Practical No 6

Aim: Write a program to create Python modules and use standard library modules such as math, random, and datetime.

Theory:

Creating and importing a module:

A module is simply a Python file with a .py extension that can be imported inside another Python program. The name of the Python file becomes the module name. The module contains definitions and implementation of classes, variables, and functions that can be used inside another program.

Example of creating and importing a Python module.

Step 1: Create a module file → calculator.py

```
def add(x, y):
    return x + y

def subtract(x, y):
    return x - y

def multiply(x, y):
    return x * y

def divide(x, y):
    return x / y
```

Step 2: Import and Use in Another File → main.py

```
import calculator

print("Addition:", calculator.add(5, 10))
print("Subtraction:", calculator.subtract(5, 10))
print("Multiplication:", calculator.multiply(5, 10))
print("Division:", calculator.divide(10, 2))
```

Different Ways of Import

(a) Import with alias

```
import calculator as calc

print("Addition:", calc.add(5, 10))
print("Subtraction:", calc.subtract(5, 10))
print("Multiplication:", calc.multiply(5, 10))
print("Division:", calc.divide(10, 2))
```

(b) Import specific functions

```
from calculator import multiply, divide

print("Multiplication:", multiply(5, 10))
print("Division:", divide(10, 2))
```

(c) Import all functions

```
from calculator import *

print(add(2, 8))
print(subtract(9, 1))
print(divide(50, 5))
```

Python's standard library modules: math, random, and datetime.

math **Module**

The **math module** provides mathematical functions to perform advanced calculations.
It includes functions for **square root, trigonometry, logarithms, constants** like π and e, etc.

Common Functions in math

1. **Square root**

```
import math
print("Square root of 36:", math.sqrt(36))
```

2. **Power and Exponent**

```
print("2 raised to 5:", math.pow(2, 5))   # 2^5
print("Exponential of 2:", math.exp(2))  # e^2
```

3. **Trigonometric Functions**

```
print("sin(0):", math.sin(0))
print("cos(0):", math.cos(0))
```

4. **Constants**

```
print("Value of pi:", math.pi)
print("Value of e:", math.e)
```

random **Module**

The **random module** is used to **generate random numbers** and make **random selections**.
It is commonly used in **games, simulations, data sampling, and testing**.

- **random.random()** → random float between 0 and 1

- **random.randint(a, b)** → random integer in range
- **random.randrange(start, stop, step)** → random number with step
- **random.choice(list)** → pick one random element
- **random.sample(list, k)** → pick multiple elements
- **random.shuffle(list)** → shuffle items in place
- **random.uniform(a, b)** → random float in range

Common Functions in random

Generate a Random Float (0 to 1)

```
import random
print("Random float between 0 and 1:", random.random())
```

Generate a Random Integer

```
print("Random integer between 1 and 10:", random.randint(1, 10))
```

Generate a Random Number in Steps

```
print("Random even number between 2 and 20:", random.randrange(2, 21, 2))
```

Random Choice from a List

```
fruits = ["Apple", "Banana", "Cherry", "Mango"]
print("Random choice:", random.choice(fruits))
```

Random Sample (Multiple Choices)

```
print("Random sample of 2 fruits:", random.sample(fruits, 2))
```

Shuffle a List

```
numbers = [1, 2, 3, 4, 5]
random.shuffle(numbers)
print("Shuffled list:", numbers)
```

Random Float in a Range

```
print("Random float between 1 and 10:", random.uniform(1, 10))
```

datetime **Module in Python**

The **datetime module** is used to **work with dates and times**.

1. Get Current Date and Time

```
import datetime

now = datetime.datetime.now()
print("Current date and time:", now)
```

2. Get Only Date or Time

```
print("Today's date:", now.date())

print("Current time:", now.time())
```

3. Extract Components

```
print("Year:", now.year)

print("Month:", now.month)

print("Day:", now.day)

print("Hour:", now.hour)

print("Minute:", now.minute)
```

Problem Statements

Creating and Importing a Module

1. Create a module geometry.py that has functions to calculate:

- Area of a circle
- Perimeter of a rectangle
- Volume of a cube

Import the module in another program and perform calculations using user input.

