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NGEE ANN
SCHOOL OF INFOCOMM TECHNOLOGY

Selection Structure

if, if..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

- **Program Structure**
- **Flowchart**
- **Selection Structures**
  - ✓ if Statement (Single-Selection)
  - ✓ if…else Statement (Double-Selection)

Program Structure

Program Structure

- So far, our statements execute one after the other in the order they are written
  - ✓ Sequential Execution / Sequence Structure

- Statements can be specified such that the next statement to be executed is *not* necessarily the next one in sequence
  - ✓ Transfer of Program Control

Program Structure

An example of sequence structure:

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

#Input values for variables height & weight
height = float(input('Enter your height in m: '))
weight = float(input('Enter your weight in kg: '))

bmi = weight / (height * height)

#Display bmi
print('Your height is ' + str(height) + 'm')
print('Your weight is ' + str(weight) + 'kg')
print('Your bmi is ' + str(bmi))
```

Program Structure

- There are in general 3 types of control structures that can be used to control program flow:
  - ✓ Sequence Structure
  - ✓ Selection Structure
  - ✓ Repetition Structure

Flowcharts

- Recall that we can present our algorithm using pseudocode.
- An algorithm can also be represented diagrammatically using **Flowcharts**

Flowcharts

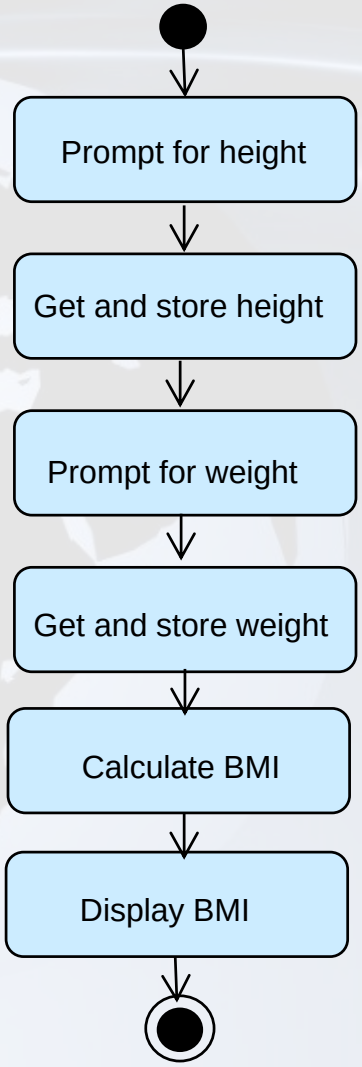
Flowcharts

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

#Input values for variables height & weight
height = float(input('Enter your height in m: '))
weight = float(input('Enter your weight in kg: '))

bmi = weight / (height * height)

#Display bmi
print('Your height is ' + str(height) + 'm')
print('Your weight is ' + str(weight) + 'kg')
print('Your bmi is ' + str(bmi))
```



Selection Structures

Selection Structures

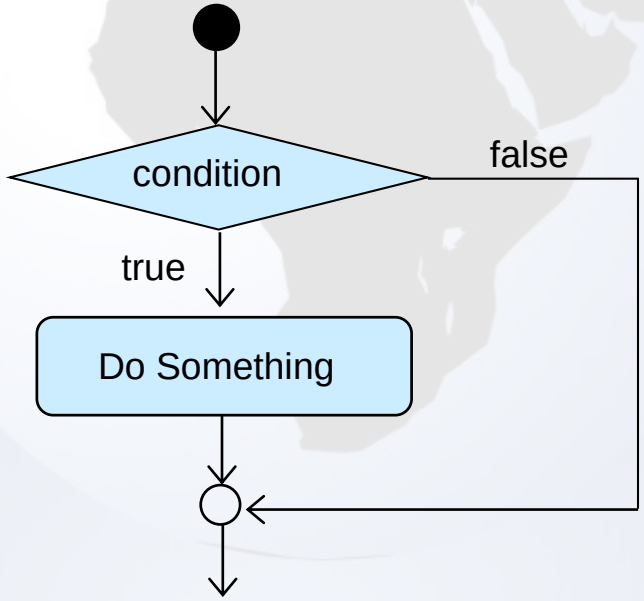
- Selection structures/statements allow selection among alternative courses of action.

