



# Programming Fundamentals

Week 03 – Home Tasks



## Important Guidelines

- Complete all tasks and push them to GitHub before the deadline. Late submissions will incur a penalty of **10%** of the total marks for each day past the deadline (this rule applies to all upcoming labs).
- Any use of AI tools to generate answers or code, or copying code from others, will result in a zero for that submission and may negatively affect overall performance, potentially leading to an F grade in the course, including both theory and lab components. Copying your own previously written code is allowed.

## Introduction

This week, we shall work together to learn and implement new programming concepts.

## Skills to be Tested:

- Writing C++ program that converts user input into the required output after doing some processing on it

## Let's do some coding.

### Task 01(OP): (Polygon Geometry Contest)

In a prestigious mathematics competition called the "Polygon Geometry Contest," brilliant young mathematicians from all over the world gather to showcase their skills in geometry. The contest features a variety of problems related to polygons, and participants need to write code to solve these problems.

### The Challenge:

The problem statement for this particular challenge is as follows:

You are given a regular polygon with  $n$  sides, and your task is to calculate the sum of all its interior angles in degrees. To find this, you can use the formula  $(n - 2) \times 180$ , which gives the total of all the angles inside the polygon. For example, if the polygon has 3 sides (a triangle), the sum of its interior angles is  $(3 - 2) \times 180 = 180^\circ$ . If it has 4 sides (a square), the sum is  $(4 - 2) \times 180 = 360^\circ$ . Your program should take the number of sides  $n$  as input and print the sum of the interior angles.

**Skill:** Compiling and Executing programs while taking input from the user



# Programming Fundamentals

Week 03 – Home Tasks



## Test Cases:

```
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ task.cpp -o task }
Enter the number of sides of the polygon: 20
The total sum of internal angles of a : 20-sided polygon is : 3240 degrees
PS E:\3rd Semester\DSAL\lab 1>
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ task.cpp -o task }
Enter the number of sides of the polygon: 40
The total sum of internal angles of a : 40-sided polygon is : 6840 degrees
PS E:\3rd Semester\DSAL\lab 1>
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ task.cpp -o task }
Enter the number of sides of the polygon: 67
The total sum of internal angles of a : 67-sided polygon is : 11700 degrees
PS E:\3rd Semester\DSAL\lab 1>
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ task.cpp -o task }
Enter the number of sides of the polygon: 87
The total sum of internal angles of a : 87-sided polygon is : 15300 degrees
PS E:\3rd Semester\DSAL\lab 1>
```

## Task 02(OP): (Video Processing Application)

You are creating a program for a video application. The program should calculate the total number of frames in a video. The user will provide the length of the video in minutes and the frames per second (FPS).

## Test Cases:

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task02.exe
Number of Minutes: 10
Frames per Second: 25
Total Number of Frames: 15000
```

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task02.exe
Number of Minutes: 1
Frames per Second: 1
Total Number of Frames: 60
```

```
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ 1.cpp -o 1 } ; if
Number of Minutes: 40
Frames Per Second : 12
Total Number of Frames : 28800
```

```
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ 1.cpp -o 1 } ; if
Number of Minutes: 32
Frames Per Second : 10
Total Number of Frames : 19200
```

**Skill:** Compiling and Executing programs while taking input from the user



# Programming Fundamentals

Week 03 – Home Tasks



## Task 03(CP): (Cars Velocity Calculation)

A toy car accelerates from initial velocity to final velocity in some time. You have to write the C++ program for calculating the Final Velocity. Take initial velocity, acceleration, and time as input from the user and calculate the final velocity of the car and display it on the screen.

The formula to Calculate the Acceleration is

$$\text{Acceleration} = (\text{Final velocity} - \text{Initial velocity}) / \text{Time}$$

**Remember:** You have to calculate the final velocity


```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task03.exe
Enter Initial Velocity (m/s): 10
Enter Acceleration (m/s^2): 23
Enter Time (s): 2
Final Velocity (m/s): 56
```

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task03.exe
Enter Initial Velocity (m/s): 11
Enter Acceleration (m/s^2): 34
Enter Time (s): 7
Final Velocity (m/s): 249
```

```
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ 2.cpp -o 2 } ; if (
Enter Initial Velocity(m/s) : 56
Enter Acceleration(m/s^2) : 20
Enter Time(s): 6
Final Velocity(m/s): 176
```

