
INFORMATICS INSTITUTE OF TECHNOLOGY

# Foundation Certificate for Higher Education

**Module**: DOC333 Introduction to Programming 1

**Module Leader**: Miss Tharushi Amarasinghe

**Type of Assignment**: Individual Coursework

**Submission Date**: 04.04.2022

**Topic**: Developing a Shapes Calculator

| Student ID | Name |
|---|---|
| 20211291 | Hashim Kalam |

# Contents

## Problem:

Write a Python program to design a shapes calculator. In this calculator, we must be able to calculate five different things. The **first one** should be to calculate the surface area of the cone using the formula Surface Area = (pi*radius*radius) + (pi*radius*slant height), given the radius & height and the slanted height is calculate by the formula slant height = (((radius*radius) + (height*height)) **0.5). The **second one** should be to calculate the volume of a cone using the formula V = 1/3* (pi * radius * radius) * height, given the radius & height. The **third one** should be to calculate the base area of a cone using the formula Base Area = pi*(radius*radius), given only the radius. The **fourth one** should be to calculate volume of the rectangular pyramid using the formula Volume = (length*width*height)/3. The **fifth one** should be to calculate surface area of the rectangular pyramid using the formula Surface area = (length*width) +length*((((width/2) *(width/2)) +(height*height)) **0.5) +width*((((length/2) *(length/2)) +(height*height)) **0.5).

## Problem understanding

It is required to develop a python program to calculate the surface area, volume, and base area of a cone, also the surface area and volume of a rectangular pyramid. User must input the radius of the cone to get the base area of the cone; radius and height of the cone to get the surface area of the cone; again, both the radius and height of the cone to get the volume. The user must input the length, width as well as the height of the rectangular pyramid to get the volume of the rectangular pyramid; the length, width, and height of the rectangular pyramid to get the surface area of the rectangular pyramid. Finally, if the user wants to exit, there is an option too for that. These values must be positive and can be in decimal values as well. Formula that will be used for this purpose is the given formula and pi value is assumed as 3.14.

## Algorithm:

1. Start
2. Define the function called “menu” and print it.
3. Ask for the preferred option (which shape they would like to calculate or to exit)
4. IF choice is 1 THEN
5. Initialize variables
6. Ask for radius of the base of the cone. IF radius value is negative or equals to zero, display an error message and go to step 10.
7. Ask for height of the cone. IF height value is negative or equals to zero, display an error message and go to step 10.
8. Calculate the slanted height using the formula slant_height = (((radius**2) + (height**2)) **0.5) and the surface area using this formula SurfaceArea = (pi*radius*radius) + (pi*radius*slant_height)
9. Display the calculated surface area.
10. Ask whether does the user want to continue with another shape.
11. IF answer is “Yes” repeat step 3.
12. ELSE IF answer is “No”, go to step 51.
13. IF choice is 2 THEN
14. Initialize variables
15. Ask for radius of the base of the cone. IF radius value is negative or equals to zero, display an error message and go to step 19.
16. Ask for height of the cone. IF height value is negative or equals to zero, display an error message and go to step 19.
17. Calculate the volume using the formula V = (pi * radius * radius) * height/3
18. Display the calculated volume.
19. Ask whether does the user want to continue with another shape.
20. IF answer is “Yes” repeat step 3.
21. ELSE IF answer is “No”, go to step 51
22. IF choice is 3 THEN
23. Initialize variables

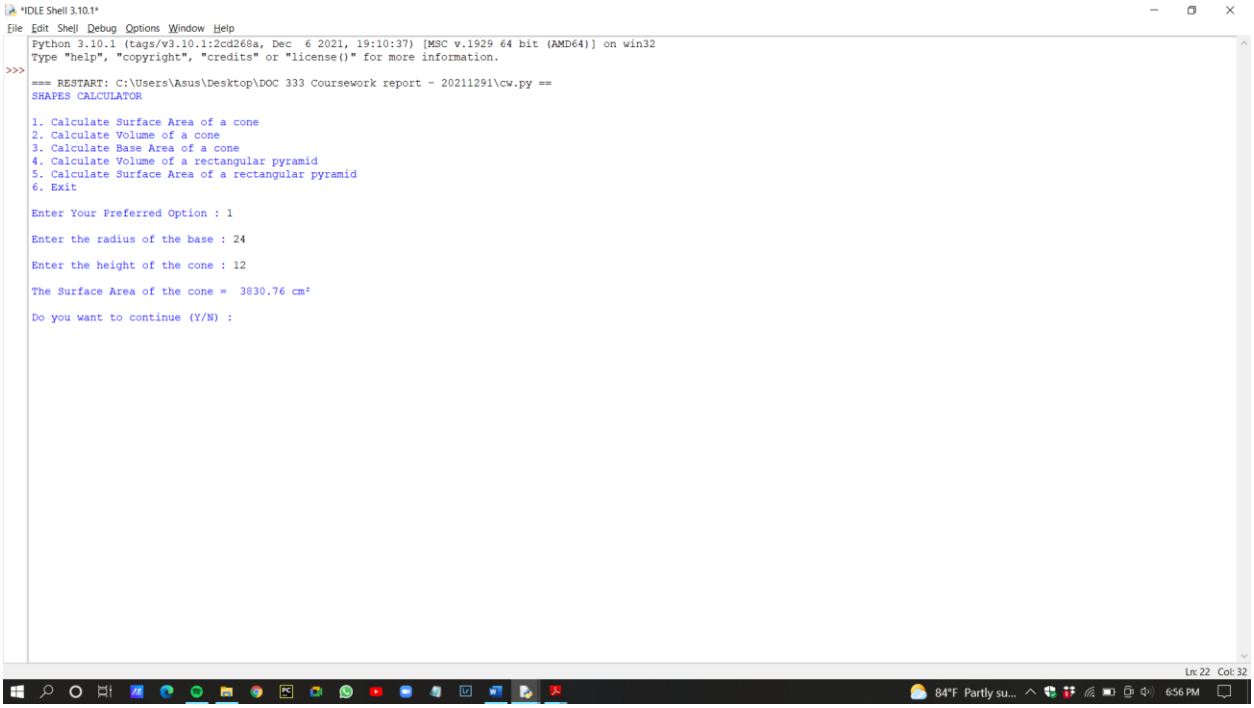
24. Ask for radius of the base of the cone. IF radius value is negative or equals to zero, display an error message and go to step 27.
25. Calculate the Base Area using the formula BaseArea = pi*(radius*radius)
26. Display the calculated Base area.
27. Ask whether does the user want to continue with another shape.
28. IF answer is “Yes” repeat step 3.
29. ELSE IF answer is “No”, go to step 51.
30. IF choice is 4 THEN
31. Initialize variables.
32. Ask for length of the base of the rectangular pyramid. IF radius value is negative or equals to zero, display an error message and go to step 37.
33. Ask for width of the base of the rectangular pyramid. IF radius value is negative or equals to zero, display an error message and go to step 37.
34. Ask for height of the rectangular pyramid. If height value is negative or equals to zero, display an error message and go to step 37.
35. Calculate the volume using the formula V = (length*width*height)/3
36. Display the calculated volume.
37. Ask whether does the user want to continue with another shape.
38. IF answer is “Yes” repeat step 3.
39. ELSE IF answer is “No”, go to step 51.
40. IF choice is 5 THEN
41. Initialize variables.
42. Ask for length of the base of the rectangular pyramid. IF radius value is negative or equals to zero, display an error message and go to step 47.
43. Ask for width of the base of the rectangular pyramid. IF radius value is negative or equals to zero, display an error message and go to step 47.
44. Ask for height of the rectangular pyramid. IF height value is negative or equals to zero, display an error message and go to step 47.
45. Calculate the surface area using the formula surface_area = (length*width) +length*((((width/2) *(width/2)) +(height*height)) **0.5) +width*((((length/2) *(length/2)) +(height*height)) **0.5)

46. Display the calculated surface area.
47. Ask whether does the user want to continue with another shape.
48. IF answer is “Yes” repeat step 3.
49. ELSE IF answer is “No”, go to step 51.
50. IF choice is 6 THEN
51. Stop

