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Date of Performance:19/12/24

Problem 1

1. **Aim: Sum of Natural Numbers up to N**

   Problem Statement: Calculate the sum of all natural numbers from 1 to n, where n is a positive integer. Use the formula: Sum=n×(n+1)/2 .

   Take n as input and output the sum of natural numbers from 1 to n .

   Task: Given an integer n, print the sum of all natural numbers from 1 to n.

   Code:

```
#include<iostream>
using namespace std;
int main()
{
   int n,sum=0;
   cout<<"enter the value of n = "<<endl;
   cin>>n;
   sum = n*(n+1)/2;
   cout<<"The sum is = "<<sum;
   return 0;
}
```

   Output:

```
enter the value of n =
5
The sum is = 15
```

Problem 2

1. **Aim: Print Multiplication Table of a Number**

Problem Statement: Print the multiplication table of a given number n. A multiplication table for a number n is a list of products of n with integers from 1 to 10. For example, the multiplication table for 3 is:
3×1=3,3×2=6,…,3×10=30.

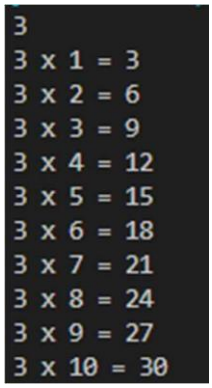
Task: Given an integer n, print the multiplication table of n from 1×n to 10×n.

Code:

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

int main()
{
   int n;
   cin>>n;
   for (int i = 1; i <= 10; i++)
   {
     cout<<n<<" x "<<i<<" = "<<n*i<<endl;
   }
   return 0;
```

2. **Output:**



Problem 3

1. **Aim: Count Digits in a Number**

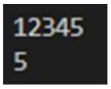
2. **Problem Statement:** Count the total number of digits in a given number n. The number can be a positive integer. For example, for the number 12345, the count of digits is 5. For a number like 900000, the count of digits is 6.
   Given an integer n, your task is to determine how many digits are present in n. This task will help you practice working with loops, number manipulation, and conditional logic.
3. **Task:** Given an integer n, print the multiplication table of n from 1×n to 10×n.
4. **Code:**

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

int main()
{
   int n, count = 0 ;
   cin>> n;
   if (n<0)
```

```
    {
       n = 0-n;
    }
    while(n>0)
    {
       n=n/10;
       count++;
    }
    cout<<count;
    return 0;
}
```

5. **Output:**



Problem 4

1. **Aim: Check if a Number is Prime**

2. **Problem Statement:** Check if a given number n is a prime number. A prime number is a natural number greater than 1 that has no positive divisors other than 1 and itself.
   To determine if a number is prime, iterate from 2 to √n and check if n is divisible by any number in this range. If it is divisible, it is not a prime number; otherwise, it is a prime

3. **Task:** Given an integer n, print "Prime" if the number is prime, or "Not Prime" if it is not

4. Code:

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

bool isPrime(int number) {
    if (number <= 1) {
        return false;
    }
    for (int i = 2; i * i <= number; i++) {
        if (number % i == 0) {
            return false;
        }
    }
    return true;
}
int main() {
    int num;
    cout << "Enter a number: ";
    cin >> num;

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

    return 0;
}
```

5. }Output:

```
Enter a number: 7
7 is a prime number.
```

Problem 5

1. **Aim: Print Odd Numbers up to N**

2. **Problem Statement:** Print all odd numbers between 1 and n, inclusive. Odd numbers are integers that are not divisible by 2. These numbers should be printed in ascending order, separated by spaces.
   This problem is a simple introduction to loops and conditional checks. The goal is to use a loop to iterate over the numbers and check if they are odd using the condition $i\%2 \neq 0$.

3. **Task:** Given an integer n, print all odd numbers from 1 to n, inclusive.
4. **Code:**

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

int main()
{
   int n;
   cout<<"INPUT NO. : ";
   cin>>n;
   for(int i = 1; i<=n; i =i+2)
   {
      cout<<i<<"\n";
   }
   return 0;
}
```

5. **Output:**

```
INPUT NO. : 7
1
3
5
7
```

Problem 6

1. **Aim: Sum of Odd Numbers up to N**
2. **Problem Statement:** Calculate the sum of all odd numbers from 1 to n. An odd number is an integer that is not divisible by 2.The sum of odd numbers, iterate through all the numbers from 1 to n, check if each number is odd, and accumulate the sum.
3. **Task:** Given an integer n, print the sum of all odd numbers from 1 to n.
4. **Code:**

