

**Problem Statement 1:** Exception Handling for Robust Programs (Error Handling & Debugging)  
Objective: Implement robust error-handling mechanisms to enhance program reliability.

**Task:**

- Design a Python program that calculates the volume of various shapes (e.g., cube, sphere, cylinder) based on user input.
- Allow the user to select the desired shape and provide the necessary dimensions.
- Implement exception handling (try-except blocks) to: Validate user input and ensure it's a valid numerical value. Handle potential errors specific to each shape calculation (e.g., negative radius for a sphere).
- Display informative error messages in case of invalid input or incompatible values.
- Provide clear instructions on how to rectify the error and continue using the program.

**CODE:**

```
def sphere(radius):
```

```
    volume = 4 / 3 * 3.14 * (radius ** 3)
```

```
    return volume
```

```
def cube(side):
```

```
    return side ** 3
```

```
def cylinder(height, radius):
```

```
    return 3.14 * radius ** 2 * height
```

```
while True:
```

```
    # Display menu
```

```
    print("Welcome to the Volume Calculator!")
```

```
    print("Please select the shape for volume calculation:")
```

```
print("1. Sphere")
print("2. Cube")
print("3. Cylinder")
print("4. Exit")
```

```
try:
```

```
    selection = int(input("Enter the corresponding number for your choice: "))
```

```
if selection == 1:
```

```
    # Sphere volume calculation
```

```
    while True:
```

```
        try:
```

```
            radius = float(input("Enter the radius of the sphere: "))
```

```
            print("The volume of the sphere is:", sphere(radius))
```

```
            break
```

```
        except ValueError:
```

```
            print("Please enter a valid number for the radius.")
```

```
elif selection == 2:
```

```
    while True:
```

```
        try:
```

```
            side = float(input("Enter the side length of the cube: "))
```

```
            print("The volume of the cube is:", cube(side))
```

```
            break
```

```
        except ValueError:
```

```
            print("Please enter a valid number for the side length.")
```

```
elif selection == 3:
```

**while True:**

**try:**

**height = float(input("Enter the height of the cylinder: "))**

**radius = float(input("Enter the radius of the cylinder: "))**

**print("The volume of the cylinder is:", cylinder(height, radius))**

**break**

**except ValueError:**

**print("Please enter valid numbers for both the height and radius.")**

**elif selection == 4:**

**print("Thank you for using the Volume Calculator. Goodbye!")**

**break**

**else:**

**print("Please enter a number between 1 and 4.")**

**except ValueError:**

**print("Please enter a valid integer for the menu selection.")**

## OUTPUT:

```
= RESTART: C:\Program Files\Python312\Questions\DataVisualisation\Assignment3.py
Welcome to the Volume Calculator!
Please select the shape for volume calculation:
1. Sphere
2. Cube
3. Cylinder
4. Exit
Enter the corresponding number for your choice: 3
Enter the height of the cylinder: 12
Enter the radius of the cylinder: 3
The volume of the cylinder is: 339.12
Welcome to the Volume Calculator!
Please select the shape for volume calculation:
1. Sphere
2. Cube
3. Cylinder
4. Exit
Enter the corresponding number for your choice: 2
Enter the side length of the cube: A
Please enter a valid number for the side length.
Enter the side length of the cube: D
Please enter a valid number for the side length.
Enter the side length of the cube: 3.0
The volume of the cube is: 27.0
Welcome to the Volume Calculator!
Please select the shape for volume calculation:
1. Sphere
2. Cube
3. Cylinder
4. Exit
Enter the corresponding number for your choice: 5
Please enter a number between 1 and 4.
Welcome to the Volume Calculator!
Please select the shape for volume calculation:
1. Sphere
2. Cube
3. Cylinder
4. Exit
```