Navrachana University

School of Engineering and Technology

Department of Computer Science and Engineering

Course: CS232 Object Oriented Programming Lab

Lab manual

Instructions

- Implement the given Questions using Object Oriented concepts in Python programming language.
- Use meaningful and descriptive variable/identifier names:
  Good variable names (camelCase): rollNo, studentName, empSalary, salesPrice, taxRate,
  Every Program should have header and footer having following information in multi-line comments
  '''
  @author: RollNo Firstname Lastname
  @description: Program No. - write short purpose/ description here
  '''
- Every Program should be with output of the Program in multi-line comment after the code of respective program.

- **Submission details:** Submit your Lab manual on Microsoft team before the given submission date. Create one **.ZIP file** containing **all Python programs** (.py files) and **one word file.** Keep filename as **RollNo-Name-LabManual.zip**.
- Programs submitted by a student should be the result of individual work based on his/her own efforts. Full or part of the code should not be copied from internet or from peer students or other sources. A student should not share/circulate the code/programs developed by them (for individual Lab manual) with their peers in any form. Violation of above will be considered as academic dishonesty and any such case will be strictly dealt with and liable to get zero in the evaluation.

1. Write a program to input roll no, student name, marks of physics, chemistry and maths out of 100. (0-100). Calculate total, percentage, calculate STATUS (pass, fail) if students scores above 40 in all the 3 subjects the STATUS should be pass otherwise fail. Calculate GRADE if STATUS is pass.
   Grade must be based on percentage value
   if percentage is above 70, then grade must be DISTINCTION
   if percentage is above 60, then grade must be FIRST CLASS
   if percentage is above 50, then grade must be SECOND CLASS
   if percentage is above 40, then grade must be PASS CLASS
   [Instruction for OOP: Make one class having 5 objects for each student. Roll no, student name, and marks of physics, chemistry, and math's are the object variables. Calculate total, percentage, STATUS and GRADE if STATUS is pass using object member function.]

2. Make a two-player Rock-Paper-Scissors game. (Hint: Ask for player plays (using input), compare them, print out a message of congratulations to the winner, and ask if the players want to start a new game) Remember the rules: Rock beats scissors, Scissors beats paper, Paper beats rock.

   [Instruction for OOP: Make one class having two objects for each player. Set the user input to the object variable(public) by constructor. print out a message of congratulations to the winner in driver code.

3. Let's say I give you a list saved in a variable: a = [1, 4, 9, 16, 25, 36, 49, 64, 81, 100]. Write one line of Python that takes this list and makes a new list that has only the even elements of this list in it.
   [**Instruction for oop**: #one class ;having one object a.
   #object have one variable which is type of list
   #construct one constructor to set the list
   #make one member function to find even elements.
   #function will also return object of the same class with list(having even elements)]

4. Take two lists a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89] b = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13] and write a program that returns a list that contains only the elements that are common between the lists (without duplicates).
   Make sure your program works on two lists of different sizes. Write this using a list comprehension.
   [**Instruction for oop**: #one class ;having two object a and b.
   #object have one variable which is type of list
   #construct one constructor to set the list
   #make one member function to find common elements.
   #function will also return object of the same class with list(having common elements)]

5. Write a program which inputs a number. Display that number in word format.
   [Instruction for OOP: make one class/static function and function will use static dictionary variable]

6. Program to print binary form of any positive number using 16-bit representation. (without library function) (You can use list for 16-bit representation)
   [*Instruction for OOP: make one class/static function]*
   E.g. Enter any number: 20
   0000000000010100

7. Write a POP to calculate the exponent from the input base and power value.
   [*Instruction for OOP: make one class and one object of that class. Base and power are two object variables. Set them using the setter functions. Get the values using the getter functions and perform the operation outside the class using one global function; print the result.]*
   Eg. Enter a base value : 3
   Enter a power value : 4
   For base 3 and power 4, the answer is 81

8. Write a Python program to find the number of divisors of a given integer is even or odd.
   [Instruction for OOP: make one class. Store User input number in static variable. Perform the task using static functions.]

9. Write a POP in python to input empid, name, basic salary, no. of experience in yrs. Calculate hra(35% of basic), da (58% of basic) and pf (9.5% of basic).
   Also calculate bonus based on experience in years.
   If experience in years is >= 30, bonus must be 59% of basic,
   If experience in years is >=23, bonus must be 51% of basic,
   If experience in years is >=15, bonus must be 45% of basic,
   If experience in years is >=7, bonus must be 33% of basic,
   If experience in years is <7, bonus must be 16% of basic
   Calculate netsalary as basic+da+hra-pf+bonus.

