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NGEE ANN
SCHOOL OF INFOCOMM TECHNOLOGY

Selection Structure I

if statement

Programming I (PRG1)

Diploma in Information Technology

Diploma in Financial Informatics

Diploma in Information Security & Forensics

Year 1 (2018/19), Semester 1

Objectives

At the end of this lecture, you will understand

- Program Structure
- Flowchart
- Selection Structures
- if Statement (Single-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

height = input ('Enter your height in m:')
weight = input ('Enter your weight in kg:')
bmi = float(weight)/(float(height) * float(height))
print('Your height is ' + height)
print('Your weight is ' + weight)
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

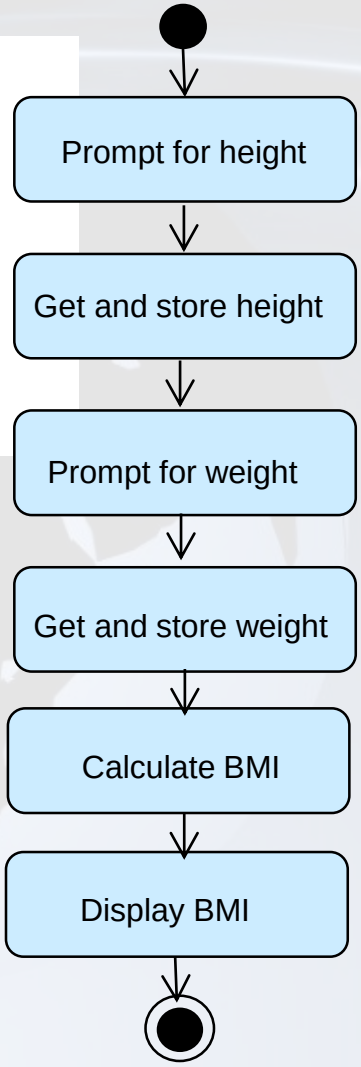
- Recall that we can present our algorithm using pseudocode.
- An algorithm can also be represented diagrammatically using Flowcharts .

Flowcharts

Flowcharts

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

height = input ('Enter your height in m:')
weight = input ('Enter your weight in kg:')
bmi = float(weight)/(float(height) * float(height))
print('Your height is ' + height)
print('Your weight is ' + weight)
print('Your bmi is ' + str(bmi))
```



Selection Structures

Selection Structures

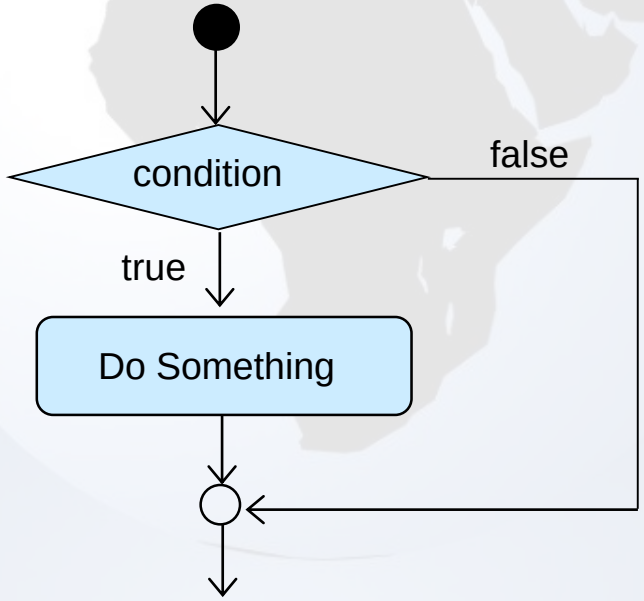
- Selection structures/statements allow selection among alternative courses of action.

- There are a few types of selection statements:
  - if -- Single-Selection statement
  - if…else -- Double-Selection statement
  - if…elif…else -- Multiway-Selection statement

`if` Single-Selection Statement

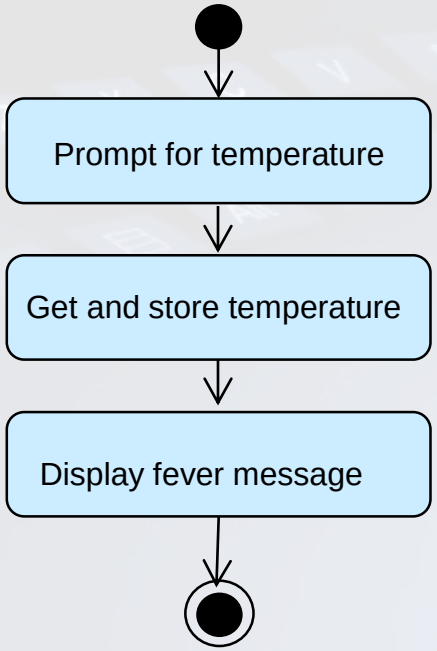
- if statement
  (for single selection)
- Either selects or ignores the action depending on the decision made
- Condition evaluates to boolean true or false
- General format:

```
if condition:
    true_statement
```



Activity 1

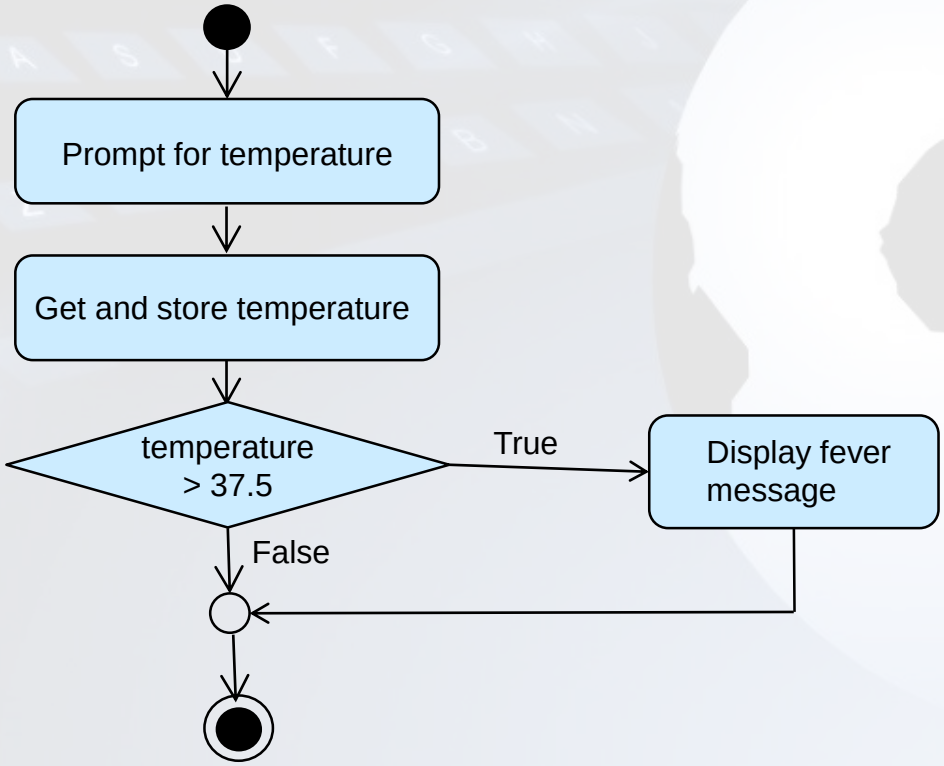
Tom is said to have a fever when his temperature is higher than 37.5 ^{0}C.



Is this the correct flow structure?

Activity 1

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 temperature > 37.5:
    print('Tom is having a fever of {} deg C.' .format(temperature))
```

`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

Compound Conditions

- Recall:

  compound conditions can be constructed using logical operators.

Logical Operator	Example
and	x > y and x > z
or	x != y or x != z
not	not (x == y)

Truth Table of Logical Operators

- Recall:

x	y	x and y	x or y	not x
False	False	False	False	True
False	True	False	True	True
True	False	False	True	False
True	True	True	True	False

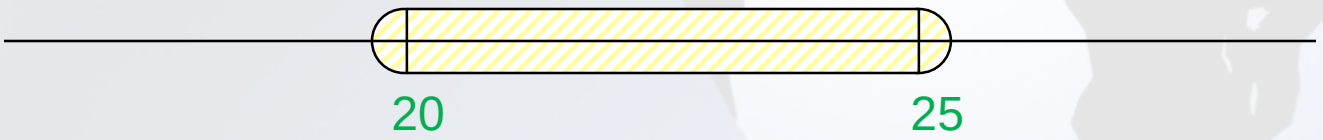
Precedence of Operators

Operators	Type	Precedence
( )	parentheses	highest
**	exponentiation	
+ -	Unary	
* / // %	multiplicative	
+ -	additive	
< <= > >= == != in, not in, is, is not	Relational, membership, identity	
not	Logical not	lowest
and	Logical and	
or	logical or	

Logical Operators: More Examples

- To check whether the value in the variable temperature is between 20 and 25 inclusively:

```
(temperature >= 20) and (temperature <= 25)
                    or
          20 <= temperature <= 25
```



Logical Operators: More Examples

- To check whether the value in the variable temperature is smaller than 20 or larger than 25 :

```
(temperature < 20) or (temperature > 25)
```

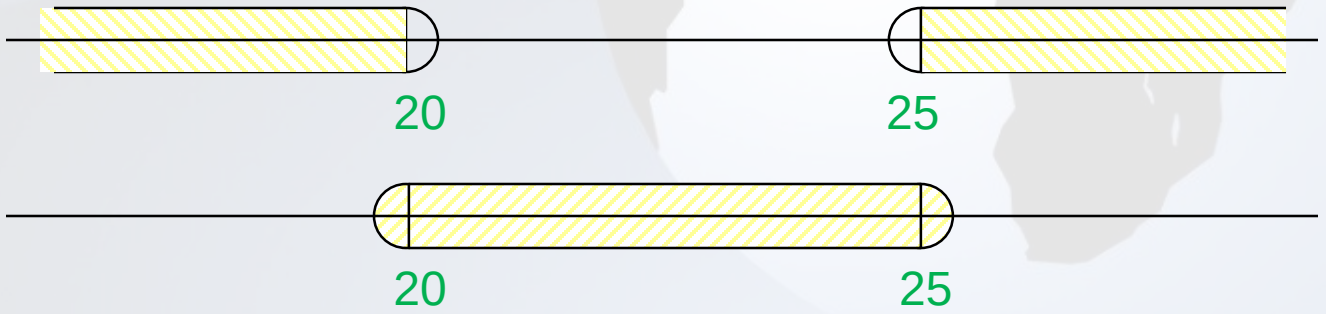
Logical Operators: More Examples

- Notice that the previous two conditions are the opposite of each other.

```
(temperature < 20) or (temperature > 25)
```

