W03 Lab

Program Development (cont.)

Exercise

Write a program that prompts the user to enter their name, surname, and age. The program should then output the provided information, along with the age at which the user will graduate (assuming a standard four-year duration).

Input (user input in red)

Input name: Chalee
Input surname: Buddee
Input age: 18

Output

My name is Chalee
And my surname is Buddee
Now I'm 18 years old
I'll graduate when I'm 22

Defining Input - Process - Output

Input (user input in red)

Input name: Chalee
Input surname: Buddee
Input age: 18

Output

My name is Chalee
And my surname is Buddee
Now I'm 18 years old
I'll graduate when I'm 22

Input	Process	Output

- Retrieve data from keyboard
- Create variable to store data
  - name
  - lastname
  - age
	- Calculate graduated_age by
	  - age + 4
		Display
		- Specific dialog with value in variables
		  - name
		  - lastname
		  - age
		  - graduated_age

Create an algorithm flow

1. Prompt user for name
2. Read name
3. Prompt user for surname
4. Read surname
5. Prompt user for age
6. Read age

Input

7. Calculate graduation age (age + 4)

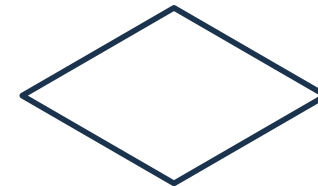Process

8. Print name, surname, age,
   and graduation age

Output

Flowchart

- A flowchart is a graphical representation of a process, algorithm, or system.

- It uses different shapes and arrows to depict the sequence of steps or actions in a logical and visual manner.

- Flowcharts are widely used in various fields, including computer programming, business process management, system analysis, and problem-solving.
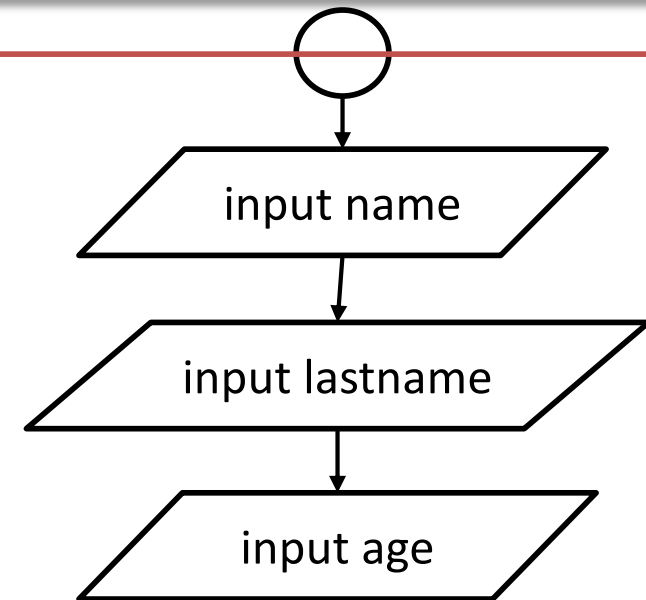
Flowchart Symbols

1. **Start/End**: Indicates the beginning or end of the process.

2. **Process/Action**: Represents a specific action or process.

3. **Decision**: Represents a decision point where the flow can branch into different paths based on a condition.

4. **Input/Output**: Represents input or output of data or information.

5. **Connector:** Connects different parts of the flowchart.
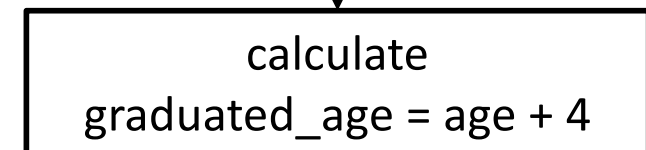
Algorithm Flow with Flowchart

1. Prompt user for name
2. Read name
3. Prompt user for surname
4. Read surname
5. Prompt user for age
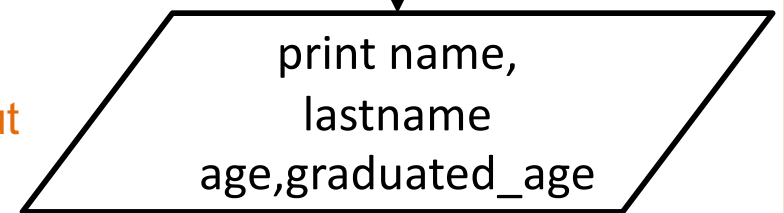6. Read age

