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NGEE ANN
SCHOOL OF INFOCOMM TECHNOLOGY

Selection Structure
if…elif…else statement

Programming I (PRG1)

Diploma in Information Technology

Diploma in Financial Informatics

Diploma in Cybersecurity & Digital Forensics

Common ICT Programme

Year 1 (2019/20), Semester 1

Objectives

At the end of this lecture, you will understand

- if..elif…else (Multiway Selection Statement)

Recall

- Lecture 1

  You had learnt to calculate the BMI for a person.

  What's the purpose of this BMI?

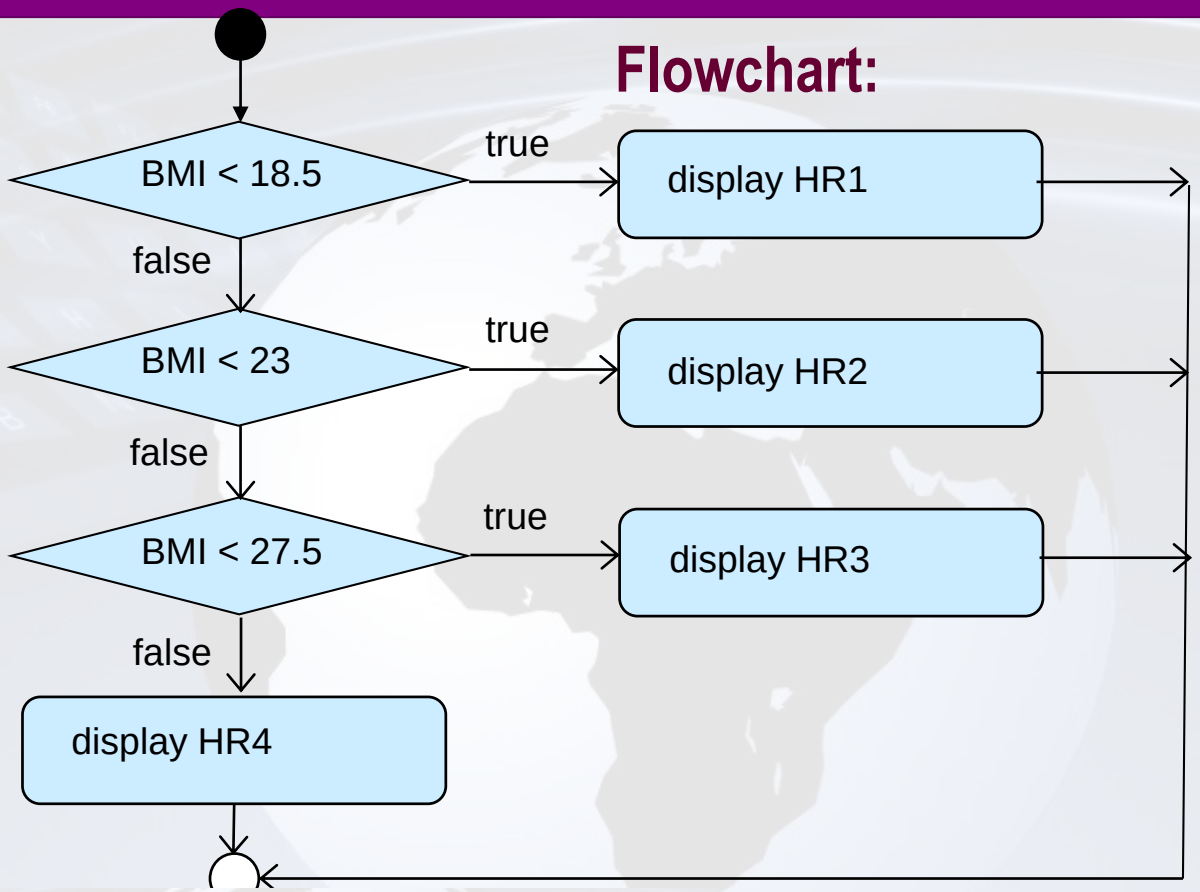
  How can you use it?

