



## Foundation certificate programme

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## Table of Contents

<b>1.QUESTION 1 .....</b>	<b>3</b>
1.1 PROBLEM.....	3
1.2 PROBLEM UNDERSTANDING.....	3
1.3 ALGORITHM.....	3
1.4 PYTHON CODE.....	4
1.5 DESK CHECK.....	5
1.6 TEST CASE 1.....	6
1.7 TEST CASE 2.....	7
1.8 TEST CASE 3.....	8
<b>2. QUESTION 2 .....</b>	<b>9</b>
2.1 PROBLEM.....	9
2.2 PROBLEM UNDERSTANDING.....	10
2.3 ALGORITHM.....	11
2.4 PYTHON CODE.....	12
2.5 DESK CHECK.....	14
2.6 TEST CASE 1.....	15
2.7 TEST CASE 2.....	15
2.8 TEST CASE 3.....	16
2.9 TEST CASE 4.....	17
2.10 TEST CASE 5.....	17
<b>3. QUESTION 3 .....</b>	<b>18</b>
3.1 PROBLEM.....	18
3.2 PROBLEM UNDERSTANDING.....	18
3.3 ALGORITHM.....	19
3.4 PYTHON CODE.....	20
3.5 DESK CHECK.....	22
3.6 TEST CASE1 .....	23
3.7 TEST CASE 2.....	23
3.8 TEST CASE 3.....	24
3.9 TEST CASE 4.....	24
3.10 TEST CASE 5.....	25

Figure 1:Python source code for question 1 .....	4
Figure 2: Test case 1 for question number 1 .....	6
Figure 3: Test case 2 for question number 1 .....	7
Figure 4: Test case 3 for question number 1 .....	8
Figure 5:Python source code for question 2 .....	13
Figure 6: Test case 1 for question number 2.....	15
Figure 7: Test case 2 for question number 2.....	15
Figure 8: Test case 3 for question number 2.....	16
Figure 9: Test case 4 for question number 2.....	17
Figure 10: Test case 5 for question number 2.....	17
Figure 11:Python source code for question 3 .....	21
Figure 12: Test case 1 for question number 3.....	23
Figure 13: Test case 2 for question number 3.....	23
Figure 14: Test case 3 for question number 3.....	24
Figure 15: Test case 4 for question number 3.....	24
Figure 16: Test case 5 for question number 3.....	25

Table 1: Text cases table 1 for question number 1 .....	5
Table 2: Test cases table 2 for question number 2.....	14
Table 3: Test cases table 3 for question number 3.....	22

# 1.Question 1

## 1.1 Problem

- In a cycle race, the participating cyclists are required to qualify from the preliminary stage into the final stage, by passing a medical test and then by completing ten rounds in a circular track. Those who do not pass the medical test will not be allowed to attempt ten rounds in the track. Those who complete ten rounds in the track are eligible to participate in the final stage. Others who get tired and are unable to complete ten rounds in the track are eliminated from the contest.

Write a suitable algorithm and a python program to the above scenario.

## 1.2 Problem understanding

- It is required to develop a python program to find people who can make it to the finals of the competition. User has to input whether he passed the medical test and whether or not the ten rounds have been completed. He must pass ten rounds and the medical test to reach the final round. If he fails either, he will be eliminated from the contest.

## 1.3 Algorithm

1. Start.
2. Create two variables as medtest = 0 and tenrounds = 0
3. Ask from user Input “did you pass the medical test type ‘pass or fail’
4. If he/she passed the medical test, ask from user input “Did you completed the ten rounds in the track type ‘yes or no’”
5. If he/she failed the exam display “you are not allowed to attempt ten rounds in the track”
6. If he/she completed the ten rounds in the track print “Congratulations, you can participate in the final round”
7. End.

## 1.4 Python code

```
#create variables
medtest=0
tenrounds=0
#get inputs
medtest=input("Did you pass the medical test type 'pass or fail' :")
#process
if medtest == ("pass"):
#input
    tenrounds = input("Did you complete the ten rounds in the track type 'Yes or No' :")
    if tenrounds == ("yes"):
#outputs
        print("Congratulations, you can participate in the final round")
    else:
        print("Sorry you are eliminated from the contest")
else:
    print("You are not allowed to attempt ten rounds in the track")
```

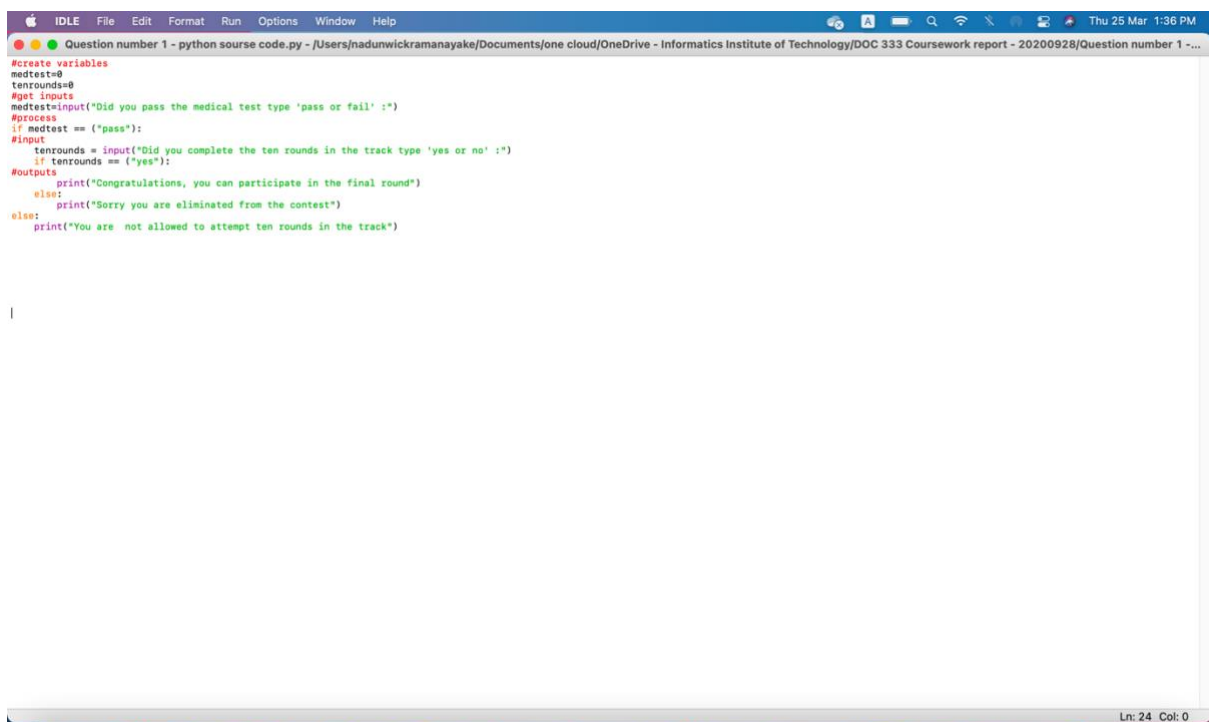


Figure 1: Python source code for question 1

## 1.5 Desk check

Test case #	Inputs		Expected output	Actual output	Remarks
	pass/fail	yes/no			
1	fail	-	You are not allowed to attempt ten rounds in the track	You are not allowed to attempt ten rounds in the track	Pass
2	pass	no	Did you complete the ten rounds in the track type 'yes or no':  Sorry you are eliminated from the contest	Did you complete the ten rounds in the track type 'yes or no':  Sorry you are eliminated from the contest	Pass
3	pass	yes	Did you complete the ten rounds in the track type 'yes or no':  Congratulations, you can participate in the final round	Did you complete the ten rounds in the track type 'yes or no':  Congratulations, you can participate in the final round	Pass

