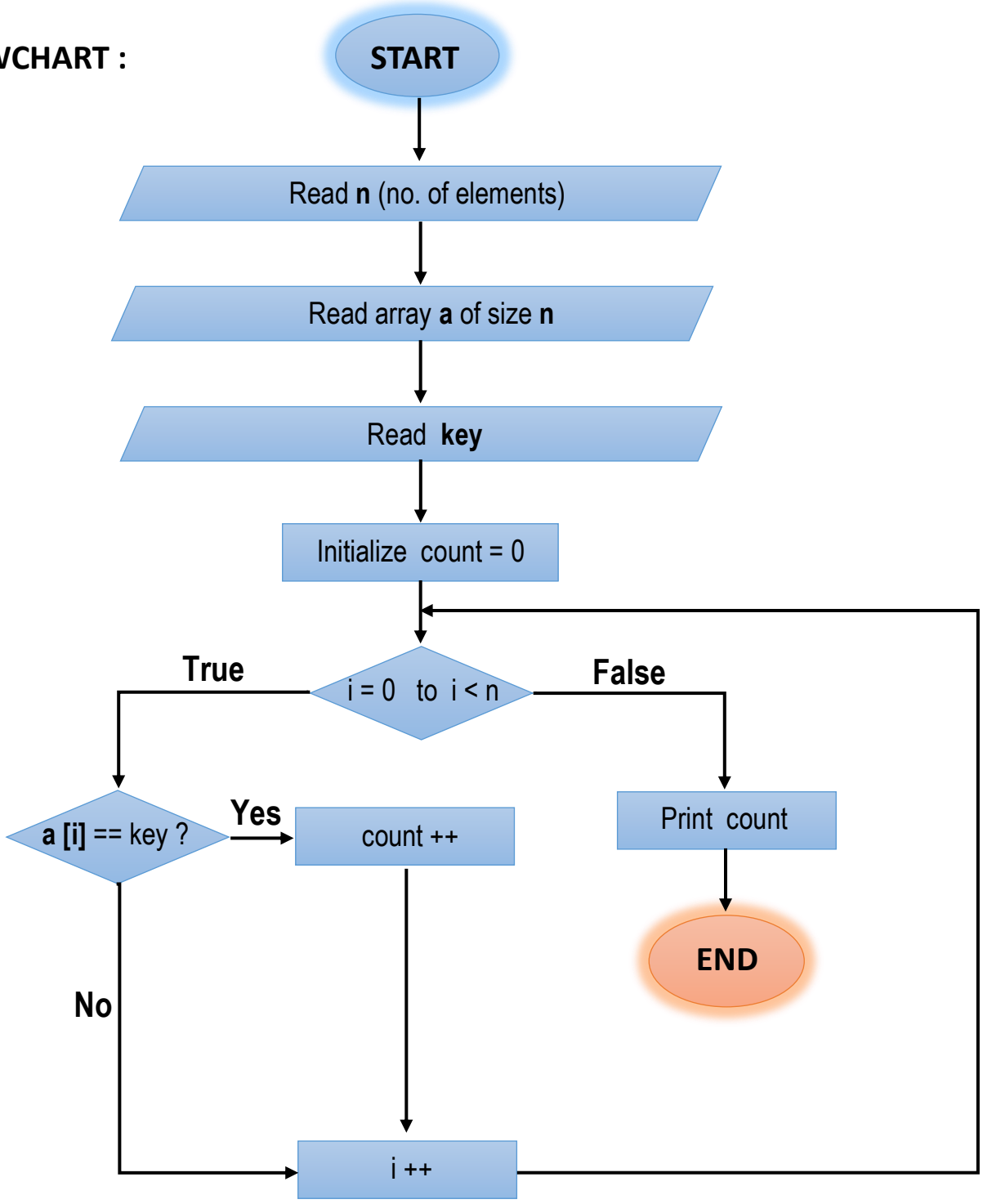
STEP 6: Repeat for i = 0 to i < n

if a [i] == key, increment count by 1

STEP 7: Print count.

STEP 8: END

FLOWCHART :


START
Read n (no. of elements)
Read array a of size n
Read key
Initialize count = 0
i = 0 to i < n
True
False
a [i] == key ?
Yes
count ++
Print count
END
No
i ++

PSEUDOCODE :

