



National University
of computer and emerging sciences

CL-1004

Object Oriented Programming- Lab

Spring' 2023

BS-SE

Lab Manual 06

Problem 1:

Create a class called **Car** that has private member variables:

- **string make**
- **string model**
- **int year**
- **int mileage**
- **double liters**

Make default and parameterized constructors.

- **Car()**
- **Car(string mk, string md, int y)**

1. Write getter setter functions for both members.

- **void setMake (string mk)**
- **string getMake ()**
- **void setModel (string md)**
- **string getModel ()**
- **void setYear (int y)**
- **int getYear ()**
- **void setMileage ()** (if year is 2015, mileage is 12000, if year is 2016, mileage is 15000, if year is 2017, mileage is 18000 and so on)
- **int getMileage ()**
- **void setFuel (double f)**
- **double getFuel ()**

2. A function that calculates the age of the car based on its year and the current year.

int getAge(int current)

3. A function that checks if the car needs to be serviced based on its mileage and age, and returns a boolean value indicating whether service is needed.

Hint: If mileage greater than 24,000 and age greater than 5 years, service is needed, else not needed.

bool serviceNeeded()

Problem 2

Create a class **Rational** for performing arithmetic with fractions.

- **numerator**
- **denominator**

Provide a default and a parameterized constructor that enables an object of this class to be initialized when it is declared. The constructors should store the fraction in reduced form. For example, the fraction 2/4 should be stored in object as 1 in the numerator and 2 in the denominator. In case of 3/4, store 3 in the numerator and 4 in the denominator.

Provide public member functions that perform each of the following tasks:

2. Write getter setter functions for both members.

- **void setNumerator (int a)**
- **int getNumerator ()**
- **void setDenominator (int a)**
- **int getDenominator ()**

Note: Following functions should be made outside the class.

3. Add two Rational numbers. The result should be stored in reduced form. Two rational numbers a/b and c/d can be added as follows:

$$(a/b) + (c/d) = (a*d + c*b) / (b*d)$$

Rational addRationalNumber(r1, r2)

4. Multiply two Rational numbers. The result should be stored in reduced form. The product of two rational numbers a/b and c/d can be found as follows:

$$(a/b) * (c/d) = (a*c) / (b*d)$$

Rational multiRationalNumber(r1, r2)

5. Divide two Rational numbers. The result should be stored in reduced form. Two rational numbers a/b and c/d can be divided as follows:

$$(a/b) \div (c/d) = (a*d) / (b*c)$$

Rational divRationalNumber(r1, r2);

6. Print Rational numbers in the form a/b where a is the numerator and b is the denominator.

void printRational();

Problem 3

Write a class Date that represents a date consisting of a

- **year**
- **month**
- **day**

A Date class should have the following methods:

- **Date()**
- **Date(int year, int month, int day)**
- Getter setter
 - **void setDay(int d)**
 - **int getDay()**
 - **void setMonth(int m)**
 - **int getMonth()**
 - **void setYear(int y)**

- **int getYear()**
- **void addD(int days)**
 Moves this Date object forward by the given number of days.
 Hint: you should decide on the basis of month and year that given month ends 30,31,28,29 days.
- **void addMD(int month , int days)**
 Moves this Date object forward by the given number of months and days. Months should be within 1 to 12 and days in 1 to 31. For Example Date 2003/12/31 and addMD(1,29) => Date will be 2004/02/29
- **void addWeeks(int weeks)**
 Moves this Date object forward by the given number of seven-day weeks.
- **void subtractM(int days)**
 Moves this Date object backward by the given number of days.
 hint: you should decide on the basis of month and year that given month ends 30,31,28,29 days.
- **void subtractMD(int month , int days)**
 Moves this Date object backward by the given number of months and days.
- **String toString()**
 Returns a String representation of this date in year/month/day order, such as "2006/07/22".

Problem 4

Write a Sphere class that has the following member variables:

- **PI : a constant double initialized with the value 3.14159**
- **radius : radius of a circle**

The class should have the following member functions:

- Default Constructor. A default constructor that sets radius to zero.
Sphere ()
- Parameterize Constructor. Accepts the radius of the sphere as an argument.
Sphere (int radius)
- Getter Setter functions ()
void setRadius(int r)
int getRadius()
- **int getDiameter()**
 Diameter = 2 * radius

- **int getArea()**
Area = $4 * \pi * \text{radius} * \text{radius}$
- **int getCircumference()**
Circumference = $2 * \pi * \text{radius}$
- **int GetVolume()**
Volume = $\frac{4}{3} * \pi * \text{radius} * \text{radius} * \text{radius}$