Table 1: Text cases table 1 for question number 1

## 1.6 Test case 1

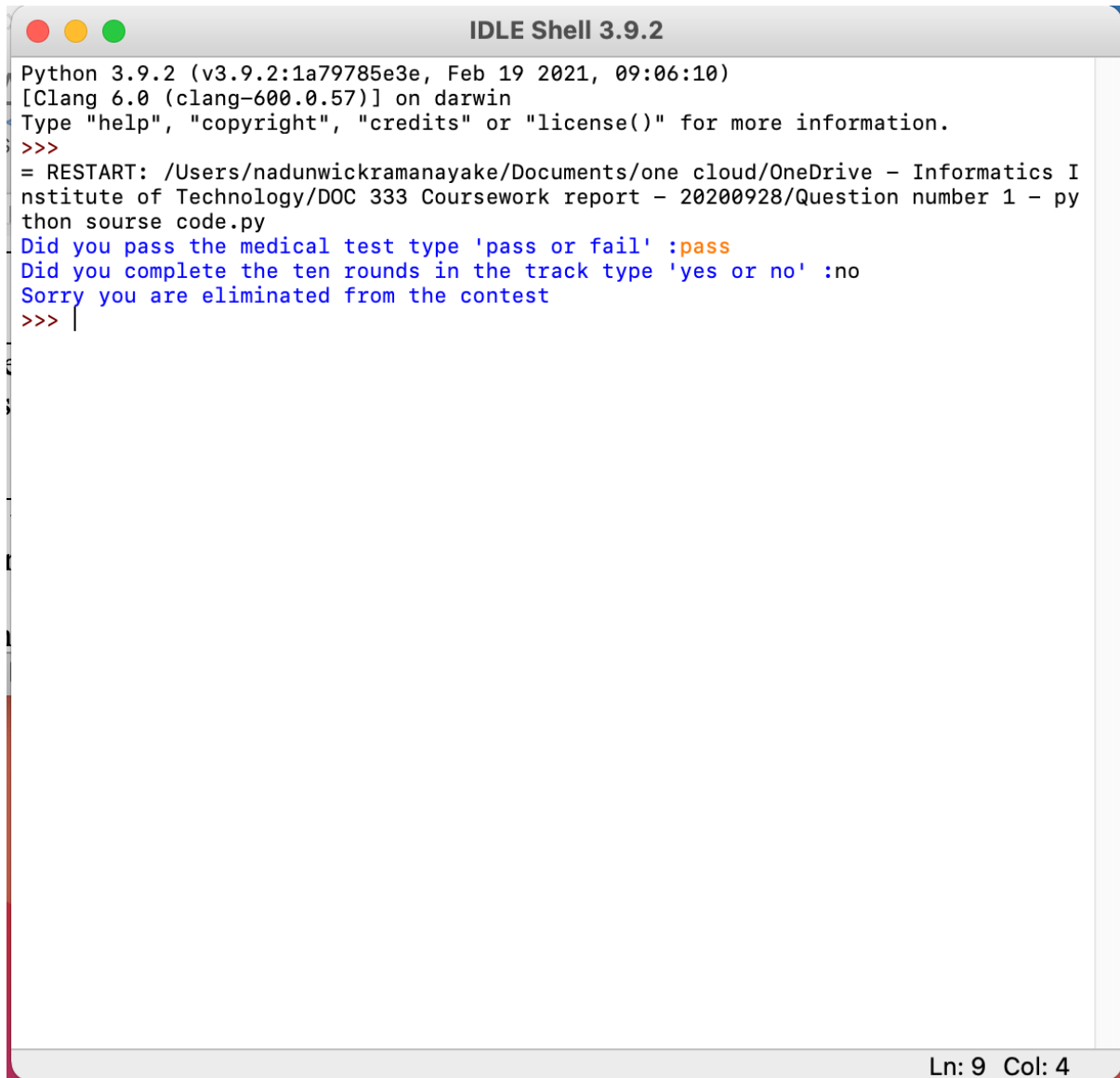


```
Python 3.9.2 (v3.9.2:1a79785e3e, Feb 19 2021, 09:06:10)
[Clang 6.0 (clang-600.0.57)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: /Users/nadunwickramanayake/Documents/one cloud/OneDrive - Informatics I
nstitute of Technology/DOC 333 Coursework report - 20200928/Question number 1 - py
thon source code.py
Did you pass the medical test type 'Pass or Fail' : fail
You are not allowed to attempt ten rounds in the track
>>>
```

Ln: 8 Col: 4

Figure 2: Test case 1 for question number 1

## 1.7 Test case 2



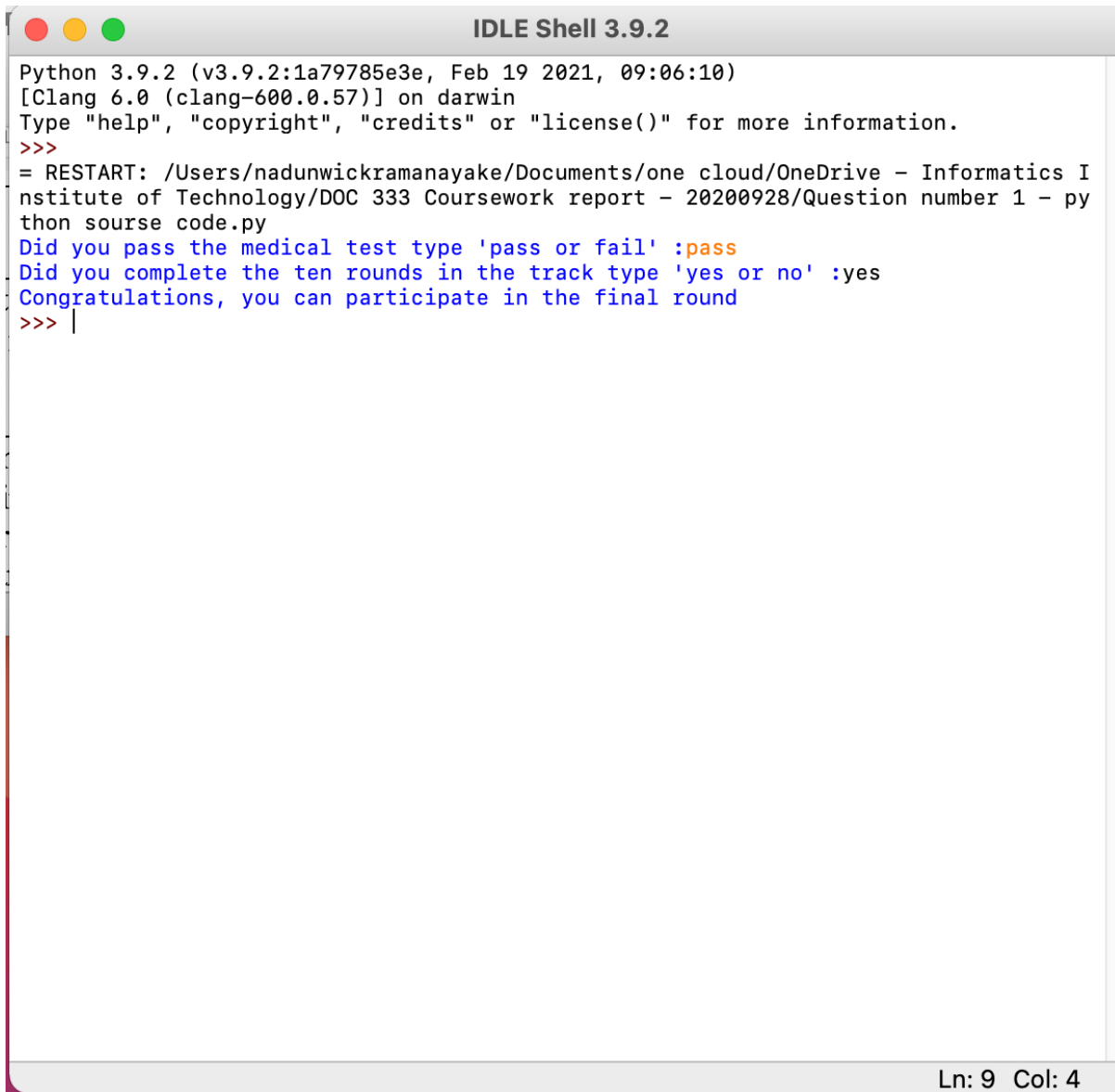
```
Python 3.9.2 (v3.9.2:1a79785e3e, Feb 19 2021, 09:06:10)
[Clang 6.0 (clang-600.0.57)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: /Users/nadunwickramanayake/Documents/one cloud/OneDrive - Informatics I
nstitute of Technology/DOC 333 Coursework report - 20200928/Question number 1 - py
thon source code.py
Did you pass the medical test type 'pass or fail' :pass
Did you complete the ten rounds in the track type 'yes or no' :no
Sorry you are eliminated from the contest
>>> |
```

Ln: 9 Col: 4

Figure 3: Test case 2 for question number 1



## 1.8 Test case 3



```
Python 3.9.2 (v3.9.2:1a79785e3e, Feb 19 2021, 09:06:10)
[Clang 6.0 (clang-600.0.57)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: /Users/nadunwickramanayake/Documents/one cloud/OneDrive - Informatics I
nstitute of Technology/DOC 333 Coursework report - 20200928/Question number 1 - py
thon sourse code.py
Did you pass the medical test type 'pass or fail' :pass
Did you complete the ten rounds in the track type 'yes or no' :yes
Congratulations, you can participate in the final round
>>> |
```