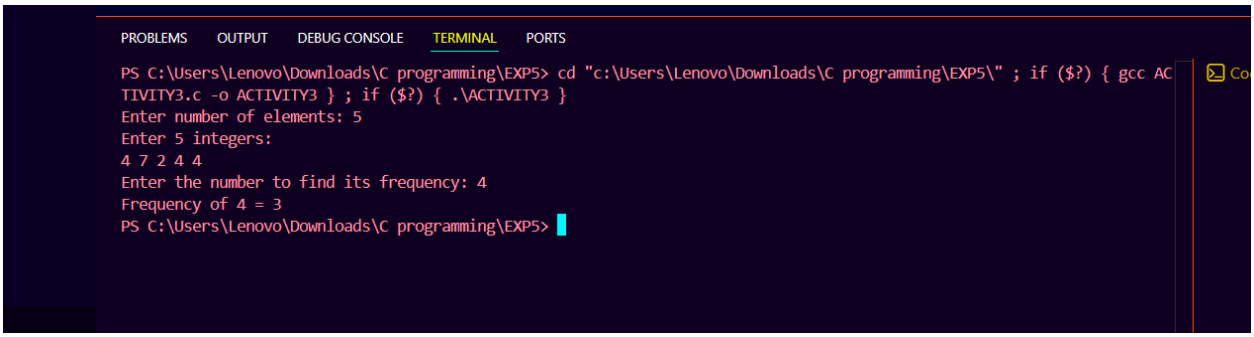
```
START

    INPUT n
    DECLARE array a[n]

    PRINT "Enter n integers:"
    FOR i = 0 TO n-1
        INPUT a[i]
    END FOR

    PRINT "Enter the number to find frequency:"
    INPUT key

    SET count = 0

    FOR i = 0 TO n-1
        IF a[i] == key THEN
            count = count + 1
        END IF
    END FOR

    PRINT "Frequency of", key, "=", count

END
```

CODE :

```c
#include <stdio.h>

int main() {
    int n, i, key, count = 0;

    printf("Enter number of elements: ");
    scanf("%d", &n);

    int a[n];
    printf("Enter %d integers:\n", n);
    for(i = 0; i < n; i++) {
        scanf("%d", &a[i]);
    }
```

```c
    printf("Enter the number to find its frequency: ");
    scanf("%d", &key);

    for(i = 0; i < n; i++) {
        if(a[i] == key) {
            count++;
        }
    }

    printf("Frequency of %d = %d\n", key, count);

    return 0;
}
```

OUTPUT :