Input

7. Calculate graduation age (age + 4)   Process

8. Print name, surname, age, and graduation age   Output

input name

input lastname

input age

calculate
graduated_age = age + 4

print name,
lastname
age,graduated_age

Transform Algorithm to Code

```python
01  # Prompt the user to enter their name
02  _____ = input("Input name: ")
03
04  # Prompt the user to enter their surname
05  _____ = input("Input surname: ")
06
07
08  # Prompt the user to enter their age
09  age = _____(input("Input age: "))
10
11  # Calculate the graduation age assuming a four-year duration
12  graduation_age = age _____
13
14  # Print the user's information and projected graduation age
15  print("My name is ", name)
16  print("And my surname is ", surname)
17  print("Now I'm ", age, "years old" )
18  print("I'll graduate when I'm ", _____)
19
```

Input

Process

Output

Practice 1: Fahrenheit to Celcius

Practice 1: Fahrenheit to Celsius

- To convert a temperature value from Fahrenheit to Celsius, you can use the following formula:
- Where:

$$\frac{C}{5} = \frac{F - 32}{9}$$

  - C is the temperature in Celsius
  - F is the temperature in Fahrenheit

- **Input:**
  - Take in input F using `input("Input temperature in Fahrenheit: ")`

- **Process:**
  - convert F to float by using `float(F)`
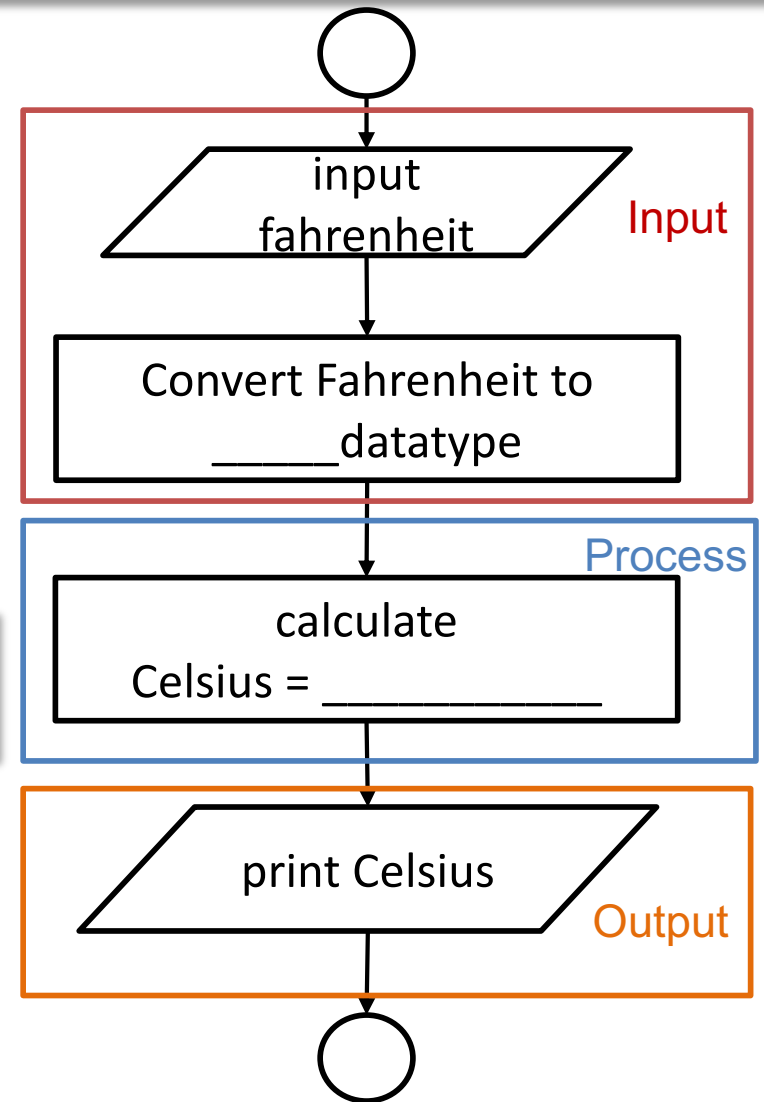 - calculate C using the formular

- **Output:**
  - print out the result as followed

```
Input temperature in Fahrenheit: 50
The temperature in Celsius is: 10.0000
```

- input has string datatype

- to use in calculation, conversion is needed

- from the formula $\dfrac{C}{5} = \dfrac{F - 32}{9}$

  - C = _____

input
fahrenheit

Input

Convert Fahrenheit to _____datatype

Process

calculate
Celsius = _____

print Celsius

Output

Transform Algorithm to Code

```
01  # Prompt the user for temperature in Fahrenheit
02  fahrenheit = input("Enter the temperature in Fahrenheit: ")
03  fahrenheit = _____(fahrenheit)                          Input
04  # Convert Fahrenheit to Celsius using the conversion formula
05  celsius = _____
06
07                                                            Process
    # Print the Celsius temperature
08
09  print("The temperature in Celsius is:", _____)
10                                                            Output
11
```

$$\frac{C}{5} = \frac{F - 32}{9}$$

If you're not sure where to start, check out the flow diagram from the previous slide.