   [Instruction for OOP: create 5 objects for each emp and all object data (empid, name, basic salary, no. of experience in yrs) should be private instance variable. Make one object member function to find the netsalary and one static function which calculates and returns the bonus to the object function.]

10. Write a OOP program to input Customer id , Customer name, electricity unit charges used. Calculate electricity bill according to the given condition:
    For first 50 units Rs. 0.50/unit

For next 100 units Rs. 0.75/unit
For next 100 units Rs. 1.20/unit
For unit above 250 Rs. 1.50/unit
An additional surcharge of 20% is added to the bill
[Instruction for OOP: create a list of 10 objects for each customer and call constructor to set object data (Customer id , Customer name), it should be private instance variable. Define one setter function to set the used electricity units and getter function to get the electricity bill and display it]

11. Write an OOP program to accept two numbers and one mathematical operator. Calculate and display appropriate answer.
    Eg output
    Enter first number : 45
    Enter mathematical operator : +
    Enter second number : 60
    45 + 60 = 105
    Note : Make use of Operator overloading concept in python Operator overloading is accomplished by following operator mapped functions
    +: __add__ , *: __mul__, /: __truediv__, -: __sub__ //: __floordiv_____, %: __mod__ , **: __pow__,
    [instruction: Make one class and two objects to store the two numbers(operands) and store the result in third object as we did in the theory session. Overload the operators.]
    Exercise Que: overload left shift operator: << (__lshift__) for printing the string like c++ for your *cout* object in python.

12. Write a program to check whether number is prime or not.
[instruction: Define one object function to check whether number is prime or not. Set the User input to object variable by overloading >> (__rshift__) operator.]
Enter a number : 13
    13 is prime
    Enter a number : 45
    45 is not a prime number

13. Write a program to display set of prime numbers between the given input range from user.
    Enter start number : 10
    Enter end number : 30
    11,13,17,19,23,29
    [Instruction: overload the function; if user enters one value, then find the number is whether prime or not, and if user enters two values, then display set of prime numbers between the given input range from user]

14. A program to check whether input string is palindrome or not. Eg
    Enter a name : liril
    [instruction: Define one class/static function to check palindrome]
    Liril is a palindrome

15. Write a OO program to find Euclidean Distance. Also overload minus (operator) to find the same.
    [instruction: Define one class and one method to set the coordinates for the point [support up to 4 coordinators by function overloading]. Overload minus operator.

Display the results and delete the objects.]

16. Write a OO program which have list with 10 elements.
    Input data from keyboard in first 5 element. The last five elements must be
    a[5]=count of odd nos
    a[6]=count of even nos
    a[7]=sum of even nos
    a[8]=sum of odd nos
    a[9]=sum of first five
    Display the whole list.
    [instruction: create getter/setter property for the list object variable.]

17. Write an OOP program to with list of 5 elements. Find the max from inputted numbers without using any library function.
    [instruction: create getter/setter property for the list object variable. find_max() function should be object function]

18. Write an OOP program with list of 5 elements. Add a function in class to sort the elements in ascending / descending order. [Note : Don't use any library function to Sort the list elements]

[instruction: create getter/setter property for the list object variable. sort() function should be object function]

19. Calculate the area of triangle given its three sides.
    The formula or algorithm used is:
    Area = sqrt(s(s – a)(s – b)(s – c)), where s = (a + b + c) / 2 or perimeter / 2 and a, b & c are the sides of triangle.

[instruction: create getter/setter property for the a, b, c object variables. area() function should be object function]

20. An equation of the form is known as the quadratic equation. The values of x that satisfy the equation are known as the roots of the equation. A quadratic equation has two roots which are given by the following two formula

    $$root1 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

    $$root2 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

    Write a program that requests the user to input the values of a,b, and c and outputs **root1** and **root2**.

[instruction: create getter/setter property for the a, b, c object variables. quadratic() function should be object function, also handle ZeroDivisionError exception]

21. Write a program to print following pattern. (hint: nested for loop)
    Input number required no. of lines and pattern character from user.
    @@@@@@
    @@@@@
    @@@@
    @@@

@@
@

[instruction: create a constructor to set object variables (no. of lines and pattern character). display() function should be object function]

22. Write a OOP program to print following pattern. (hint: nested for loop)
    Input number required no. of lines and pattern character from user.

```
          @
         @@@
        @@@@@
       @@@@@@@
      @@@@@@@@@
     @@@@@@@@@@@
```

    [instruction: create a constructor to set object variables (no. of lines and pattern character). display() function should be object function]

23. Write a program to print following pattern. (hint: nested for loop)
    Input number required no. of lines.

```
      1
     121
    12321
   1234321
  123454321
12345654321
```

    [instruction: create a constructor to set object variable (no. of lines). display() function should be object function]

24. Create a class Numerics in Python which contains
    a. Function to calculate factorial of a number.
    b. Function to display multiplication table of given number.
    NOTE : Do not use any library function.

