

Project Report:

Critical Thinking 1 – Basic Calculator

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CSC500: Principles of Programming

Professor: Dr. Brian Holbert

September 14, 2025

Project Report:

Critical Thinking Assignment 1 – Basic Calculator

This documentation is part of the Critical Thinking Assignment 1 from CSC500: Principles of Programming at Colorado State University Global. This Project Report is an overview of the program's functionality and testing scenarios, including console output screenshots. The program is coded in Python 3.12, and it is called Critical Thinking Assignment 1 – Basic Calculator.

The Assignment Direction:

Creating Python Programs

Part 1:

Write a Python program to find the addition and subtraction of two numbers.

Ask the user to input two numbers (num1 and num2). Given those two numbers, add them together to find the output. Also, subtract the two numbers to find the output.

Part 2:

Write a Python program to find the multiplication and division of two numbers.

Ask the user to input two numbers (num1 and num2). Given those two numbers, multiply them together to find the output. Also, divide num1/num2 to find the output.

Compile and submit your pseudocode, source code, and screenshots of the application executing the code from parts 1 and 2, the results, and GIT repository in a single document (Word is preferred).

Note: Refer to the Module 1 Overview for resources and help using GIT.

My Program Description:

The program is an addition/subtraction - multiplication/division calculator.

Part 1 addition/subtraction

Part 2 multiplication/division.

Git Repository:

I use [GitHub](#) as my Distributed Version Control System (DVCS).

The following is a link to my GitHub profile, [Omega.py](#).



The link to this specific assignment is:

<https://github.com/Omegapy/Principles-of-Programming-CSC500/tree/main/Critical-Thinking-1>

Figure-1
Code on GitHub

The screenshot shows a GitHub repository interface for the 'Principles-of-Programming-CSC500' project. The repository name is 'Omegapy'. The current file being viewed is 'basic_calculator.py' located in the 'Critical-Thinking-1' directory. The code is a Python script for a basic calculator. It includes comments explaining its purpose, structure, and dependencies. The code defines functions for addition, subtraction, multiplication, and division, along with utility functions for user input and output. The GitHub interface shows the file structure on the left and the code content on the right, with various navigation and search tools at the top.

```

# -----
# File: basic_calculator.py
# Project: Critical Thinking Assignment 1
# Author: Alexander Ricciardi
# Date: 2025-09-09
# File Path: standalone script
#
# Course: CSS-500 Principles of Programming
# Professor: Dr. Brian Helbert
# Fall C-2025
# Sep.-Nov. 2025
#
# Assignment:
# Critical Thinking Assignment 1
#
# Directions:
# Creating Python Programs
# Part 1:
# Write a Python program to find the addition and subtraction of two numbers.
# Ask the user to input two numbers (num1 and num2). Given those two numbers, add them together
# to find the output. Also, subtract the two numbers to find the output.
#
# Part 2:
# Write a Python program to find the multiplication and division of two numbers.
# Ask the user to input two numbers (num1 and num2). Given those two numbers, multiply them
# together to find the output. Also, divide num1/num2 to find the output.
#
# ...
# --- Module Functionality...
# The program is an addition/subtraction - multiplication/division calculator.
# Part 1 addition/subtraction
# Part 2 multiplication/division.
#
# ...
#
# --- Module Contents Overview ...
# - Constants: header, results_header
# - Functions: wait_for_enter()
# - Functions: get_two_numbers()
# - Functions: addition_subtraction()
# - Functions: multiplication_division()
# - Function: main()
#
# ...
#
# --- Dependencies / Imports ---
# - Standard Library: builtins (input/print)
# - Third-Party: None
# - Project Modules: None
# --- Requirements ---
# - Python 3.12.3
#
# ...
#
# --- Usage / Integration ---
# - Standalone usage: python basic_calculator.py
# - Importing usage: Import this file and call "main()" or call individual
#   functions.
#
# ...
#
# --- Apache-2.0 ---
# © 2025 Alexander Samuel Ricciardi - All rights reserved.
# License: Apache-2.0
#
# ...
#
# -----
# Imports
# None
#
# -----
# Global Constants / Variables
#
# Application Header
header = """
    [REDACTED]
    Basic Calculator
    [REDACTED]
"""

# Results Header
results_header = """
    [REDACTED]
    | Results |
    [REDACTED]
"""

# -----
# User Prompt Utilities Functions
# -----
# -----
# Args:
#   None
# Returns:
#   None
# Side Effects:
#   Awaiting user input.
#   ***
#   Input("\n      Press Enter to continue...")
#   and wait_for_enter()
# -----
# def wait_for_enter() -> None:
#     """Pause execution until the user presses Enter.
#     This helper function allows the user time to read
#     the screen before continuing.
#     """
#     Args:
#       None
#     Returns:
#       None
#     Side Effects:
#       Awaiting user input.
#       ***
#       Input("\n      Press Enter to continue...")
#       and wait_for_enter()
#   and wait_for_enter()

# def get_two_numbers() -> tuple[float, float]:
#     """Prompt the user to enter 2 floating-point numbers and capture them.
#     The function loops until valid numeric input are entered.
#     It uses "ValueError" to check inputs.
#     """
#     Args:
#       None
#     Returns:
#       None