- 3 types of selection statements:
  - ✓ if -- Single-Selection statement
  - ✓ if…else -- Double-Selection statement
  - ✓ if…elif…else -- Multiway-Selection statement

`if` Single-Selection Statement

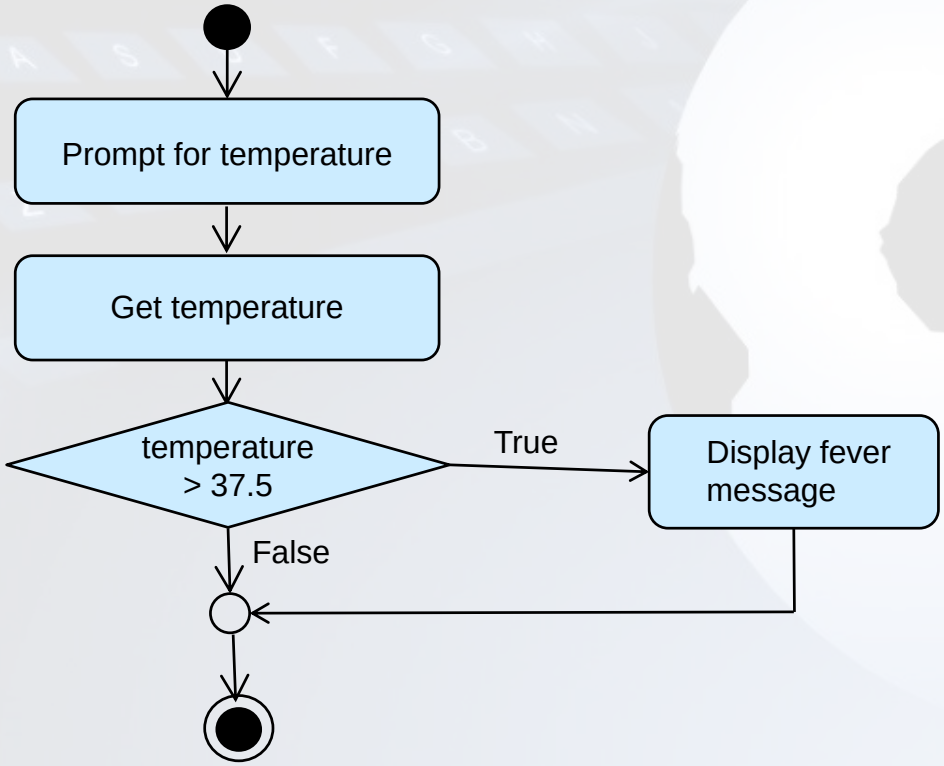
- Either selects or ignores the action depending on the decision made
- Condition evaluates to boolean true or false
- General format:

```
if condition:
    true_statement
```



Example

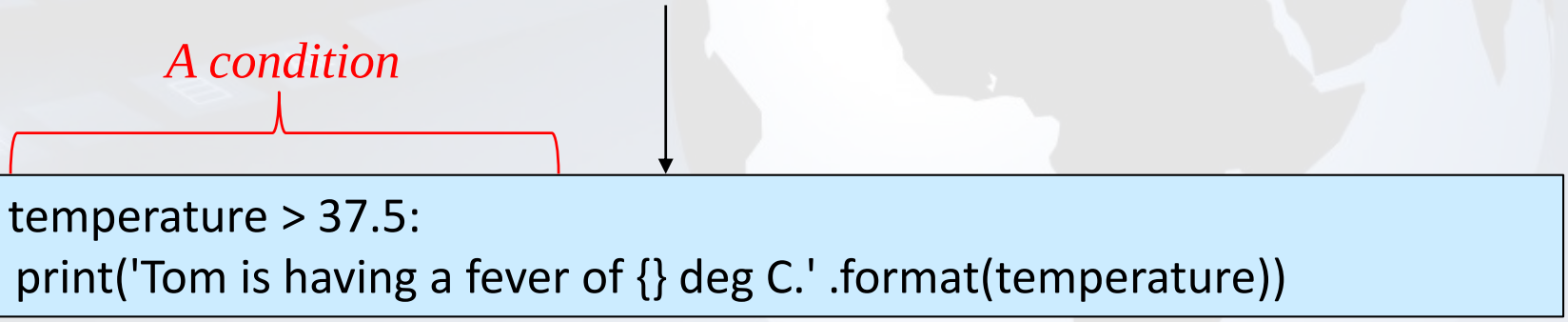
Tom is said to have a fever when his temperature is higher than 37.5 ^{0}C.



`if` Single-Selection Statement

- The algorithm may be written in the following code:

```
IF temperature > 37.5 THEN
        display "Tom is having a fever"
 ENDIF
```



`if` Single-Selection Statement

Practical Note:

- At the interactive prompt, be sure to terminate multiline compound statements(e.g. if tests or loops) with a blank line, i.e. by pressing Enter key twice to make it run.

```
>>> temperature = 38
>>> if temperature > 37.5:
        print('Tom is having a fever of {:.1f}' .format(temperature))


Tom is having a fever of 38.0
```

- This is not required in the script file.
  - ✓ Blank lines are simply ignored when present.
  - ✓ Thus pasting code from script file into interactive prompt may not work, unless code includes the blank lines.

