



Answer the following Questions:

Question 1:

a) Write a class named **Fraction** that has two integer data members num and den (doesn't equal zero) and the following methods:

- 1) Constructor: that takes two integers a and b then put them in num and den.
- 2) Setden: that takes an integer a and put it in den
- 3) Setnum: that takes an integer a and put it in num
- 4) Getnum: that returns the value of num.
- 5) Getden: that returns the value of den.

6) Addfraction: that takes an object of type Fraction and adds it to its object and returns the resulting object.

$$\text{Note that } \frac{a}{b} + \frac{c}{d} = \frac{ad+bc}{bd}$$

7) Divfraction: that takes an object of type Fraction and divides its object by that object and returns the resulting object.

$$\text{Note that } \frac{a}{b} \div \frac{c}{d} = \frac{ad}{bc}$$

b) Write the main method to define four objects f1, f2, f3 and f4 and store the sum of f1 and f2 in f3 and store f1 / f2 in f4.

Question 2:

Suppose that a program has to deal with motor Vehicles where it includes the variables and methods common to all vehicles

- a) Write three subclasses of Vehicle: Car, Truck and Motorcycle which hold variables and methods specific to particular types of vehicles. The Car class add an instance variable numberofdoors, the Truck class has numberofaxles and the Motorcycles class has a Boolean variable hassidear.
- b) Declare an object myvehicle to have a type Vehicle and write a constructor required for this object

Question 3:

Write the meaning of polymorphism and explain your answer by giving an example of Shape class and its subclasses

Question 4:

- a) Explain the use of an enum types.
- b) Write the definition of an enum type named months of the year and add the following methods:
 - 1) toStringing method to return the name of the month in lower case except the first letter to be in upper case
 - 2) numberofdays method to return the number of days of a month provided the year is given

وفقك الله وحفظك ورزقك خيري الدنيا والآخرة

د/خالد فتحي