```
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ 2.cpp -o 2 } ; if (
Enter Initial Velocity(m/s) : 30
Enter Acceleration(m/s^2) : 23
Enter Time(s): 4
Final Velocity(m/s): 122
```

## Task04(CP):(AmongUs)

Create a program that calculates the chance of being an imposter in the **AMONG US**  game. The formula for the chances of being an imposter is  $100 \times (i / p)$  where  $i$  is the imposter count and  $p$  is the player count. Make sure to round the value as integer and print the value as a percentage.

**Skill:** Compiling and Executing programs while taking input from the user



# Programming Fundamentals

## Week 03 – Home Tasks



```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task04.exe
Enter Imposter Count: 3
Enter Player Count: 15
Chance of being an imposter: 20%
```

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task04.exe
Enter Imposter Count: 2
Enter Player Count: 5
Chance of being an imposter: 40%
```

```
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ 3.cpp -o 3 } ; if (
Enter Imposter Count: 7
Enter Player Count: 32
Chance of being an imposter: 21%
```

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task04.exe
Enter Imposter Count: 1
Enter Player Count: 8
Chance of being an imposter: 12%
```

### Task 05(CP): (Weight Loss Calculation)

A clinic has hired you to develop a software tool that helps individuals calculate the time it will take to achieve their weight loss goals by following specific recommendations. The clinic wants to provide a user-friendly solution for their clients who are looking to lose weight and improve their health.

The doctor at the clinic has provided the following weight loss recommendations:

- Consume a daily calorie intake of 4000 calories.
- Engage in one hour of walking every day.

The doctor informs clients that by strictly adhering to these suggestions, they can expect to lose 1 kilogram of weight after 15 days. The clinic wants the software to allow users to input their name and calculate the number of days required to lose a specified amount of weight based on these recommendations.

**Skill:** Compiling and Executing programs while taking input from the user



# Programming Fundamentals

## Week 03 – Home Tasks



```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task05.exe
Enter the Name of the Person: Amir
Enter the target weight loss in kilograms: 12
Amir will need 180 days to lose 12 kg of weight by following the doctor's suggestions
```

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task05.exe
Enter the Name of the Person: Fatima
Enter the target weight loss in kilograms: 14.5
Fatima will need 217.5 days to lose 14.5 kg of weight by following the doctor's suggestions
```

```
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ 3.cpp -o 3 } ; if (
Enter the Name of the Person: Hamza
Enter the target weight to lose in kilograms: 10
Hamza will need 150 days to lose weight by the doctor's suggestions
```

```
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ 3.cpp -o 3 } ; if
Enter the Name of the Person: ALi
Enter the target weight to lose in kilograms: 5.5
ALi will need 82.5 days to lose_weight by the doctor's suggestions
```

### Task 06(CP): (Summer Project)

Every summer, Ahmad and Fatima grow vegetables in their backyard. They buy seeds and fertilizer from a local nursery, which sells different types of fertilizer in bags of various sizes. When they buy a bag, they want to figure out how much the fertilizer costs for each pound and how much it will cost to use it on their garden area.

Write a C++ program that asks the user to enter:

1. The weight of the fertilizer bag.
2. The cost (price) of the bag.
3. The size of the area the bag can cover.

The program should then calculate and display:

1. The price of the fertilizer for each pound.
2. The cost of using the fertilizer for each square foot of the garden.

**Skill:** Compiling and Executing programs while taking input from the user



# Programming Fundamentals

## Week 03 – Home Tasks



```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task06.exe
Enter the size of the fertilizer bag in pounds: 5
Enter the cost of the bag: $500
Enter the area in square feet that can be covered by the bag: 10
Cost of fertilizer per pound: $100
Cost of fertilizing per square foot: $50
```

```
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ 4.cpp -o 4 } ; if (
Enter size of the fertilizer bag in pounds: 8
Enter the cost of the bag: $600
Enter the area in square feet that can be covered by the bag: 14
Cost of the fertilizer per pound is: $75
Cost of fertilizing per square foot is: $42.8571
```

```
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ 4.cpp -o 4 } ; if (
Enter size of the fertilizer bag in pounds: 9
Enter the cost of the bag: $230
Enter the area in square feet that can be covered by the bag: 3
Cost of the fertilizer per pound is: $25.5556
Cost of fertilizing per square foot is: $76.6667
```

```
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ 4.cpp -o 4 } ; if (
Enter size of the fertilizer bag in pounds: 15
Enter the cost of the bag: $400
Enter the area in square feet that can be covered by the bag: 23
Cost of the fertilizer per pound is: $26.6667
Cost of fertilizing per square foot is: $17.3913
```