```

Code Snippet 1

Project Code in VS Code

```

# -----
# File: basic_calculator.py
# Project: Critical Thinking Assignment 1
# Author: Alexander Ricciardi
# Date: 2025-09-09
# File Path: standalone script
# -----
# Course: CSS-500 Principles of Programming
# Professor: Dr. Brian Holbert
# Fall C-2025
# Sep.-Nov. 2025
# -----
# Assignment:
# Critical Thinking Assignment 1
#
# Directions:
# Creating Python Programs
# Part 1:
# Write a Python program to find the addition and subtraction of two numbers.
# Ask the user to input two numbers (num1 and num2). Given those two numbers, add them together
# to find the output. Also, subtract the two numbers to find the output.
#
# Part 2:
# Write a Python program to find the multiplication and division of two numbers.
# Ask the user to input two numbers (num1 and num2). Given those two numbers, multiply them
# together to find the output. Also, divide num1/num2 to find the output.
# -----
# --- Module Functionality---
# The program is an addition/subtraction - multiplication/division calculator.
# Part 1 addition/subtraction
# Part 2 multiplication/division.
# -----
# --- Module Contents Overview ---
# - Constants: header, results_header
# - Function: wait_for_enter()
# - Function: get_two_numbers()
# - Function: addition_subtraction()
# - Function: multiplication_division()
# - Function: main()
# -----
# --- Dependencies / Imports ---
# - Standard Library: builtins (input/print)
# - Third-Party: None
# - Local Project Modules: None
# --- Requirements ---
# - Python 3.12.3
# -----
# --- Usage / Integration ---
# - Standalone usage: `python basic_calculator.py`
# - Importing usage: import this file and call `main()` or call individual
#   functions.
# -----
# --- Apache-2.0 ---
# © 2025 Alexander Samuel Ricciardi - All rights reserved.
# License: Apache-2.0
# -----

```

```

# -----
# Imports
#
# None

#
# Global Constants / Variables
#

# Application Header
header = '''

    Basic Calculator

'''


# Results Header
results_header = '''

    Results
'''


# =====
# User Prompt Utilities Functions
# =====

# ----- wait_for_enter()
def wait_for_enter() -> None:
    """Pause execution until the user presses Enter.

    This helper function allows the user time to read
    the screen before continuing.

    Args:
        None

    Returns:
        None

    Side Effects:
        Awaiting user input.
    """
    input("\n        Press Enter to continue...")
# ----- end wait_for_enter()

# ----- get_two_numbers()
def get_two_numbers() -> tuple[float, float]:
    """Prompts the user to enter 2 floating-point numbers and captures them.

    The function loops until valid numeric input are entered.
    It uses `ValueError` to check inputs.

    Args:
        None

    Returns:
        tuple[float, float]: A pair (num1, num2) entered by the user.

    Notes:
        The inputs are converted using `float(...)`.

    """
    # Get first number
    while True:

```

```

try:
    num1 = float(input("      Enter the first number: "))
    break
except ValueError:
    print("      Error: Please enter a valid number for the first number!\n")

# Get second number
while True:
    try:
        num2 = float(input("      Enter the second number: "))
        break
    except ValueError:
        print("      Error: Please enter a valid number for the second number!\n")

return num1, num2
# ----- end get_two_numbers()

# =====
# Part 1 Operations (Addition & Subtraction)
# =====

# ----- addition_subtraction()

def addition_subtraction() -> None:
    """Part 1: Compute and display results of the addition and subtraction operations

Workflow:
1. Displays section header
2. Captures two numbers using `get_two_numbers()`
3. Computes addition and subtraction
4. Displays results

Args:
None

Returns:
None

Side Effects:
Prints results to stdout and waits for user input to continue
"""

header_part1 = '''

| PART 1: Addition and Subtraction |
'''

print(header_part1)

num1, num2 = get_two_numbers()

```

```

# Calculate results
addition = num1 + num2
subtraction = num1 - num2

# Display results
print(results_header)
print("      Addition:")
print(f"      {num1} + {num2} = {addition}")
print("      Subtraction:")
print(f"      {num1} - {num2} = {subtraction}")

wait_for_enter()
# ----- end addition_subtraction()

# =====
# Part 2 Operations (Multiplication & Division)
# =====

# ----- multiplication_division()

def multiplication_division() -> None:
    """Part 2: Computes and displays multiplication and division operations for two numbers

    Division by zero is handled by showing an 'error' descriptive message.

    Workflow:
    1. Displays section header
    2. Captures two numbers using `get_two_numbers()`
    3. Computes multiplication and division operations
    4. Displays results with a formatted results header

    Args:
        None

    Returns:
        None

    Side Effects:
        Prints results to stdout and waits for user input to continue.

    """
    header_part2 = '''

    | PART 2: Multiplication and Division |
    | ... |

    print(header_part2)

