Project Report on

Programming in Python

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Project-1

1. Write a program using python showing implementation of any arithmetic and quadratic operation.

Ans:- This program performs basic arithmetic operations like addition, subtraction, multiplication, division and also solves quadratic equations using the quadratic formula.

```
import math

# Perform selected Arithmetic Operation
def arithmetic_operations(a, b,
operation):     print("\nArithmetic
Operation:")     if operation == '1':
        print(f"Addition: {a} + {b} = { a +
      }")     elif operation == '2':     b
        print(f"Subtraction: {a} - {b}       a -   = {
      }")     elif operation == '3':         b
        print(f"Multiplication: {a} * {b} =       a *
{     }")     elif operation == '4':         if b    b
!= 0:
            print(f"Division: {a} / {b} = { a /        }")
else:             print("Division:          b Undefined
(division by zero)")     else:
print("Invalid operation choice!")

# Quadratic Equation Solver
# Equation format: ax^2 + bx + c = 0 def
solve_quadratic(a, b, c):
print("\nSolving Quadratic Equation:")
print(f"Equation: {a}x² + {b}x + {c} = 0")
discriminant = b**2 - 4*a*c

    if discriminant > 0:
        root1 = (-b + math.sqrt(discriminant)) / (2*a)
root2 = (-b - math.sqrt(discriminant)) / (2*a)
        print(f"Two real roots: { root1:.2f} and {root2:.2f
      }")     elif discriminant                          ==
0:         root = -b / (2*a)
        print(f"One real root: { root:.2f
      }")     else:
real_part = -b / (2*a)
        imag_part = math.sqrt(-discriminant) / (2*a)
        print(f"Two complex roots: { real_part:.2f} + {imag_part:.2f}i and
  real_part:.2f} - {imag_part:.2f{                                    }i")

# Main Code

# Arithmetic operation input
print("Arithmetic Operations Menu:")
print("1. Addition") print("2.
Subtraction") print("3.
Multiplication") print("4.
Division")
choice = input("Choose an operation (1-4): ")

a1 = float(input("Enter first number (a): "))
b1 = float(input("Enter second number (b): "))
```

```
arithmetic_operations(a1, b1, choice)
```

```
# Quadratic equation input
print("\nEnter coefficients for quadratic equation ax² + bx + c = 0:") a2 =
float(input("Enter coefficient a: ")) b2 = float(input("Enter coefficient b:
")) c2 = float(input("Enter coefficient c: ")) solve_quadratic(a2, b2, c2)
```

Output:-

```
Arithmetic Operations Menu:
1. Addition
2. Subtraction
3. Multiplication
4. Division
Choose an operation (1-4):
1
Enter first number (a):
12
Enter second number (b):
15

Arithmetic Operation:
Addition: 12.0 + 15.0 = 27.0

Enter coefficients for quadratic equation ax² + bx + c = 0:
Enter coefficient a:
1
Enter coefficient b:
6
Enter coefficient c:
5

Solving Quadratic Equation:
Equation: 1.0x² + 6.0x + 5.0 = 0
Two real roots: -1.00 and -5.00


** Process exited - Return Code: 0 **
Press Enter to exit terminal
```

Project-2

2.Write a Python program showing implementation of linear equation.

Ans:- Solves a system of two linear equations with two variables using **NumPy**. The program uses matrix representation and applies **numpy.linalg.solve** to find the values of x and y that satisfy both equations.

```
import numpy as np

# Linear Equations in Two Variables
# Equations: a1x + b1y = c1 and a2x + b2y = c2 def
solve_two_variable_linear(a1, b1, c1, a2, b2, c2):
print("\nSolving Linear                    Equations
(Two Variables):")       {a1}x +  {b1}y =  {c1
   print(f"Equation 1:   {a2}x +  {b2}y =  {c2  }")
print(f"Equation 2:                        }")

   # Matrix representation: AX = B
A = np.array([[a1, b1], [a2, b2]])     B
= np.array([c1, c2])

   # Check if determinant is non-zero
det = np.linalg.det(A)

   if det != 0:
      solution = np.linalg.solve(A, B)
      x, y = solution
      print(f"Solution: x = {    x:.2f}, y = {  y:.2f          }")
else:       print("No unique                    solution
(Determinant is zero)")

# Main Program
print("Enter coefficients for the system of equations:") print("Equation
format: a1x + b1y = c1 and a2x + b2y = c2")

# User input a1 =
float(input("Enter a1: ")) b1 =
float(input("Enter b1: ")) c1 =
float(input("Enter c1: "))

a2 = float(input("Enter a2: "))
b2 = float(input("Enter b2: "))
c2 = float(input("Enter c2: "))

# Solve the system
solve_two_variable_linear(a1, b1, c1, a2, b2, c2)
```

