


程式設計概論

Programming 101

一程式的流程控制與邏輯判斷語法 (Decision structures)

授課老師：邱淑怡

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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 programming.
- It can provide an overview of the program process and communicate with others.

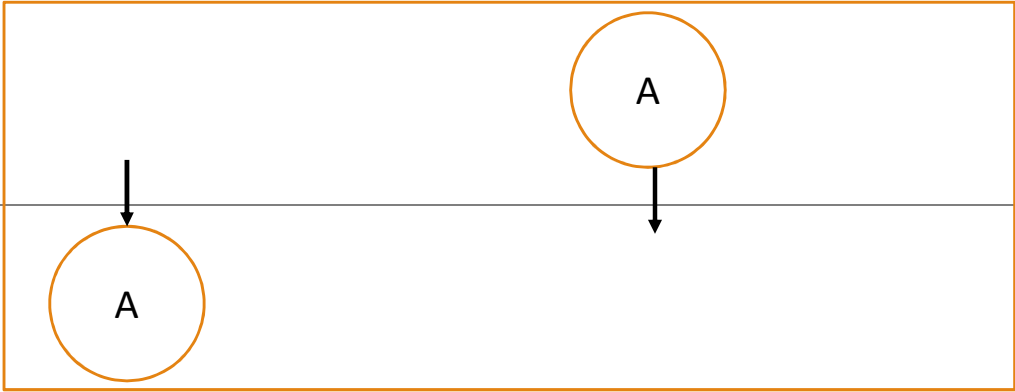
flowchart symbol



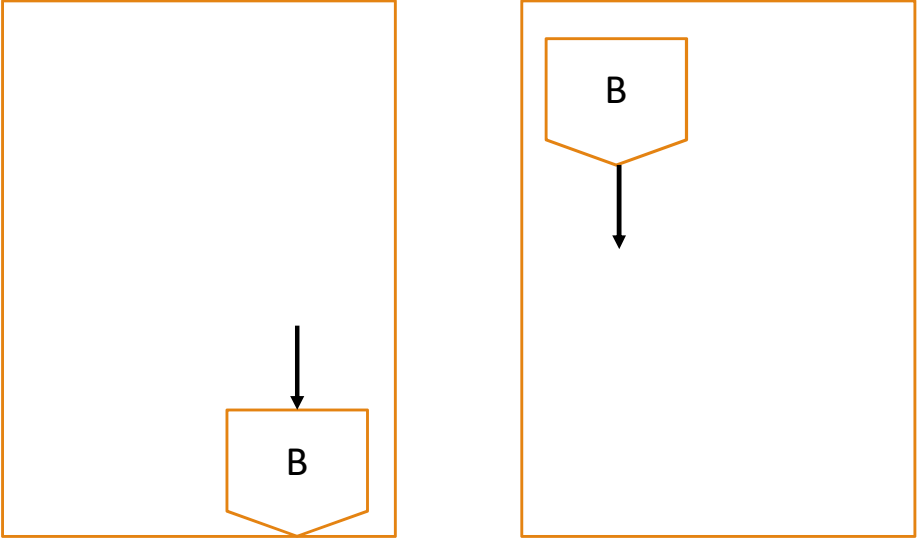
name	symbol	meaning
start or finish		start and finish of a flowchart
direction		the direction of a flowchart
processing symbol		a task to be done
input or output symbol		input or output
decision making symbol		determine the direction based on conditional expression
connection point (same page)		connect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

