# PROGRAMMING FUNDAMENTALS

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Write a program in c++ that inputs a decimal number and converts it into binary using function.

```
#include <iostream>

using namespace std;



// Function to convert decimal to binary

void decimalToBinary(int decimal) {

   int binary[32]; // Array to store binary digits

   int i = 0;



 while (decimal > 0) {

      binary[i] = decimal % 2;

      decimal = decimal / 2;

      i++;

   }



   // Printing binary in reverse order

   cout << "Binary representation: ";

   for (int j = i - 1; j >= 0; j--) {

      cout << binary[j];

   }

}



int main() {

 int decimal;



 cout << "Enter a decimal number: ";

 cin >> decimal;
```

```
 decimalToBinary(decimal);


   return 0;
}
```

Write a program in c++ that converts bunary into decimaal using function

```
#include <iostream>

#include <cmath>
using namespace std;


int binaryToDecimal(long long binaryNumber) {
 int decimalNumber = 0, i = 0, remainder;
 while (binaryNumber != 0) {
       remainder = binaryNumber % 10;
       binaryNumber /= 10;
       decimalNumber += remainder * pow(2, i);
       ++i;
   }
 return decimalNumber;
}


int main() {
 long long binaryNumber;


 cout << "Enter a binary number: ";
 cin >> binaryNumber;


 int decimalNumber = binaryToDecimal(binaryNumber);
```

```
 cout << "Decimal equivalent: " << decimalNumber << endl;


   return 0;
}
```

Write a program in c++ that counts the number of zeros,odd and even numbers using function

```
#include <iostream>
using namespace std;

void countNumbers(int arr[], int size, int& zeros, int& evens, int& odds) {
   for (int i = 0; i < size; i++) {
      if (arr[i] == 0) {
         zeros++;
      } else if (arr[i] % 2 == 0) {
         evens++;
      } else {
         odds++;
      }
   }
}

int main() {
   int arr[] = {0, 5, 12, 0, 3, 8, 0, 9};
   int size = sizeof(arr) / sizeof(arr[0]);
   int zeroCount = 0, evenCount = 0, oddCount = 0;

 countNumbers(arr, size, zeroCount, evenCount, oddCount);
```

```
 cout << "Number of zeros: " << zeroCount << endl;
 cout << "Number of even numbers: " << evenCount << endl;
 cout << "Number of odd numbers: " << oddCount << endl;


   return 0;
}
```

Write a program in c++ that enter number from user and displays Fabonocci number from 1 to given numbers using function

```
#include <iostream>



// Function to calculate the Fibonacci series
void fibonacciSeries(int n) {
 int a = 0, b = 1, nextTerm;
std::cout << "Fibonacci Series up to " << n << " terms:" << std::endl;


   for (int i = 1; i <= n; ++i) {
      std::cout << a << " ";


      nextTerm = a + b;
      a = b;
      b = nextTerm;
   }
}


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

```
 fibonacciSeries(num);


   return 0;

}
```

Write a program in c++ that accepts two numbers and tells whether or not the first is multiple of second using function

```
#include <iostream>



bool isMultiple(int first, int second) {

   if (second == 0) {

      // Avoid division by zero

      return false;

   }


 return (first % second) == 0;

}


int main() {

 int num1, num2;

 std::cout << "Enter the first number: ";

std::cin >> num1;

 std::cout << "Enter the second number: ";

std::cin >> num2;


 if (isMultiple(num1, num2)) {

      std::cout << num1 << " is a multiple of " << num2 << std::endl;

   } else {
```

```
        std::cout << num1 << " is not a multiple of " << num2 << std::endl;
    }


    return 0;
}
```

Write a program in c++ that accepts two numbers and passes them to function the function displays first number raised to the power of second number using function

```
#include <iostream>
#include <cmath>


void displayPower(double base, double exponent) {
 double result = pow(base, exponent);
 std::cout << base << " raised to the power of " << exponent << " is: " << result << std::endl;
}


int main() {
 double num1, num2;

 std::cout << "Enter the first number: ";
 std::cin >> num1;

 std::cout << "Enter the second number: ";
 std::cin >> num2;

 displayPower(num1, num2);

    return 0;
}
```

Write a program in c++ that enters a number and reverse it write a function to reverse a number using function