Output:-

```
Enter coefficients for the system of equations:
Equation format: a1x + b1y = c1 and a2x + b2y = c2
Enter a1:
4
Enter b1:
2
Enter c1:
1
Enter a2:
3
Enter b2:
2
Enter c2:
1

Solving Linear Equations (Two Variables):
Equation 1: 4.0x + 2.0y = 1.0
Equation 2: 3.0x + 2.0y = 1.0
Solution: x = 0.00, y = 0.50


** Process exited - Return Code: 0 **
Press Enter to exit terminal
```

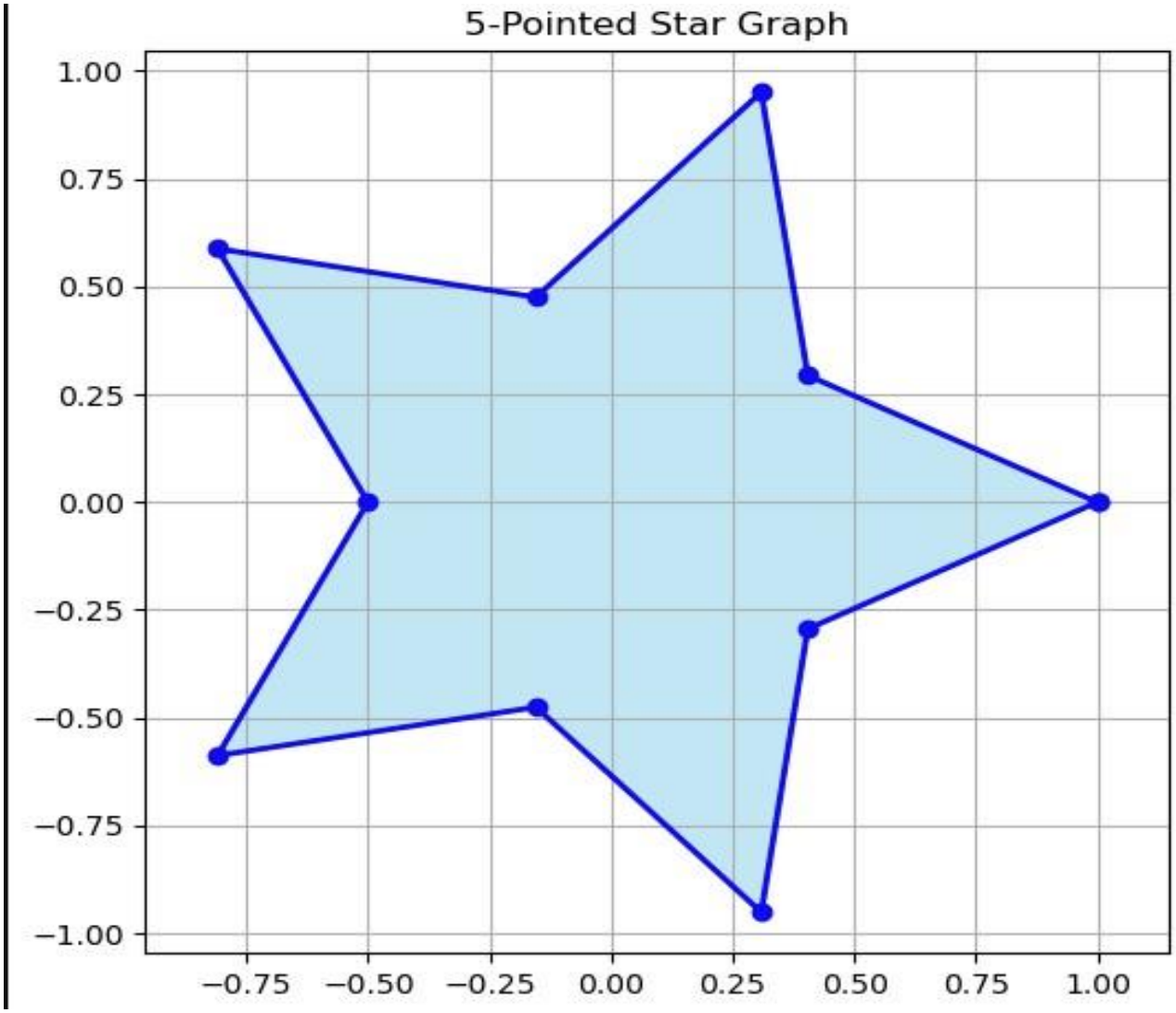
Project-3

3. Write a python program using any mathematical function or equation to give graphical representation like star graph.

Ans:- This Python script uses **matplotlib** to generate a star-shaped polar graph. It demonstrates the use of mathematical equations for plotting complex visual patterns. Ideal for learning how to represent equations graphically.

```
import matplotlib.pyplot as plt
import numpy as np

def draw_star(n_points=5, inner_radius=0.5, outer_radius=1):
    """
    Draw a star with n_points using polar
coordinates.    inner_radius: radius of inner vertices
outer_radius: radius of outer vertices
    """

    print(f"Drawing a }-{n_points pointed star...")

    angles = np.linspace(0, 2 * np.pi, num=2 * n_points, endpoint=False)
radii = np.empty(2 * n_points)

    # Alternate between outer and inner radius
    radii[::2] = outer_radius
radii[1::2] = inner_radius

    # Convert polar to Cartesian
coordinates    x = radii * np.cos(angles)
y = radii * np.sin(angles)

    # Close the star shape by repeating the first
point    x = np.append(x, x[0])    y = np.append(y,
y[0])

    # Plotting
    plt.figure(figsize=(6, 6))
    plt.plot(x, y, marker='o', color='blue', linestyle='-', linewidth=2)
plt.fill(x, y,                color='skyblue', alpha=0.5)