PROGRAM:

```
def circlearea(r):
    return 3.14*r*r

def perirec(l,b):
```

```
    return 2*(l+b)

def cubevol(s):
    return s*s*s
```

```
import geometry
r=float(input("Enter radius of circle to find area:"))
print(f"Area of circle:",geometry.circlearea(r))

l=float(input("Enter length of rectangle :"))
b=float(input("Enter breadth of rectangle:"))
print(f"Perimeter of Rectangle:",geometry.perirec(l,b))

s=float(input("Enter side of cube:"))
print(f"volume of Cube:",geometry.cubevol(s))
```

OUTPUT:

```
========== RESTART: C:/Use
Enter radius of circle to find area:6
Area of circle: 113.03999999999999
Enter length of rectangle :8
Enter breadth of rectangle:5
Perimeter of Rectangle: 26.0
Enter side of cube:4
volume of Cube: 64.0
```

2. Create a module **marks.py** that has functions to:

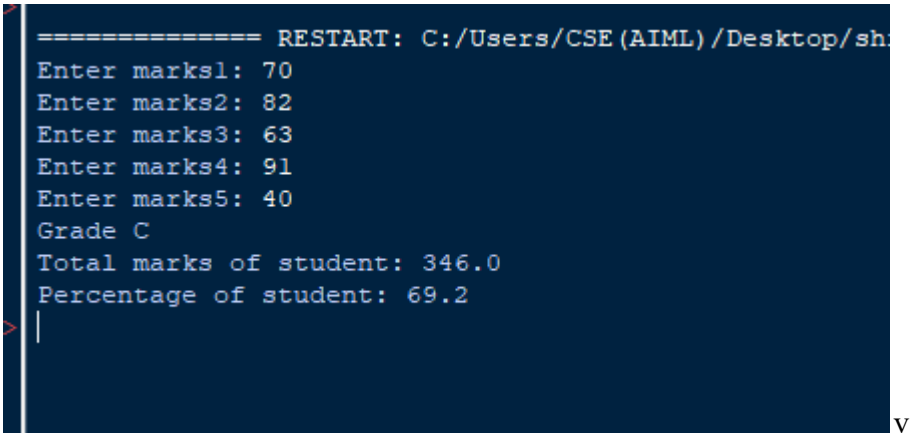
- Calculate total marks of a student
- Calculate percentage
- Determine grade based on percentage
  Import the module in another program and evaluate results for user-entered marks.

PROGRAM:

```
marks.py
def totalmarks(m1, m2, m3, m4, m5):
   return m1+m2+m3+m4+m5
```

```
def percentage(m1, m2, m3, m4, m5):
    return (m1+m2+m3+m4+m5)/5

def grade(perce):
    if perce >= 90:
        print("Grade A")
    elif 75 < perce < 90:
        print("Grade B")
    elif 50 < perce < 75:
        print("Grade C")
    else:
        print("Fail")

import marks

m1 = float(input("Enter marks1: "))
m2 = float(input("Enter marks2: "))
m3 = float(input("Enter marks3: "))
m4 = float(input("Enter marks4: "))
m5 = float(input("Enter marks5: "))

total = marks.totalmarks(m1, m2, m3, m4, m5)
perce = marks.percentage(m1, m2, m3, m4, m5)
grade = marks.grade(perce)

print(f"Total marks of student: {total}")
print(f"Percentage of student: {perce}")
```

OUTPUT:



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3. Create a module **banking.py** that has functions to:

- Deposit money
- Withdraw money (handle insufficient balance)

- Show current balance
  Import the module in another program and perform banking operations using user input

- PROGRAM:

module : banking.py

```
def depositmoney(balance,enteredamount):
    if enteredamount<1000:
        print(f"amount should atleast be above 1000")
    else:
        balance = balance + enteredamount
        print("Amount deposited successfully!")
    return balance

def withdrawMoney(balance, amount):
    if amount > balance:
        print(f",can't Withdraw , Insufficient balance")
    else:
        balance = balance - amount
        print(f"Remaining balance :",balance)
    return balance

def display(balance):
    print(f"Current balance",balance)

mian code:

import banking
balance=0
enteredamount = float(input("ENTER AMOUNT TO DEPOSIT: "))
balance = banking.depositmoney(balance, enteredamount)

amount = float(input("ENTER AMOUNT TO WITHDRAW: "))
balance = banking.withdrawMoney(balance, amount)
print(f"DISPLAYING:",banking.display(balance))
```