Ln: 9 Col: 4

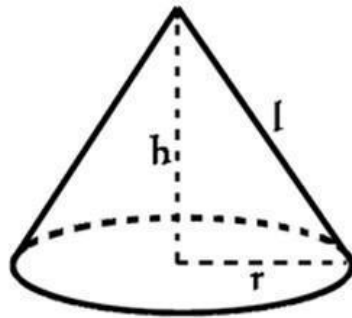
Figure 4: Test case 3 for question number 1

## 2. Question 2

### 2.1 Problem

Design and develop the shapes calculator as explained below with the mentioned functionalities. Scenario:

- Python program reads the Radius (r), the Height (h) and the Slant height (l) of a cone. User can type in the radius, the height and the slant



(a) When user inputs 'A' as an option, the program should calculate & display the Surface Area, the Volume and the Base Area of the cone using the following formulas.

$$\text{Base area of a cone} = \pi r^2$$

$$\text{Surface area of a cone} = \pi r^2 + \pi r l$$

$$\text{Volume of a cone} = 1/3 * \pi r^2 * h \text{ where } \pi = 3.14$$

(b) When user inputs 'S' as an option 'Surface Area', 'V' as an option then 'Volume' and 'B' as an option, 'Base Area' independently, program should calculate & display (using the given formulas) the respective value.

(c) When preferred character is entered, if the necessary input values are blank, program should display an appropriate error message(s).

## 2.2 Problem understanding

It is required to develop a python program to design and develop the cone (shape) calculator to find surface area, volume and base area of a cone. We need create seven variables (with special variable) and we need create a special variable for get a letter from user and display the respective value ( 's'= Surface area of the cone , 'b' = Base area of the cone , 'v' = Volume of the cone , 'a' = Surface area , Base area and Volume of the cone:") and user needs input Radius (r), the Height (h) and the Slant height (l) of a cone. So, after doing the process part we can get our expected outputs. If user input an invalid letter or if the necessary input values are blank program should show valid an appropriate message.

## 2.3 Algorithm

1. Start
2. Create seven variables as radius=0, height=0, slant\_height=0, letter=0, surface\_area\_of\_a\_cone = 0, base\_area\_of\_a\_cone = 0, volume\_of\_a\_cone = 0
3. Ask from user to input radius of the cone
4. Ask from user to input height of the cone
5. Ask from user to input slant height of the cone
6. Ask from user to input "Type the letter you want out of these four 's'= Surface area of the cone , 'b' = Base area of the cone , 'v' = Volume of the cone , 'a' = Surface area , Base area and Volume of the cone "
7.  $\text{surface\_area\_of\_a\_cone} = 3.14 * \text{radius} * \text{radius} + 3.14 * \text{radius} * \text{slant\_height}$
8.  $\text{base\_area\_of\_a\_cone} = 3.14 * \text{radius} * \text{radius}$
9.  $\text{volume\_of\_a\_cone} = 1/3 * 3.14 * \text{radius} * \text{radius} * \text{height}$
10. if letter = "a" display surface area of the cone , volume of the cone and base area of the cone
11. elseif letter = "s" display surface area of the cone
12. elseif letter = "b" display base area of the cone
13. elseif letter = "v" display volume of the cone
14. else display "Please enter a valid letter"
15. End.

## 2.4 Python code

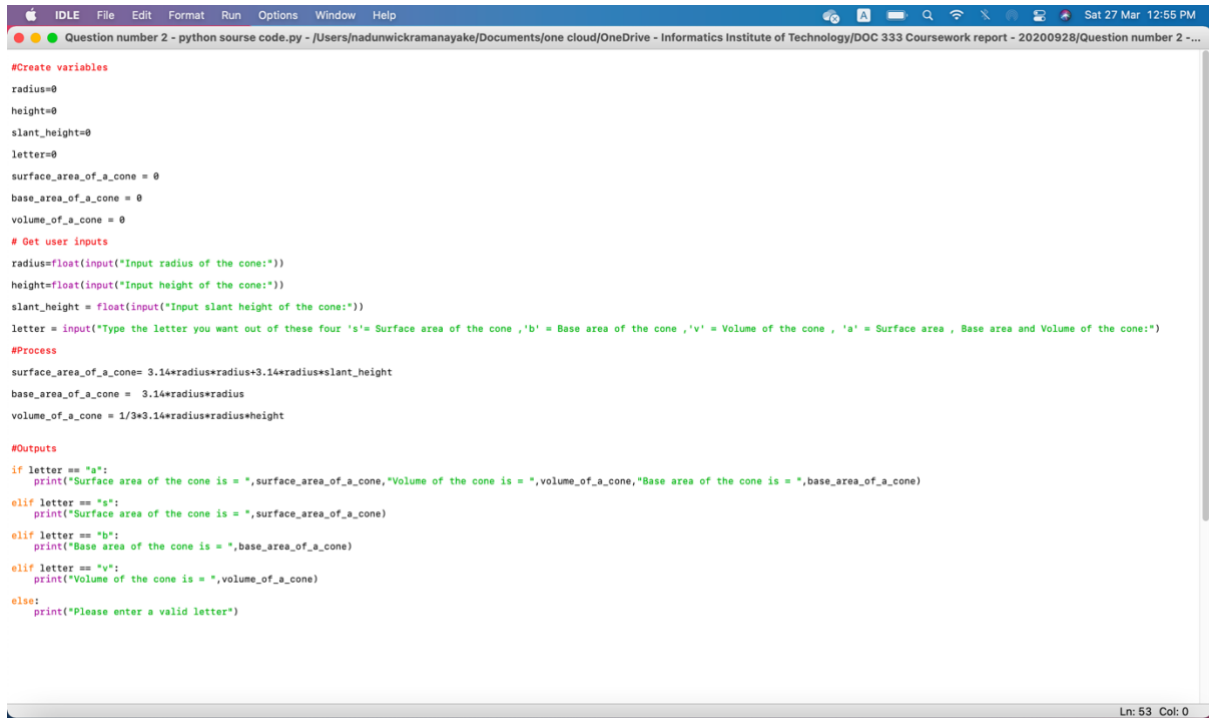
```
#Create variables
radius=0
height=0
slant_height=0
letter=0
surface_area_of_a_cone = 0
base_area_of_a_cone = 0
volume_of_a_cone = 0
# Get user inputs
radius=float(input("Input radius of the cone:"))
height=float(input("Input height of the cone:"))
slant_height = float(input("Input slant height of the cone:"))
letter = input("Type the letter you want out of these four 's'= Surface area of the cone
,'b' = Base area of the cone ,'v' = Volume of the cone , 'a' = Surface area , Base area
and Volume of the cone:")
#Process
surface_area_of_a_cone= 3.14*radius*radius+3.14*radius*slant_height
base_area_of_a_cone = 3.14*radius*radius
volume_of_a_cone = 1/3*3.14*radius*radius*height
#Outputs
if letter == "a":
    print("Surface area of the cone is = ",surface_area_of_a_cone,"Volume of the cone
is = ",volume_of_a_cone,"Base area of the cone is = ",base_area_of_a_cone)

elif letter == "s":
    print("Surface area of the cone is = ",surface_area_of_a_cone)
elif letter == "b":
    print("Base area of the cone is = ",base_area_of_a_cone)
elif letter == "v":
```

```

print("Volume of the cone is =",volume_of_a_cone)
else:
    print("Please enter a valid letter")

```



```

#Create variables
radius=0
height=0
slant_height=0
letter=0
surface_area_of_a_cone = 0
base_area_of_a_cone = 0
volume_of_a_cone = 0

# Get user inputs
radius=float(input("Input radius of the cone:"))
height=float(input("Input height of the cone:"))
slant_height = float(input("Input slant height of the cone:"))
letter = input("Type the letter you want out of these four 's'= Surface area of the cone , 'b' = Base area of the cone , 'v' = Volume of the cone , 'a' = Surface area , Base area and Volume of the cone:")

#Process
surface_area_of_a_cone= 3.14*radius*radius+3.14*radius*slant_height
base_area_of_a_cone = 3.14*radius*radius
volume_of_a_cone = 1/3*3.14*radius*radius*height

#Outputs
if letter == "a":
    print("Surface area of the cone is =",surface_area_of_a_cone,"Volume of the cone is =",volume_of_a_cone,"Base area of the cone is =",base_area_of_a_cone)
elif letter == "s":
    print("Surface area of the cone is =",surface_area_of_a_cone)
elif letter == "b":
    print("Base area of the cone is =",base_area_of_a_cone)
elif letter == "v":
    print("Volume of the cone is =",volume_of_a_cone)
else:
    print("Please enter a valid letter")