`if` Statement – a block

- If there is more than one statement to execute when the condition is true,
  - ✓ *must* consistently indent the statements.
- A set of statements that follow the same physical indentation is called a **block**.

```
if condition:
    true_statement_1
    true_statement_2
          :
    true_statement_n
```

```
if temperature > 37.5:
    print('Tom is having a fever.')
    print('He should drink more water ')
    print('and take more rest.')
```

Conditions

- **Recall:**
  - ✓ Conditions are boolean expressions that evaluate to True / False. e.g. temperature > 37.5
  - ✓ Relational operators are used.

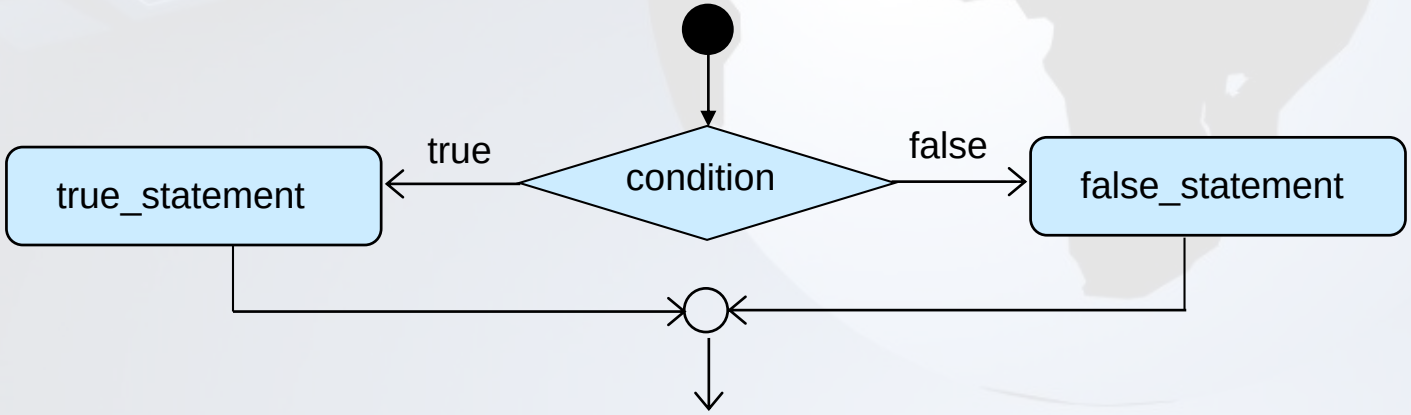
Relational Operator	Meaning	Example of Condition	Meaning
<	Less than	x < y	x is less than y
>	Greater than	x > y	x is greater than y
==	Equal to	x == y	x is equal to y
<=	Less than or equal to	x <= y	x is less than or equal to y
>=	Greater than or equal to	x >= y	x is greater than or equal to y
!=	Not equal to	x != y	x is not equal to y