    plt.title(f" {n_points          }-Pointed Star
Graph")    plt.axis('equal')    plt.grid(True)
plt.show() # Run star shapes
draw_star(n_points=5)  # 5-point star
```

Output:-



Project-4 4. Write a

python program showing the implementation of a function.

Ans:- This Python program demonstrates the use of simple functions to perform basic tasks: addition, squaring a number, and checking if a number is even or odd.

```
# Function to add two
numbers def add(a, b):
return a + b

# Function to find the square of a
number def square(n):    return n * n

# Function to check if a number is even or
odd def is_even(n):    return n % 2 == 0

# Main Program print("Function
Implementation Example:\n")

# Using add function with user input x =
int(input("Enter first number for addition: ")) y =
int(input("Enter second number for addition: "))
print(f"Addition of {x} and {y} is: {add(x, y)}\n")

# Using square function with user input
num = int(input("Enter a number to find its square: "))
print(f"Square of {num} is: {square(num)}\n")

# Using is_even function with user input check_num =
int(input("Enter a number to check even or odd: ")) if
is_even(check_num):    print(f"{check_num} is Even") else:
   print(f"{check_num} is Odd")
```

Output:-

```
Function Implementation Example:

Enter first number for addition:
10
Enter second number for addition:
2
Addition of 10 and 2 is: 12

Enter a number to find its square:
4
Square of 4 is: 16

Enter a number to check even or odd:
3
3 is Odd


** Process exited - Return Code: 0 **
Press Enter to exit terminal
```

Project-5

5.Write a python program using tinker make any formatted application according to our ideas (Tetris,Snake,Card-block).