25. Create a class in Python which contains
    a. Function to reverse a number.
    b. Function to check whether number is palindrome or not.

26. Write a program for lottery simulation. Generate 6 digit random number.
    Allow user to input only 6 digit number.
    If all the 6 digits matches then user wins 100000,
    if 5 digits match in sequence then user wins 85000,
    if 4 digits match in sequence then user wins 50000,
    if 3 digits matches in sequence then user wins 20000,
    if 2 digit matches user wins 2000.
    [instruction: create one class. Constructor will generate one random number. make one object member function for lottery simulation to match the given number with random number.]
    Eg.
    Random number: 123456
    User input: 343245
    user wins 2000

27. Write a program in python OOP which accepts the data of 5 cricket players (batsman) as follows.
    a) Name of the player

b) Number of ODI's played/batted
c) Total Runs scored by player in ODI

Calculate the batting averages of all the players and display them.
Also display the details of the players having maximum batting average and minimum batting average by defining one class member function.
[note: create 5 object for each player and all object data (name, total matches, runs and average) should be private instance variable]

28. Design a voting application which imitates the current EVM's used in elections. In an EVM, add at least 4 candidates with necessary details like id, name of candidate, name of the party, no. of votes, etc. .The voters can cast their votes in queue one by one. At the end provide facility to display results from EVM. Design appropriate classes for the required system.

29. Write a program to overload +, ==, !=, -, * , >=, <= to perform operation between objects of MyNumber class. (Note : MyNumber class contains only one integer member variable)

30. Write a program to create a class BankAccount, Inherit BankAccount to SavingsAccount and FixedDepositAccount. The savings account should allow customer to deposit and withdraw. The fixed-deposit account must calculate the due amount by inputting principal, rate of interest and no. of years value. (Note : Decide on your own the static variables, member variables, constructors, methods/functions to be created withing a program)
(Formula : $A=P(1+R/100)^N$

31. Create abstract superclass Figure having abstract method def area( ). Create concrete subclasses Rectangle and Circle of Figure which provide specific implementation of area( ) method. Rectangle has length and breadth data-members while circle has radius data-member. Define parameterized constructors in both classes. In the driver part create objects of Rectangle and Circle classes with suitable length, breadth and radius and find the area.

32. Write an Object Oriented Program which reads texts from a file. It must display file statistics a below.
    a. No. of sentences. (Counts the number of sentences by checking for . ! ?)
    b. No. of words.
    c. No. of total characters (Does not include whitespace)
    d. No. of whitespaces
    e. Total no. of digits, uppercase and lowercase letters.

33. Write an Object Oriented Program that copies the content of one file to another file in uppercase.

34. Write an Object Oriented Program which imitates Banking Transaction for a Saving account on an ATM machine. Store BankCustomer details permanently in a file. The Software is operated by a Bank Customer through an ATM. After entering username and password(instead of card and pin), customer is allowed to view his details, Change his pin number, withdraw, deposit into his account. He must be able to transfer amount from his account to other also. (Use JSON data to handle a file) Below is the example flow

Enter Username : Vrund

Enter password : 123
//////////////////////////
Name : Vrund
Account no : 12345 Balance : 45000
Your Transaction
1. Withdraw in-self
2. Deposit in-self
3. Deposit to Others
4. password change

Enter your choice : 1
Enter Withdrawal Amount : 30000
20000 is a limit at one go
Now your balance is 28000
Your Transaction
1. Withdraw
2. Deposit
3. Deposit to Others
4. password change

Enter your choice : 1
Enter Withdrawal Amount : 7000
Transaction Successfull
Now your balance is 38000
Your Transaction
1. Withdraw
2. Deposit
3. Deposit to Others
4. password change .

Enter your choice : 3
Enter amount to be deposited to Others account : 10000
Enter account no of your beneficiary : 12323434

35. Create a phone book to store name and contact no. Allow user to add, delete, update, and insert details. Design proper interface for the same. [use pickle library for the implementation]

36. Using Pickle library, write an object oriented program to perform CRUD operations on products object. Create a class which encapsulates Product information such as productId, productName and productPrice. Store its object collection using dictionary to a file making use of Pickle library.

37. Write a python program mathfinder.py which finds sum, average, maximum, minimum value entered through command line arguments.

38. Write a python program which invokes C function which does summation of all the values stored in 4X4 matrix.