

Experiment No. 2 - Calculating Areas of Geometric Figures

Aim: Write a python program to calculate areas of geometric figures circle, rectangle and triangle.

Theory:

Calculating the areas of geometric figures using Python, it's essential to understand both the mathematical theory behind these calculations and how Python can be utilized to automate and facilitate these tasks.

1. **Circle:** The area of a circle can be calculated using the formula:

$$\text{Area}=\pi\times r^2$$

Where:

- r is the radius of the circle.
- π (Pi) is approximately 3.14159.

The area represents the total space enclosed within the circumference of the circle.

2. **Rectangle:** The area of a rectangle is found by multiplying its length and width:

$$\text{Area}=\text{length} \times \text{width}$$

Where:

- Length is the longer side of the rectangle.
- Width is the shorter side of the rectangle.

The area of a rectangle gives the total surface inside the rectangle.

3. **Triangle:** The area of a triangle can be calculated using the formula:

$$\text{Area}=1/2\times\text{base}\times\text{height}$$

Where:

- Base is the length of the bottom edge of the triangle.
- Height is the perpendicular distance from the base to the top vertex.

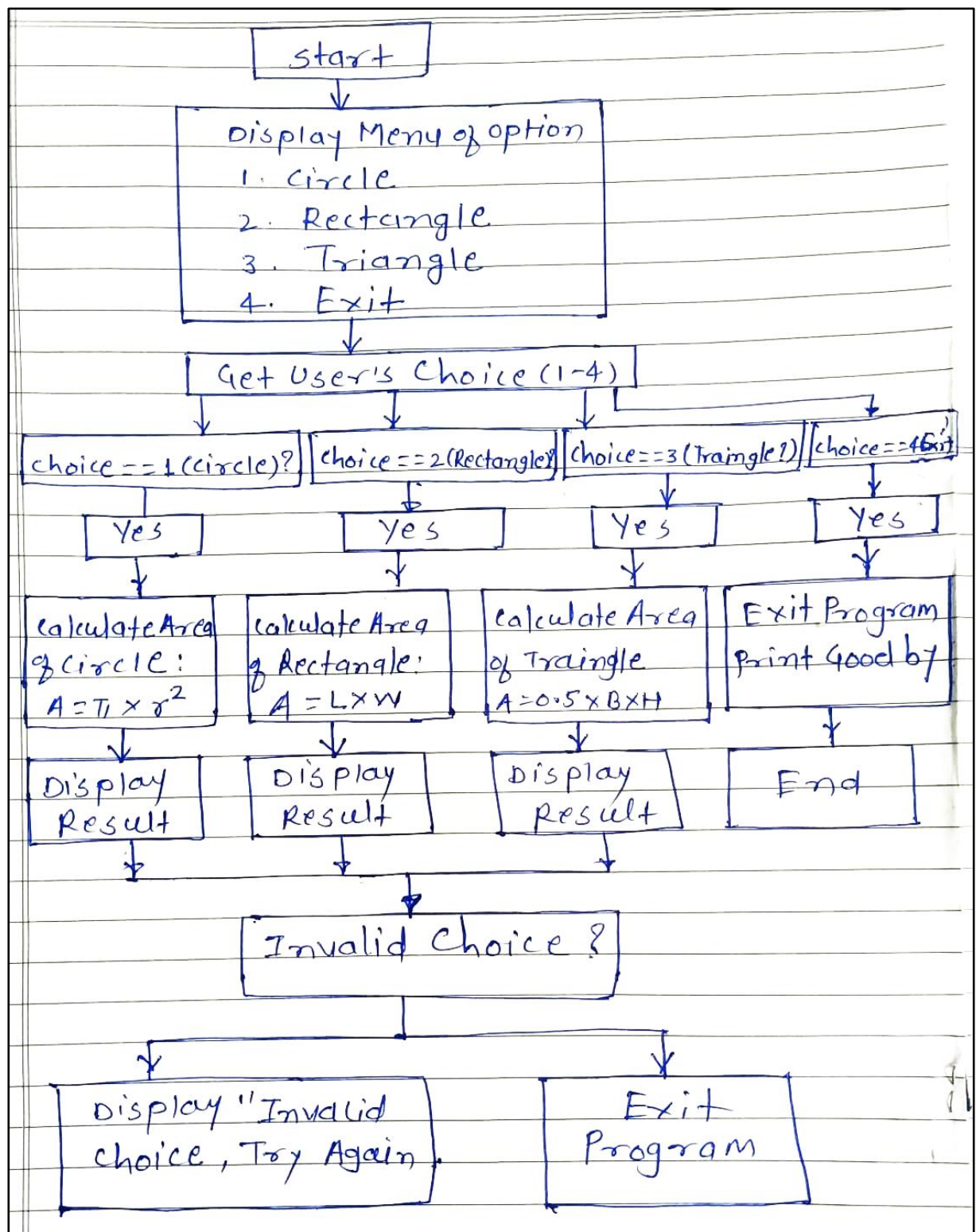
The area of a triangle represents the space enclosed by the three sides of the triangle.

The significance of calculating areas using Python lies in the automation, accuracy, and versatility it offers. Beyond simple manual calculations, Python opens the door to dynamic, real-time, and large-scale solutions for various fields, from education to professional applications.

Algorithm for the Program:

1. **Start the program.**
2. **Define the function calculate_circle_area:**
 - Prompt the user to enter the radius of the circle.
 - Calculate the area of the circle using the formula: $\text{Area} = \pi \times r^2$
 - Print the calculated area of the circle.
3. **Define the function calculate_rectangle_area:**
 - Prompt the user to enter the length and width of the rectangle.
 - Calculate the area of the rectangle using the formula: $\text{Area} = \text{length} \times \text{width}$
 - Print the calculated area of the rectangle.
4. **Define the function calculate_triangle_area:**
 - Prompt the user to enter the base and height of the triangle.
 - Calculate the area of the triangle using the formula: $\text{Area} = 1/2 \times \text{base} \times \text{height}$
 - Print the calculated area of the triangle.
5. **Main function (main) to manage user interaction:**
 - Start an infinite loop that continuously presents the user with options to calculate the area.
 - Display the following choices:
 - Option 1: Circle
 - Option 2: Rectangle
 - Option 3: Triangle
 - Option 4: Exit
 - Get user input for their choice (1-4).
6. **Process the user's choice:**
 - If the choice is '1':
 - Call the calculate_circle_area() function.
 - If the choice is '2':
 - Call the calculate_rectangle_area() function.
 - If the choice is '3':
 - Call the calculate_triangle_area() function.
 - If the choice is '4':
 - Print "Exiting the program. Goodbye!".
 - Break the loop and end the program.
 - If the choice is invalid (not 1, 2, 3, or 4):
 - Print an error message: "Invalid choice. Please try again."
7. **End the program.**

Flowchart:



Program:

```
import math

# Function to calculate the area of a circle
def calculate_circle_area():
    radius = float(input("Enter the radius of the circle: "))
    area = math.pi * radius ** 2
    print(f"The area of the circle is: {area:.2f}")

# Function to calculate the area of a rectangle
def calculate_rectangle_area():
    length = float(input("Enter the length of the rectangle: "))
    width = float(input("Enter the width of the rectangle: "))
    area = length * width
    print(f"The area of the rectangle is: {area:.2f}")

# Function to calculate the area of a triangle
def calculate_triangle_area():
    base = float(input("Enter the base of the triangle: "))
    height = float(input("Enter the height of the triangle: "))
    area = 0.5 * base * height
    print(f"The area of the triangle is: {area:.2f}")

# Main function to drive the program
def main():
    while True:
        print("\nChoose a geometric figure to calculate its area:")
        print("1. Circle")
        print("2. Rectangle")
        print("3. Triangle")
        print("4. Exit")

        choice = input("Enter your choice (1-4): ")

        if choice == '1':
            calculate_circle_area()
        elif choice == '2':
            calculate_rectangle_area()
        elif choice == '3':
            calculate_triangle_area()
        elif choice == '4':
            print("Exiting the program. Goodbye!")
            break
        else:
            print("Invalid choice. Please try again.")

# Run the main function
if __name__ == "__main__":
    main()
```

Output:

Choose a geometric figure to calculate its area:

1. Circle
2. Rectangle
3. Triangle
4. Exit

Enter your choice (1-4): 1

Enter the radius of the circle: 20

The area of the circle is: 1256.64

Choose a geometric figure to calculate its area:

1. Circle
2. Rectangle
3. Triangle
4. Exit

Enter your choice (1-4): 2

Enter the length of the rectangle: 15

Enter the width of the rectangle: 20

The area of the rectangle is: 300.00

Choose a geometric figure to calculate its area:

1. Circle
2. Rectangle
3. Triangle
4. Exit

Enter your choice (1-4): 3

Enter the base of the triangle: 50

Enter the height of the triangle: 60

The area of the triangle is: 1500.00

Choose a geometric figure to calculate its area:

1. Circle
2. Rectangle
3. Triangle
4. Exit

Enter your choice (1-4): 4

Exiting the program. Goodbye!