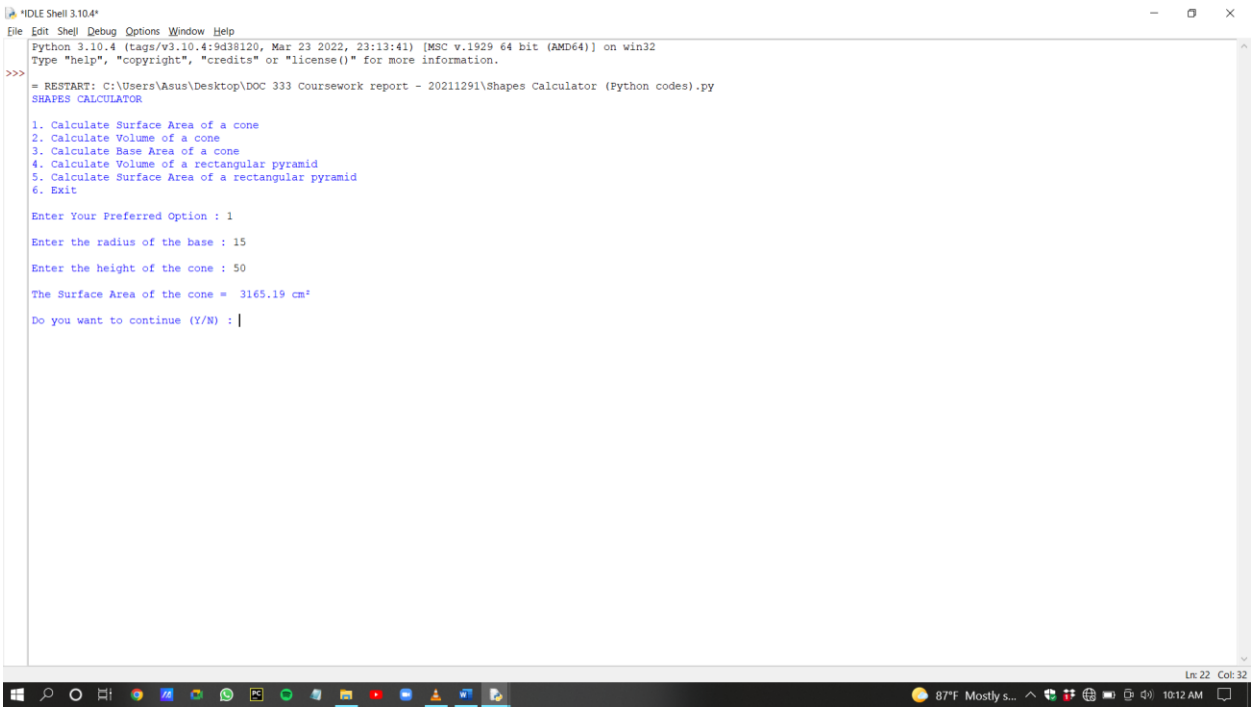
# For the Surface Area of the cone

| Test Case # | Inputs | | Expected Output | Actual Output | Remarks |
|---|---|---|---|---|---|
| | **Radius** | **Width** | | | |
| **1** | 24 | 12 | Surface area of the cone = 3830.76 $cm^2$<br>Do you want to continue (Y/N) : | Surface area of the cone = 3830.76 $cm^2$<br>Do you want to continue (Y/N) : | Test case pass. |
| **2** | 15 | 50 | The Surface Area of the cone = 3165.19 $cm^2$<br>Do you want to continue (Y/N) : | The Surface Area of the cone = 3165.19 $cm^2$<br>Do you want to continue (Y/N) : | Test case pass. |
| **3** | 21 | -4 | The height value cannot be negative.<br>Could not calculate the Surface Area due to invalid inputs. Please try again with valid inputs. | The height value cannot be negative.<br>Could not calculate the Surface Area due to invalid inputs. Please try again with valid inputs. | Test case pass. |
| **4** | 2.25 | 1.49 | Surface area of the cone = 34.96 $cm^2$<br>Do you want to continue (Y/N) : | Surface area of the cone = 34.96 $cm^2$<br>Do you want to continue (Y/N) : | Test case pass |
| **5** | -5.2 | - | The radius value cannot be negative.<br>Could not calculate the Surface Area due to invalid inputs. Please try again with valid inputs. | The radius value cannot be negative.<br>Could not calculate the Surface Area due to invalid inputs. Please try again with valid inputs. | Test case pass |

# Test Case 1



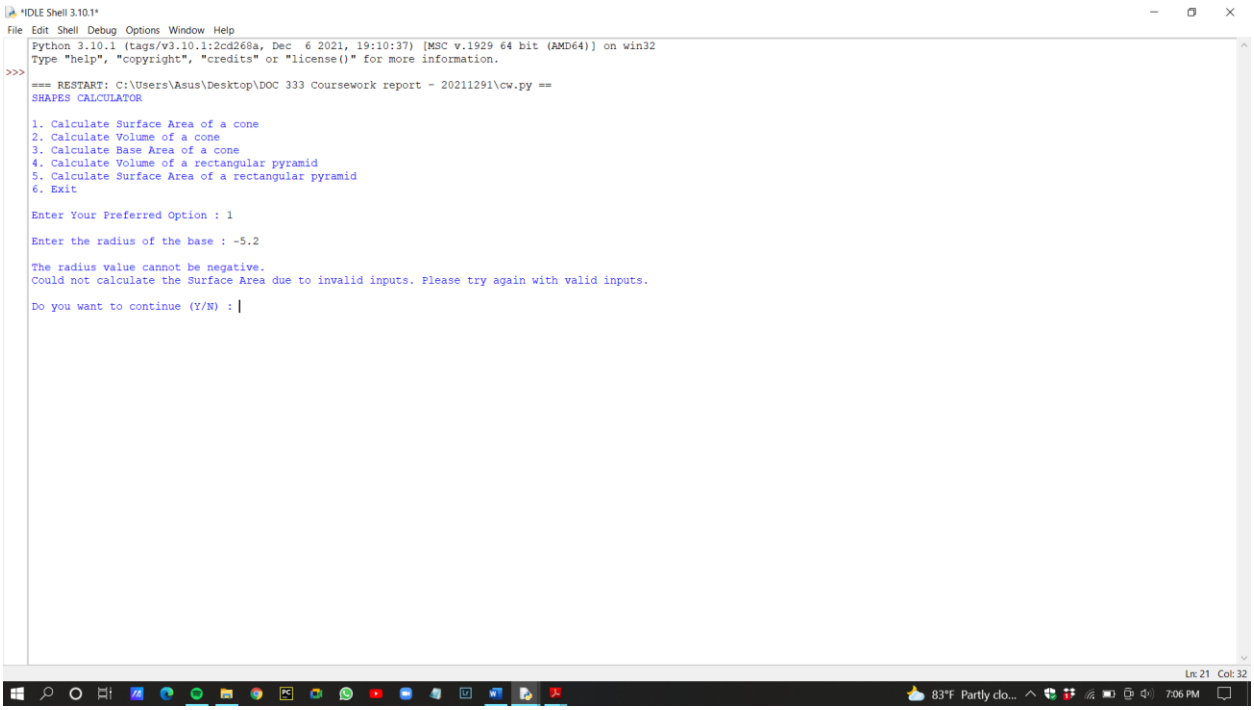

# Test case 2



# Test Case 3


# Test Case 4

# Test Case 5


*IDLE Shell 3.10.1*
File Edit Shell Debug Options Window Help
Python 3.10.1 (tags/v3.10.1:2cd268a, Dec 6 2021, 19:10:37) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
=== RESTART: C:\Users\Asus\Desktop\DOC 333 Coursework report - 20211291\cw.py ==
SHAPES CALCULATOR
1. Calculate Surface Area of a cone
2. Calculate Volume of a cone
3. Calculate Base Area of a cone
4. Calculate Volume of a rectangular pyramid
5. Calculate Surface Area of a rectangular pyramid
6. Exit
Enter Your Preferred Option : 1
Enter the radius of the base : -5.2
The radius value cannot be negative.
Could not calculate the Surface Area due to invalid inputs. Please try again with valid inputs.
Do you want to continue (Y/N) :
Ln: 21 Col: 32
83°F Partly clo...
7:06 PM

