University of Mila

Faculty of Science and Technology

Department of Process Engineering

Practical Work 01: SOLUTIONS

Course Title: Introduction to Programming

Level: 1st year ST - ENG & LMD

Semester 02

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Exercise 01: Sum of Natural Numbers Using Different Loops

Question 01: Write a C program to find sum of natural numbers from 1 to N using **for** loop.

Program 01:

```c
#include <stdio.h>

int main() {
    int i, n, sum = 0;
    // Input upper limit from user
    printf("Enter upper limit: ");
    scanf("%d", &n);
    // Find sum of all numbers
    for(i = 1; i <= n; i++) {
        sum = sum + i;
    }
    printf("sum= %d", sum);
    return 0;
}
```

Program 01 - RUN 1:

```
Enter upper limit: 4
sum= 10
```

Program 01 - RUN 2:

```
Enter upper limit: 1000000
sum= 1784293664
```

Question 02: Write a C program to find sum of natural numbers from 1 to N using **while** loop.

Program 02:

```c
#include <stdio.h>

int main() {
    int sum = 0, n;
    int i = 1;
    // Input upper limit from user
    printf("Enter upper limit: ");
    scanf("%d", &n);
    // While loop to iterate from 1 to n
    while (i <= n) {
        sum += i;
        i++;
    }
    // Print the result
    printf("The sum is: %d\n", sum);
    return 0;
}
```

Program 02 - RUN 1:

```
Enter upper limit: 4
The sum is: 10
```

Program 02 - RUN 2:

```
Enter upper limit: 1000000
The sum is: 1784293664
```

Exercise 02: Print Natural Numbers Using Different Loops

Question 01: Write a C program to print all natural numbers from 1 to N using **for** loop.

Program 01:

```c
#include <stdio.h>

int main() {
    int i, N;
    /* Input upper limit from user */
    printf("Enter any number: ");
    scanf("%d", &N);
    printf("Natural_numb from 1 to %d:\n", N);
    for(i = 1; i <= N; i++) {
        printf("%d\n", i);
    }
    return 0;
}
```

Output:

```
Natural_numb from 1 to 8:
1
2
3
4
5
6
7
8
```

Question 02: Write a C program to print all natural numbers from 1 to N using **while** loop.

Program 02:

```c
#include <stdio.h>

int main() {
    int i, N;
    // Input a number from user
    printf("Natural numbers from 1 to: ");
    scanf("%d", &N);
    // Print natural numbers from 1 to N
    i = 1;
    while(i <= N) {
        printf("%d\n", i);
        i++;
    }
    return 0;
}
```

Output:

```
Natural numbers from 1 to: 8
1
2
3
4
5
6
7
8
```

Question 03: Write a C program to print all natural numbers from 1 to N using **do while** loop.

Program 03:

```c
#include <stdio.h>

int main() {
    int i, N;
    // Input a number from user
    printf("Natural numbers from 1 to: ");
    scanf("%d", &N);
    // Print natural numbers from 1 to N
    i = 1;
    do {
        printf("%d\n", i);
        i++;
    } while(i <= N);
    return 0;
}
```

Output:

```
Natural numbers from 1 to: 8
1
2
3
4
5
6
7
8
```

Exercise 03: Even and Odd Numbers Using Loops

Question 01: Write a C program to print all even numbers from 1 to N using loops.

Program 01:

```c
#include <stdio.h>

int main() {
    int i, N;
    // Input upper limit of even number from user
    printf("Print all even numbers till: ");
    scanf("%d", &N);
    printf("Even numb from 1 to %d are:\n", N);
    for(i = 1; i <= N; i++) {
        // Check even condition before printing
        if(i % 2 == 0) {
            printf("%d\n", i);
        }
    }
    return 0;
}
```

Output:

```
Print all even numbers till: 10
Even numb from 1 to 10 are:
2
4
6
8
10
```

Question 02: Write a C program to print all odd numbers from 1 to N using loops.

Program 02:

```c
#include <stdio.h>

int main() {
    int i, N;
    // Input upper limit from user
    printf("Print odd numbers till: ");
    scanf("%d", &N);
    printf("odd numb from 1 to %d are:\n", N);
    for(i = 1; i <= N; i++) {
        // If 'i' is odd then print it
        if(i % 2 != 0) {
            printf("%d\n", i);
        }
    }
    return 0;
}
```

Output:

```
Print odd numbers till: 10
odd numb from 1 to 10 are:
1
3
5
7
9
```

Exercise 04: Sum of Even Numbers Using Different Loops

Question 01: Write a C program to find sum of all even numbers between 1 to N using **for** loop.