Ans:- A classic Snake game made using `Tkinter`. The snake moves with arrow keys, grows on eating food, and the game ends if the snake hits the wall or itself. Real-time movement, score tracking, and collision detection are implemented.

```
import tkinter as tk
import random

# Constants
GAME_WIDTH = 600
GAME_HEIGHT = 400
SNAKE_ITEM_SIZE = 20
INITIAL_SPEED = 100  # milliseconds
FOOD_COLOR = "red"
SNAKE_COLOR = "green"

DIRECTIONS = {
   "Up": (0, -1),
   "Down": (0, 1),
   "Left": (-1, 0),
   "Right": (1, 0)
}

class SnakeGame:    def
__init__(self, root):
self.root = root
      self.root.title(" Snake Game - Enhanced Version")
      self.canvas = tk.Canvas(root, width=GAME_WIDTH, height=GAME_HEIGHT, bg="black")
      self.canvas.pack()

      self.reset_game()
      self.root.bind("<Key>", self.change_direction)
self.update()

   def reset_game(self):       self.snake = [(100,
100), (80, 100), (60, 100)]       self.direction =
"Right"       self.running = True       self.paused =
False       self.score = 0       self.speed =
INITIAL_SPEED

      self.canvas.delete("all")       self.score_text = self.canvas.create_text(50, 10, fill="white",
            font="Arial 14", text=f"Score:
  self.score {}")
      self.draw_snake()
self.create_food()    def
draw_snake(self):
```

```
        self.canvas.delete("snake")
for x, y in self.snake:
            self.canvas.create_rectangle(x, y, x + SNAKE_ITEM_SIZE, y + SNAKE_ITEM_SIZE,
fill=SNAKE_COLOR, tags="snake")

    def create_food(self):
self.canvas.delete("food")
x          =    random.randint(0,    (GAME_WIDTH    -    SNAKE_ITEM_SIZE)    //    SNAKE_ITEM_SIZE)    *
SNAKE_ITEM_SIZE
y          = random.randint(0, (GAME_HEIGHT - SNAKE_ITEM_SIZE) // SNAKE_ITEM_SIZE) *
SNAKE_ITEM_SIZE
        self.food = (x, y)
        self.canvas.create_oval(x, y, x + SNAKE_ITEM_SIZE, y + SNAKE_ITEM_SIZE,
fill=FOOD_COLOR, tags="food")

    def change_direction(self, event):
key = event.keysym          if key ==
"p":
            self.paused = not self.paused
elif key == "r":
            self.reset_game()          elif key in DIRECTIONS:              opposite = {"Up":
"Down", "Down": "Up", "Left": "Right", "Right": "Left"}              if key !=
opposite.get(self.direction):                  self.direction = key

    def move_snake(self):          dx, dy = DIRECTIONS[self.direction]          head_x, head_y =
self.snake[0]          new_head = (head_x + dx * SNAKE_ITEM_SIZE, head_y + dy *
SNAKE_ITEM_SIZE)

        # Collision Check
        if (new_head in self.snake or              not 0 <=
new_head[0] < GAME_WIDTH or              not 0 <=
new_head[1] < GAME_HEIGHT):              self.running
= False
            self.canvas.create_text(GAME_WIDTH // 2, GAME_HEIGHT // 2, fill="white",
font="Arial 24 bold", text="Game Over!\nPress 'R' to Restart")              return
self.snake.insert(0, new_head)

        if new_head == self.food:
            self.score += 1
            self.speed = max(50, INITIAL_SPEED - (self.score * 2))
self.canvas.itemconfig(self.score_text, text=f"Score:                {self.score
            }")              self.create_food()          else:              self.snake.pop()
self.draw_snake()
```

```
   def update(self):        if self.running
and not self.paused:
self.move_snake()
      self.root.after(self.speed, self.update)


# ------------ Run the Game ------------if
__name__ == "__main__":    root =
tk.Tk()
   game = SnakeGame(root)
root.mainloop()
```

Output:-