When you are done, show your code to the instructor or the TA for review

Practice 2: BMI Calculation

Practice 2: BMI Calculation

- Write a program that asks the user to enter their weight in **kilograms** and their height in **centimeters**.

- The program should then calculate and print their BMI (Body Mass Index).

- The BMI calculation is based on the formula: BMI = weight / (height^2), where

  - weight is measured in kilograms

  - height is measured in meters.

  - 1 meter = 100 centimeters

Algorithm Flow

1. Prompt the user to enter their weight in kilograms.

2. Read the user's _____.

3. Prompt the user to enter their height in centimeters.

4. Read the user's _____.

5. Convert height from **centimeters** to **meters** by using formula height_m = _____

6. Calculate the BMI using the formula
   BMI = _____

7. Print the calculated BMI.

Algorithm Flow in Flowchart
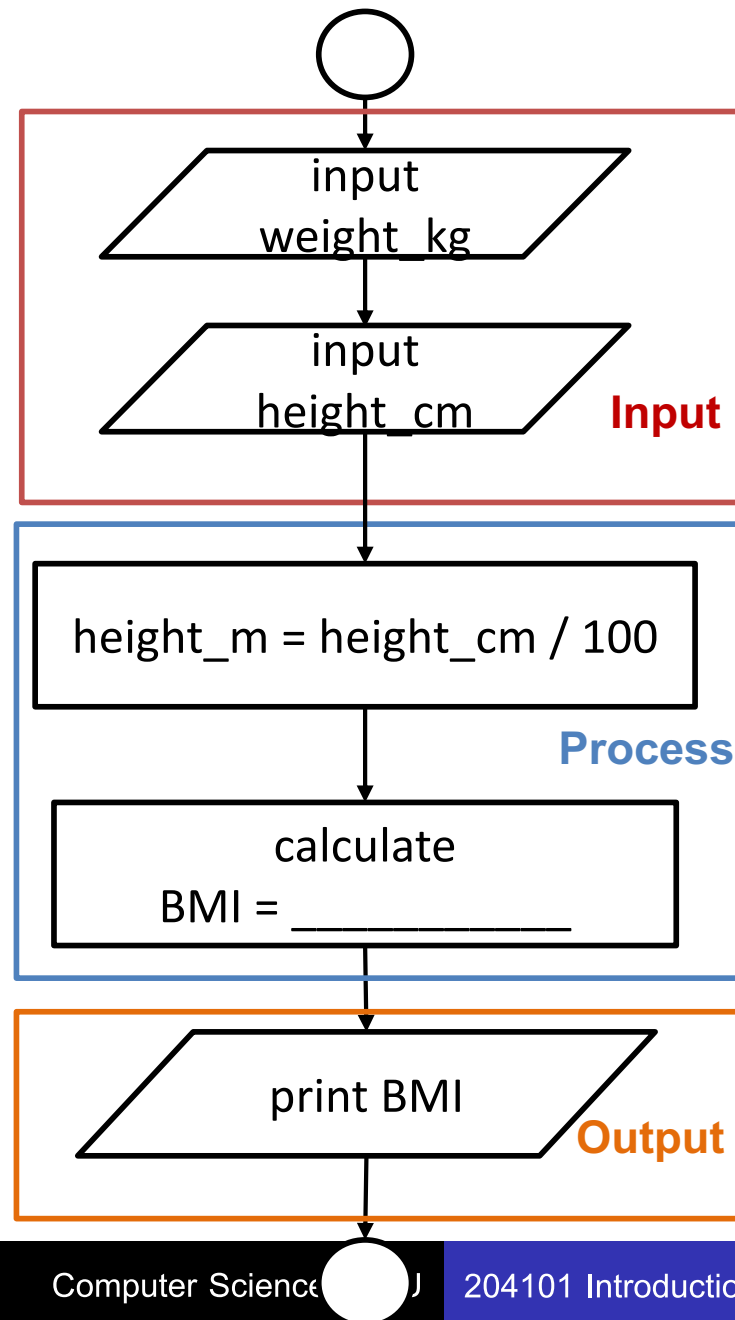
Transform Algorithm to Code

```
01  # Prompt the user for weight in kilograms
02  weight_kg = _____(input("Enter your weight in kilograms: "))
03
                                                            Input
04  # Prompt the user for height in centimeters
05  height_cm = _____(input("Enter your height in centimeters: "))
06
07
08  # Convert height from centimeters to meters
09  height_m = _____              Process
10
11  # Calculate BMI using the formula BMI = weight / (height^2)
12  bmi = _____
13
14  # Print the calculated BMI
15  print("Your BMI is:", bmi)                    Output
```