Program 01:

```c
#include <stdio.h>

int main() {
    int j, N, sum = 0;
    /* Input upper limit from user */
    printf("Enter upper limit: ");
    scanf("%d", &N);
    for(j = 2; j <= N; j++) {
        if(j % 2 == 0) {
            // Add current even number to sum
            sum += j;
        }
    }
    printf("Sum of all even number b/w 1 to %d = %d", N, sum);
    return 0;
}
```

Output:

```
Enter upper limit: 10
Sum of all even number b/w 1 to 10 = 30
```

Question 02: Write a C program to find sum of all even numbers between 1 to N using **while** loop.

Program 02:

```c
#include <stdio.h>

int main() {
    int j = 1, N, sum = 0;
    /* Input upper limit from user */
    printf("Enter upper limit: ");
    scanf("%d", &N);
    while(j <= N) {
        if(j % 2 == 0) {
            // Add current even number to sum
            sum += j;
        }
        j++;
    }
    printf("Sum of all even number b/w 1 to %d = %d", N, sum);
    return 0;
}
```

Output:

```
Enter upper limit: 10
Sum of all even number b/w 1 to 10 = 30
```

Exercise 05: Sum of Even Numbers from User Input

Question 01: Write a C program to input N numbers from user and find sum of all even numbers using loops.

Program 01:

```c
#include <stdio.h>

int main() {
    int i, n, num, sum = 0;
    printf("Input number of terms: ");
    scanf("%d", &n);
    printf("\nThe entered numbers are:\n");
    for(i = 1; i <= n; i++) {
        scanf("%d", &num);
        if(num % 2 == 0) {
            sum += num;
        }
    }
    printf("\nThe Sum of even Natural Number: %d\n", sum);
    return 0;
}
```

Output:

```
Input number of terms: 5
The entered numbers are:
12
15
28
200
111
The Sum of even Natural Number: 240
```

Exercise 06: Counting and Conditional Summation

Question 01: Write a C program that prompts the user to enter N integers and then calculates and prints the number of even and odd numbers using a do-while loop.

Program 01:

```c
#include <stdio.h>

int main() {
    int i = 1, N, num, sumEven = 0, sumOdd = 0;
    printf("Input number of integers: ");
    scanf("%d", &N);
    printf("\nThe entered numbers are:\n");
    // Calculate the sum of even and odd numbers
    do {
        // Check if the current number is even
        scanf("%d", &num);
        if(num % 2 == 0)
            sumEven += 1;
```

```c
        else
            sumOdd += 1;
        i++;
    } while (i <= N);
    printf("Sum of even numbers: %d\n", sumEven);
    printf("Sum of odd numbers: %d\n", sumOdd);
    return 0;
}
```

Output:

```
Input number of integers: 5
The entered numbers are:
1
12
30
55
10
Sum of even numbers: 3
Sum of odd numbers: 2
```

Question 02: Write a C program that repeatedly asks the user to enter a positive number and calculates the sum of all positive numbers entered. The program should stop when the user enters a negative number.

Program 02:

```c
#include <stdio.h>

int main() {
    int num, sum = 0;
    printf("Input a numbers (input a negative_number to stop): ");
    do {
        scanf("%d", &num);
        if (num >= 0) {
            sum += num;
        }
    } while (num >= 0);
    printf("Sum of all positive numbers: %d\n", sum);
    return 0;
}
```

Output:

```
Input a numbers (input a negative_number to stop): 4
5
4
56
-5
Sum of all positive numbers: 69
```

Exercise 07: Reverse Natural Numbers Using Different Loops

Question 01: Write a C program to print all natural numbers in **reverse** from N to 1 using **for** loop.

Program 01:

```c
#include <stdio.h>

int main() {
    int i, start, end;
    // Input start limit from user
    printf("Enter starting value: ");
    scanf("%d", &start);
    for(i = start; i >= 1; i--) {
        printf("%d\n", i);
    }
    return 0;
}
```

Output:

```
Enter starting value: 8
8
7
6
5
4
3
2
1
```

Exercise 08: Pattern Printing

Question: Write C programs to display each of the following patterns.

Program 01: Right Half Pyramid Pattern of Stars

```c
#include <stdio.h>

int main() {
    int rows = 5;
    // first loop for printing rows
    for (int i = 0; i < rows; i++) {
        // second loop for printing character in each rows
        for (int j = 0; j <= i; j++) {
            printf("* ");
        }
        printf("\n");
    }
    return 0;
}
```

Output:

```
*
* *
* * *
* * * *
* * * * *
```

Program 02: Right Half Pyramid Pattern of Numbers

```c
#include <stdio.h>

int main() {
    int rows = 5;
    // first loop for printing rows
    for (int i = 0; i < rows; i++) {
        // second loop for printing number in each rows
        for (int j = 1; j <= i; j++) {
            printf("%d ", j);
        }
        printf("\n");
    }
    return 0;
}
```

Output:

```
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
```

Program 03: Inverted Left Half Pyramid Pattern of Numbers

```c
#include <stdio.h>

int main() {
    int rows = 5;
    // first loop for printing all rows
    for (int i = 0; i < rows; i++) {
        // first inner loop for printing white spaces
        for (int j = 0; j < i; j++) {
            printf("  ");
        }
        // second inner loop for printing numbers
        for (int k = 1; k <= rows - i; k++) {
            printf("%d ", k);
        }
        printf("\n");
    }
    return 0;
}
```

Output:

```
1 2 3 4 5
  1 2 3 4
    1 2 3
      1 2
        1
```

Exercise 09: Factorial Calculation

Question: Write a C program to find and print the factorial of a given number using for loop.