```

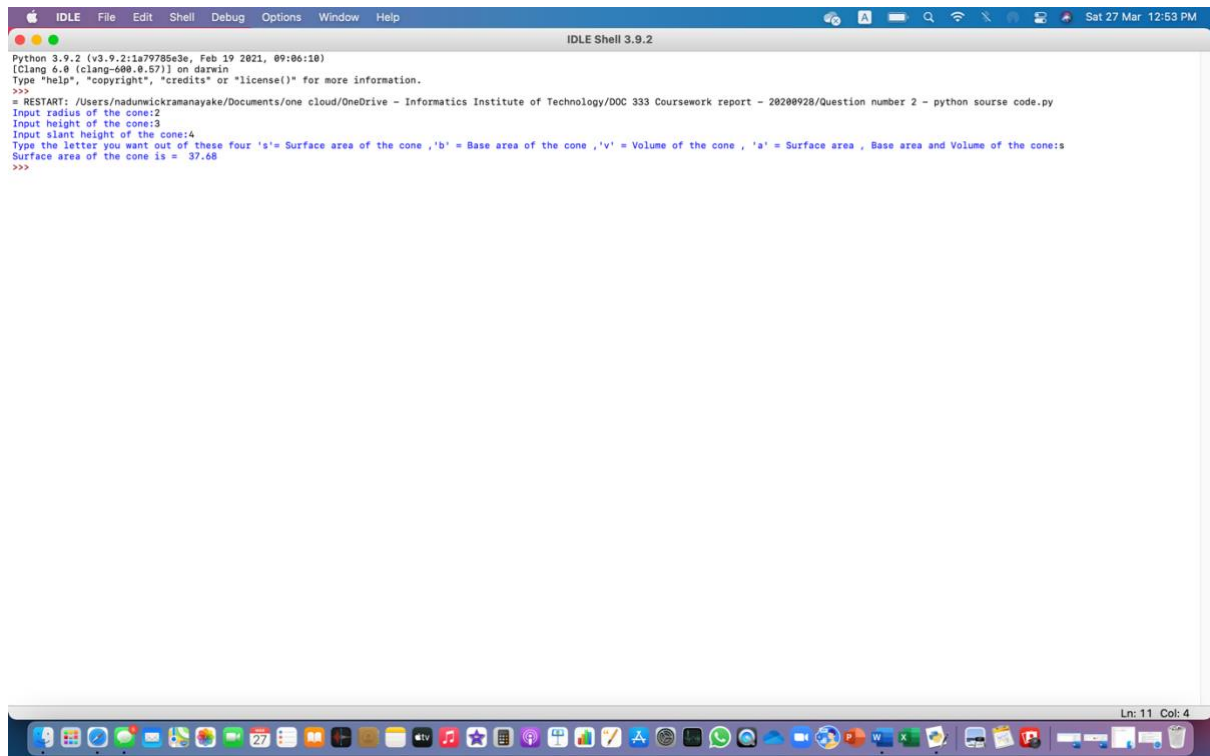
Figure 5:Python source code for question 2

## 2.5 Desk check

Test case #	Inputs				Expected output	Actual output	Remarks
	Radius(r)	Height(h)	Slant height (l)	Letter			
1	2	3	4	s	Surface area of the cone is = 37.68	Surface area of the cone is = 37.68	Pass
2	2	3	5	b	Base area of the cone is = 12.56	Base area of the cone is = 12.56	Pass
3	2	3	6	v	Volume of the cone is = 12.559999999999999	Volume of the cone is = 12.559999999999999	Pass
4	2	3	7	a	Surface area of the cone is = 56.52 Volume of the cone is = 12.559999999999999 Base area of the cone is = 12.56	Surface area of the cone is = 56.52 Volume of the cone is = 12.559999999999999 Base area of the cone is = 12.56	pass
5	12	12	3	n	Please enter a valid letter	Please enter a valid letter	pass

Table 2: Test cases table 2 for question number 2

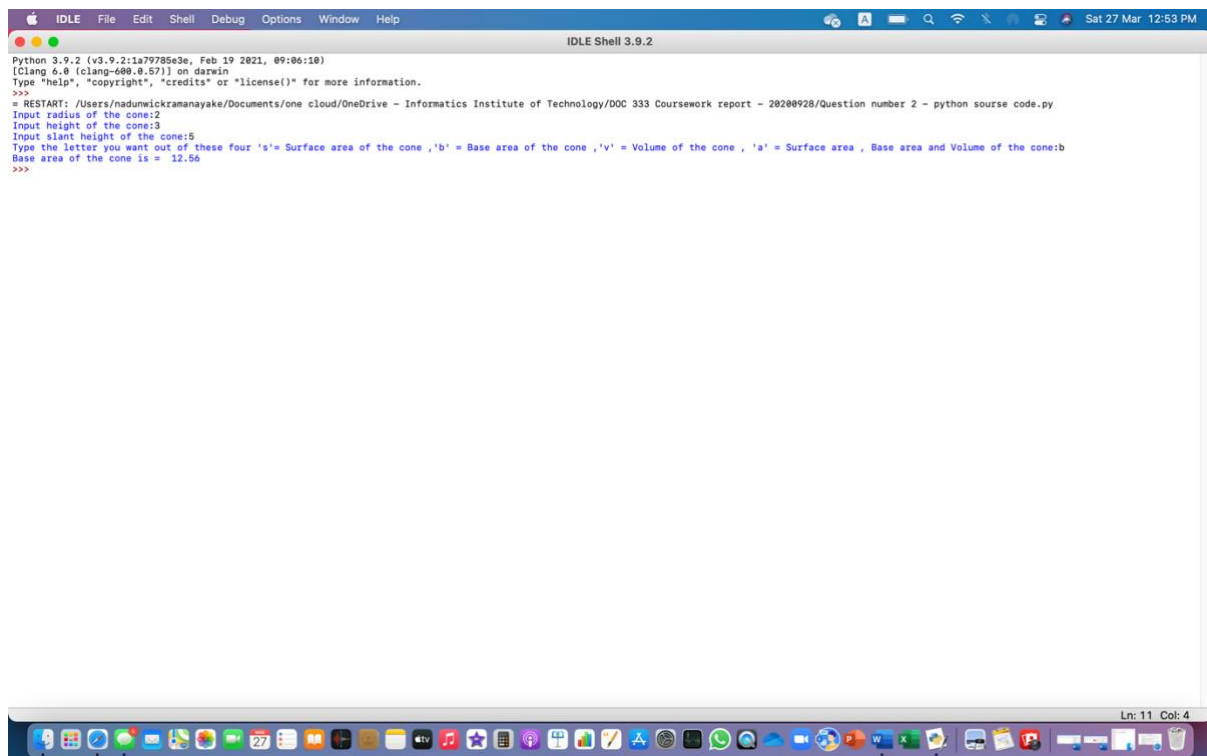
## 2.6 Test case 1



```
Python 3.9.2 (v3.9.2:1a79785e3e, Feb 19 2021, 09:06:18)
[Clang 6.0 (clang-600.0.57)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: /Users/nadunwickramanayake/Documents/one cloud/OneDrive - Informatics Institute of Technology/DOC 333 Coursework report - 20200928/Question number 2 - python source code.py
Input radius of the cone:2
Input height of the cone:3
Input slant height of the cone:4
Type the letter you want out of these four 's'= Surface area of the cone , 'b' = Base area of the cone , 'v' = Volume of the cone , 'a' = Surface area , Base area and Volume of the cone:s
Surface area of the cone is = 37.68
>>>
```