### Task 07(CP): (Movie Theater)

A local movie theater is very popular, and the owner wants to help a charity by donating a part of the money earned from ticket sales. Write a C++ program that asks the user to enter:

1. The name of the movie
2. The price of an adult ticket
3. The price of a child ticket
4. The number of adult tickets sold
5. The number of children's tickets sold
6. The percentage of the total money to donate to charity

The program should first calculate the total money earned from all the tickets. Then, it should figure out how much money will be given to the charity and finally display the remaining money earned from the movie.

**Skill:** Compiling and Executing programs while taking input from the user





# Programming Fundamentals

## Week 03 – Home Tasks



```
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ 5.cpp -o 5 } ; if (
Enter the movie name: Fast
Enter the adult ticket price: $20
Enter the child ticket price: $30
Enter the number of adult tickets sold: 200
Enter the number of child tickets sold: 500
Enter the percentage of amount to be donated to charity: 15
-----
Movie: Fast
Total Amount Generated from ticket sales: $19000
Donation to charity(15): $2850
Remaining amount after donation: $16150
```

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task07.exe
Enter the movie name: Avengers
Enter the adult ticket price: $20
Enter the child ticket price: $10
Enter the number of adult tickets sold: 1000
Enter the number of child tickets sold: 5000
Enter the percentage of the amount to be donated to charity: 10

Movie: Avengers
Total amount generated from ticket sales: $70000
Donation to charity (10%): $7000
Remaining amount after donation: $63000
```

### Task 08(CP): (Harvest Vegetables)

A gardener is selling his harvest on the vegetables market. He is selling vegetables for N coins per kilogram and fruits for M coins per kilogram. Write a program that calculates the earnings of the harvest in Rupees (Rps). Assume the Rps / coin rate is fixed: 1 Rp == 1.94 coins.

#### Input Data and Output Data:

Four numbers are read from the console, one per line:

- First line: vegetable price per kilogram – a floating-point number.
- Second line: fruit price per kilogram – a floating-point number.
- Third line: total kilograms of vegetables – an integer.
- Fourth line: total kilograms of fruits – an integer.

**Skill:** Compiling and Executing programs while taking input from the user



# Programming Fundamentals

## Week 03 – Home Tasks



The output should be the earnings of all fruits and vegetables in Rps on the console.

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task08.exe
Enter vegetable price per kilogram (in coins): 0.194
Enter fruit price per kilogram (in coins): 19.4
Enter total kilograms of vegetables: 10
Enter total kilograms of fruits: 10
Total earnings in Rupees (Rps): 101
```

```
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ 6.cpp -o 6 } ; if (
Enter vegetable price per kilogram (in coins): 2.1
Enter fruit price per kilogram (in coins): 1.4
Enter total kilograms of vegetables: 4
Enter total kilograms of fruits: 8
Total earnings in Rupees (Rps): 10.1031
```

```
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ 6.cpp -o 6 } ; if
Enter vegetable price per kilogram (in coins): 5
Enter fruit price per kilogram (in coins): 2.2
Enter total kilograms of vegetables: 15
Enter total kilograms of fruits: 10
Total earnings in Rupees (Rps): 50
```

### Task 09(CP): (4-digit Sum)

Imagine you have a 4-digit number that you want to explore further. You're curious about the individual digits that make up this number and their sum. You know that there's a mathematical operator called the modulus operator, often represented by the symbol '%', which returns the remainder when one number is divided by another.

Here's a quick example of how the modulus operator works:

- When you take the modulus of 4 with 3, it returns 1 because 4 divided by 3 leaves a remainder of 1.
- If you try  $7 \% 4$ , it returns 3 because 7 divided by 4 leaves a remainder of 3.
- If you try  $7 \% 10$ , it returns 7 because 7 divided by 10 leaves a remainder of 7.

With this knowledge in mind, create a C++ program to calculate the sum of the individual digits of a 4-digit number. This program will allow you to input any 4-digit number, and it will use the modulus operator to extract each digit and find their sum.