Connection point

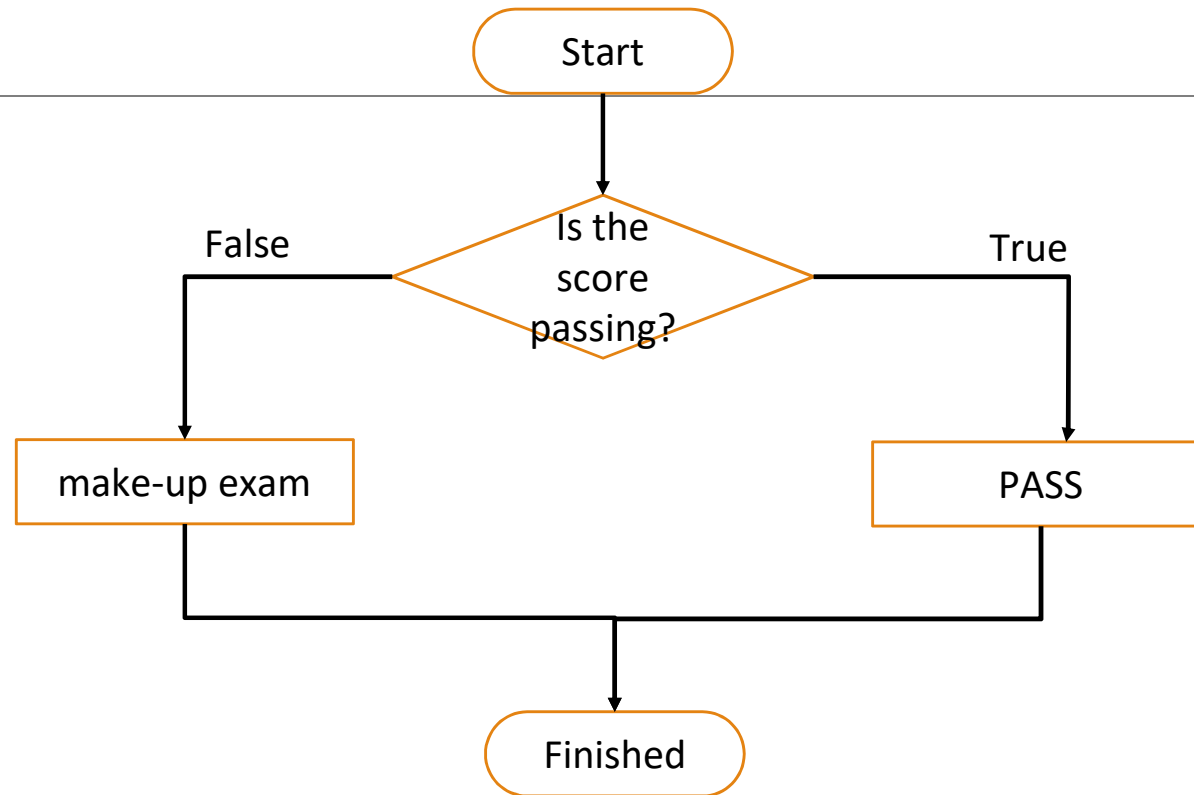
same page



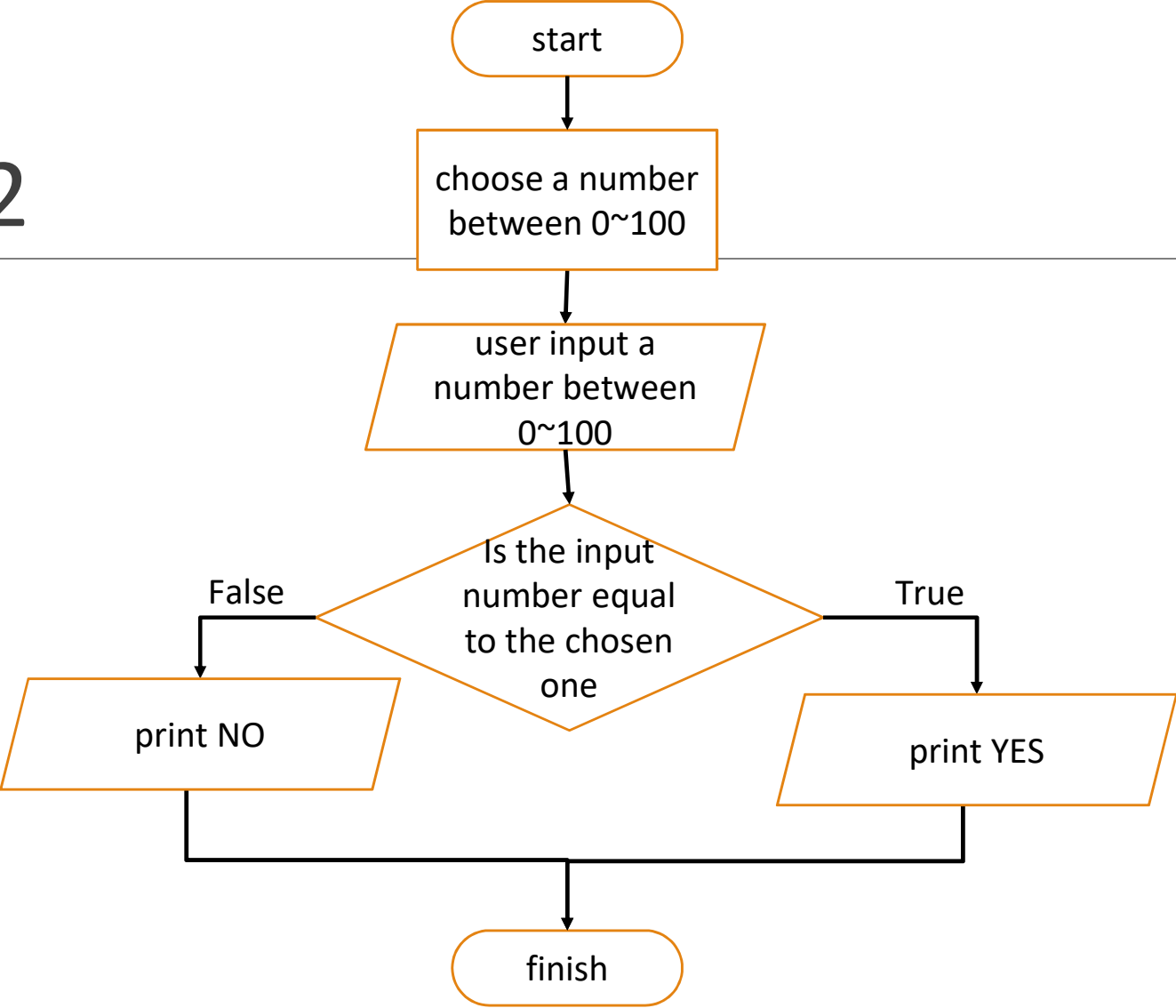
change page



Example 1



Example 2

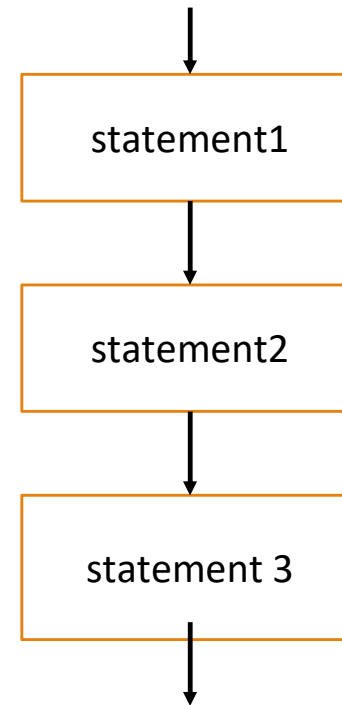


Three basic program structures

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