# For the Volume of the cone

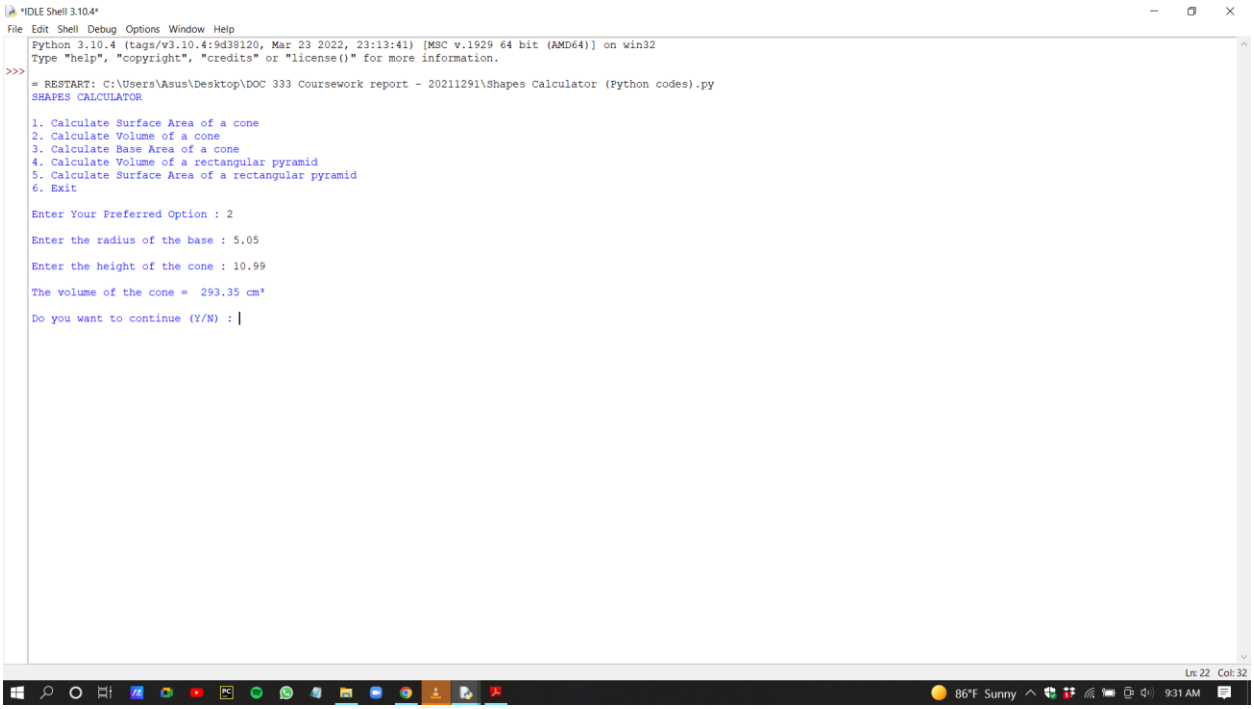
| Test Case # | Inputs | | Expected Output | Actual Output | Remarks |
|---|---|---|---|---|---|
| | **Radius** | **Width** | | | |
| **1** | 13 | 27 | Volume of the cone = 4775.94 $cm^3$<br>Do you want to continue (Y/N) : | Volume of the cone = 4775.94 $cm^3$<br>Do you want to continue (Y/N) : | Test case pass. |
| **2** | 5 | -7 | The height value cannot be negative<br>Could not calculate the volume due to invalid inputs. Please try again with valid inputs. | The height value cannot be negative<br>Could not calculate the volume due to invalid inputs. Please try again with valid inputs. | Test case pass. |
| **3** | 1.21 | 5.01 | Volume of the cone = 7.68 $cm^3$<br>Do you want to continue (Y/N) : | Volume of the cone = 7.68 $cm^3$<br>Do you want to continue (Y/N) : | Test case pass |
| **4** | 5.05 | 10.99 | The volume of the cone = 293.35 $cm^3$<br>Do you want to continue (Y/N) : | The volume of the cone = 293.35 $cm^3$<br>Do you want to continue (Y/N) : | Test case pass |
| **5** | -10.10 | - | The radius value cannot be negative<br>Could not calculate the volume due to invalid inputs. Please try again with valid inputs. | The radius value cannot be negative<br>Could not calculate the volume due to invalid inputs. Please try again with valid inputs. | Test case pass |