When you are done, show your code to the instructor or the TA for review

Input: 90
                186
Expected: 26.014568158168572

INTRODUCING FUNCTIONS

functions

- In Python, you can define your own functions using the `def` keyword.

(parameters are optional)

```python
def function_name(parameters):
    # Function body (code block)
    # Perform tasks here
    # Return a value (optional)
```

4 spaces

Functions

- A function is a section of reusable code that performs a specific task or set of tasks.

- To call a function, type its name followed by a pair of parentheses.

- You can pass data, known as arguments, to the function, but this requires a matching set of parameters in the function's definition.

- A function can return data back to the location where it was called.

Function Example

We define the square function here

```
01  def square(number):
02      result = number ** 2
03      return result
04
05  # Call the square function with an argument
06  num = int(input("Input number: "))    #5
07  result = square(num)
08  print(result)   # Output: 25
```

- ## Line 01 - 03

  - The function **square** takes a parameter called *number*.

  - Inside the function, it calculates the square of the number by multiplying it by itself *(number ** 2).*

  - Then, it returns the result using the return statement.

Function Example

The square function

```
01  def square(number):
02      result = number ** 2
03      return result
04
05  # Call the square function with an argument
06  num = int(input("Input number: "))    #5
07  result = square(num)
08  print(result)   # Output: 25
```

Calling the square function to use its process (pass in the value from the user input as an argument)

- ## Line 06-08

  - we call the **square** function and pass the value 5 as an argument (from the user input).

  - The function executes its code block, calculates the square of 5, and returns the result.

  - The returned result is stored in the *result* variable, which is then printed to the console