Figure 6: Test case 1 for question number 2

## 2.7 Test case 2

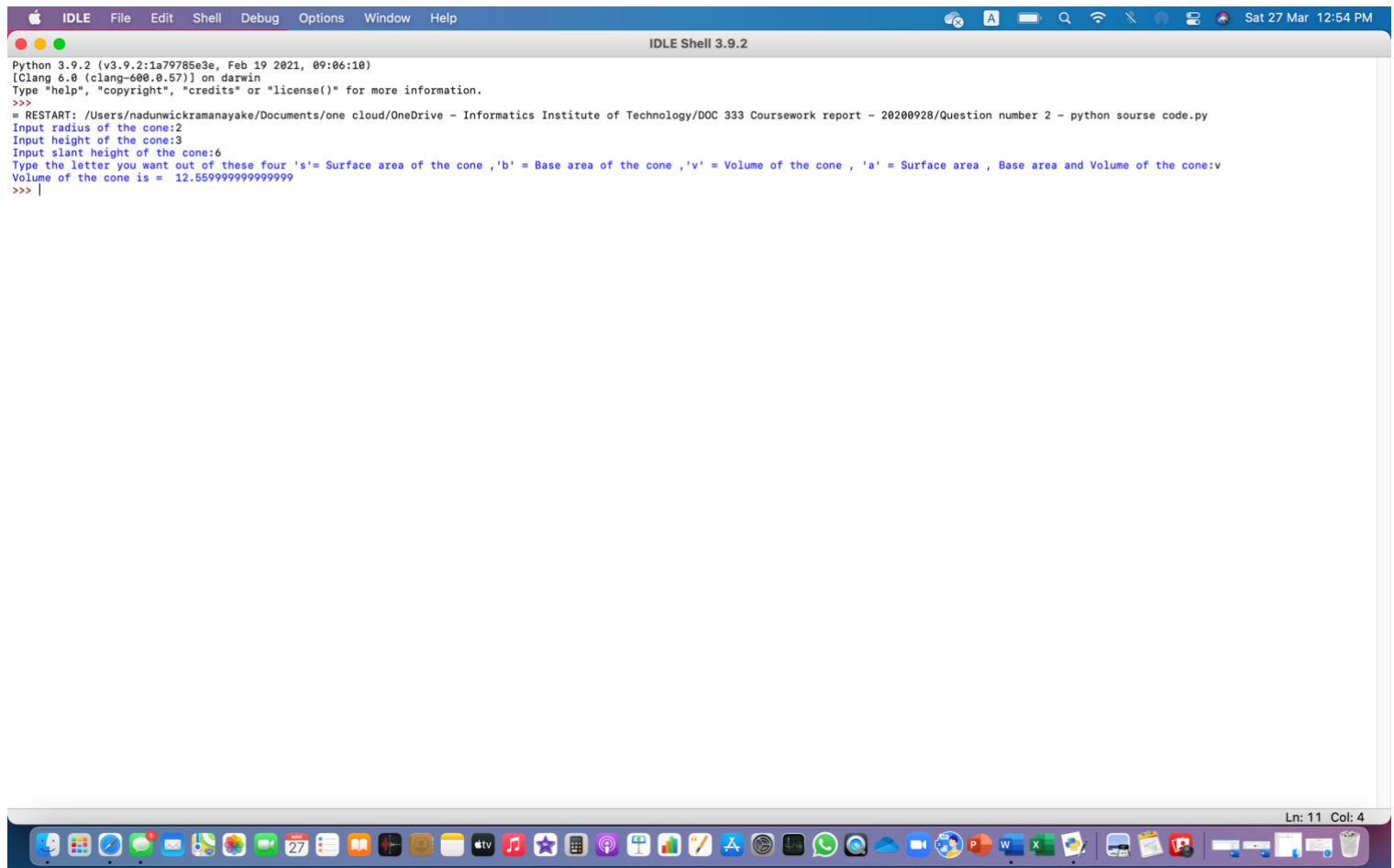


```
Python 3.9.2 (v3.9.2:1a79785e3e, Feb 19 2021, 09:06:18)
[Clang 6.0 (clang-600.0.57)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: /Users/nadunwickramanayake/Documents/one cloud/OneDrive - Informatics Institute of Technology/DOC 333 Coursework report - 20200928/Question number 2 - python source code.py
Input radius of the cone:2
Input height of the cone:3
Input slant height of the cone:5
Type the letter you want out of these four 's'= Surface area of the cone , 'b' = Base area of the cone , 'v' = Volume of the cone , 'a' = Surface area , Base area and Volume of the cone:b
Base area of the cone is = 12.56
>>>
```

Figure 7: Test case 2 for question number 2



## 2.8 Test case 3



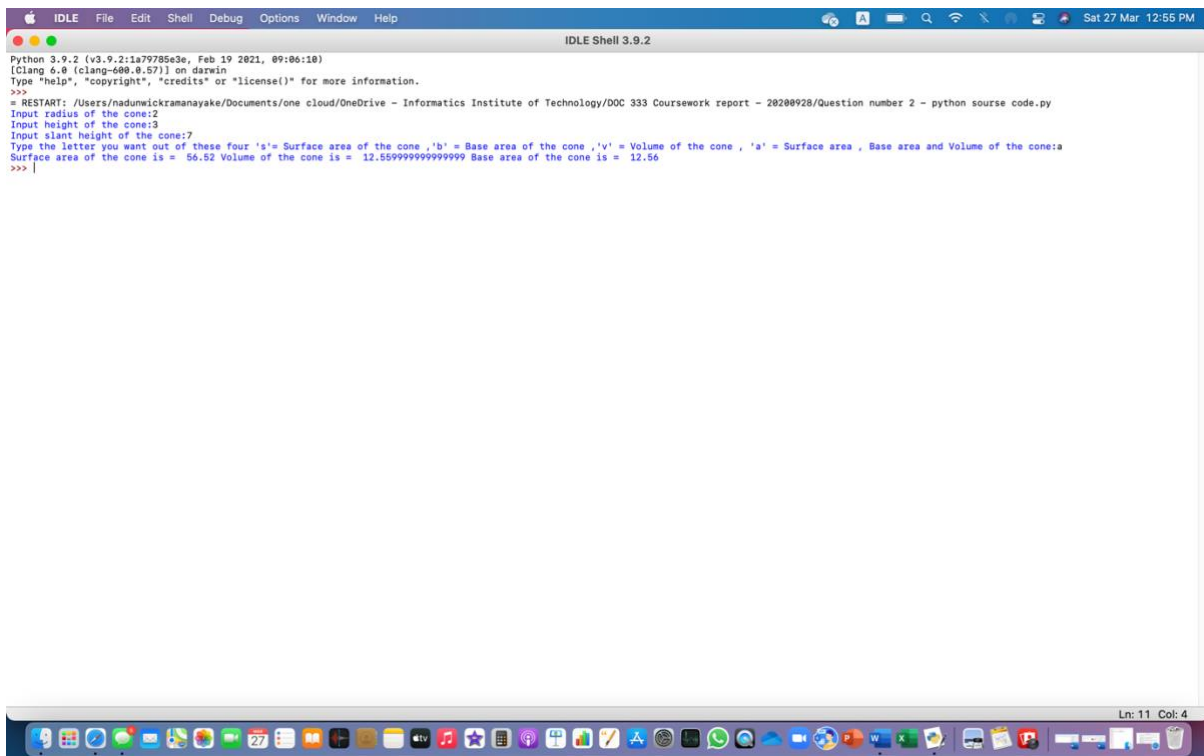
The screenshot shows a Mac OS desktop with an IDLE Python Shell window open. The window title is "IDLE Shell 3.9.2". The menu bar at the top includes Apple, IDLE, File, Edit, Shell, Debug, Options, Window, and Help. The system status bar on the right shows the date and time: "Sat 27 Mar 12:54 PM".

```
Python 3.9.2 (v3.9.2:1a79785e3e, Feb 19 2021, 09:06:10)
[Clang 6.0 (clang-600.0.57)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: /Users/nadunwickramanayake/Documents/one cloud/OneDrive - Informatics Institute of Technology/DOC 333 Coursework report - 20200928/Question number 2 - python source code.py
Input radius of the cone:2
Input height of the cone:3
Input slant height of the cone:6
Type the letter you want out of these four 's'= Surface area of the cone , 'b' = Base area of the cone , 'v' = Volume of the cone , 'a' = Surface area , Base area and Volume of the cone:v
Volume of the cone is = 12.559999999999999
>>> |
```

The dock at the bottom of the screen contains various application icons, including Finder, Launchpad, Safari, Messages, Mail, Photos, Calendar (showing 27), Reminders, Notes, Music, TV, App Store, and several utility and communication apps like System Settings, Keychain Access, Wallet, Health, Home, Phone, Messages, Mail, Photos, Safari, and others. The status bar at the bottom right of the window indicates "Ln: 11 Col: 4".