**Skill:** Compiling and Executing programs while taking input from the user





# Programming Fundamentals

## Week 03 – Home Tasks



```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task09.exe
Enter a 4-digit number: 1234
Sum of the individual digits: 10
```

```
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ 7.cpp -o 7 } ; if
Enter a 4-digit number: 6789
Sum of individual digits = 30
```

```
PS E:\3rd Semester\DSAL\lab 1> cd "e:\3rd Semester\DSAL\lab 1\" ; if ($?) { g++ 7.cpp -o 7 } ; if ($?)
Enter a 4-digit number: 8704
Sum of individual digits = 19
```

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task09.exe
Enter a 4-digit number: 4901
Sum of the individual digits: 14
```

### Task 10(CP): (Complex Calculation)

Imagine a program that takes 15 numbers as input, with a specific plan in mind for mathematical operations. The program's goal is to perform various calculations on these numbers in a structured manner.

Here's how the program works:

1. The program prompts the user to enter 15 numbers, one at a time.
2. It then proceeds to execute three distinct mathematical operations:
  - It adds together the first 5 numbers.
  - It multiplies the next 5 numbers.
  - It subtracts the last 5 numbers.
3. After obtaining the results of these three operations, the program continues its mathematical exploration:
  - It adds the results of the addition and multiplication.
  - It subtracts the result of the subtraction.
4. Finally, the program displays the ultimate result on the screen.

**Skill:** Compiling and Executing programs while taking input from the user



# Programming Fundamentals

## Week 03 – Home Tasks



```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task10.exe
Number 1: 1
Number 2: 2
Number 3: 3
Number 4: 4
Number 5: 5
Number 6: 0
Number 7: 57
Number 8: 45
Number 9: 76
Number 10: 345
Number 11: 565
Number 12: 34
Number 13: 23
Number 14: 65
Number 15: 34
The final result is: -394
```

### Task 11(CP): (Residence History)

You are tasked with developing a program to analyze a person's residence history and calculate the average duration they've spent living in a single house. This calculation is based on two critical factors: the person's current age and the number of times they've moved from one house to another.

#### Input Data:

1. The person's age (age) represented as an integer.
2. The number of times they've moved house (moves) also represented as an integer.

The goal is to develop a program that can efficiently calculate the average number of years the person has lived in a single house based on this input.

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task11.exe
Enter the person's age: 30
Enter the number of times they've moved: 2
Average number of years lived in the same house: 10

G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task11.exe
Enter the person's age: 41
Enter the number of times they've moved: 1
Average number of years lived in the same house: 20
```

**Skill:** Compiling and Executing programs while taking input from the user



# Programming Fundamentals

Week 03 – Home Tasks



```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task11.exe
Enter the person's age: 80
Enter the number of times they've moved: 0
Average number of years lived in the same house: 80
```

## Task12(CP): (Paint Walls)

I have a bucket containing an amount of navy-blue paint and I'd like to paint as many walls as possible. Create a program that prints the number of complete walls that I can paint, before I need to head to the shops to buy more.

- $n$  is the number of square meters I can paint.
- $w$  and  $h$  are the widths and heights of a single wall in meters.

Notes

- Don't count a wall if I don't manage to finish painting all of it before I run out of paint.
- All walls will have the same dimensions.
- All numbers will be positive integers.

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task12.exe
Number of square meters you can paint: 100
Width of the single wall (in meters): 4
Height of the single wall (in meters): 5
Number of walls you can paint: 5
```

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task12.exe
Number of square meters you can paint: 10
Width of the single wall (in meters): 15
Height of the single wall (in meters): 12
Number of walls you can paint: 0
```

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Programming Day Tasks>Task12.exe
Number of square meters you can paint: 41
Width of the single wall (in meters): 3
Height of the single wall (in meters): 6
Number of walls you can paint: 2
```

## Task13(CP): (Food for Thought)

Write a program that takes 5 integers from the user and displays their sum on screen. **But** you can only use two variables.

**Skill:** Compiling and Executing programs while taking input from the user



# Programming Fundamentals

Week 03 – Home Tasks



Test cases:

Enter 5 integers:

34

23

55

23

13

Sum = 148

Enter 5 integers:

45

54

36

24

7

Sum = 166

Enter 5 integers:

22

24

12

44

5

Sum = 107

**Good Luck and Best Wishes !!**

**Happy Coding ahead :)**

**Skill:** Compiling and Executing programs while taking input from the user