Let's modify our code for BMI calculation to include a function.
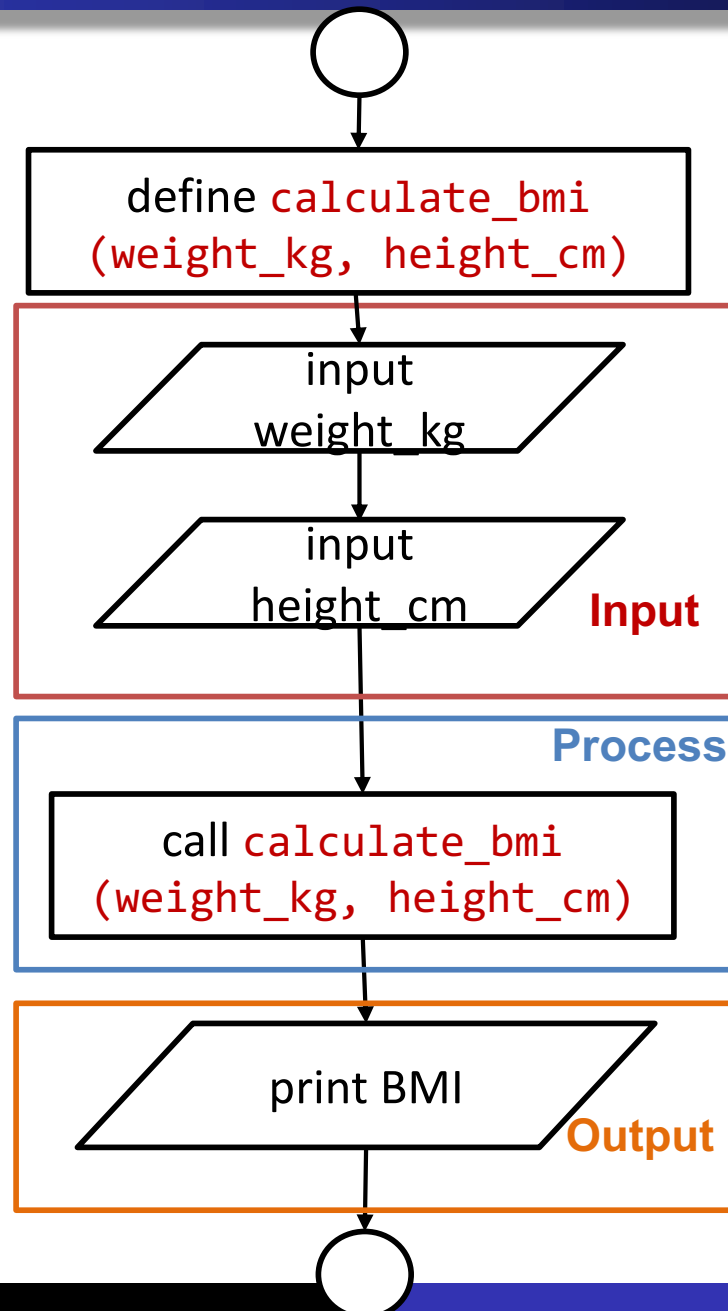
BMI Calculation as a Function
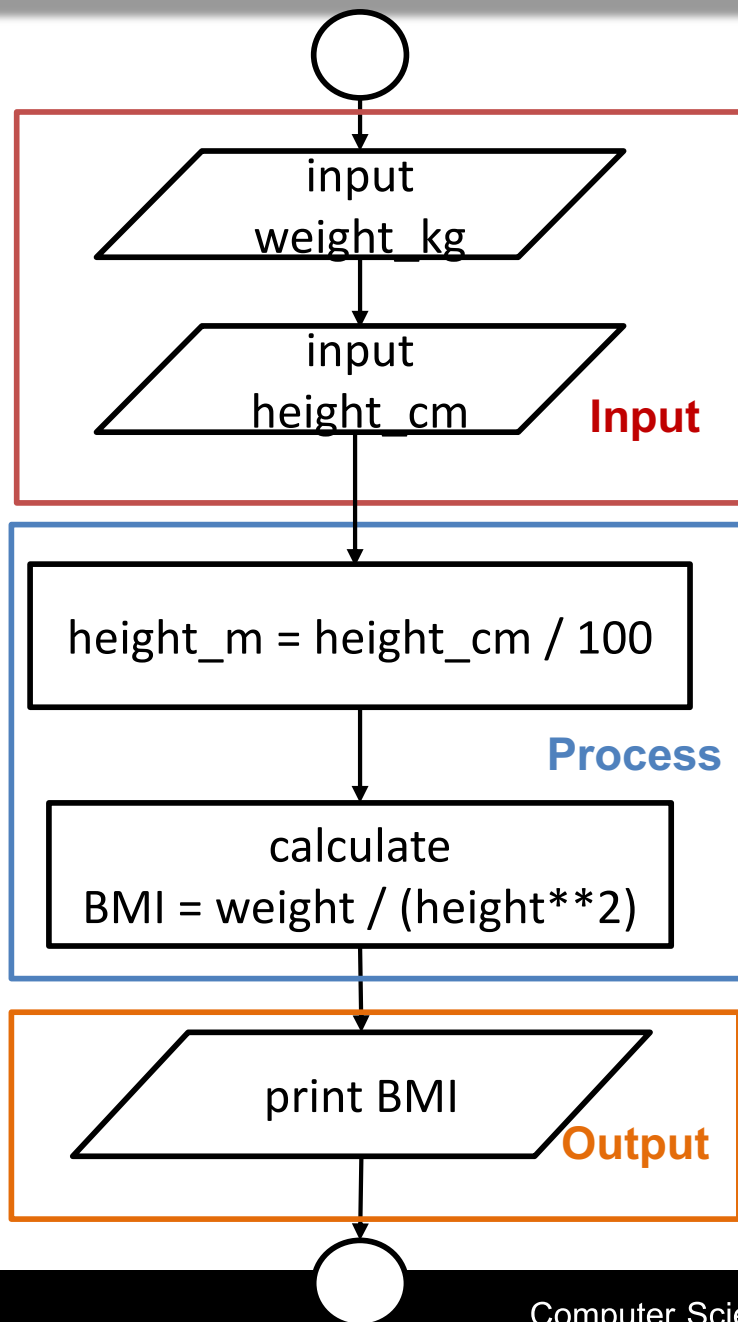
To improve code organization and reusability, we can introduce a function for the BMI calculation.