# Test Case 1

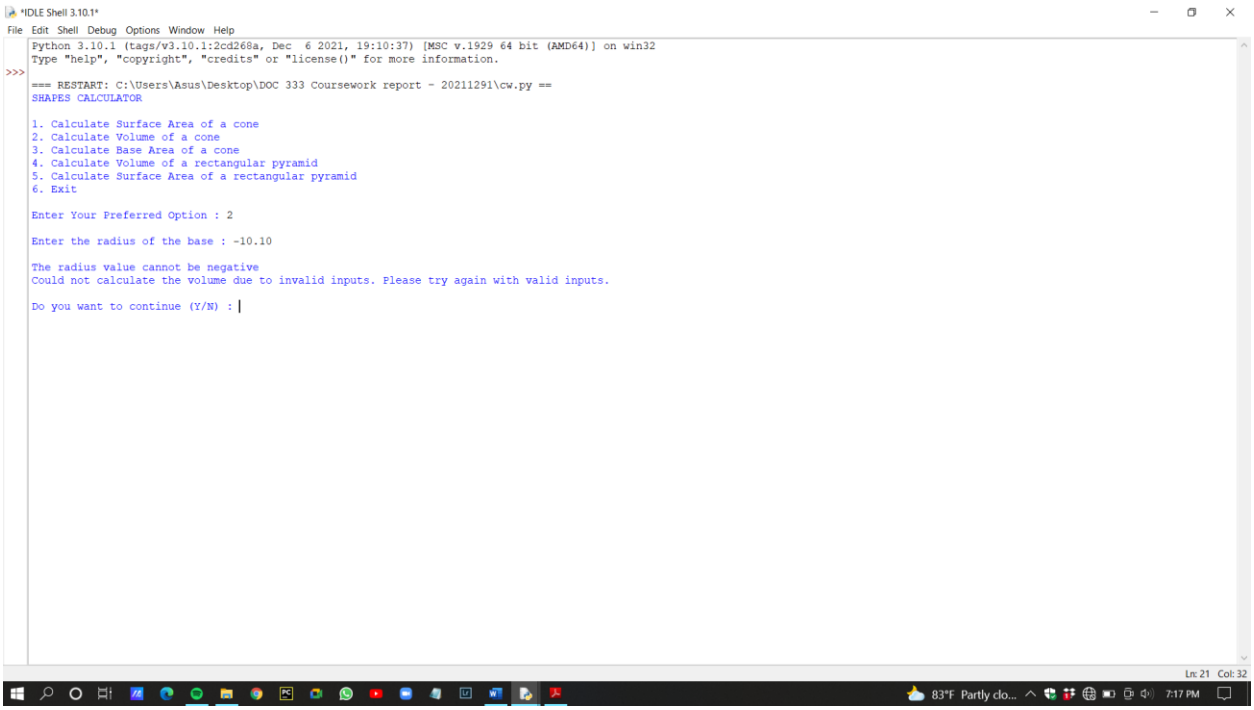

# Test Case 2

# Test Case 3


# Test Case 4



# Test case 5

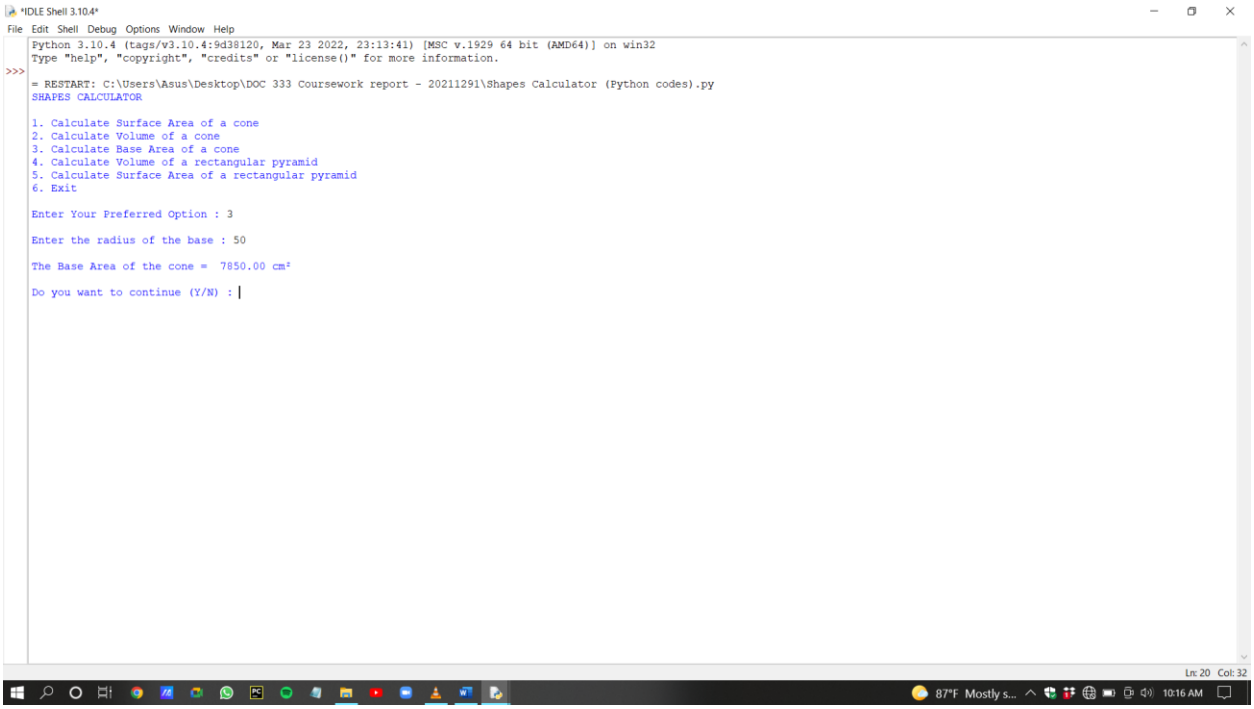

*IDLE Shell 3.10.1*
File Edit Shell Debug Options Window Help
Python 3.10.1 (tags/v3.10.1:2cd268a, Dec 6 2021, 19:10:37) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
=== RESTART: C:\Users\Asus\Desktop\DOC 333 Coursework report - 20211291\cw.py ==
SHAPES CALCULATOR
1. Calculate Surface Area of a cone
2. Calculate Volume of a cone
3. Calculate Base Area of a cone
4. Calculate Volume of a rectangular pyramid
5. Calculate Surface Area of a rectangular pyramid
6. Exit
Enter Your Preferred Option : 2
Enter the radius of the base : -10.10
The radius value cannot be negative
Could not calculate the volume due to invalid inputs. Please try again with valid inputs.
Do you want to continue (Y/N) :
Ln: 21 Col: 32
83°F Partly clo...
7:17 PM

# For the Base Area of the cone

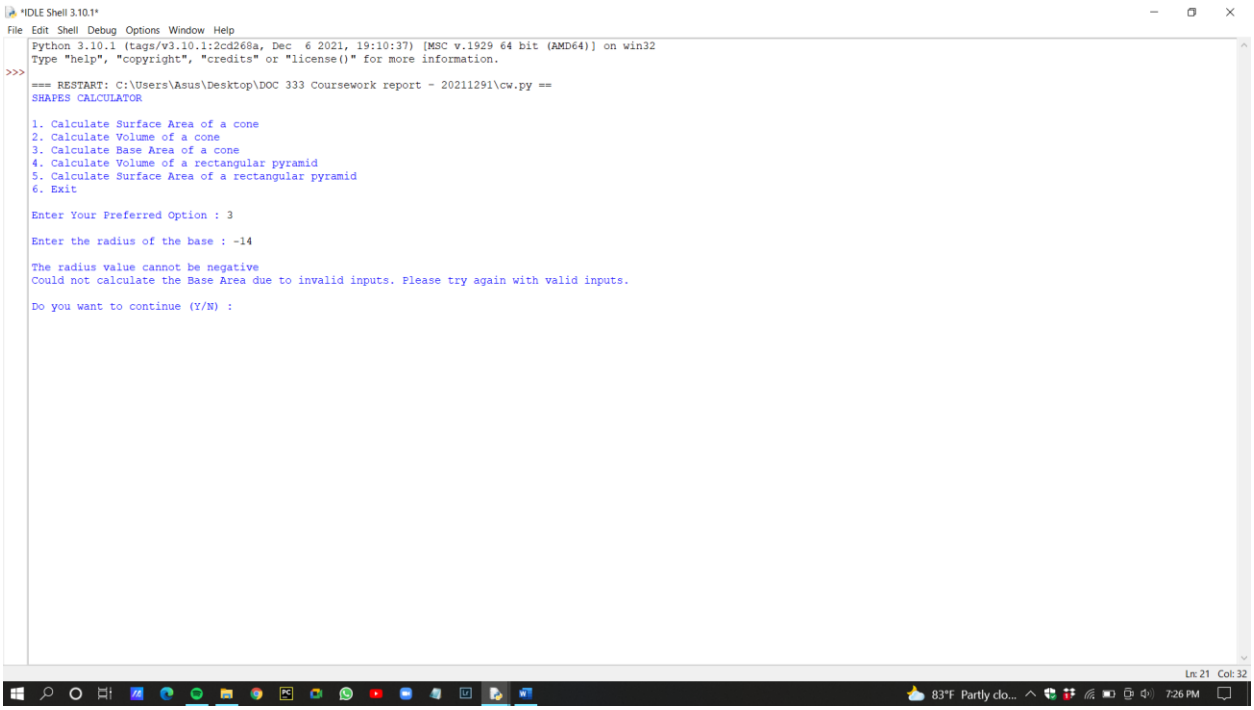
| Test Case # | Inputs | Expected Output | Actual Output | Remarks |
|---|---|---|---|---|
| | **Radius** | | | |
| **1** | 5 | The Base Area of the cone = 78.50 $cm^2$<br>Do you want to continue (Y/N) : | The Base Area of the cone = 78.50 $cm^2$<br>Do you want to continue (Y/N) : | Test case pass. |
| **2** | 50 | The Base Area of the cone = 7850.00 cm²<br>Do you want to continue (Y/N) : | The Base Area of the cone = 7850.00 cm²<br>Do you want to continue (Y/N) : | Test case pass. |
| **3** | -14 | The radius value cannot be negative<br>Could not calculate the Base Area due to invalid inputs. Please try again with valid inputs. | The radius value cannot be negative<br>Could not calculate the Base Area due to invalid inputs. Please try again with valid inputs. | Test case pass. |
| **4** | 1.49 | The Base Area of the cone = 6.97 $cm^2$<br>Do you want to continue (Y/N) : | The Base Area of the cone = 6.97 $cm^2$<br>Do you want to continue (Y/N) : | Test case pass |
| **5** | 10.1 | The Base Area of the cone = 320.31 cm²<br>Do you want to continue (Y/N) : | The Base Area of the cone = 320.31 cm²<br>Do you want to continue (Y/N) : | Test case pass |

# Test Case 1

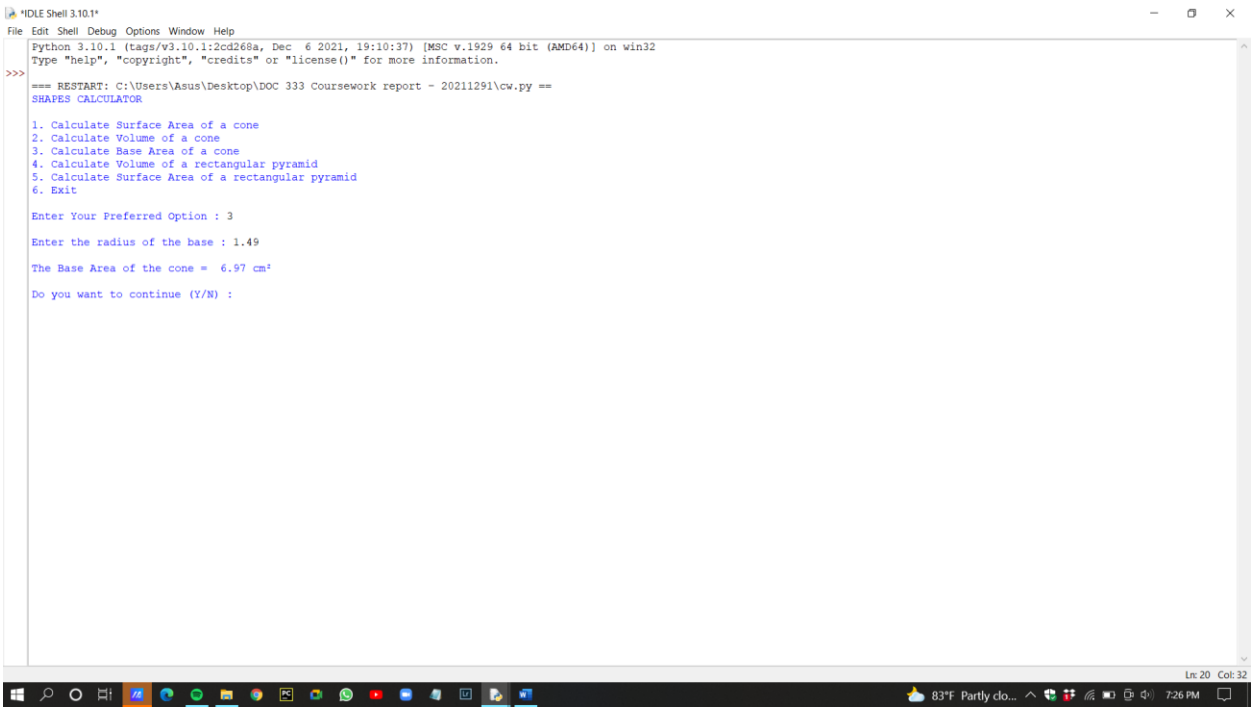

# Test Case 2



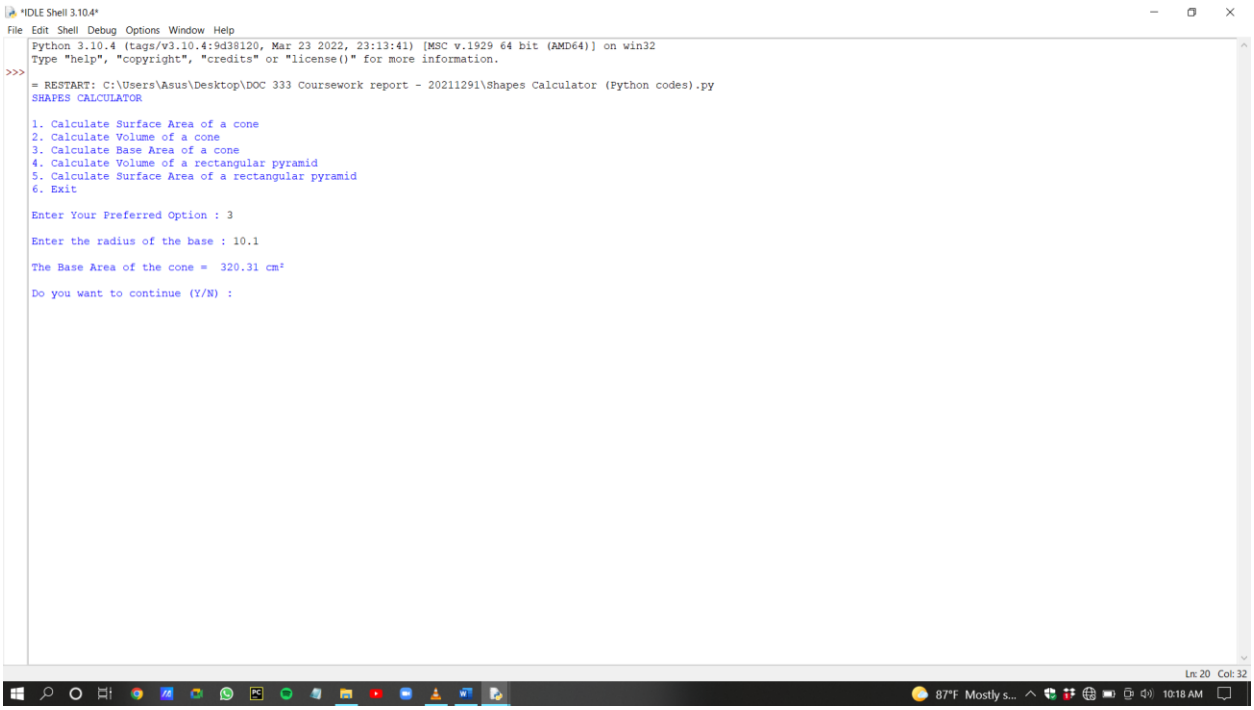
# Test case 3




# Test Case 4



# Test case 5

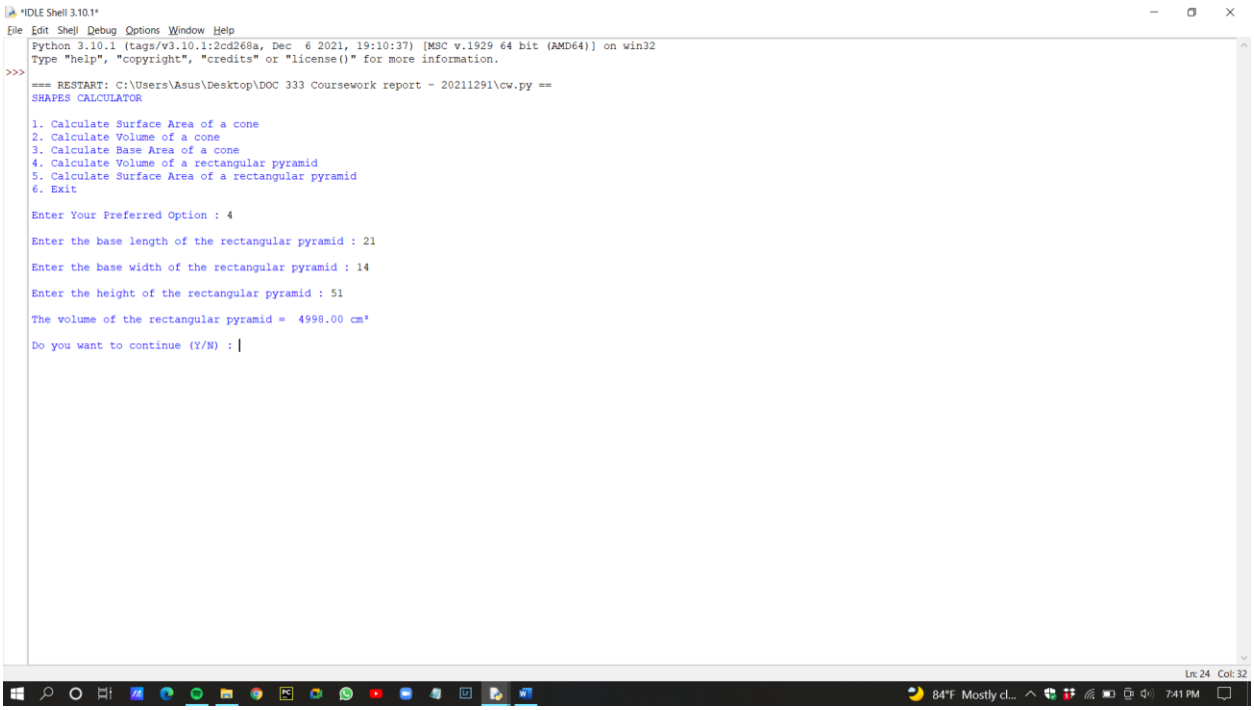

*IDLE Shell 3.10.4*
File Edit Shell Debug Options Window Help
Python 3.10.4 (tags/v3.10.4:9d38120, Mar 23 2022, 23:13:41) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: C:\Users\Asus\Desktop\DOC 333 Coursework report - 20211291\Shapes Calculator (Python codes).py
SHAPES CALCULATOR
1. Calculate Surface Area of a cone
2. Calculate Volume of a cone
3. Calculate Base Area of a cone
4. Calculate Volume of a rectangular pyramid
5. Calculate Surface Area of a rectangular pyramid
6. Exit
Enter Your Preferred Option : 3
Enter the radius of the base : 10.1
The Base Area of the cone = 320.31 cm²
Do you want to continue (Y/N) :
Ln: 20 Col: 32
87°F Mostly s...
10:18 AM

# For the Volume of a rectangular pyramid

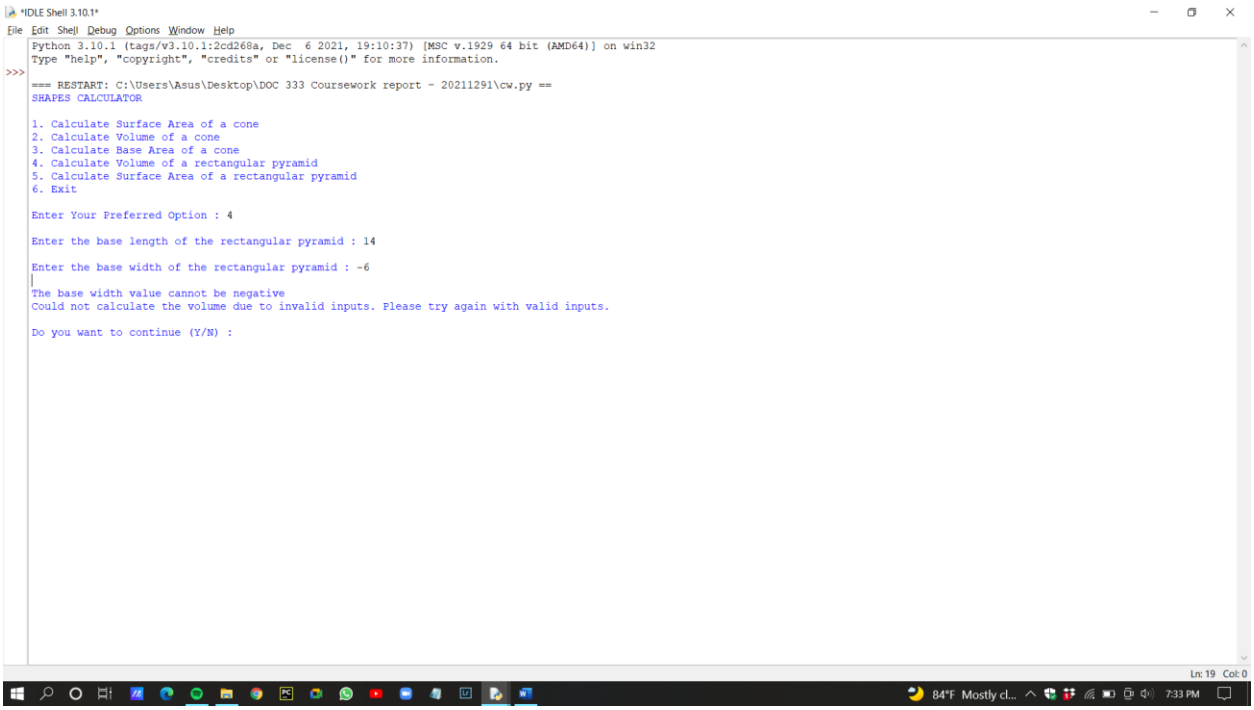
| Test Case # | Inputs | | | Expected Output | Actual Output | Remarks |
|---|---|---|---|---|---|---|
| | **Length** | **Width** | **Height** | | | |
| **1** | 21 | 14 | 51 | The volume of the rectangular pyramid = 4998.00 $cm^2$<br>Do you want to continue (Y/N) : | The volume of the rectangular pyramid = 4998.00 $cm^2$<br>Do you want to continue (Y/N) : | Test case pass. |
| **2** | 14 | -6 | - | The base width value cannot be negative<br>Could not calculate the volume due to invalid inputs. Please try again with valid inputs. | The base width value cannot be negative<br>Could not calculate the volume due to invalid inputs. Please try again with valid inputs. | Test case pass. |
| **3** | 21 | 11 | -4 | The height value cannot be negative<br>Could not calculate the volume due to invalid inputs. Please try again with valid inputs. | The height value cannot be negative<br>Could not calculate the volume due to invalid inputs. Please try again with valid inputs. | Test case pass |
| **4** | -5.2 | - | - | The base length value cannot be negative<br>Could not calculate the volume due to invalid inputs. Please try again with valid inputs. | The base length value cannot be negative<br>Could not calculate the volume due to invalid inputs. Please try again with valid inputs. | Test case pass |

| | | | | | | |
|---|---|---|---|---|---|---|
| **5** | 11.2 | 12.5 | 14.1 | The volume of the rectangular pyramid = 658.00 $cm^2$<br>Do you want to continue (Y/N) : | The volume of the rectangular pyramid = 658.00 $cm^2$<br>Do you want to continue (Y/N) : | Test case pass |

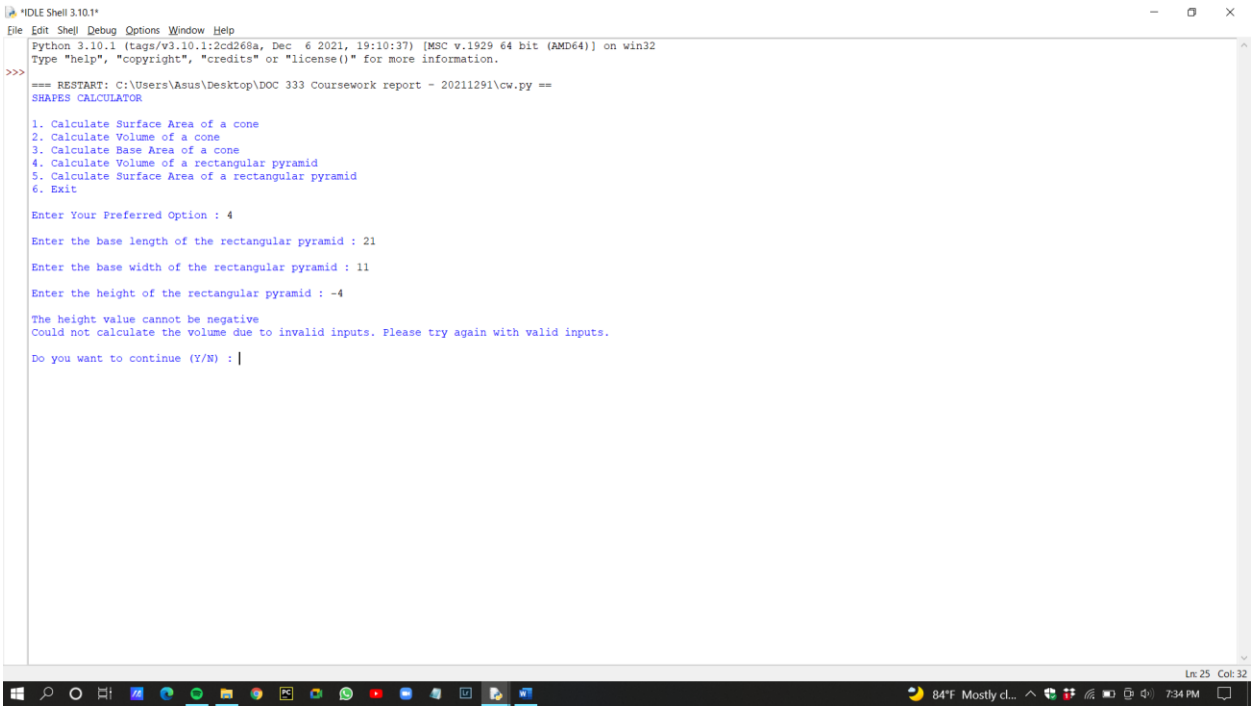
## Test Case 1



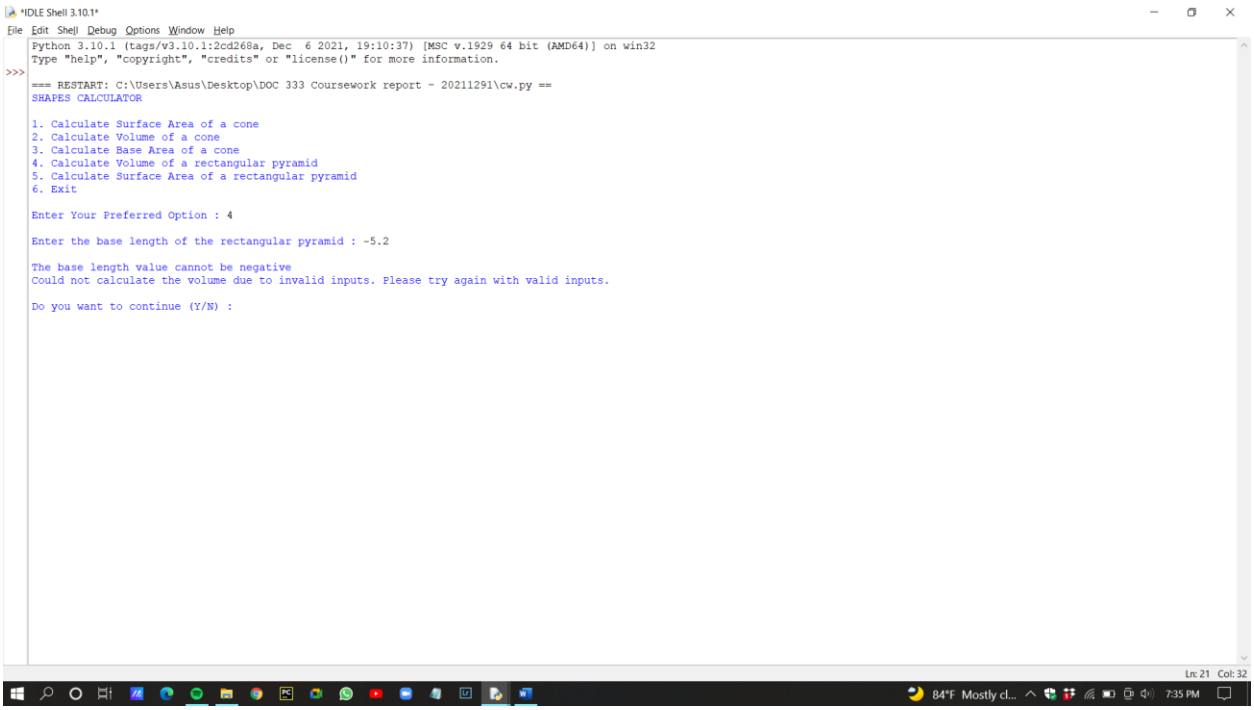
# Test Case 2



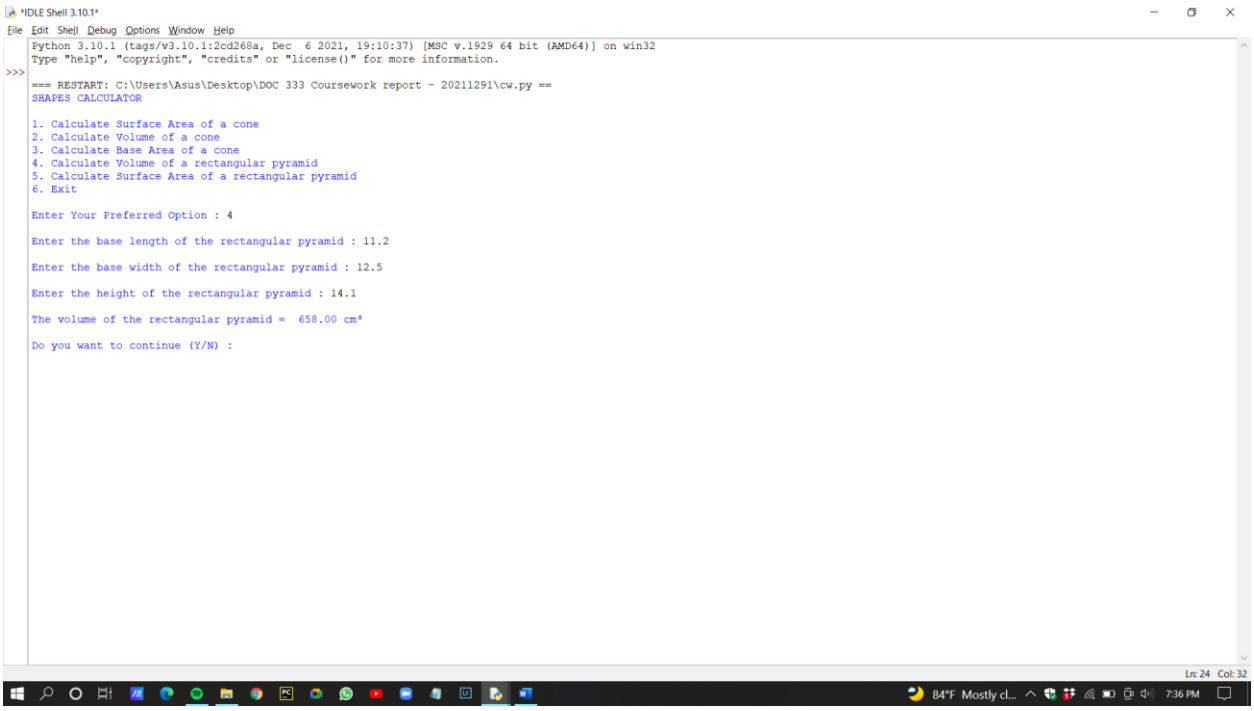

# Test Case 3



# Test Case 4




# Test Case 5

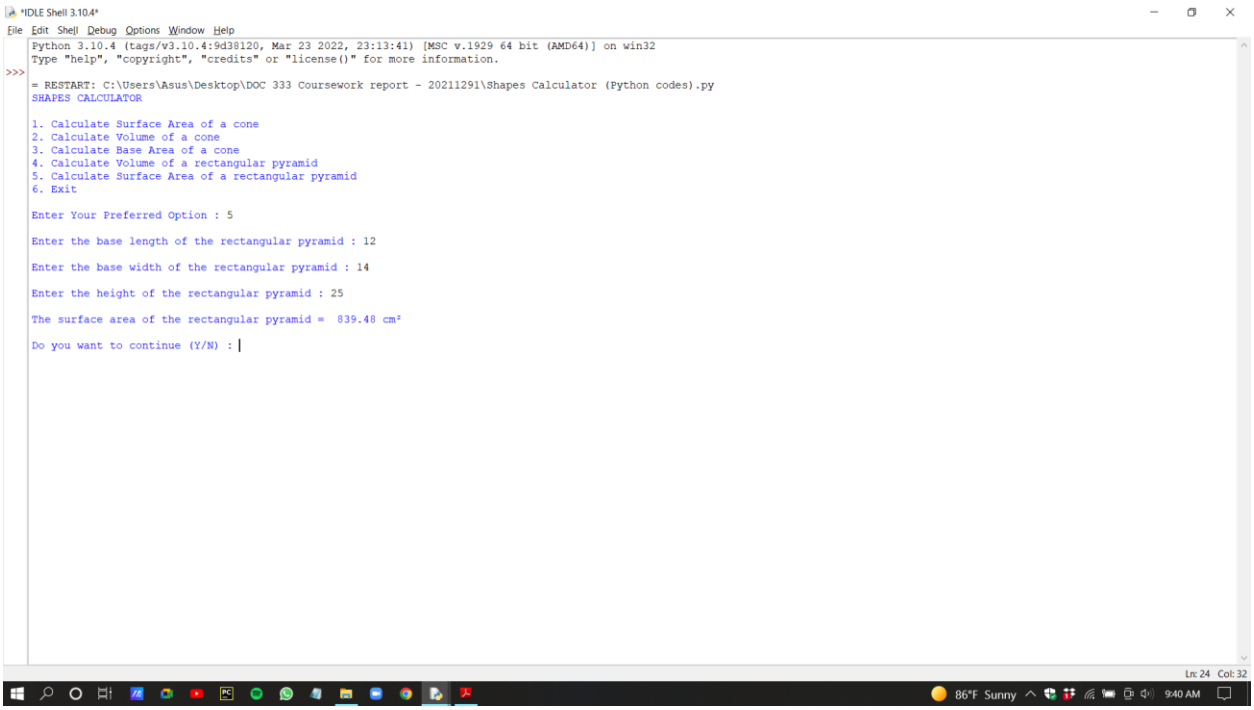


# For the Surface Area of a rectangular pyramid

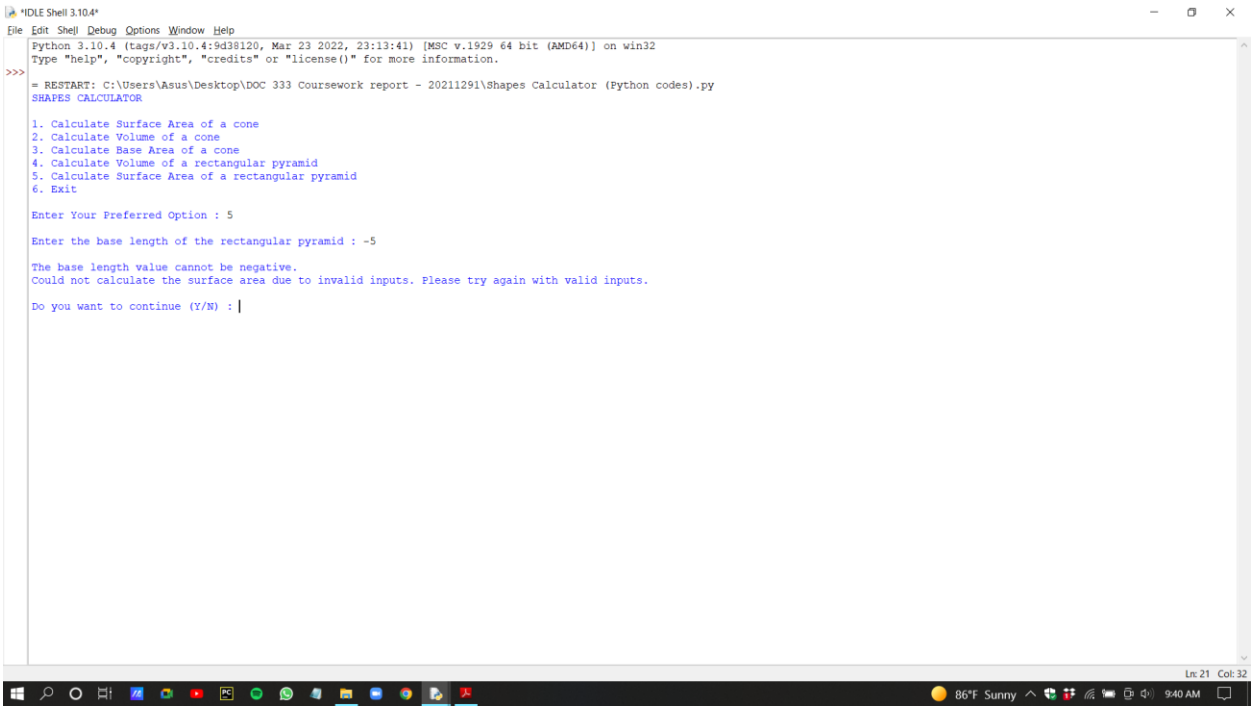
| Test Case # | Inputs | | | Expected Output | Actual Output | Remarks |
|---|---|---|---|---|---|---|
| | **Length** | **Width** | **Height** | | | |
| **1** | 12 | 14 | 25 | The surface area of the rectangular pyramid = 839.48 $cm^2$<br>Do you want to continue (Y/N) : | The surface area of the rectangular pyramid = 839.48 $cm^2$<br>Do you want to continue (Y/N) : | Test case pass. |
| **2** | -5 | - | - | The base length value cannot be negative<br>Could not calculate the volume due to invalid inputs. Please try again with valid inputs. | The base length value cannot be negative<br>Could not calculate the volume due to invalid inputs. Please try again with valid inputs. | Test case pass. |