```
#include <iostream>



// Function to reverse a number

int reverseNumber(int num) {

int reversedNum = 0;



   while (num > 0) {

      int digit = num % 10;

      reversedNum = (reversedNum * 10) + digit;

      num /= 10;

   }



   return reversedNum;

}



int main() {

 int number;

std::cout << "Enter a number: ";

 std::cin >> number;



   int reversedNumber = reverseNumber(number);



   std::cout << "Reversed number: " << reversedNumber << std::endl;



   return 0;

}
```

Write a program in c++ that enters a number and passess to a function the function displays whether the number is prime or not using function

```
#include <iostream>


bool isPrime(int num) {
if (num <= 1) {
      return false;
   }
 for (int i = 2; i * i <= num; ++i) {
      if (num % i == 0) {
         return false;
      }
   }
   r e t u r n   t r u e ;
}


int main() {
int number;
std::cout << "Enter a number: ";
std::cin >> number;


 if (isPrime(number)) {
      std::cout << number << " is a prime number." << std::endl;
   } else {
      std::cout << number << " is not a prime number." << std::endl;
   }
```

```
    return 0;
}
```

Write a program in c++ thatinput five numbers and passess to a function at one time the function return true if integer is even and false otherwise using function

```
#include <iostream>



bool isEven(int num) {
 if (num % 2 == 0) {
       return true; // number is even
   }
   e l s e    {
       return false; // number is odd
   }
}


int main() {
 int numbers[5];

 // Input five numbers
 std::cout << "Enter five numbers:\n";
   for (int i = 0; i < 5; i++) {
       std::cin >> numbers[i];
   }

 // Check if each number is even or odd
 std::cout << "Even/Odd results:\n";
   for (int i = 0; i < 5; i++) {
```

```
    if (isEven(numbers[i])) {
        std::cout << numbers[i] << " is even.\n";
    }
    e l s e   {
        std::cout << numbers[i] << " is odd.\n";
    }
  }

  return 0;
}
```

Write a program in c++ tha declares a functioon accepting two parameters the first parameter is floating point number and second parameter is integer . The program should multiply floating point number by itself the number of times as indicated by integer using function. the function should return the results to main function the main function ask the user of floating number and integer . it should then call function and store results in variable .finally main function display the results .

```
#include <iostream>

// Function to multiply a floating-point number by itself 'n' times
float multiply(float num, int n) {
float result = num;
  for (int i = 1; i < n; i++) {
    result *= num;
  }
  return result;
}

int main() {
 float num;
```

```
    int n;

    // Get input from the user
  std::cout << "Enter a floating-point number: ";
  std::cin >> num;
    std::cout << "Enter an integer: ";
    std::cin >> n;

    // Call the function and store the result
  float result = multiply(num, n);

    // Display the result
    std::cout << "The result is: " << result << std::endl;

    return 0;
}
```

Write a program in c++ that acceepts salary and return tax according to rules :

No tax for Rs 1000

5% tax for second Rs 1000

4% tax for third Rs 1000

3% tax for remain untaxed salary

```
#include <iostream>
using namespace std;

double calculateTax(double salary) {
    double tax = 0.0;

    // No tax for the first Rs 1000
```

```
    if (salary > 1000) {
        tax += 0.0;
        salary -= 1000;
    } else {
        return tax;
    }

    // 5% tax for the second Rs 1000
    if (salary > 1000) {
        tax += 0.05 * 1000;
        salary -= 1000;
    } else {
        return tax + (0.05 * salary);
    }

    // 4% tax for the third Rs 1000
    if (salary > 1000) {
        tax += 0.04 * 1000;
        salary -= 1000;
    } else {
        return tax + (0.04 * salary);
    }

    // 3% tax for the remaining untaxed salary
    tax += 0.03 * salary;

    return tax;
}
```

```
int main() {
    double salary;
    cout << "Enter the salary: ";
    cin >> salary;

    double tax = calculateTax(salary);
    cout << "Tax to be paid: " << tax << endl;

    return 0;
}
```

Write a program in c++ that calculates greatest common divisor of two numbers using recursive function