1. Define a function named `calculate_bmi` that takes two parameters: `weight_kg` and `height_cm`.

2. Inside the function, convert the height from centimeters to meters by dividing it by 100.

3. Calculate the BMI using the formula BMI = weight / (height**2).

4. Return the calculated BMI from the function.

BMI Calculation as a Function

BMI Calculation as a Function
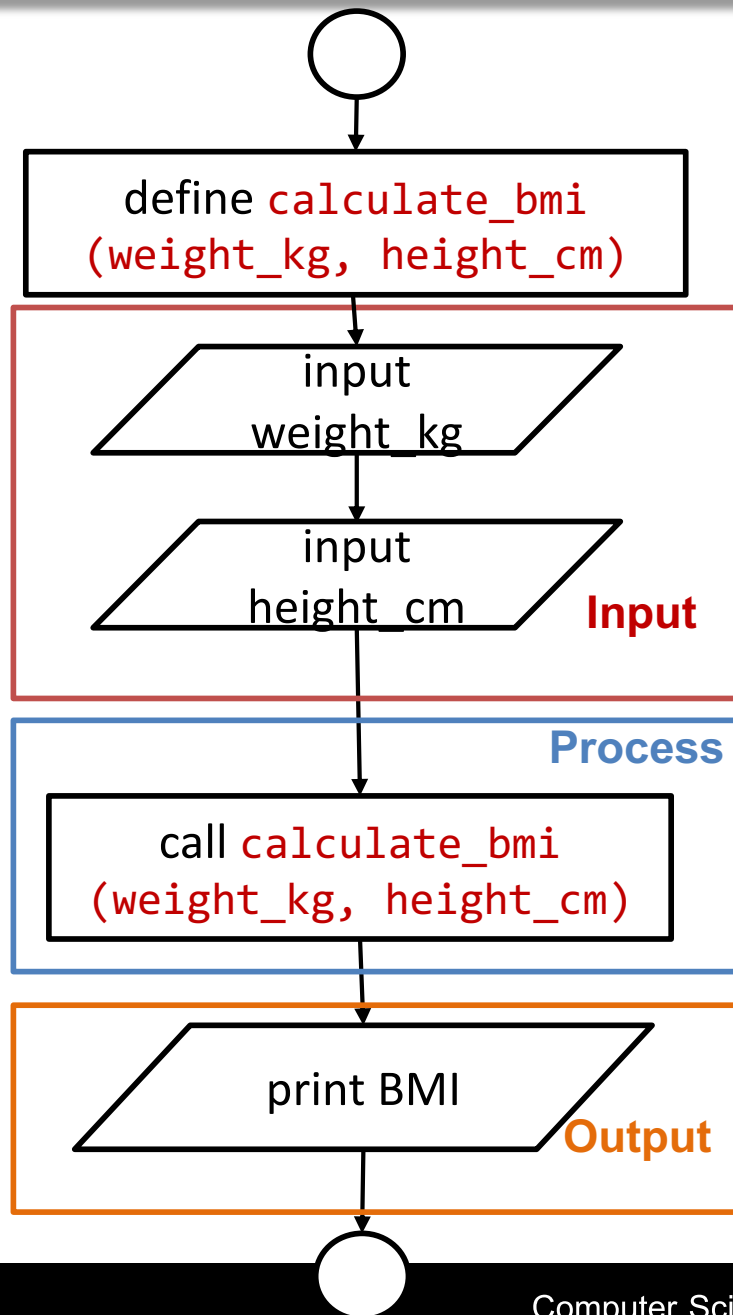

```
01  def calculate_bmi(weight, height_cm):
02      height_m = height_cm / 100
03      bmi = weight / (height_m ** 2)
04      return bmi
```

```
14  bmi = calculate_bmi(weight, height_cm)
```

BMI Calculation as a Function

```python
01  def calculate_bmi(weight, height_cm):
02      height_m = height_cm / 100
03      bmi = weight / (height_m ** 2)
04      return bmi
05
06  # Prompt the user to enter their weight in kilograms
07  weight = float(input("Enter your weight in kilograms: "))
08
09  # Prompt the user to enter their height in centimeters
10  height_cm = float(input("Enter your height in centimeters: "))
11
12  # Call the calculate_bmi function with the provided weight and
13  height inputs
14  bmi = calculate_bmi(weight, height_cm)
15
16  # Print the calculated BMI
17  print("Your BMI is:", bmi)
18
```

**Process:
Function Definition**

Input

**Process:
Function Call**

Output

Now that you've been exposed to the concept of functions, you should be able to complete the lab assignments with ease!