1- Write a program that prompts the user to enter an integer 'num' and then prints the even numbers from 1 to 'num' in ascending order.

اكتب برنامجًا يطلب من المستخدم إدخال عدد صحيح "num" ثم طباعة الأعداد الزوجية من 1 إلى "num" بترتيب تصاعدي.

Input

```
Enter a number: 7
```

Output

```
Even numbers from 1 to 7: 2 4 6
```

Solution

```cpp
// www.gammal.tech

#include <iostream>
using namespace std;

// Function to print even numbers from 1 to n recursively
void printNumbers(int n) {
    if (n > 0) {
        printNumbers(n - 1);
        if (n % 2 == 0)
            cout << n << " ";
    }
}

int main() {
    int num;

    // Input: Get an integer from the user
    cout << "Enter a number: ";
    cin >> num;

    // Output: Display even numbers from 1 to N
    cout << "Even numbers from 1 to " << num << ": ";
    printNumbers(num);
    cout << endl;

    return 0;
}
```

2- Write a program that prompts the user to enter an integer 'num' and then prints the odd numbers from 1 to 'num' in ascending order.

اكتب برنامجًا يطلب من المستخدم إدخال عدد صحيح "num" ثم طباعة الأرقام الفردية من 1 إلى "num" بترتيب تصاعدي.

Input

```
Enter a number: 8
```

Output

```
Odd numbers from 1 to 8: 1 3 5 7
```

Solution

```cpp
// www.gammal.tech

#include <iostream>
using namespace std;

// Function to print odd numbers from 1 to n recursively
void printNumbers(int n) {
    if (n > 0) {
        printNumbers(n - 1);
        if (n % 2 != 0)
            cout << n << " ";
    }
}

int main() {
    int num;

    // Input: Get an integer from the user
    cout << "Enter a number: ";
    cin >> num;

    // Output: Display odd numbers from 1 to N
    cout << "Odd numbers from 1 to " << num << ": ";
    printNumbers(num);
    cout << endl;

    return 0;
}
```

3- Write a program that takes a positive integer 'num' as input from the user. The program should count and display the number of even digits, calculate and display the sum of even digits, and calculate and display the product of even digits in 'num'.

اكتب برنامجًا يأخذ عددًا صحيحًا موجبًا "num" كمدخل من المستخدم. يجب أن يقوم البرنامج بحساب وعرض عدد الأرقام الزوجية، وحساب وعرض مجموع الأرقام الزوجية، وحساب وعرض حاصل ضرب الأرقام الزوجية في "num".

Input

```
Enter a positive integer: 12345
```

Output

```
Number of even digits: 2
Sum of even digits: 6
Product of even digits: 8
```

Solution

```cpp
// www.gammal.tech

#include <iostream>
using namespace std;

// Function to count the number of even digits in a positive integer recursively
int countEvenDigits(int n) {
    return (n == 0) ? 0 : (n % 2 == 0) + countEvenDigits(n / 10);
}

// Function to calculate the sum of even digits in a positive integer recursively
int sumEvenDigits(int n) {
    return (n == 0) ? 0 : ((n % 2 == 0) ? n % 10 : 0) + sumEvenDigits(n / 10);
}

// Function to calculate the product of even digits in a positive integer recursively
int productEvenDigits(int n) {
    return (n == 0) ? 1 : ((n % 2 == 0) ? n % 10 : 1) * productEvenDigits(n / 10);
}

int main() {
    int num;

    // Input: Get a positive integer from the user
    cout << "Enter a positive integer: ";
    cin >> num;

    // Output: Display the number of even digits
    cout << "Number of even digits: " << countEvenDigits(num) << endl;

    // Output: Display the sum of even digits
    cout << "Sum of even digits: " << sumEvenDigits(num) << endl;

    // Output: Display the product of even digits
    cout << "Product of even digits: " << productEvenDigits(num) << endl;

    return 0;
}
```

4- Write a program to calculate the factorial of a given number using recursion.

اكتب برنامجًا لحساب مضروب عدد معين using recursion.

Input

```
Enter a number: 5
```

Output

```
Factorial of 5 is: 120
```

Solution

```cpp
// www.gammal.tech

#include <iostream>
using namespace std;

int factorial(int n) {
    if (n == 0 || n == 1)
        return 1;
    else
        return n * factorial(n - 1);
}

int main() {
    int num;
    cout << "Enter a number: ";
    cin >> num;
    cout << "Factorial of " << num << " is: " << factorial(num) << endl;
    return 0;
}
```

5- Write a program to generate the Fibonacci series up to a given number using recursion.

اكتب برنامجًا لتوليد متسلسلة فيبوناتشي حتى رقم معين باستخدام التكرار.

Input

```
Enter the number of terms: 7
```

Output

```
Fibonacci Series: 0 1 1 2 3 5 8
```

Solution

```cpp
// www.gammal.tech

#include <iostream>
using namespace std;

int fibonacci(int n) {
    if (n <= 1)
        return n;
    else
        return fibonacci(n - 1) + fibonacci(n - 2);
}

int main() {
    int num;
    cout << "Enter the number of terms: ";
    cin >> num;

    cout << "Fibonacci Series: ";
    for (int i = 0; i < num; i++) {
        cout << fibonacci(i) << " ";
    }

    cout << endl;
    return 0;
}
```

6- Write a program to check if a given positive integer is a palindrome using recursion.

