PYTHON LABOTORY

PROJECT REPORT

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Table of Contents

1. Introduction

This Python project covers a range of basic to intermediate programming tasks such as math operations, equation solving, visualization, and game development using Tkinter.

2. Arithmetic and Quadratic Operations

Code:

```
import cmath


def arithmetic_operations(a, b):
    print("Addition:", a + b)
    print("Subtraction:", a - b)
    print("Multiplication:", a * b)
    print("Division:", a / b if b != 0 else "Division by zero error")


def solve_quadratic(a, b, c):
    d = (b ** 2) - (4 * a * c)
    root1 = (-b - cmath.sqrt(d)) / (2 * a)
    root2 = (-b + cmath.sqrt(d)) / (2 * a)
    print(f"Roots: {root1} and {root2}")


# Example usage
arithmetic_operations(10, 5)
solve_quadratic(1, -3, 2)
```

Output:

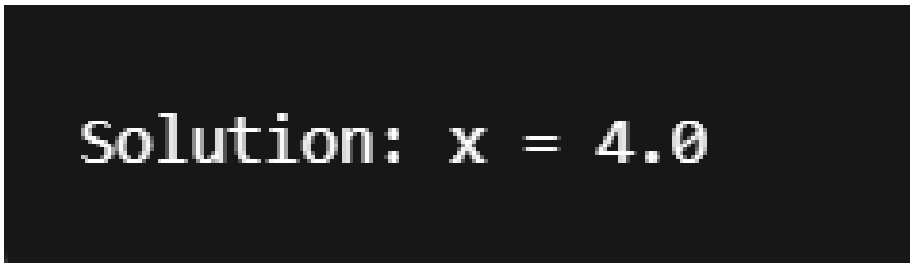
```
Addition: 15
Subtraction: 5
Multiplication: 50
Division: 2.0
Roots: (1+0j) and (2+0j)
```

3. Linear Equation Solver

Code:

```
def solve_linear(a, b):
    if a == 0:
        print("No solution" if b != 0 else "Infinite solutions")
    else:
        x = -b / a
        print(f"Solution: x = {x}")


# Example
solve_linear(2, -8)
```

Output :

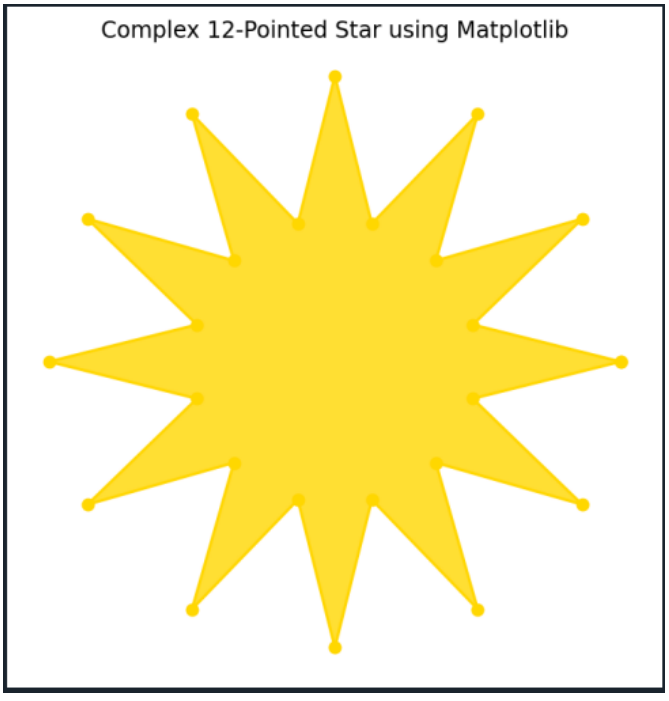


4. Graphical Representations

Code :

```
import matplotlib.pyplot as plt

import numpy as np

# Function to create a complex star

def complex_star(num_points=12, outer_radius=5, inner_radius=2.5):

    angles = np.linspace(0, 2 * np.pi, num_points * 2 + 1)  # +1 to close the star

    radius = np.array([outer_radius if i % 2 == 0 else inner_radius for i in
range(len(angles))])

    x = radius * np.cos(angles)

    y = radius * np.sin(angles)

    return x, y

# Generate coordinates for a 12-pointed complex star

x, y = complex_star()
```