`if…elif…else` Multiway Selection

HR	Health Risk	BMI (kg/m^2)
HR1	Risk of developing problems such as nutritional deficiency and osteoporosis	under 18.5
HR2	Low Risk (healthy range)	18.5 to 23
HR3	Moderate risk of developing heart disease, high blood pressure, stroke, diabetes	23 to 27.5
HR4	High risk of developing heart disease, high blood pressure, stroke, diabetes	over 27.5

`if…elif…else` Multiway Selection

Flowchart:



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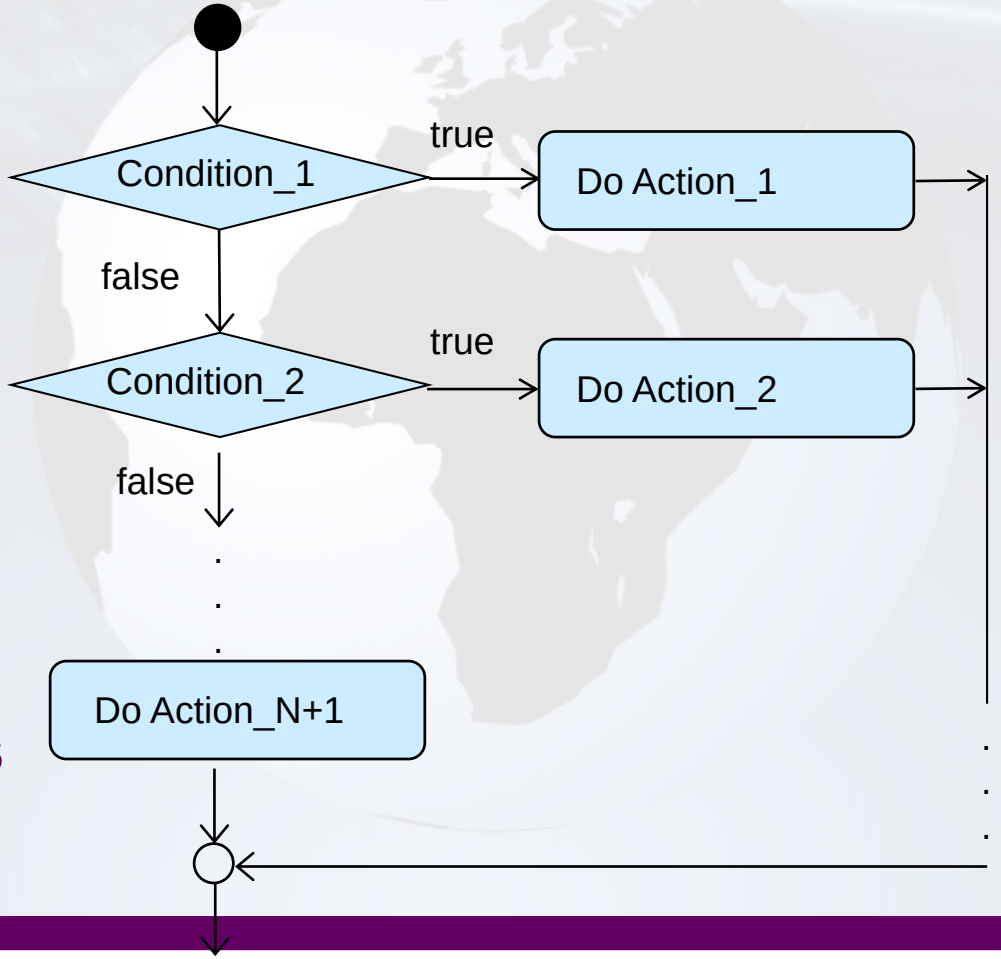
if… elif…else Multiway Selection

- Selects from various course of actions depending on the decision made
- General format:

```
if condition_1:
   true_statement_1
elif condition_2:
   true_statement_2
elif…
   …
else:
   false_statement
```



- default (catch-all) condition is the else statement *(optional)*

`if…elif…else` Multiway Selection

Pseudocode:

```
IF BMI < 18.5 THEN
    display “Risk of developing osteoporosis"
ELSE IF BMI < 23 THEN
    display “Healthy"
ELSE IF BMI < 27.5 THEN
    display “Low risk of developing heart disease, stroke, etc."
ELSE
    display “High risk of developing heart disease, stroke, etc."
ENDIF
```

`if…elif…else` Multiway Selection

The algorithm can be translated into Python code as follows:

```
if bmi < 18.5:
    print ("Risk of developing osteoporosis")
elif bmi < 23:
    print ("Healthy")
elif bmi < 27.5:
    print ("Low risk of developing heart disease, stroke, etc.")
else:
   print("High risk of developing heart disease, stroke, etc.")
```