اكتب برنامجًا للتحقق مما إذا كان هو palindrome ب using recursion

Input

```
Enter a positive integer: 1221
```

Output

```
1221 is a palindrome number.
```

Solution

```cpp
// www.gammal.tech

#include <iostream>
using namespace std;

bool isPalindromeNumber(int n, int &temp) {
    if (n == 0)
        return true;

    if (isPalindromeNumber(n / 10, temp) && (n % 10 == temp % 10)) {
        temp /= 10;
        return true;
    }

    return false;
}

int main() {
    int num;
    cout << "Enter a positive integer: ";
    cin >> num;

    int temp = num;
    if (isPalindromeNumber(num, temp))
        cout << num << " is a palindrome number." << endl;
    else
        cout << num << " is not a palindrome number." << endl;

    return 0;
}
```

7- Write a program to print the first N terms of a sequence using recursion.

اكتب برنامجًا لطباعة

N terms of a sequence using recursion.

Input

```
Enter the number of terms: 5
```

Output

```
First 5 terms of the sequence: 1 3 5 7 9
```

Solution

```cpp
// www.gammal.tech

#include <iostream>
using namespace std;

void printSequence(int n, int term = 1) {
    if (n > 0) {
        cout << term << " ";
        printSequence(n - 1, term + 2);
    }
}

int main() {
    int num;
    cout << "Enter the number of terms: ";
    cin >> num;

    cout << "First " << num << " terms of the sequence: ";
    printSequence(num);
    cout << endl;

    return 0;
}
```

8- Write a program that dynamically allocates memory for a floating-point array of size 2 using malloc and initializes it. Then, use realloc to resize the array to size 5 and assign new values.

اكتب برنامجًا يخصص الذاكرة ديناميكيًا array فاصلة floating بحجم 2 باستخدام malloc وتهيئتها. ثم استخدم realloc لتغيير حجم array إلى الحجم 5 وتعيين قيم جديدة.

Output

```
Initial Array: 2.50 3.50
Final Array: 2.50 3.50 4.50 5.50 6.50
```

Solution

```c
// www.gammal.tech

#include <stdio.h>
#include <stdlib.h>

int main() {
    // Allocate memory for a floating-point array of size 2
    double *arr = (double *)malloc(2 * sizeof(double));

    // Initialize the array with values 2.5 and 3.5
    arr[0] = 2.5;
    arr[1] = 3.5;

    // Print the initial array elements
    printf("Initial Array: %.2lf %.2lf\n", arr[0], arr[1]);

    // Resize the array to size 5 using realloc
    arr = (double *)realloc(arr, 5 * sizeof(double));

    // Assign new values to the additional elements
    arr[2] = 4.5;
    arr[3] = 5.5;
    arr[4] = 6.5;

    // Print the final array elements
    printf("Final Array: %.2lf %.2lf %.2lf %.2lf %.2lf\n", arr[0], arr[1], arr[2], arr[3], arr[4]);

    // Free the allocated memory
    free(arr);

    return 0;
}
```

9- Write a program that dynamically allocates memory for an array of integers using malloc, initializes it with values 1 to 3, and then uses realloc to increase the size of the array to 5, assigning new values 4 and 5.

اكتب برنامجًا يخصص الذاكرة ديناميكيًا array من الأعداد الصحيحة باستخدام malloc، وتهيئتها بالقيم من 1 إلى 3، ثم يستخدم realloc لزيادة حجم array إلى 5، وتعيين قيمتين جديدتين 4 و5.

Output

```
Initial Array: 1 2 3
Final Array: 1 2 3 4 5
```

Solution

```c
// www.gammal.tech

#include <stdio.h>
#include <stdlib.h>

int main() {
    // Allocate memory for an integer array of size 3
    int *arr = (int *)malloc(3 * sizeof(int));

    // Initialize the array with values 1, 2, and 3
    for (int i = 0; i < 3; i++)
        arr[i] = i + 1;

    // Print the initial array elements
    printf("Initial Array: %d %d %d\n", arr[0], arr[1], arr[2]);

    // Resize the array to size 5 using realloc
    arr = (int *)realloc(arr, 5 * sizeof(int));

    // Assign new values to the additional elements
    arr[3] = 4;
    arr[4] = 5;

    // Print the final array elements
    printf("Final Array: %d %d %d %d %d\n", arr[0], arr[1], arr[2], arr[3], arr[4]);

    // Free the allocated memory
    free(arr);

    return 0;
}
```

10- Write a program that dynamically allocates memory for an integer array of user-defined size, initializes it, calculates the sum, and then displays the result.

اكتب برنامجًا يخصص الذاكرة ديناميكيًا ل array أعداد صحيحة ذات حجم محدد من قبل المستخدم، ثم يقوم بتهيئتها، ثم يحسب المجموع، ثم يعرض النتيجة.

Input

```
Enter the size of the array: 3
Enter 3 elements:
1 2 3
```

Output

```
Sum of array elements: 6
```

Solution

```c
// www.gammal.tech

#include <stdio.h>
#include <stdlib.h>

int main() {
    int *arr, n, sum = 0;

    // Get array size from user
    printf("Enter the size of the array: ");
    scanf("%d", &n);

    // Dynamically allocate memory
    arr = (int*)malloc(n * sizeof(int));

    // Initialize and calculate sum
    printf("Enter %d elements:\n", n);
    for (int i = 0; i < n; i++) {
        scanf("%d", &arr[i]);
        sum += arr[i];
    }

    // Display the sum
    printf("Sum of array elements: %d\n", sum);


    return 0;
}
```