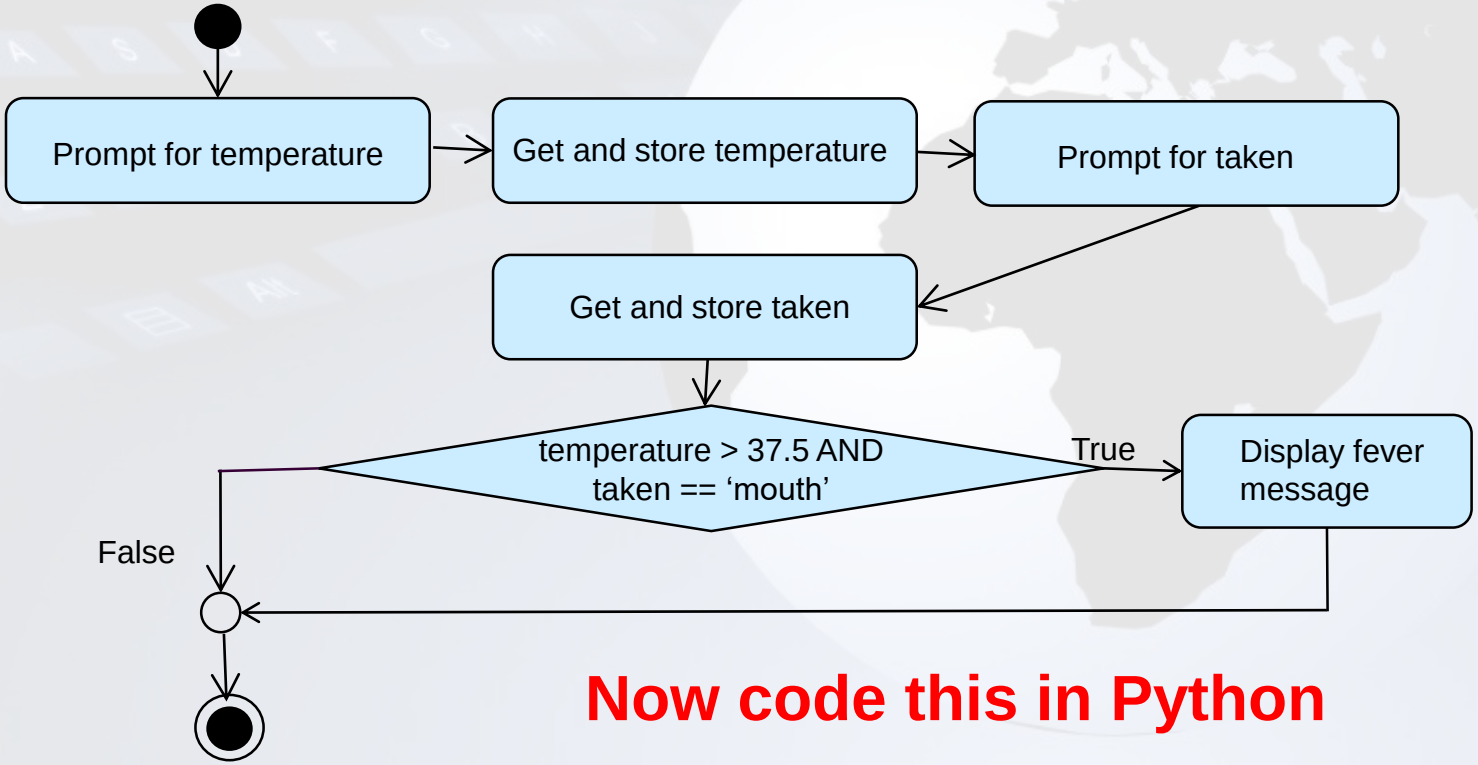
is equivalent to

```
not((temperature >= 20) and (temperature <= 25))
```



Activity 2

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



Now code this in Python

Activity 2

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

```
Please enter Tom's temperature : 38
How was it taken - mouth, ear : mouth
Tom is having a fever.
>>>
```

```
Please enter Tom's temperature : 36.4
How was it taken - mouth, ear : mouth
>>>
>>>
```

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
  - There are a few types of Selection Statements depending on the number of possible courses of actions available to choose from, including if , if…else, and if…elif…else.
- The if Single-Selection Statement executes a course of action(s) or ignores it depending evaluation of condition.