CalculateBMI.py - Program

```
# This program calculates the body mass index of a person

height = float(input('Enter your height in m:'))
weight = float(input('Enter your weight in kg: '))

bmi = weight / (height * height)
print('Your height is {:.2f} m.'.format(height))
print('Your weight is {:.2f} kg.'.format(weight))
print('Your bmi is {:.4f}'.format(bmi))

if bmi < 18.5:
        print ("Risk of developing osteoporosis")
elif bmi < 23:
        print ("Healthy")
elif bmi < 27.5:
        print ("Low risk of developing heart disease, stroke, etc.")
else:
    print("High risk of developing heart disease, stroke, etc.")
```

Output

```
Enter your height in m:1.63
Enter your weight in kg: 58
Your height is 1.63 m.
Your weight is 58.00 kg.
Your bmi is 21.8300
Healthy
>>> ================================ RESTART ======
>>>
Enter your height in m:1.5
Enter your weight in kg: 80
Your height is 1.50 m.
Your weight is 80.00 kg.
Your bmi is 35.5556
High risk of developing heart disease, stroke, etc.
```

Multiway Selection

Is it necessary to specify both the upper and lower limit of the range of values?

```
if bmi < 18.5:
    print("Risk of developing osteoporosis")
elif 18.5 <= bmi < 23:
    print("Healthy")
elif 23 <= bmi < 27.5:
    print ("Low risk of developing heart disease, stroke, etc.")
elif bmi >= 27.5:
   print("High risk of developing heart disease, stroke, etc.")
```

Checking of unnecessary conditions

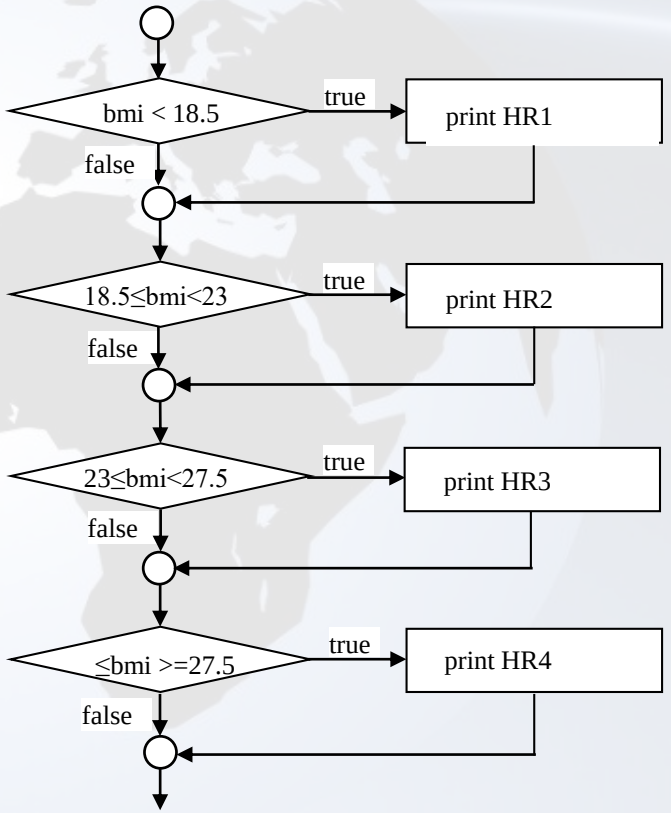
➔ **waste of resources**

➔ **inefficient!**

Multiway Selection

How about using multiple if statements?

```
if bmi < 18.5:
    print("Risk of developing osteoporosis")
if 18.5 <= bmi < 23:
    print("Healthy")
if 23 <= bmi < 27.5:
    print ("Low risk of developing heart disease, stroke, etc.")
if bmi >= 27.5:
    print("High risk of developing heart disease, stroke, etc.")
```



Checking of more conditions again

➔ **waste of resources**

➔ **inefficient!**

Activity 1- DetTempActivity.py

- If you are living in UK or Canada, you made plans to do various activities based on the outdoor temperature as follows:

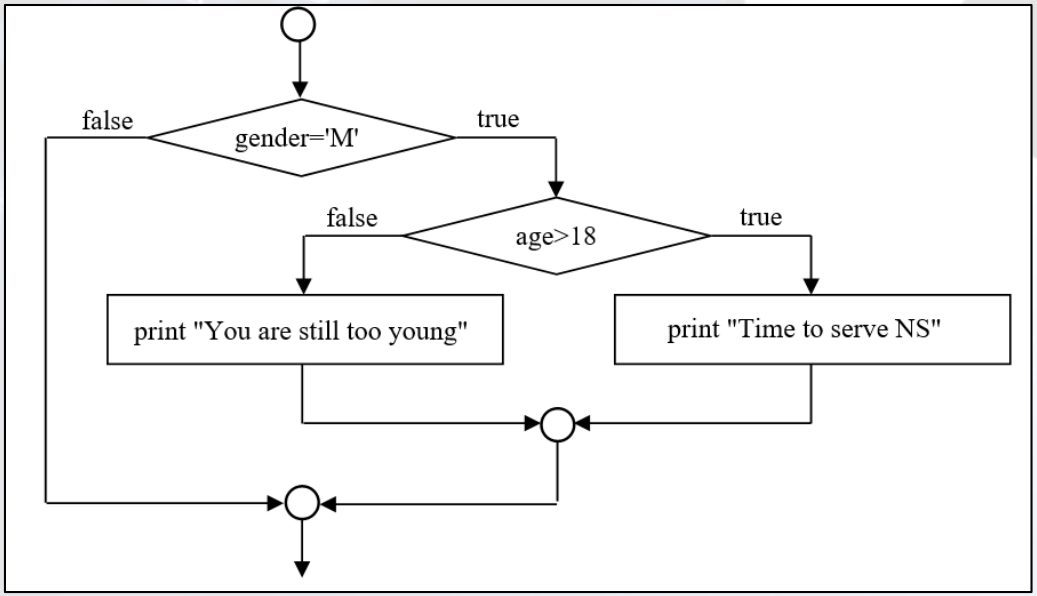
Temperature	Activity
<= -5	Go Bowling
-5< and <= 0	Go Skiing
0< and <= 20	Go Jogging
20<and <= 25	Play Tennis; wear white clothes
25< and <= 30	Go Sun-tanning in the park
> 30	Go Swimming

```
>>> ================================ RESTART =
>>>
Please enter outdoor temperature : 10
Go jogging
>>> ================================ RESTART =
>>>
Please enter outdoor temperature : 32
Go swimming
>>>
```

Draw a flowchart and translate the algorithm to a program recommends the activity given the temperature.

Nested `if` Statements

- **In some cases you may want one decision to depend on the result of an earlier decision.**
  - ✓ E.g. To display that a male citizen has to serve National Service (NS) if he is above 18 years old and to display that he is too young otherwise.



Nested `if` Statements

```
if gender == 'M':
    if age > 18:
        print('Time to serve NS')
    else:
        print('You are still too young')
```

inner if statement

- **This is equivalent to putting an inner if statement within the body of another if statement**
  - ✓ The body of the outer if statement is indented, and the body of the inner **if..else** statement is indented one more time

Activity 2

- **What is the expected output if the mark input is:**
  - ✓ 25, -10, 70, 101

```
if mark > 0 :
    if mark >= 50:
        print('You have passed')
        print('Good job done')
    else:
        print('You have failed')
else:
    print ('Invalid mark')
```

Activity 3 –CalCost.py

- **The rate for photocopy in a printing shop is as follows:**
  - ✓ First 100 pages: 3 cents per page
  - ✓ Next 200 pages: 2 cents per page
  - ✓ Over 300 pages: 1 cent per page

Calculate the cost for printing based on the number of pages input.

```
Enter number of pages to print: 20
Cost of printing 20 pages is $0.60
>>> ================================
>>>
Enter number of pages to print: 200
Cost of printing 200 pages is $5.00
>>> ================================
>>>
Enter number of pages to print: 600
Cost of printing 600 pages is $10.00
```

Reading Reference

- **How to Think Like a Computer Scientist: Learning with Python 3**
  - ✓ Chapter 5
  - ✓ http://www.openbookproject.net/thinkcs/python/english3e/conditionals.html
- **PolyMall – Problem Solving and Programming**
  - ✓ https://polymall.polytechnic.edu.sg/

Summary

The if…elif…else (Multiway-Selection Statement) chooses from various course of actions depending on which of the conditions evaluates to true.