```
#include <iostream>

// Recursive function to calculate the GCD
int gcd(int a, int b)
{
    if (b == 0)
        return a;
    else
        return gcd(b, a % b);
}

int main()
{
    int num1, num2;
 std::cout << "Enter two numbers: ";
```

```
 std::cin >> num1 >> num2;


 int result = gcd(num1, num2);
 std::cout << "GCD: " << result << std::endl;


    return 0;
}
```

Write a program in c++ that calculates fabinocci series of a number using recursive function

```
#include <iostream>
using namespace std;

// Recursive function to calculate Fibonacci series
int fibonacci(int n)
{
    if (n <= 1)
        return n;

    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) << " ";
   }

   return 0;
}
```

Write a program in c++ that calculates and displays the average of player . The program inputs runs and balls delivered to player in main function the average is calculated as :

avg = (total runs given * 60 ) / (total number of balls delivered )

```
#include <iostream>

double calculateAverage(int runs, int ballsDelivered) {
 double average = (runs * 60.0) / ballsDelivered;
   return average;
}

int main() {
   int runs;
 int ballsDelivered;

   std::cout << "Enter the total runs given by the player: ";
   std::cin >> runs;

 std::cout << "Enter the total number of balls delivered: ";
 std::cin >> ballsDelivered;

 double average = calculateAverage(runs, ballsDelivered);
```

```
    std::cout << "The average of the player is: " << average << std::endl;


    return 0;
}
```

Write a program in c++ that inputs an integer passes it to function the function displays the number of digits in integer

```
#include <iostream>
using namespace std;



int countDigits(int num) {
    int count = 0;
 while (num != 0) {
        num /= 10;
        count++;
    }
    r e t u r n    c o u n t ;
}


int main() {
 int number;
    cout << "Enter an integer: ";
 cin >> number;


 int digits = countDigits(number);
 cout << "Number of digits: " << digits << endl;


    return 0;
```

}

Write a program in c++ that inputs five integers in one dimensional array and passees array to function the function finds maximmum value in array and returns to main function where it displayed

```
#include <iostream>



int findMaximum(int arr[], int size) {
 int max = arr[0];
   for (int i = 1; i < size; i++) {
       if (arr[i] > max) {
          max = arr[i];
       }
   }
 return max;
}

int main() {
   int arr[5];

   std::cout << "Enter five integers: ";

   for (int i = 0; i < 5; i++) {
      std::cin >> arr[i];
   }

 int max = findMaximum(arr, 5);

 std::cout << "The maximum value is: " << max << std::endl;
```

```
    return 0;
}
```

Write a program in c++ that inputs two numbers one should be passed by value and other passed by reference and check original variables whether their values have been changed or not .

```
#include <iostream>

// Function to modify the value passed by reference
void modifyByReference(int& num) {
    num *= 2;
}

// Function to modify the value passed by value
void modifyByValue(int num) {
    num *= 2;
}

int main() {
    int value1, value2;

    // Input the first value
    std::cout << "Enter the first value: ";
    std::cin >> value1;

    // Input the second value
    std::cout << "Enter the second value: ";
    std::cin >> value2;
```

```
    // Print the original values
    std::cout << "Original values:" << std::endl;
    std::cout << "Value 1: " << value1 << std::endl;
    std::cout << "Value 2: " << value2 << std::endl;

    // Modify value1 by reference
    modifyByReference(value1);

    // Modify value2 by value
    modifyByValue(value2);

    // Print the modified values
    std::cout << "Modified values:" << std::endl;
    std::cout << "Value 1: " << value1 << std::endl;
    std::cout << "Value 2: " << value2 << std::endl;

    return 0;
}
```

Write a program in c++ that inputs number passses it to function the function displays prime factors of this number

```
#include <iostream>
#include <vector>

// Function to display prime factors of a number
void displayPrimeFactors(int number) {
    // Vector to store the prime factors
    std::vector<int> primeFactors;
```

```
    // Find all the prime factors
    for (int factor = 2; factor <= number; ++factor) {
        while (number % factor == 0) {
            primeFactors.push_back(factor);
            number /= factor;
        }
    }