if...else
Double-Selection

`if…else` Double-Selection Statement

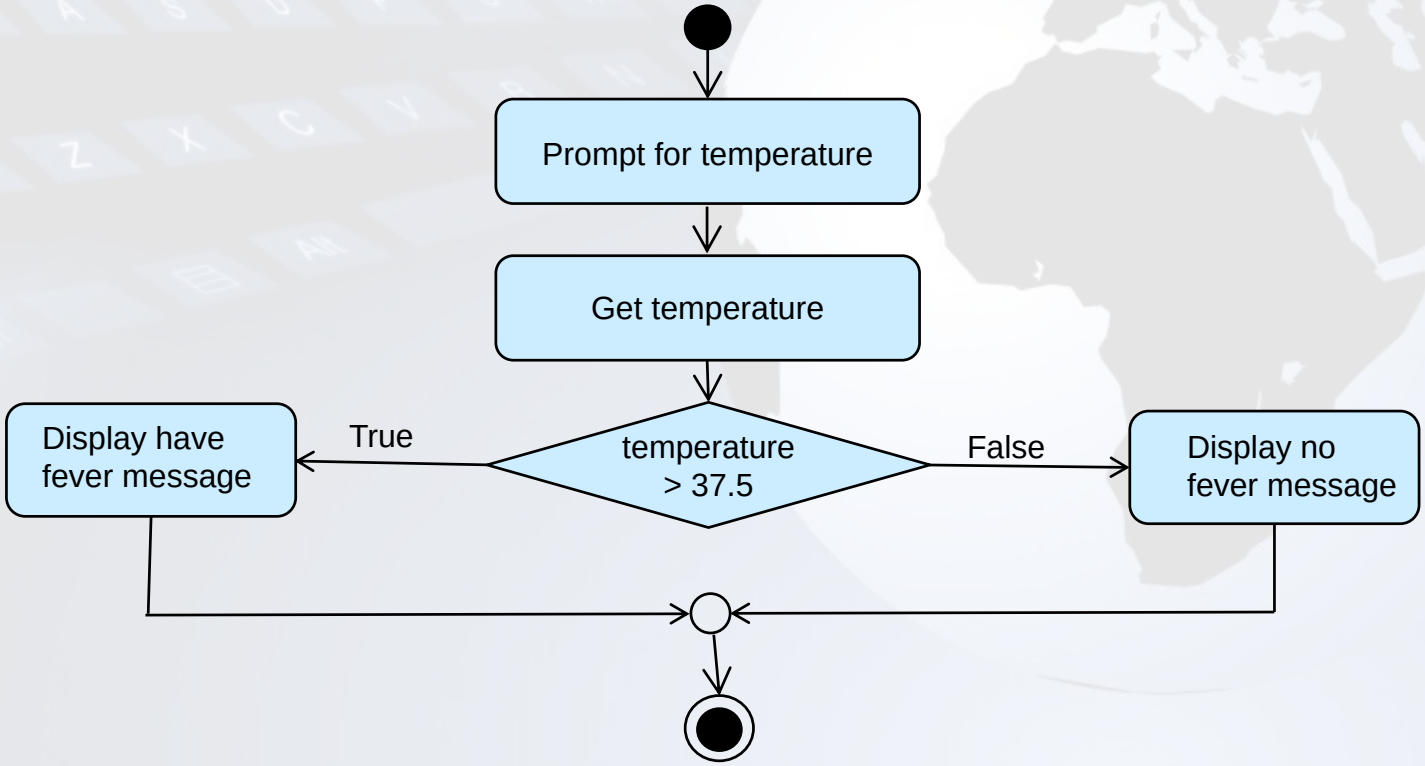
- Select from 2 different actions depending on the condition
- General format:

```
if condition:
   true_statement
else:
   false_statement
```



Example

Tom is said to have a fever when his temperature is higher than 37.5 ^{0}C otherwise he is not.



`if…else` Double-Selection Statement

Tom is said to have a fever when his temperature is higher than 37.5 ^{0}C otherwise he is not.

Pseudocode:

```
IF temperature is greater than 37.5 THEN
        display "Tom is having a fever."
ELSE
        display "Tom is not having a fever."
ENDIF
```

`if…else` Double-Selection Statement

Pseudocode:

```
IF temperature is greater than 37.5 THEN
        display “Tom is having a fever.”
        display “He should have more rest.”
ELSE
        display “Tom is not having a fever.”
        display “He can perform his normal duties.”
ENDIF
```

Python code:

```
if temperature > 37.5:
        print('Tom is having a fever of {} deg C. ' .format(temperature))
        print('He should have more rest. ')
else:
        print('Tom is not having a fever.')
        print('He can perform his normal duties.')
```

Activity 1 – CalComm.py

- ABC Company pays its sales agents on a commission basis. Each agent is paid 10% commission for monthly sales above or equal to $10,000 and 5% commission for monthly sales below $10,000.
- Write a program to accept the monthly sales of a particular agent and based on the amount, determine and print out the commission earned.

```
Enter monthly sales of sales agent: 12000
The commission rate is : 10%
The commission paid is : $1200.00
```

```
Enter monthly sales of sales agent: 8000
The commission rate is : 5%
The commission paid is : $400.00
```

Activity 2 – NumGenerator.py

- Write a program that generates two integers between 0 and 100 inclusive and prompts the user to enter the sum of these 2 integers. The program reports if the answer is correct or wrong (program will also print the correct answer if the user answer is wrong).
- Hint: you need to use the **random** module
  - ✓ i.e. import random
    num1 = random.randint(0,100)

```
>>>
Enter the sum of 72 and 12: 84
Your answer is correct!
>>> ================================ RESTART ==
>>>
Enter the sum of 83 and 6: 141
Your answer is wrong.
The correct answer is 89.
```

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

- **There are 3 types of Control structure in a program:**
  - ✓ Sequence, Selection and Repetition structures
- **Flowchart**
- **Selection Structure**
  - ✓ The if Single-Selection Statement executes a course of action(s) or ignores it depending evaluation of condition.
  - ✓ The if…else Double-Selection Statement executes a course of action(s) if condition evaluates to true, and another course of action(s) if condition is false.