Output :



5. Function Implementation (Factorial)

Code :

```
def factorial(n):
    if n == 0 or n == 1:
        return 1
    return n * factorial(n - 1)


print("Factorial of 5:", factorial(5))
```

Output :

7. "Color Catcher" – A Reflex and Memory Game using Tkinter

Code :

```
import tkinter as tk
import random

# --- Game Variables ---
colors = ['red', 'blue', 'green', 'yellow', 'purple']
score = 0
time_left = 60
target_color = random.choice(colors)
ball_speed = 5
ball_interval = 1500  # milliseconds

# --- Create Main Window ---
root = tk.Tk()
root.title("Color Catcher")
root.geometry("400x600")
root.resizable(False, False)

canvas = tk.Canvas(root, width=400, height=600, bg='white')
canvas.pack()

# --- Basket ---
basket = canvas.create_rectangle(170, 550, 230, 570, fill='black')

# --- Score & Time ---
score_text = canvas.create_text(10, 10, anchor='nw', font=('Arial', 14), text="Score: 0")
time_text = canvas.create_text(300, 10, anchor='nw', font=('Arial', 14), text="Time: 60")
target_text = canvas.create_text(10, 35, anchor='nw', font=('Arial', 14), text=f"Catch: {target_color}", fill=target_color)
```

```
# --- Ball List ---
balls = []

# --- Controls ---
def move_left(event):
    canvas.move(basket, -20, 0)

def move_right(event):
    canvas.move(basket, 20, 0)

root.bind("<Left>", move_left)
root.bind("<Right>", move_right)

# --- Update Score Display ---
def update_score():
    canvas.itemconfig(score_text, text=f"Score: {score}")

# --- Drop Balls ---
def drop_ball():
    color = random.choice(colors)
    x = random.randint(10, 370)
    ball = canvas.create_oval(x, 0, x + 30, 30, fill=color, outline=color)
    balls.append((ball, color))
    root.after(ball_interval, drop_ball)

# --- Move Balls ---
def move_balls():
    global score
    to_remove = []
    for ball, color in balls:
```

```
        canvas.move(ball, 0, ball_speed)
        pos = canvas.coords(ball)
        if pos[3] >= 550 and pos[2] >= canvas.coords(basket)[0] and pos[0] <= canvas.coords(basket)[2]:
            # Collision detected
            if color == target_color:
                score += 10
            else:
                score -= 5
            canvas.delete(ball)
            to_remove.append((ball, color))
            update_score()
        elif pos[3] >= 600:
            canvas.delete(ball)
            to_remove.append((ball, color))
    for b in to_remove:
        balls.remove(b)
    root.after(50, move_balls)

# --- Update Target Color ---
def change_target_color():
    global target_color
    target_color = random.choice(colors)
    canvas.itemconfig(target_text, text=f"Catch: {target_color}", fill=target_color)
    root.after(10000, change_target_color)

# --- Countdown Timer ---
def countdown():
    global time_left
    time_left -= 1
    canvas.itemconfig(time_text, text=f"Time: {time_left}")
    if time_left > 0:
```

```
        root.after(1000, countdown)
    else:
        canvas.create_text(200, 300, text="Game Over!", font=('Arial', 24), fill='red')
        canvas.create_text(200, 340, text=f"Final Score: {score}", font=('Arial', 18))

# --- Start Game ---
drop_ball()
move_balls()
change_target_color()
countdown()
root.mainloop()
```

OUTPUT :