```

```

num1, num2 = get_two_numbers()

# Calculate results
multiplication = num1 * num2

# Handle division by zero
if num2 != 0:
    division = num1 / num2
    division_text = str(division)
else:
    division_text = "undefined -> cannot divide by zero"

# Display results
print(results_header)
print("      Multiplication:")
print(f"      {num1} * {num2} = {multiplication}")
print("      Division:")
print(f"      {num1} / {num2} = {division_text}")

wait_for_enter()
# ----- end
multiplication_division()

# =====
# Program Entry / Menu Loop
# =====

# ----- main()
def main() -> None:
    """Entry point for the calculator's menu.

    Presents a looped menu with three choices:
    1. Part 1: Addition and Subtraction
    2. Part 2: Multiplication and Division
    3. Exit

    Args:
        None

    Returns:
        None

    Side Effects:
        Prints a menu, captures user input, and runs the operations,
        and loops until the user exits
    """

    while True:
        print("\nCalculator Menu")
        print("1. Addition and Subtraction")
        print("2. Multiplication and Division")
        print("3. Exit")
        choice = input("Enter your choice (1, 2, or 3): ")
        if choice == "1":
            addition_subtraction()
        elif choice == "2":
            multiplication_division()
        elif choice == "3":
            print("Exiting calculator...")
            break
        else:
            print("Invalid choice. Please enter 1, 2, or 3.")


if __name__ == "__main__":
    main()

```

```

"""
print(header)

while True:
    menu = '''

    | Menu:
    | 1. Addition and Subtraction (Part 1)
    | 2. Multiplication and Division (Part 2)
    | 3. Exit
    '''

    ...
    print(menu)
    choice = input("      Enter 1, 2, or 3: ").strip()

    if choice == '1':
        addition_subtraction()
    elif choice == '2':
        multiplication_division()
    elif choice == '3':
        print("\n      Bye! 🌟\n")
        break
    else:
        print("\n      Error: Please enter 1, 2, or 3.")
        wait_for_enter()

# ----- end main()

# -----
# Module Initialization / Main Execution Guard
# This code runs only when the file is executed
# ----- main_guard
# Run the program
if __name__ == "__main__":
    main()

# ----- end main_guard

```

Continue next page

Figure 2
Project Outputs in the VS Code Terminal

```

omega-py@WorkStation:/mnt/p/CS5-500/Module-1-Critical-Thinking$ uv run python3 basic_calculator.py

Basic Calculator

Menu:
1. Addition and Subtraction (Part 1)
2. Multiplication and Division (Part 2)
3. Exit

Enter 1, 2, or 3: 1

PART 1: Addition and Subtraction

Enter the first number: 22
Enter the second number: 2

Results

Addition:
22.0 + 2.0 = 24.0
Subtraction:
22.0 - 2.0 = 20.0

Press Enter to continue...

Menu:
1. Addition and Subtraction (Part 1)
2. Multiplication and Division (Part 2)
3. Exit

Enter 1, 2, or 3: 2

PART 2: Multiplication and Division

Enter the first number: 23
Enter the second number: 3

Results

Multiplication:
23.0 * 3.0 = 69.0
Division:
23.0 / 3.0 = 7.666666666666667

Press Enter to continue...

Menu:
1. Addition and Subtraction (Part 1)
2. Multiplication and Division (Part 2)
3. Exit

Enter 1, 2, or 3: W

Error: Please enter 1, 2, or 3.

Press Enter to continue...

Menu:
1. Addition and Subtraction (Part 1)
2. Multiplication and Division (Part 2)
3. Exit

Enter 1, 2, or 3: 1

PART 1: Addition and Subtraction

Enter the first number: Wrong input
Error: Please enter a valid number for the first number!

Enter the first number: 45
Enter the second number: Wrong input type
Error: Please enter a valid number for the second number!

Enter the second number: 2

Results

Addition:
45.0 + 2.0 = 47.0
Subtraction:
45.0 - 2.0 = 43.0

Press Enter to continue...

```

```
Menu:  
1. Addition and Subtraction (Part 1)  
2. Multiplication and Division (Part 2)  
3. Exit  
  
Enter 1, 2, or 3: 2  
  
PART 2: Multiplication and Division  
  
Enter the first number: 90  
Enter the second number: 0  
  
Results  
  
Multiplication:  
90.0 * 0.0 = 0.0  
Division:  
90.0 / 0.0 = undefined -> cannot divide by zero  
  
Press Enter to continue...  
  
Menu:  
1. Addition and Subtraction (Part 1)  
2. Multiplication and Division (Part 2)  
3. Exit  
  
Enter 1, 2, or 3: 3  
  
Bye! 🖐  
  
omega-py@WorkStation:/mnt/p/CSS-500/Module-1-Critical-Thinking$ Ln 283, Col 61 Spaces: 4 UTF-8 LF {è Python Finish Setup 12:42 PM 9/9/2025
```

As shown in Figures 2 and Code Snippet 1, the program runs without any issues, displaying the correct outputs as expected.