OUTPUT:

```
==================================================
ENTER AMOUNT TO DEPOSIT: 1500
Amount deposited successfully!
ENTER AMOUNT TO WITHDRAW: 500
Remaining balance : 1000.0
DISPLAYING:
Current balance 1000.0

==================================================
ENTER AMOUNT TO DEPOSIT: 2000
Amount deposited successfully!
ENTER AMOUNT TO WITHDRAW: 5000
,can't Withdraw , Insufficient balance
DISPLAYING:
Current balance 2000.0
```

Math Module

4. Write a program that:

- Accepts a number from the user
- Prints its **square root**
- Prints its **factorial**

PROGRAM:

```
import math

num1 = int(input("enter number to find square root "))

print("square root : ",math.sqrt(num1))

num2 = int(input("enter number to find factorial"))

print("Factorial : ",math.factorial(num2))
```

OUTPUT:

```
==========
enter number to find square root 4
square root :  2.0
enter number to find factorial5
Factorial :  120
```

5. Write a program to:

- Calculate 2 raised to 5
- Calculate e^3

PROGRAM:

```
import math

print("2 raised to 5 : ",math.pow(2,5))

print(" exponential of 3 (e^3):",math.exp(3))
```

OUTPUT:

```
========== RESTAR
2 raised to 5 :  32.0
 exponential of 3 (e^3): 20.085536923187668
```

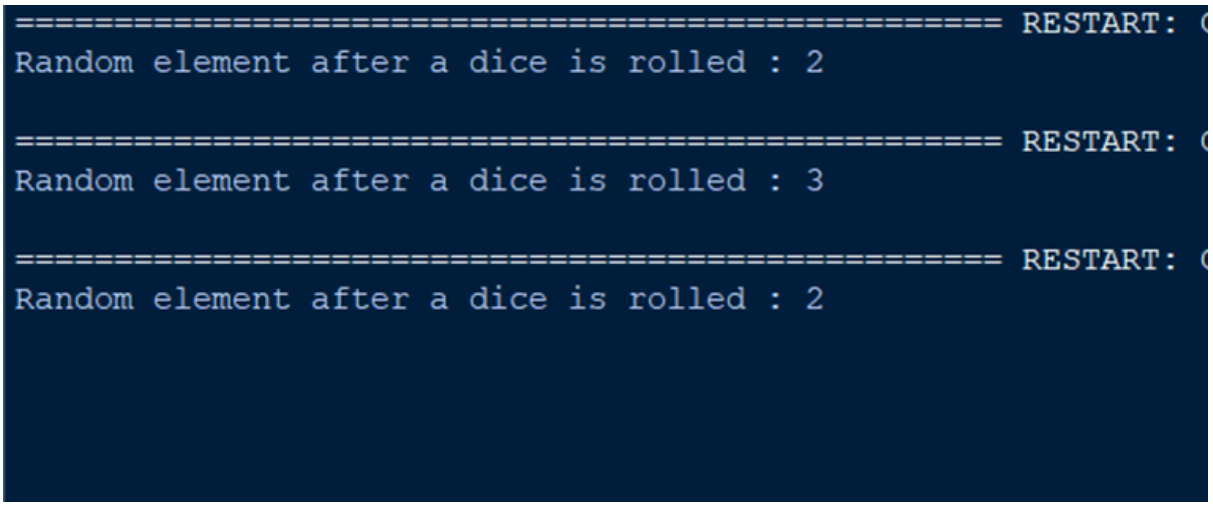
Random Module

6. Write a program that simulates rolling a **dice** (random integer between 1 and 6).

PROGRAM:

```
import random

print("Random element after a dice is rolled :", random.randint(1,6))
```

OUTPUT:



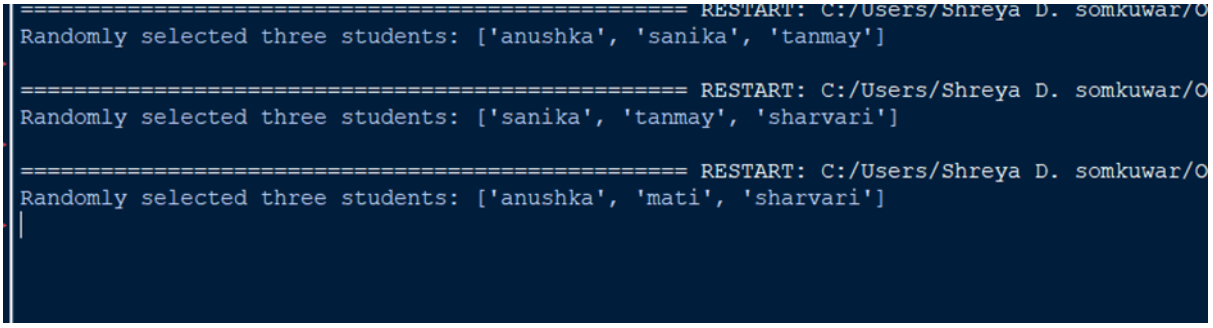
7. Write a program that:

- Creates a list of 10 student names
- Randomly selects 3 names using random.sample()

PROGRAM:

```
import random

names = ["shreya","vibhuti","sharvari","sanika","tanmay","anushka","mati"]

print("Randomly selected three students:", random.sample(names,3))
```

OUTPUT:



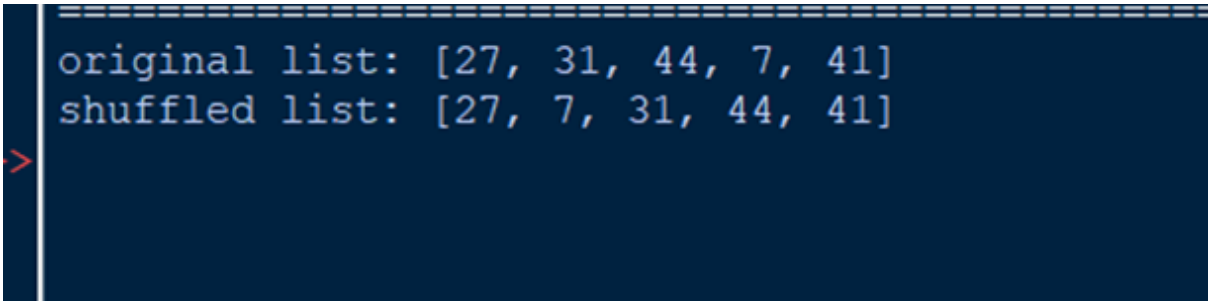
8. Write a program to:

- Generate 5 random numbers between 1 and 50
- Shuffle them using random.shuffle()

PROGRAM:

```
import random

nums= [random.randint(1,50) for _ in range(5)]

print("original list:", nums)

random.shuffle(nums)

print("shuffled list:",nums)
```

OUTPUT:

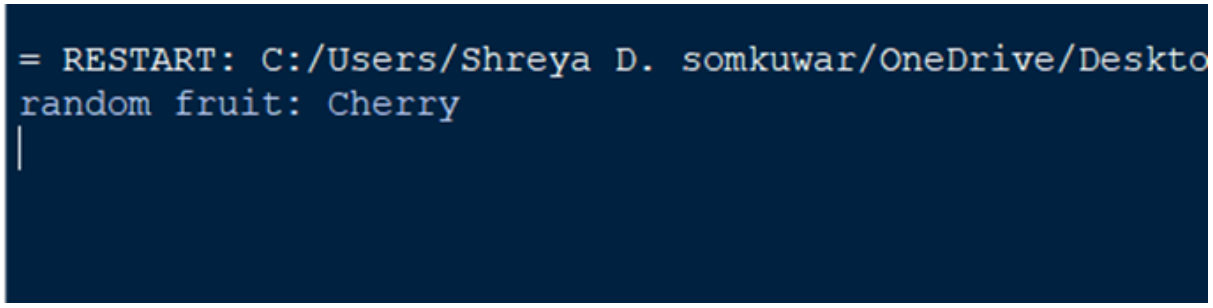


9. Write a program to select a **random fruit** from a list ["Apple", "Banana", "Cherry", "Mango"].

PROGRAM:

```
import random

list = ["Apple", "Banana", "Cherry", "Mango"]

print("random fruit:",random.choice(list))
```

OUTPUT:



10. Write a program to generate a **random floating-point number** between 10 and 100.

PROGRAM:

```
import random

print("random floating-point number between 10 and 100:",random.uniform(10,100))
```

OUTPUT: