# 程式設計概論 Programming 101 —程式的流程控制與邏輯判斷語法 (Decision structures)

授課老師: 邱淑怡 DATE: 3/11/2024

# Outline

#### Flowchart

#### Four decision structures

- A single alternative decision structure: one-way conditional statement (單向判斷式)
- A dual alternative decision structure: two-way conditional statement (雙向判斷式)
- ➢ nested decision structure (巢狀判斷式)
- ➢ if-elif-else statement (多向判斷式)

# Goal of flowchart

•Summarize the program flow graphically.

- •It can be used as a planning tool before programing.
- •It can provide an overview of the program process and communicate with others.

# flowchart symbol



name	symbol	meaning
start or finish		start and finish of a flowchart
process symbol	Ļ	the direction
program processing symbol		a task to be done
input or output symbol		input or output
decision making symbol		determine the direction based on conditional expression
connection point (same page)		connect the process on the same page
connection point (change page)		connect the process to the next page







# Three basic program structures

- 1. The sequence structure
- 2. The decision structure
- 3. The repetition structure(will talk about it next chapter)

# 1. The sequence structure



# The decision structure A single alternative decision structure: if statement





# A dual alternative decision structure: if-else statement





Source: http://yltang.net/tutorial/python/7/

# The conditional expression

- 「>=」:conditional operator, determine whether the operation result on the left is greater than or equal to the right.
- conditional operator
  - equal to :  $\Gamma == \Box$
  - not equal to : [] = ]
  - greater than :  $\lceil > \rfloor$
  - greater than or equal to :  $^{\Gamma} >= \_$
  - less than :  $\lceil < \rfloor$
  - less than or equal to :  $\lceil <= \rfloor$

```
grade = int(input('input grade: '))
if grade >= 60:
    print('Pass')
else:
    print("Fail")
```

# if-else statement practice

- Write a Python program that requires user to input a integer and able to determine whether it is an odd or even number.
- Print "it is odd" if it is odd, otherwise, print "it is even".

# Python code

- Write a Python program that requires user to input a integer and able to determine whether it is an odd or even number.
- Print "it is odd" if it is odd, otherwise, print "it is even".

```
x= int(input('input an integer: '))
if x%2==0:
```

```
print('{:d}, it is even.'.format(x))
else:
```

```
print('{:d}, it is odd.'.format(x))
```



#### Nested decision structure



# Multiple conditional expression

#### > and

- example :  $\lceil a == b \text{ and } 5 == c \rfloor$
- > or
  - example :  $\lceil x \mid = y \text{ or } z \mid = 3 \rfloor$

#### Practise

Write a Python program that requires users to input a number and determine whether it able to divide by 3 and 4. If true, print "correct", otherwise, print "incorrect".



# if-elif-else statement practise

### Practice

Write a Python program that requires the user to input their score(0~100) and divide the score into A, B, C, D, and E based on the following rule:

A:90 or more.

B:89~80.

C:79~70.

D:69~60.

E:59 or less

# solve the question using a nested decision structure

Write a Python program that require a user to input their score(0~100) and divide the score into A, B, C, D, and E based on the following rule:

A:90 or more.

B:89~80.

C:79~70.

D:69~60.

E:59 or less

score= float(input("input a class score(0-100): ")) if score  $\geq =90$ : print('You got A') else: if score  $\geq$  80: print('You got B') else: if score  $\geq 70$ : print('You got C') else: if score  $\geq = 60$ : print('You got D') else: print(You got E')

# Student exercise\_3

# **Question 1: calculates BMI**

- Write a Python program that requires user to input height(cm)and weight(kg) and determine the BMI based on the following formula :
  - BMI=weight(kg)/height<sup>2</sup>(m<sup>2</sup>).
  - If less than 18.5 (excluding 18.5), print underweight
  - If between 18.5~24 (excluding 24), print normal
  - If between 24 ~ 27 (excluding 27), print overweight
  - If greater than 27, print obese

### Question 2

Write an program that displays 'Speed is normal' if the speed variable is within the range of 24 to 56. If the speed variable's value is outside this range, display 'Speed is abnormal'.

# Question 3

Serendipity Booksellers has a book club that awards points to its customers based on the number of books purchased each month. The points are awarded as follows:

- If a customer purchases 0 books, he or she earns 0 points.
- If a customer purchases 1 book, he or she earns 5 points.
- If a customer purchases 2 books, he or she earns 15 points.
- If a customer purchases 3 books, he or she earns 30 points.
- If a customer purchases 4 or more books, he or she earns 60 points. Write a program that asks the user to enter the number of books

#### Review

Textbook chapter4: 4.1, 4.2, 4.4