Figure 8: Test case 3 for question number 2

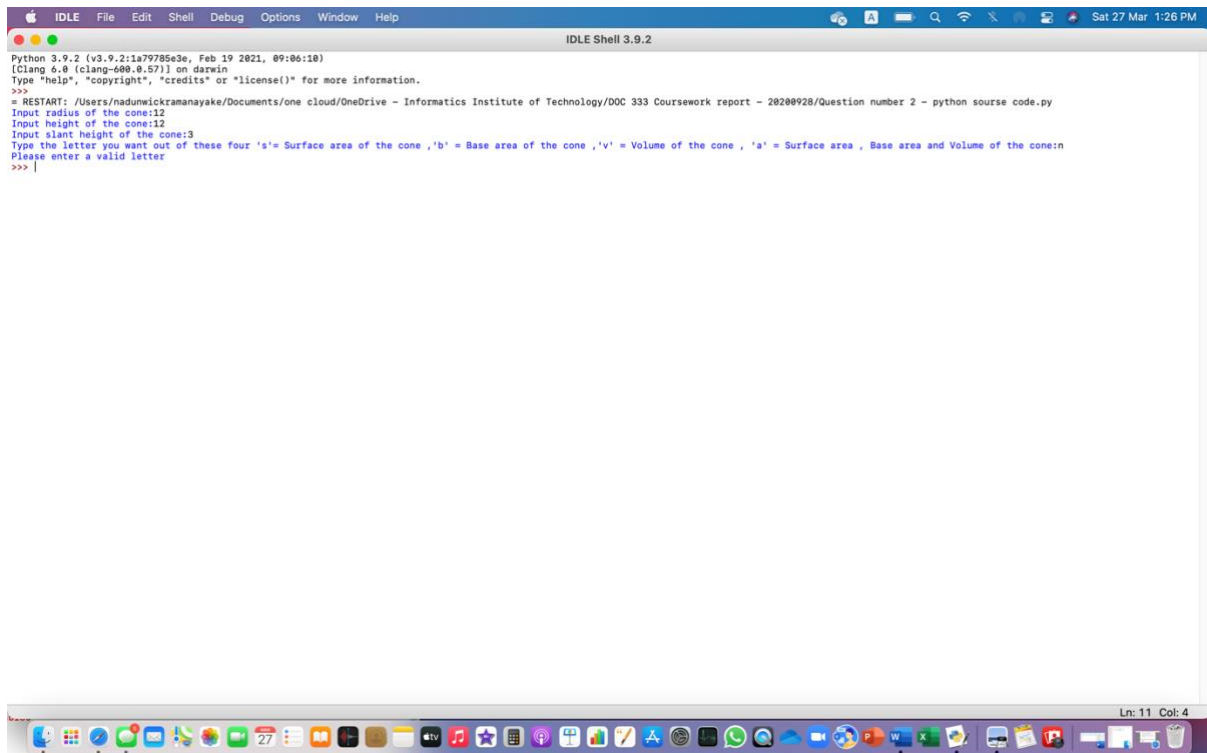
## 2.9 Test case 4



```
Python 3.9.2 (v3.9.2:1a79785e3e, Feb 19 2021, 09:06:18)
[Clang 6.0 (clang-600.0.57)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: /Users/nadumickramanayake/Documents/one cloud/OneDrive - Informatics Institute of Technology/DOC 333 Coursework report - 20200928/Question number 2 - python source code.py
Input radius of the cone:2
Input height of the cone:3
Input slant height of the cone:7
Type the letter you want out of these four 's'= Surface area of the cone , 'b'= Base area of the cone , 'v'= Volume of the cone , 'a'= Surface area , Base area and Volume of the cone:a
Surface area of the cone is = 55.52 Volume of the cone is = 12.559999999999999 Base area of the cone is = 12.56
>>> |
```

Figure 9: Test case 4 for question number 2

## 2.10 Test case 5



```
Python 3.9.2 (v3.9.2:1a79785e3e, Feb 19 2021, 09:06:18)
[Clang 6.0 (clang-600.0.57)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: /Users/nadumickramanayake/Documents/one cloud/OneDrive - Informatics Institute of Technology/DOC 333 Coursework report - 20200928/Question number 2 - python source code.py
Input radius of the cone:12
Input height of the cone:12
Input slant height of the cone:3
Type the letter you want out of these four 's'= Surface area of the cone , 'b'= Base area of the cone , 'v'= Volume of the cone , 'a'= Surface area , Base area and Volume of the cone:
Please enter a valid letter
>>> |
```

Figure 10: Test case 5 for question number 2

### 3. Question 3

#### 3.1 Problem

Write a python program to create a BMI calculator application that reads the user's weight in kilograms and height in meters, then calculates and displays the user's body mass index. Also, the application should display the following information. The user can evaluate his/her BMI

$$\text{BMI} = \text{weight}(\text{kg}) / (\text{height}(\text{m}) * \text{height}(\text{m}))$$

#### BMI VALUES

Underweight: less than 18.5

Normal: between 18.5 and 24.9

Overweight: between 25 and 29.9

Obese: 30 or greater

#### 3.2 Problem understanding

It is required to develop a python program to find user's BMI value and the program should show whether the BMI value is underweight, normal, overweight or obese.

User must enter his height and weight for this program to work (It must be a positive value). We need create three variables and get user inputs. After got user inputs we can move to the process part and finally we can get our expected outputs.

### 3.3 Algorithm

1. Start
2. Create variables weight=0, height=0, BMI=0
3. Ask from user to input your weight in kilograms
4. Ask from user to input your height in meters
5.  $BMI = \text{weight} / (\text{height} * \text{height})$
6. Display (BMI)
7. if  $BMI < 18.5$  display "Your body mass index 'BMI' is underweight"
8. elseif  $18.5 \leq BMI \leq 24.9$  display "Your body mass index 'BMI' is normal"
9. elseif  $25 \leq BMI < 29.9$  display "Your body mass index 'BMI' is overweight"
10. else  $BMI \geq 30$  display "Your body mass index 'BMI' is obese"
11. End.

### 3.4 Python code

```
#create variables
weight=0
height=0
BMI=0

#get user inputs
weight=float(input("Please input your weight in kilograms:"))
height=float(input("Please input your height in meters:"))

#process to calculate the BMI value
BMI=weight/(height*height)

#outputs
print("BMI =",BMI)
if BMI<18.5:
    print("Your body mass index 'BMI' is underweight")
elif 18.5<=BMI<=24.9:
    print("Your body mass index 'BMI' is normal")
elif 25<=BMI<29.9:
    print("Your body mass index 'BMI' is overweight")
else:
    BMI>=30
    print("Your body mass index 'BMI' is obese")
```

```
Apple IDLE File Edit Format Run Options Window Help
Question number 3 - python source code.py - /Users/nadunwickramanayake/Documents/one cloud/OneDrive - Informatics Institute of Technology/DOC 333 Coursework report - 20200928/Question number 3 - ...

#create variables
weight=0
height=0
BMI=0

#get user inputs
weight=float(input("Please input your weight in kilograms:"))
height=float(input("Please input your height in meters:"))

#process to calculate the BMI value
BMI=weight/(height*height)

#outputs
print("BMI =",BMI)
if BMI<18.5:
    print("Your body mass index 'BMI' is underweight")
elif 18.5<=BMI<=24.9:
    print("Your body mass index 'BMI' is normal")
elif 25<=BMI<29.9:
    print("Your body mass index 'BMI' is overweight")
else:
    BMI>=30
    print("Your body mass index 'BMI' is obese")

Ln: 7 Col: 61
```

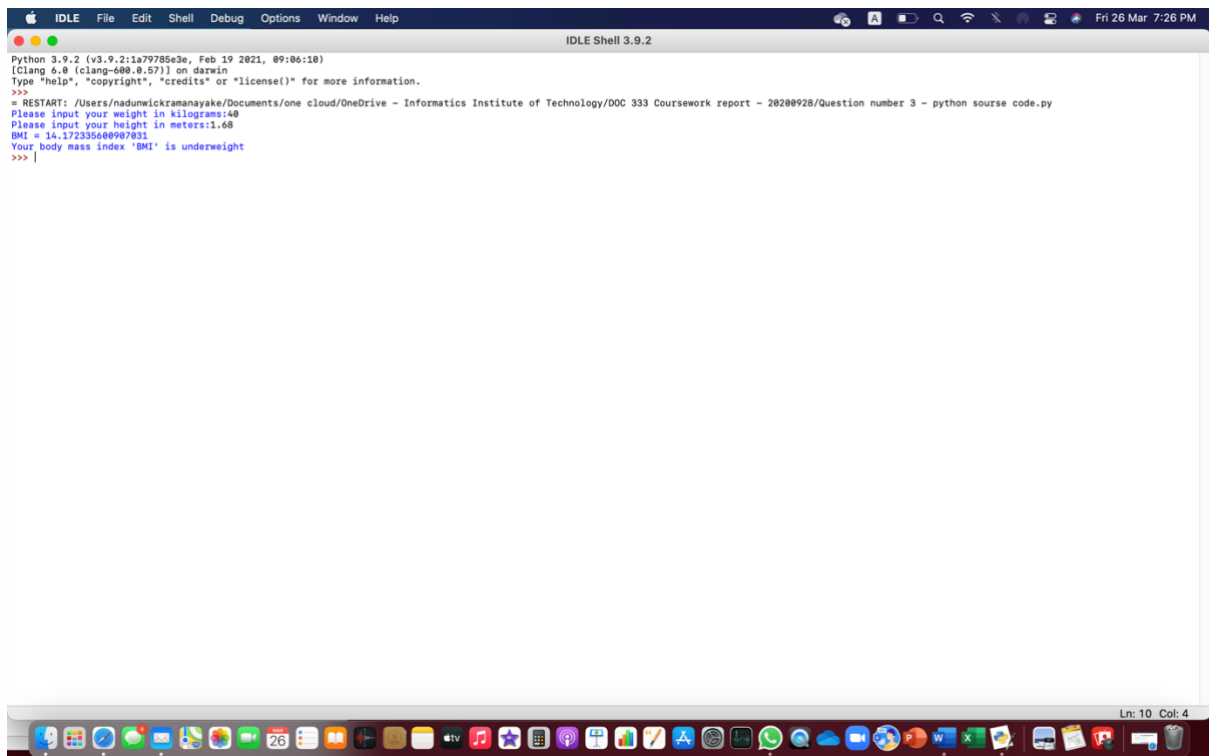
Figure 11: Python source code for question 3

