Project Lesson: Simple Calculator in Python

Objective: Create a simple calculator that performs basic arithmetic operations (addition, subtraction, multiplication, and division). The program will take user input for numbers and the operation to perform, handle errors (e.g., division by zero), and display the result.

Step 1: Import Required Modules

No external modules are required for this project. However, we'll use built-in Python functionality to handle user input and error handling.

Step 2: Define Functions for Arithmetic Operations

Create separate functions for each operation to make the code modular and reusable.

```
# Function to add two numbers
def add(x, y):
    return x + y

# Function to subtract two numbers
def subtract(x, y):
    return x - y

# Function to multiply two numbers
def multiply(x, y):
    return x * y

# Function to divide two numbers
def divide(x, y):
    if y == 0:
        return "Error! Division by zero."
    return x / y
```

Step 3: Display the Menu

Provide a menu for the user to select the desired operation.

```
def display_menu():
    print("\n--- Calculator Menu ---")
    print("1. Addition (+)")
    print("2. Subtraction (-)")
    print("3. Multiplication (*)")
    print("4. Division (/)")
    print("5. Exit")
```

Step 4: Get User Input

Prompt the user to enter their choice and the numbers for the calculation. Validate the input to ensure it's numeric.

```
def get_user_input():
    try:
        num1 = float(input("Enter the first number: "))
        num2 = float(input("Enter the second number: "))
        return num1, num2
    except ValueError:
        print("Invalid input! Please enter numeric values.")
        return None, None
```

Step 5: Perform the Calculation

Use conditional statements to determine which operation to perform based on the user's choice. Call the appropriate function and display the result.

```
def perform_calculation(choice, num1, num2):
    if choice == '1':
        print(f"Result: {num1} + {num2} = {add(num1, num2)}")
    elif choice == '2':
        print(f"Result: {num1} - {num2} = {subtract(num1, num2)}")
    elif choice == '3':
        print(f"Result: {num1} * {num2} = {multiply(num1, num2)}")
    elif choice == '4':
        result = divide(num1, num2)
        print(f"Result: {num1} / {num2} = {result}")
```

Step 6: Main Loop

Combine everything into a main loop that keeps the program running until the user chooses to exit.

```
def main():
    while True:
        display_menu()
        choice = input("Enter your choice (1-5): ")

        if choice == '5':
            print("Exiting the calculator. Goodbye!")
            break

        if choice not in ['1', '2', '3', '4']:
            print("Invalid choice. Please try again.")
```

```
            continue

        num1, num2 = get_user_input()
        if num1 is None or num2 is None:
            continue

        perform_calculation(choice, num1, num2)
```

Full Code

```
# Function to add two numbers
def add(x, y):
    return x + y

# Function to subtract two numbers
def subtract(x, y):
    return x - y

# Function to multiply two numbers
def multiply(x, y):
    return x * y

# Function to divide two numbers
def divide(x, y):
    if y == 0:
        return "Error! Division by zero."
    return x / y

# Function to display the menu
def display_menu():
    print("\n--- Calculator Menu ---")
    print("1. Addition (+)")
    print("2. Subtraction (-)")
    print("3. Multiplication (*)")
    print("4. Division (/)")
    print("5. Exit")

# Function to get user input
def get_user_input():
    try:
        num1 = float(input("Enter the first number: "))
        num2 = float(input("Enter the second number: "))
        return num1, num2
    except ValueError:
        print("Invalid input! Please enter numeric values.")
        return None, None

# Function to perform the calculation
def perform_calculation(choice, num1, num2):
    if choice == '1':
        print(f"Result: {num1} + {num2} = {add(num1, num2)}")
```

```
    elif choice == '2':
        print(f"Result: {num1} - {num2} = {subtract(num1, num2)}")
    elif choice == '3':
        print(f"Result: {num1} * {num2} = {multiply(num1, num2)}")
    elif choice == '4':
        result = divide(num1, num2)
        print(f"Result: {num1} / {num2} = {result}")

# Run the calculator
while True:
    display_menu()
    choice = input("Enter your choice (1-5): ")

    if choice == '5':
        print("Exiting the calculator. Goodbye!")
        break

    if choice not in ['1', '2', '3', '4']:
        print("Invalid choice. Please try again.")
        continue

    num1, num2 = get_user_input()
    if num1 is None or num2 is None:
        continue

    perform_calculation(choice, num1, num2)
```

Sample Output

```
--- Calculator Menu ---
1. Addition (+)
2. Subtraction (-)
3. Multiplication (*)
4. Division (/)
5. Exit
Enter your choice (1-5): 1
Enter the first number: 10
Enter the second number: 5
Result: 10.0 + 5.0 = 15.0

--- Calculator Menu ---
1. Addition (+)
2. Subtraction (-)
3. Multiplication (*)
4. Division (/)
5. Exit
Enter your choice (1-5): 4
Enter the first number: 10
Enter the second number: 0
Result: 10.0 / 0.0 = Error! Division by zero.
```

```
--- Calculator Menu ---
1. Addition (+)
2. Subtraction (-)
3. Multiplication (*)
4. Division (/)
5. Exit
Enter your choice (1-5): 5
Exiting the calculator. Goodbye!
```
