COMSATS University Islamabad

LAB ASSIGNMENT # 04

Submitted To:

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Program:

BDS-1A

Subject:

AICT

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Question no 1:

Write a calculator function that takes two numbers and a string specifying the operation and returns the result. It should be able to do addition, subtraction, multiplication, and division.

Algorithm :

1. Take inputs as number 1, number2 and operator.
2. If operator is **"+",** return number1 + number2.
3. If **"-",** return subtraction.
4. If **"*",** return multiplication.
5. If operator is **"/",** check division by zero.
6. Return result.

Python code :

```
def calculator(a, b, operation):
    if operation == "add":
        return a + b
    elif operation == "subtract":
        return a - b
    elif operation == "multiply":
        return a * b
    elif operation == "divide":
        if b == 0:
            return "Error: Division by zero!"
        return a / b
    else:
        return "Invalid operation!"
```

```
# ==== INPUT FROM USER ====

num1 = float(input("Enter first number: "))

num2 = float(input("Enter second number: "))

op = input("Enter operation (add / subtract / multiply / divide): ")


print("Result:", calculator(num1, num2, op))
```

Question no 2:

Write a program that takes in 4 numbers and returns the largest number of them all. 137

Algorithm :

1. Take four numbers.
2. Assume first number is largest
3. Compare with second, third, fourth.
4. Return the largest number.

Python code:

```
def largest_of_four(a, b, c, d):

   """Returns the largest number among four."""

   return max(a, b, c, d) # --- User Input Version ---

n1 = float(input("Enter 1st number: "))

n2 = float(input("Enter 2nd number: "))

n3 = float(input("Enter 3rd number: "))

n4 = float(input("Enter 4th number: "))


print("Largest number is:", largest_of_four(n1, n2, n3, n4)
```

Question no 3:

Write a function that takes in a number and returns the Fibonacci sequence till that number. The Fibonacci Sequence is the series of numbers: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, ... The next number is found by adding up the two numbers before it.

Algorithm :

1. Start with list [0, 1].
2. Keep adding new numbers which are sum of last two numbers.
3. Stop when next number exceeds limit.
4. Return the sequence.

Python code:

```
def fibonacci_upto(n):

"""Returns Fibonacci sequence up to number n."""

 sequence = []

a, b = 0, 1



 while a <= n:

  sequence.append(a)

a, b = b, a + b

return sequence



# --- User Input Version ---

limit = int(input("Enter a number: "))

print("Fibonacci sequence:", fibonacci_upto(limit))
```

Question no 4:

Write a function that takes in parameters for different shape measurements and returns the area of that shape depending upon those measurements and the type of shape. If the type of shape is not specified it should by default calculate the area of a rectangle. It should be able to calculate the area of square, rectangle, circle, and triangle.

Algorithm :

1. Function takes: shape type + required dimensions.
2. If shape = square: area = side²
3. rectangle: area = length × width
4. rectangle: area = length × width
5. circle: πr²
6. triangle: ½ × base × height
7. If no shape specified → assume rectangle

Python code:

```
def area(shape="rectangle", **values):
    """
    Calculates area based on shape.
    Default shape: rectangle.
    Shapes: rectangle, square, circle, triangle
    """
    if shape == "rectangle":
        return values["length"] * values["width"]

    elif shape == "square":
        return values["side"] ** 2
```

```
    elif shape == "circle":
        import math
        return math.pi * (values["radius"] ** 2)

    elif shape == "triangle":
        return 0.5 * values["base"] * values["height"]

    else:
        return "Invalid shape!"

# --- User Input Version ---
print("Shapes: rectangle, square, circle, triangle")
shape_type = input("Enter shape: ")

if shape_type == "rectangle":
    L = float(input("Enter length: "))
    W = float(input("Enter width: "))
    print("Area:", area(length=L, width=W))

elif shape_type == "square":
    s = float(input("Enter side: "))
    print("Area:", area(shape="square", side=s))
```

```
elif shape_type == "circle":
    r = float(input("Enter radius: "))
    print("Area:", area(shape="circle", radius=r))

elif shape_type == "triangle":
    b = float(input("Enter base: "))
    h = float(input("Enter height: "))
    print("Area:", area(shape="triangle", base=b, height=h))

else:
    print("Invalid shape!")
```

Question no 5:

Write a Python function that prints out the first n rows of Pascal's triangle

Algorithm :

1. Start with first row [1].
2. Each next row is formed by summing adjacent numbers of previous row.
3. Continue until n rows are printed.

Python code:

```
def pascal_triangle(n):
    triangle = []

    for i in range(n):
        row = [1] * (i + 1)
```

```
        for j in range(1, i):
            row[j] = triangle[i-1][j-1] + triangle[i-1][j]

        triangle.append(row)
    return triangle


# --- User Input Version ---
rows = int(input("Enter number of rows: "))
triangle = pascal_triangle(rows)
for r in triangle:
print(r)
```