### 3.5 Desk check

Test case #	Inputs		Expected output	Actual output	Remarks
	Weight(kg)	Height(m)			
1	40	1.68	BMI = 14.172335600907031 Your body mass index 'BMI' is underweight	BMI = 14.172335600907031 Your body mass index 'BMI' is underweight	Pass
2	68	1.68	BMI = 24.092970521541954 your body mass index 'BMI' is normal	BMI = 24.092970521541954 Your body mass index 'BMI' is normal	Pass
3	70	1.65	BMI = 25.71166207529844 Your body mass index 'BMI' is overweight	BMI = 25.71166207529844 Your body mass index 'BMI' is overweight	Pass
4	90	1.69	BMI = 31.51150169811982 Your body mass index 'BMI' is obese	BMI = 31.51150169811982 Your body mass index 'BMI' is obese	pass
5	100	1.8	BMI = 30.864197530864196 Your body mass index 'BMI' is obese	BMI = 30.864197530864196 Your body mass index 'BMI' is obese	pass

Table 3: Test cases table 3 for question number 3

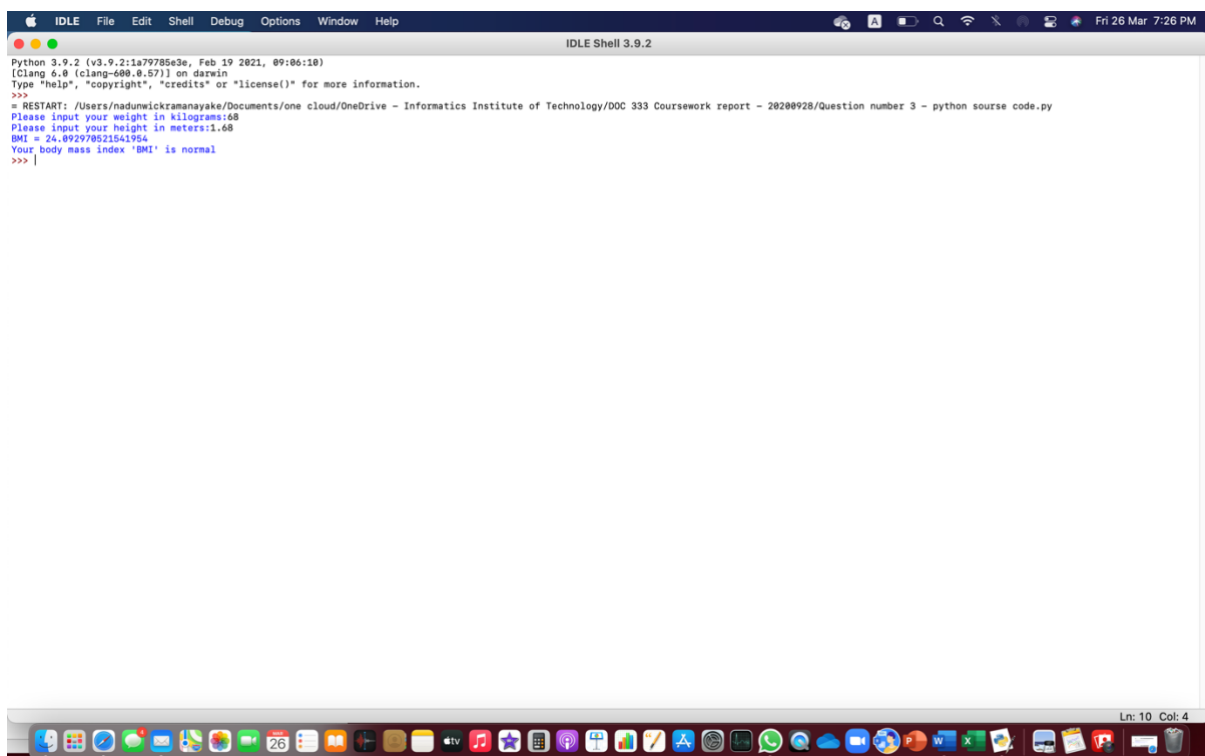
## 3.6 Test case1



```
Python 3.9.2 (v3.9.2:1a79785e3e, Feb 19 2021, 09:06:10)
[Clang 6.0 (clang-600.0.57)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: /Users/nadumickramanayake/Documents/one cloud/OneDrive - Informatics Institute of Technology/DOC 333 Coursework report - 20200928/Question number 3 - python source code.py
Please input your weight in kilograms:40
Please input your height in meters:1.68
BMI = 14.172335600907031
Your body mass index 'BMI' is underweight
>>> |
```

Figure 12: Test case 1 for question number 3

## 3.7 Test case 2

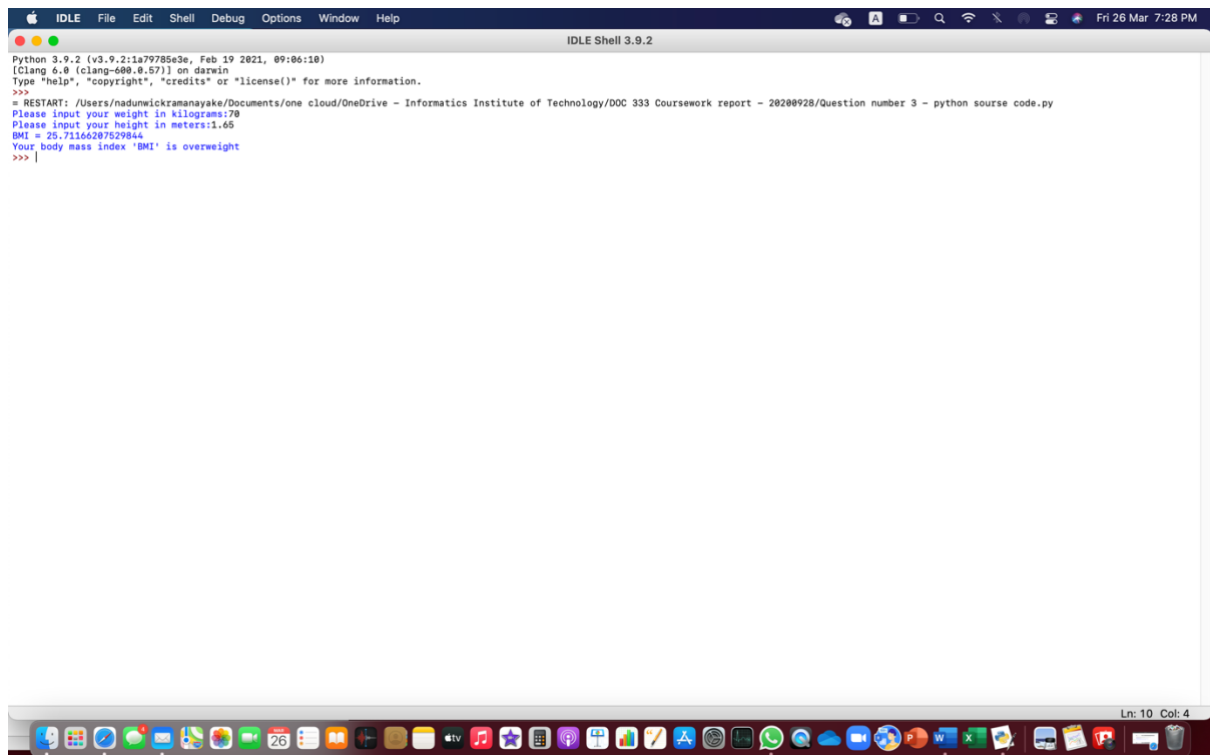


```
Python 3.9.2 (v3.9.2:1a79785e3e, Feb 19 2021, 09:06:10)
[Clang 6.0 (clang-600.0.57)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: /Users/nadumickramanayake/Documents/one cloud/OneDrive - Informatics Institute of Technology/DOC 333 Coursework report - 20200928/Question number 3 - python source code.py
Please input your weight in kilograms:68
Please input your height in meters:1.68
BMI = 24.092978021941954
Your body mass index 'BMI' is normal
>>> |
```

Figure 13: Test case 2 for question number 3



### 3.8 Test case 3

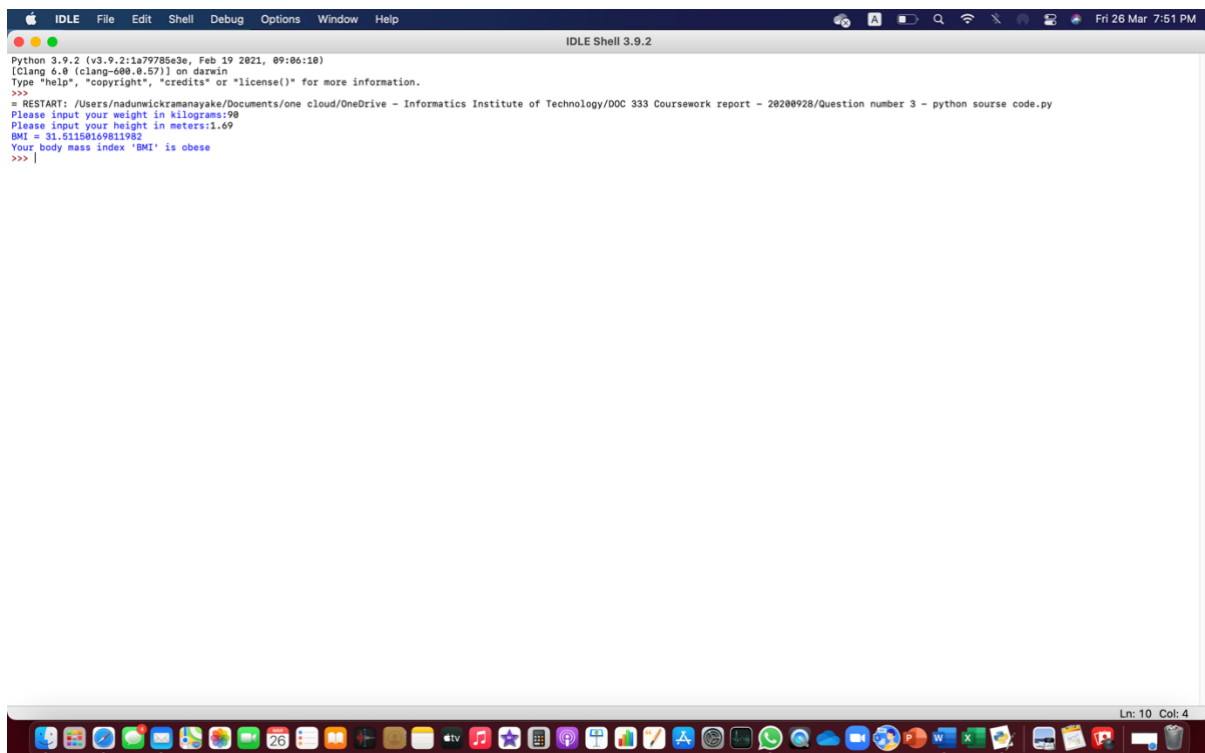


The screenshot shows an IDLE Shell window with the following text:

```
Python 3.9.2 (v3.9.2:1a79785e3e, Feb 19 2021, 09:06:10)
[Clang 6.0 (clang-600.0.57)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: /Users/nadunwickramanayake/Documents/one cloud/OneDrive - Informatics Institute of Technology/DOC 333 Coursework report - 20200928/Question number 3 - python source code.py
Please input your weight in kilograms:70
Please input your height in meters:1.65
BMI = 25.71166207529844
Your body mass index 'BMI' is overweight
>>> |
```

Figure 14: Test case 3 for question number 3

### 3.9 Test case 4

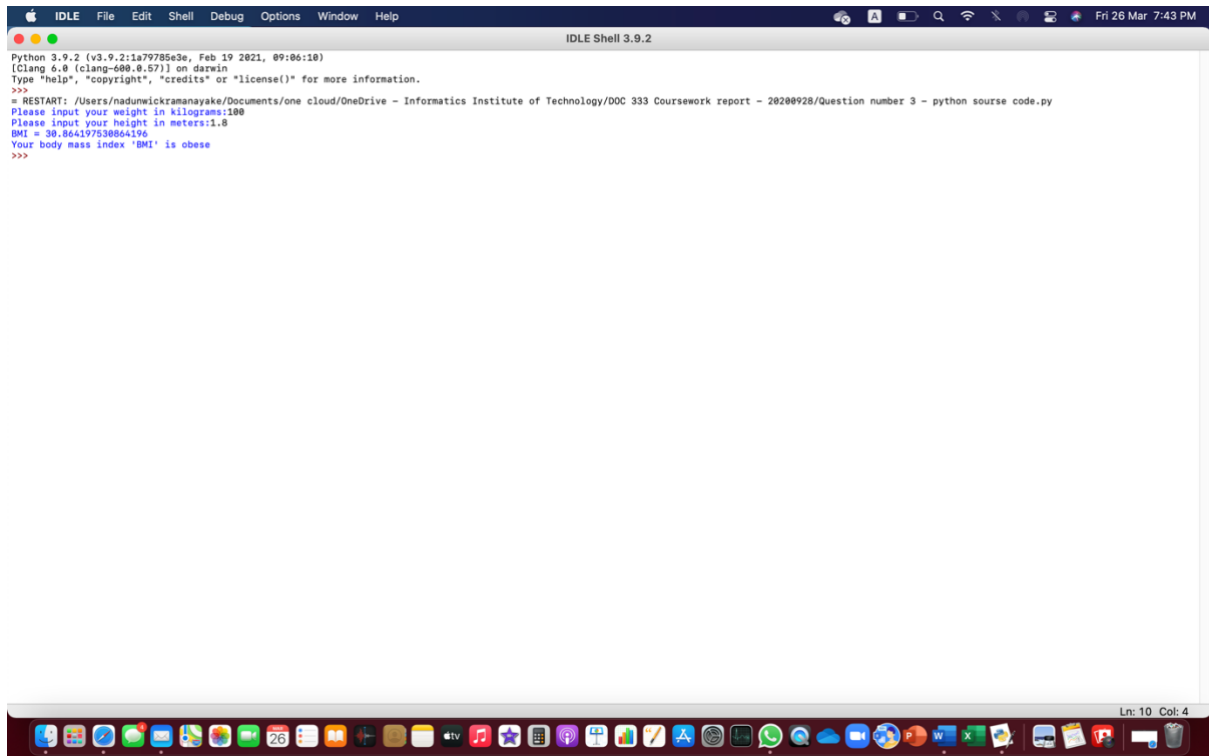


The screenshot shows an IDLE Shell window with the following text:

```
Python 3.9.2 (v3.9.2:1a79785e3e, Feb 19 2021, 09:06:10)
[Clang 6.0 (clang-600.0.57)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: /Users/nadunwickramanayake/Documents/one cloud/OneDrive - Informatics Institute of Technology/DOC 333 Coursework report - 20200928/Question number 3 - python source code.py
Please input your weight in kilograms:90
Please input your height in meters:1.69
BMI = 31.51150169811982
Your body mass index 'BMI' is obese
>>> |
```

Figure 15: Test case 4 for question number 3

### 3.10 Test case 5



```
Python 3.9.2 (tags/v3.9.2:1a797853e, Feb 19 2021, 09:06:10)
[Clang 6.0 (clang-600.0.57)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: /Users/nadumwickramanayake/Documents/one cloud/OneDrive - Informatics Institute of Technology/DOC 333 Coursework report - 20200928/Question number 3 - python source code.py
Please input your weight in kilograms:100
Please input your height in meters:1.8
BMI = 30.864197530864196
Your body mass index 'BMI' is obese
>>>
```

Figure 16: Test case 5 for question number 3