    // Display the prime factors
    std::cout << "Prime factors: ";
    for (int factor : primeFactors) {
        std::cout << factor << " ";
    }
    std::cout << std::endl;
}

int main() {
    int number;

    // Input the number
    std::cout << "Enter a positive integer: ";
    std::cin >> number;

    // Display the prime factors
    displayPrimeFactors(number);

    return 0;
```

}

Write a program in c++to use two functions large () and sum ( ) the large gets two intteger arguments by reference and sets larger number to its square the sum function gets integer arguments by value and returns the sum of individual digits of number . the main function inputs two integers from user and prints sum of individual digits of number and square of larger number

```
#include <iostream>


void large(int& num1, int& num2) {
    if (num1 > num2)
        num1 = num1 * num1;
    else
        num2 = num2 * num2;
}


int sum(int number) {
    int digitSum = 0;


    while (number != 0) {
        digitSum += number % 10;
        number /= 10;
    }


    return digitSum;
}


int main() {
    int num1, num2;


    std::cout << "Enter two integers: ";
```

```
    std::cin >> num1 >> num2;

    large(num1, num2);

    std::cout << "Square of the larger number: ";
    if (num1 > num2)
        std::cout << num1 << std::endl;
    else
        std::cout << num2 << std::endl;

    int sumOfDigits1 = sum(num1);
    int sumOfDigits2 = sum(num2);

    std::cout << "Sum of individual digits of the first number: " << sumOfDigits1 << std::endl;
    std::cout << "Sum of individual digits of the second number: " << sumOfDigits2 << std::endl;

    return 0;
}
```

Write a program in c++ that inputs five integers in one dimensional array and passees array to function the function finds minimum value in array and returns to main function where it displayed

```
#include <iostream>

int findMinimum(int arr[], int size) {
    int min = arr[0]; // Assume the first element is the minimum

    for (int i = 1; i < size; i++) {
        if (arr[i] < min) {
            min = arr[i]; // Update minimum if a smaller element is found
```

```
        }
    }

    return min;
}

int main() {
    int arr[5];

    // Input five integers
    std::cout << "Enter five integers: ";
    for (int i = 0; i < 5; i++) {
        std::cin >> arr[i];
    }

    // Find the minimum value
    int min = findMinimum(arr, 5);

    // Display the minimum value
    std::cout << "Minimum value: " << min << std::endl;

    return 0;
}
```

Write a program in c++ that inputs name and population of two cities in structure variable and passes them to function the fuction displays record of city that has less population

```
#include <iostream>
#include <string>
using namespace std;
```

```
struct City {
    string name;
    int population;
};

void displayCityWithLowerPopulation(const City& city1, const City& city2) {
    if (city1.population < city2.population) {
        cout << "City: " << city1.name << endl;
        cout << "Population: " << city1.population << endl;
    } else {
        cout << "City: " << city2.name << endl;
        cout << "Population: " << city2.population << endl;
    }
}

int main() {
    City city1, city2;

    cout << "Enter details of City 1:" << endl;
    cout << "Name: ";
    getline(cin, city1.name);
    cout << "Population: ";
    cin >> city1.population;

    cin.ignore(); // Ignore the newline character

    cout << "Enter details of City 2:" << endl;
```

```
    cout << "Name: ";
    getline(cin, city2.name);
    cout << "Population: ";
    cin >> city2.population;

 displayCityWithLowerPopulation(city1, city2);

    return 0;
}
```

Write a program in c++ that inputs float array of 10 elements the program uses reverse function to reverse this array the main fuction displays original and reverse array

```
#include <iostream>

// Function to reverse the array
void reverseArray(float arr[], int size) {
    int start = 0;
    int end = size - 1;

    while (start < end) {
        // Swap the elements at start and end indices
        float temp = arr[start];
        arr[start] = arr[end];
        arr[end] = temp;

        start++;
        end--;
    }
}
```

```
int main() {
    const int SIZE = 10;
    float arr[SIZE];

    // Input the array elements
    std::cout << "Enter " << SIZE << " float numbers: ";
    for (int i = 0; i < SIZE; i++) {
        std::cin >> arr[i];
    }

    // Display original array
    std::cout << "\nOriginal Array: ";
    for (int i = 0; i < SIZE; i++) {
        std::cout << arr[i] << " ";
    }