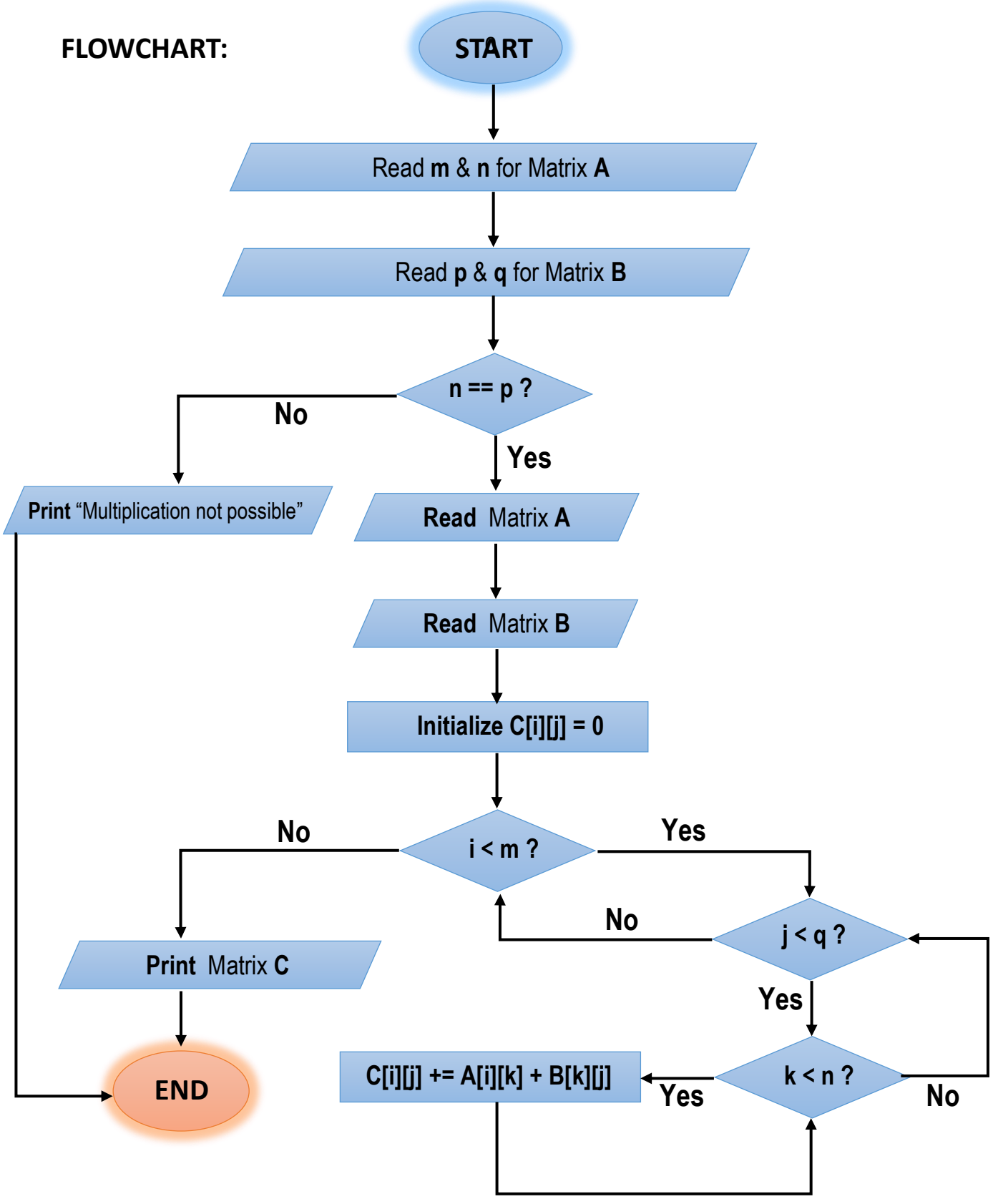


Activity 4 : *WAP that reads two matrices A (m x n) and B (p x q) and computes the product A and B. Read matrix A and matrix B in row major order respectively. Print both the input matrices and resultant matrix with suitable headings and output should be in matrix format only. Program must check the compatibility of orders of the matrices for multiplication. Report appropriate message in case of incompatibility.*

ALGORITHM:

STEP 1: START
STEP 2: **Read** no. of rows and column matrix A – **m** & **n**
STEP 3: Read no. of rows and column matrix B – **p** & **q**
STEP 4: If n != p **print "**Multiplication not possible**" & goto STEP 10**
else goto STEP5
STEP 5: **Read** the elements of matrix **A**
STEP 6: Read the elements of matrix **B**
STEP 7: Initialize all elements of Matrix **C (m × q)** to 0
STEP 8: Repeat for i = 0 to i = m - 1:
for j = 0 to j = q – 1
for k = 0 to k = n – 1
C[i][j] = **C**[i][j] + **A**[i][k] × **B**[k][j]
STEP 9: Print Matrix **C**
STEP 10: END

FLOWCHART:


START
Read m & n for Matrix A
Read p & q for Matrix B
n == p ?
No
Yes
Print "Multiplication not possible"
Read Matrix A
Read Matrix B
Initialize C[i][j] = 0
i < m ?
No
Yes
Print Matrix C
END
j < q ?
No
Yes
k < n ?
No
Yes
C[i][j] += A[i][k] + B[k][j]

PSEUDOCODE :

```
START

    // Read matrix dimensions
    PRINT "Enter rows and columns of Matrix A:"
    INPUT m, n

    PRINT "Enter rows and columns of Matrix B:"
    INPUT p, q

    // Check compatibility
    IF n != p THEN
        PRINT "Matrix multiplication not possible."
        PRINT "Because columns of A (", n, ") != rows of B (", p, ")"
        STOP
    END IF

    // Declare matrices A[m][n], B[p][q], C[m][q]

    // Read Matrix A in row-major order
    PRINT "Enter elements of Matrix A (row-wise):"
    FOR i = 0 TO m-1
        FOR j = 0 TO n-1
            INPUT A[i][j]
        END FOR
    END FOR

    // Read Matrix B in row-major order
    PRINT "Enter elements of Matrix B (row-wise):"
    FOR i = 0 TO p-1
        FOR j = 0 TO q-1
            INPUT B[i][j]
        END FOR
    END FOR

    // Initialize and compute Matrix C = A x B
    FOR i = 0 TO m-1
        FOR j = 0 TO q-1
            SET C[i][j] = 0
            FOR k = 0 TO n-1
                C[i][j] = C[i][j] + A[i][k] * B[k][j]
            END FOR
        END FOR
    END FOR
```

```
    // Print resultant matrix
    PRINT "Resultant Matrix (A x B):"
    FOR i = 0 TO m-1
        FOR j = 0 TO q-1
            PRINT C[i][j], " "   // print values in matrix format
        END FOR
        PRINT new line
    END FOR

END
```

CODE :

```
#include <stdio.h>

int main() {
    int m, n, p, q;

    // Reading dimensions
    printf("Enter rows and columns of Matrix A: ");
    scanf("%d %d", &m, &n);

    printf("Enter rows and columns of Matrix B: ");
    scanf("%d %d", &p, &q);

    // Compatibility check
    if (n != p) {
        printf("\nMatrix multiplication not possible.\n");
        printf("Because columns of A (%d) != rows of B (%d)\n", n, p);
        return 0;
    }

    int A[m][n], B[p][q], C[m][q];

    // Reading Matrix A
    printf("\nEnter elements of Matrix A (row-wise):\n");
    for (int i = 0; i < m; i++)
        for (int j = 0; j < n; j++)
            scanf("%d", &A[i][j]);

    // Reading Matrix B
    printf("\nEnter elements of Matrix B (row-wise):\n");
```

```c
    for (int i = 0; i < p; i++)
        for (int j = 0; j < q; j++)
            scanf("%d", &B[i][j]);

    // Matrix multiplication
    for (int i = 0; i < m; i++) {
        for (int j = 0; j < q; j++) {
            C[i][j] = 0;
            for (int k = 0; k < n; k++) {
                C[i][j] += A[i][k] * B[k][j];
            }
        }
    }

    // Printing Resultant Matrix C
    printf("\nResultant Matrix (A x B):\n");
    for (int i = 0; i < m; i++) {
        for (int j = 0; j < q; j++)
            printf("%d ", C[i][j]);
        printf("\n");
    }

    return 0;
}
```

OUTPUT :