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

int main()
{
   int n, SUM;
   cout<<"INPUT NO. : ";
   cin>>n;
   for(int i = 1; i<=n; i =i+2)
   {
      SUM += i;
   }
   cout<<SUM;
   return 0;
}
```

5. **Output:**

```
INPUT NO. : 5
9
```

Problem 7

1. **Aim: Reverse a Number**
2. **Problem Statement:** Reverse the digits of a given number n. For example, if the input number is 12345, the output should be 54321. The task involves using loops and modulus operators to extract the digits and construct the reversed number
3. **Task:** Given an integer n, print the number with its digits in reverse order.
4. **Code:**

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

int main() {
    int num, rev_num = 0;
    cout << "Enter a number: ";
    cin >> num;
    while (num != 0) {
        rev_num = rev_num * 10 + num % 10;
        num /= 10;
    }
    cout << "Reversed Number: " << rev_num << endl;
    return 0;
}
```

5. **Output:**

```
Enter a number: 12345
Reversed Number: 54321
```

Problem 8

1. **Aim: Find the Largest Digit in a Number**
2. **Problem Statement:** Find the largest digit in a given number n. For example, for the number 2734, the largest digit is 7. You need to extract each digit from the number and determine the largest one. The task will involve using loops and modulus operations to isolate the digits.
3. **Task:** Given an integer n, find and print the largest digit in n.
4. **Code:**

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

int main() {
    long long number;
    cout << "Enter a number: ";
    cin >> number;
    std::string numStr = std::to_string(number);
    char largestDigit = '0';
    for (char digit : numStr) {
        if (digit > largestDigit) {
            largestDigit = digit;
        }
    }
     std::cout << "The largest digit in the number is: " << largestDigit << std::endl;
    return 0;
}
```

5. **Output:**

```
Enter a number: 2734
The largest digit in the number is: 7
```

Problem 9

1. **Aim: Function Overloading with Hierarchical Structure.**
2. **Problem Statement:** Write a program that demonstrates function overloading to calculate the salary of employees at different levels in a company hierarchy. Implement overloaded functions to compute salary for:
   Intern (basic stipend).
   Regular employee (base salary + bonuses).
   Manager (base salary + bonuses + performance incentives).

3. **Code:**

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

void sum(int stipend)
{
   cout<<"Intern Salary: "<<stipend<<endl;
}
void sum(int basesalary , int bonuses )
{
   cout<<"Employee Salary: "<<basesalary+bonuses<<endl;
}
void sum(int basesalary , int bonuses , int incentives )
{
   cout<<"Manager Salary: "<<basesalary+bonuses+incentives;
}
int main()
{
   sum(10000);
   sum(5000, 2000);
   sum(8000, 3000, 2000);
   return 0;
```

```
}
```

4. **Output:**

```
Intern Salary: 10000
Employee Salary: 7000
Manager Salary: 13000
```

Problem 10

1. **Aim: Function Overloading for Calculating Area.**
2. **Problem Statement:** Write a program to calculate the area of different shapes using function overloading. Implement overloaded functions to compute the area of a circle, a rectangle, and a triangle.
3. **Code:**

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

double calculateArea(double radius) {
    const double PI = 3.14159;
    return PI * radius * radius;
}
double calculateArea(double length, double breadth) {
    return length * breadth;
}
double calculateArea(double base, double height, bool isTriangle) {
    return 0.5 * base * height;
}
int main() {
    double radius, length, breadth, base, height;
    cout << "Enter the radius of the circle: ";
    cin >> radius;
    cout << "Enter the length and breadth of the rectangle: ";
    cin >> length >> breadth;
```

```
    cout << "Enter the base and height of the triangle: ";
    cin >> base >> height;
    cout << "Area of Circle: " << calculateArea(radius) << endl;
    cout << "Area of Rectangle: " << calculateArea(length, breadth) << endl;
    cout << "Area of Triangle: " << calculateArea(base, height, true) << endl;

    return 0;
}
```

4. **Output:**

```
Enter the radius of the circle: 5
Enter the length and breadth of the rectangle: 4
6
Enter the base and height of the triangle: 3
7
Area of Circle: 78.5397
Area of Rectangle: 24
Area of Triangle: 10.5
```