Program 01:

```c
#include <stdio.h>

int main() {
    int n, i, f;
    f = i = 1;
    printf("Enter the number n: ");
    scanf("%d", &n);
    while(i <= n) {
        f *= i;
        i++;
    }
    printf("factorial(%d)= %d\n", n, f);
    printf("or %d!= %d\n", n, f);
    return 0;
}
```

Output:

```
Enter the number n: 5
factorial(5)= 120
or 5!= 120
```

Program 02:

```c
#include <stdio.h>

int main() {
    int n, i, f;
    f = i = 1;
    printf("Enter the number n: ");
    scanf("%d", &n);
    while(i <= n) {
        f *= i;
        i++;
    }
    printf("factorial(%d)= %d\n", n, f);
    printf("or %d!= %d\n", n, f);
    return 0;
}
```

Output:

```
Enter the number n: 5
factorial(5)= 120
or 5!= 120
```

Exercise 10: Factorial Series

Question: Write a C program to calculate and print the factorial of numbers from 1 to n.

Program 01:

```c
#include <stdio.h>

int main() {
```

```c
    int n, i, f;
    f = i = 1;
    printf("Enter the number n: ");
    scanf("%d", &n);
    while(i <= n) {
        f *= i;
        i++;
    }
    printf("factorial(%d)= %d\n", n, f);
    printf("or %d!= %d\n", n, f);
    return 0;
}
```

Output:

```
factorial(1)= 1
factorial(2)= 2
factorial(3)= 6
factorial(4)= 24
factorial(5)= 120
factorial(6)= 720
factorial(7)= 5040
factorial(8)= 40320
factorial(9)= 362880
factorial(10)= 3628800
```

Program 02:

```c
#include <stdio.h>

int main() {
    long factorial;
    int k, a = 1, n;
    printf("Enter the number n: ");
    scanf("%d", &n);
    do {
        factorial = 1;
        k = 1;
        do {
            factorial *= k;
            ++k;
        } while (k <= a);
        printf("%d!= %d\n", a, factorial);
        ++a;
    } while (a <= n);
    return 0;
}
```

Output:

```
Enter the number n: 10
1!= 1
2!= 2
3!= 6
4!= 24
5!= 120
6!= 720
```

```
7!= 5040
8!= 40320
9!= 362880
10!= 3628800
```

Exercise 11: Homework Fibonacci Series

Question: Write a C program to print Fibonacci series up to 100.

Program 01:

```c
#include <stdio.h>

int main() {
    int a = 1, b = 1, c = 0, i;
    printf("****Fibonacci series upto 100****\n");
    printf("%d\t%d\t", a, b);
    for(i = 0; i <= 10; i++) {
        c = a + b;
        if(c <= 100) {
            printf("%d\t", c);
        }
        a = b;
        b = c;
    }
    return 0;
}
```

Output:

```
****Fibonacci series upto 100****
0    1    1    2    3    5    8    13    21    34    55    89
```

Program 02:

```c
#include <stdio.h>

int main() {
    int a = 0, b = 1, c, i;
    printf("Fibonacci series upto 100\n");
    printf("%d\t%d\t", a, b);
    c = a + b;
    do {
        printf("%d\t", c);
        a = b;
        b = c;
        c = a + b;
    } while(c <= 100);
    return 0;
}
```

Output:

```
Fibonacci series upto 100
0    1    1    2    3    5    8    13    21    34    55    89
```

Program 03:

```c
#include <stdio.h>

int main() {
    int i, n;
    // initialize first and second terms
    int t1 = 0, t2 = 1;
    // initialize the next term (3rd term)
    int nextTerm = t1 + t2;
    // get no. of terms from user
    printf("Enter the number of terms: ");
    scanf("%d", &n);
    printf("Fibonacci Series: ");
    printf(" %d, %d, ", t1, t2);
    // print 3rd to nth terms
    while (nextTerm <= n) {
        printf("%d, ", nextTerm);
        t1 = t2;
        t2 = nextTerm;
        nextTerm = t1 + t2;
    }
    return 0;
}
```

Output:

```
Enter the number of terms: 100
Fibonacci Series: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89,
```