    // Reverse the array
    reverseArray(arr, SIZE);

    // Display reversed array
    std::cout << "\nReversed Array: ";
    for (int i = 0; i < SIZE; i++) {
        std::cout << arr[i] << " ";
    }

    std::cout << std::endl;
```

```
    return 0;
}
```

Write a program in c++ that accepts an array of integers and its size as parameters in function . it divides all array elements by 5 that are divisible by 5 and multiplies array elemnts by 2

```
#include <iostream>

void modifyArray(int arr[], int size) {
    for (int i = 0; i < size; i++) {
        if (arr[i] % 5 == 0) {
            arr[i] /= 5;
        } else {
            arr[i] *= 2;
        }
    }
}

void printArray(int arr[], int size) {
    for (int i = 0; i < size; i++) {
        std::cout << arr[i] << " ";
    }
    std::cout << std::endl;
}

int main() {
    int size;
    std::cout << "Enter the size of the array: ";
    std::cin >> size;
```

```
    int arr[size];
    std::cout << "Enter the elements of the array: ";
    for (int i = 0; i < size; i++) {
        std::cin >> arr[i];
    }

    std::cout << "Original array: ";
    printArray(arr, size);

    modifyArray(arr, size);

    std::cout << "Modified array: ";
    printArray(arr, size);

    return 0;
}
```

Write a program in c++ that inputs five integers in two arrays each it declares a function that accepts four parameters first parameter is first array , second parameter is second array third parameter is third array fourth parameter is length of arrays the function adds corresponding values of first two arrays and store results in corresponding element of tird array the main function displays the values of all arrays .

```
#include <iostream>

void addArrays(int arr1[], int arr2[], int arr3[], int length) {
    for (int i = 0; i < length; i++) {
        arr3[i] = arr1[i] + arr2[i];
    }
}
```

```
int main() {
    int arr1[5];
    int arr2[5];
    int arr3[5];

    // Input values for arr1
    std::cout << "Enter five integers for the first array:\n";
    for (int i = 0; i < 5; i++) {
        std::cin >> arr1[i];
    }

    // Input values for arr2
    std::cout << "Enter five integers for the second array:\n";
    for (int i = 0; i < 5; i++) {
        std::cin >> arr2[i];
    }

    // Add arrays
    addArrays(arr1, arr2, arr3, 5);

    // Display values of all arrays
    std::cout << "Values of the first array:\n";
    for (int i = 0; i < 5; i++) {
        std::cout << arr1[i] << " ";
    }
    std::cout << std::endl;
```

```
    std::cout << "Values of the second array:\n";
    for (int i = 0; i < 5; i++) {
        std::cout << arr2[i] << " ";
    }
    std::cout << std::endl;

    std::cout << "Values of the third array (result of addition):\n";
    for (int i = 0; i < 5; i++) {
        std::cout << arr3[i] << " ";
    }
    std::cout << std::endl;

    return 0;
```

} Write a program in c++ that inputs values in 2d array of 5 columns and 5 rows it displays these values using display ( ) function ait passes array to a function times 2 ( ) that doubles the values stored in all elements of array the program then again displays the changed values of array using display function

```
#include <iostream>

const int ROWS = 5;
const int COLS = 5;

void display(int arr[][COLS]) {
 for (int i = 0; i < ROWS; i++) {
        for (int j = 0; j < COLS; j++) {
            std::cout << arr[i][j] << " ";
        }
        std::cout << std::endl;
    }
```

```
}

void times2(int arr[][COLS]) {
 for (int i = 0; i < ROWS; i++) {
        for (int j = 0; j < COLS; j++) {
            arr[i][j] *= 2;
        }
    }
}

int main() {
 int arr[ROWS][COLS];

    std::cout << "Enter values for the array:" << std::endl;
 for (int i = 0; i < ROWS; i++) {
        for (int j = 0; j < COLS; j++) {
            std::cin >> arr[i][j];
        }
    }

    std::cout << "Original array:" << std::endl;
    display(arr);

    times2(arr);

    std::cout << "Updated array:" << std::endl;
    display(arr);
```

```
    return 0;

}
```