

# INTRODUCTION

## Program Overview:

**This program calculates the following properties of an object moving in a circular path:**

- 1. Centripetal Force:** The force that keeps the object moving in a circle.
- 2. Centripetal Acceleration:** The acceleration directed towards the center of the circular path.
- 3. Angular Velocity:** The rate of change of the angle at which the object moves around the circle.

**The program accepts the following inputs:**

- **Mass of the object (mass)** in kilograms (kg)
- **Velocity of the object (velocity)** in meters per second (m/s)
- **Radius of the circular path (radius)** in meters (m)

## File Structure:

- 1. circular\_motion.h:** Header file that contains function declarations.
- 2. circular\_motion.c:** Source file that contains the implementation of the functions.
- 3. main.c:** Main program that interacts with the user, takes inputs, and calls the functions to perform the calculations.

## File 1: circular\_motion.h

This is the header file that contains the declarations of the functions used for calculating circular motion properties.

```
1 // circular_motion.h
2 #ifndef CIRCULAR_MOTION_H
3 #define CIRCULAR_MOTION_H
4
5 // Function declarations for circular motion calculations
6 double calculateCentripetalForce(double mass, double velocity, double radius);
7 double calculateCentripetalAcceleration(double velocity, double radius);
8 double calculateAngularVelocity(double velocity, double radius);
9
10 #endif // CIRCULAR_MOTION_H
11
```

## Explanation:

- The header guard (#ifndef, #define, #endif) prevents the file from being included more than once, which could cause errors.
- The three functions declared here are:
  1. calculateCentripetalForce(double mass, double velocity, double radius)
  2. calculateCentripetalAcceleration(double velocity, double radius)
  3. calculateAngularVelocity(double velocity, double radius)

## File 2: circular\_motion.c

This file contains the actual implementations (definitions) of the functions declared in circular\_motion.h.

```
#include "circular_motion.h"

// Function to calculate centripetal force
double calculateCentripetalForce(double mass, double velocity, double radius) {
    return mass * (velocity * velocity) / radius;
}

// Function to calculate centripetal acceleration
double calculateCentripetalAcceleration(double velocity, double radius) {
    return (velocity * velocity) / radius;
}

// Function to calculate angular velocity
double calculateAngularVelocity(double velocity, double radius) {
    return velocity / radius;
}
```

### Function Descriptions:

1. **calculateCentripetalForce(double mass, double velocity, double radius):**
  - Formula:  $F = m \times v^2 / R$
  - Returns the centripetal force (in Newtons) based on the mass, velocity, and radius.
2. **calculateCentripetalAcceleration(double velocity, double radius):**
  - Formula:  $a = v^2 / R$
  - Returns the centripetal acceleration (in  $m/s^2$ ) based on velocity and radius.
3. **calculateAngularVelocity(double velocity, double radius):**
  - Formula:  $\omega = v / R$
  - Returns the angular velocity (in radians per second) based on velocity and radius.

### File 3: main.c

This is the main file that interacts with the user, takes input, and calls the functions from circular\_motion.c.

```
> C main.c > ...
// main.c
#include <stdio.h>
#include "circular_motion.h"

int main() {
    double mass, velocity, radius;

    // Input values for mass, velocity, and radius
    printf("Enter the mass of the object (in kg): ");
    scanf("%lf", &mass);

    printf("Enter the velocity of the object (in m/s): ");
    scanf("%lf", &velocity);

    printf("Enter the radius of the circular path (in meters): ");
    scanf("%lf", &radius);

    // Calculate centripetal force, centripetal acceleration, and angular velocity
    double centripetalForce = calculateCentripetalForce(mass, velocity, radius);
    double centripetalAcceleration = calculateCentripetalAcceleration(velocity, radius);
    double angularVelocity = calculateAngularVelocity(velocity, radius);

    // Output the results
    printf("\nCentripetal Force: %.2lf N\n", centripetalForce);
    printf("Centripetal Acceleration: %.2lf m/s^2\n", centripetalAcceleration);
    printf("Angular Velocity: %.2lf rad/s\n", angularVelocity);

    return 0;
}
```

### Explanation:

#### 1. Input Handling:

- The program prompts the user to enter the mass, velocity, and radius of the object.
- It uses `scanf` to read the values from the user.

#### 2. Function Calls:

- The program then calls the following functions:
  - `calculateCentripetalForce()`
  - `calculateCentripetalAcceleration()`
  - `calculateAngularVelocity()`

### **3. Output:**

- The results of these calculations are displayed to the user in Newtons for force, meters per second squared for acceleration, and radians per second for angular velocity.

### **GIVE THE DIRECTORY: IN THE TERMINAL**

```
cd C:\Users\PURUSHOTTAM\Desktop\string\task2
```

```
gcc main.c circular_motion.c -o main
```

```
.\main
```

## **ISSUE THAT I FACED:**

How to make your own library.

Calling the main function.

How to make logic.

What is centrifugal motion calculator.

Compile the both file in terminal.

## **How I try to resolve it:**

Watching the videos of making library.

Know the basics of Function.

Help from AI to base my logic.

Know the all formula of centrifugal force.

Knowing the how to make directory for compile the code.