| **3** | 2 | -12 | - | The base width value cannot be negative.<br>Could not calculate the surface area due to invalid inputs. Please try again with valid inputs. | The base width value cannot be negative.<br>Could not calculate the surface area due to invalid inputs. Please try again with valid inputs. | Test case pass |
| **4** | 12 | 19 | -15 | The height value cannot be negative.<br>Could not calculate the surface area due to invalid inputs. Please try again with valid inputs. | The height value cannot be negative.<br>Could not calculate the surface area due to invalid inputs. Please try again with valid inputs. | Test case pass |

| | | | | | | |
|---|---|---|---|---|---|---|
| **5** | 12.1 | 21.5 | 24.15 | The surface area of the rectangular pyramid = 1115.28 $cm^2$<br>Do you want to continue (Y/N) : | The surface area of the rectangular pyramid = 1115.28 $cm^2$<br>Do you want to continue (Y/N) : | Test case pass |

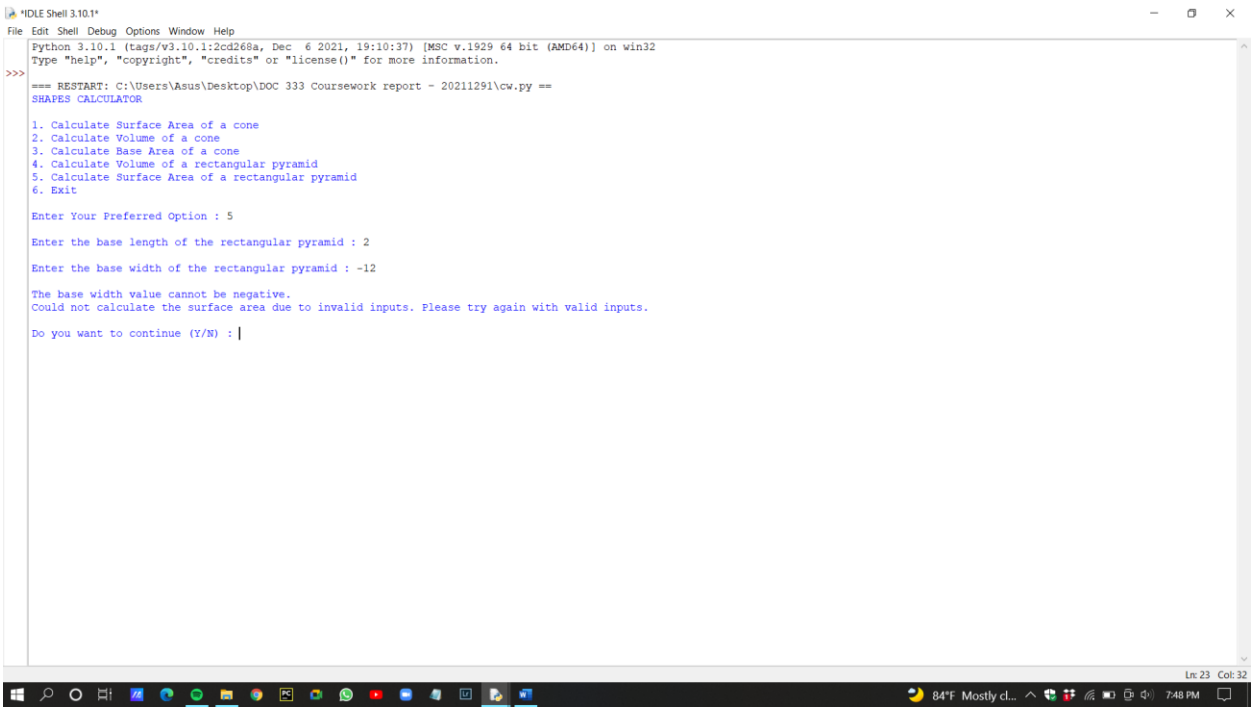
## Test Case 1



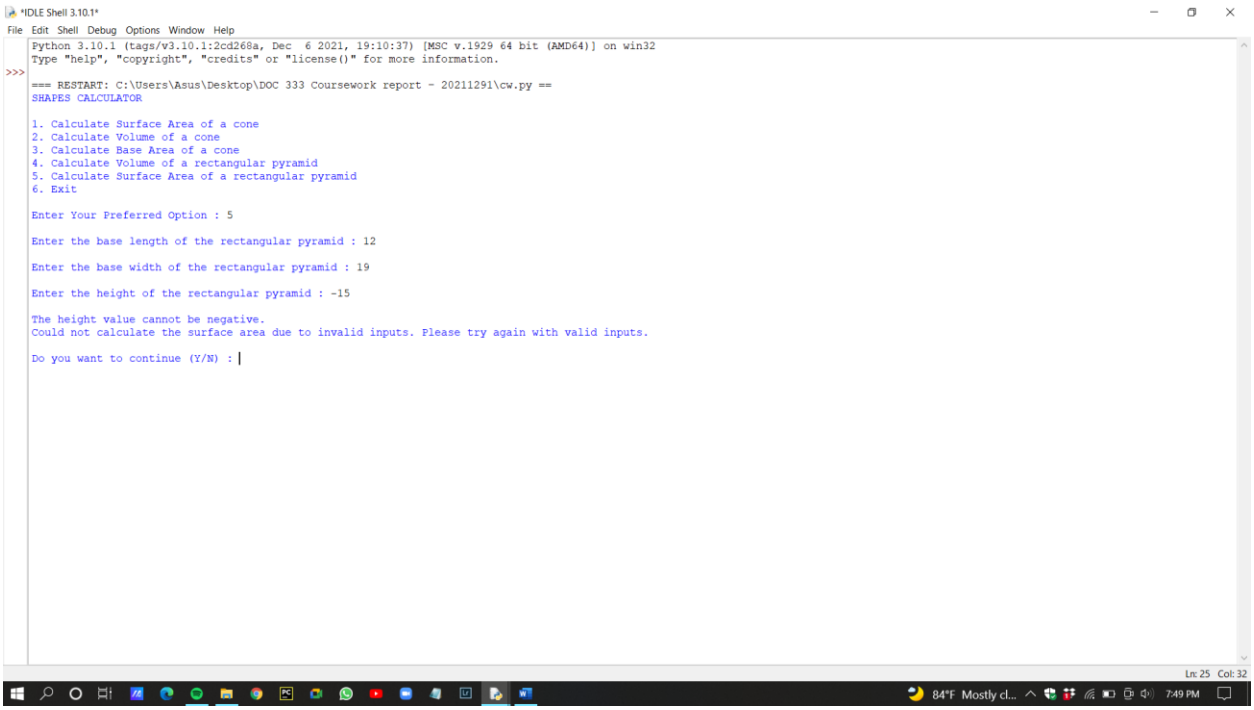
# Test Case 2




# Test Case 3



# Test Case 4




# Test Case 5