1. The sequence structure

- `print('Hello World!')`
- `a= 128//7`
- `print(a+3)`
- `print('Hello'+ 'Everyone')`



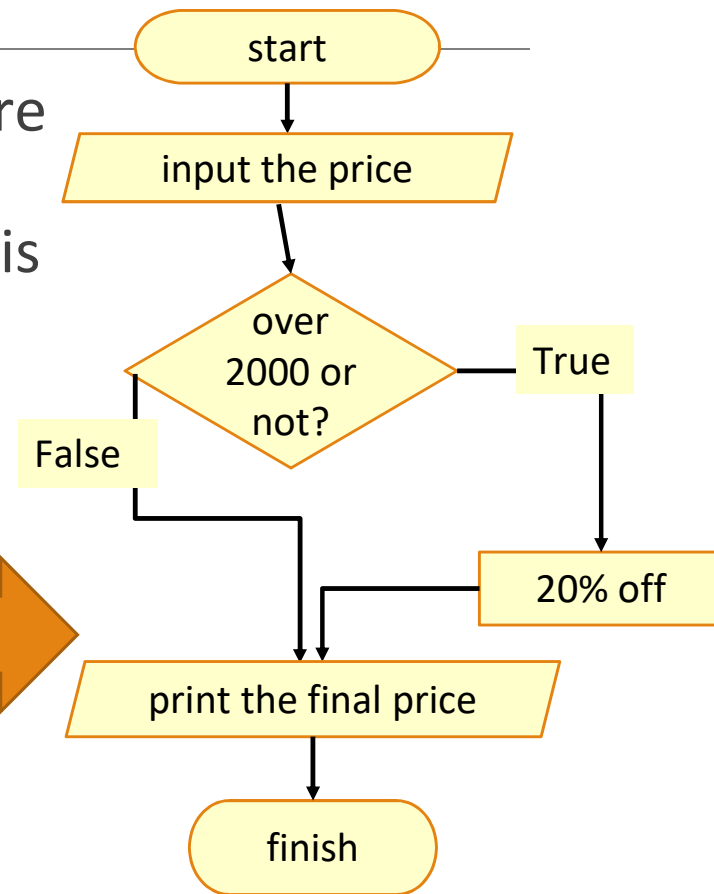
2. The decision structure

--- A single alternative decision structure: if statement

if condition:
 statement
 statement
 ...
sequence statement
...

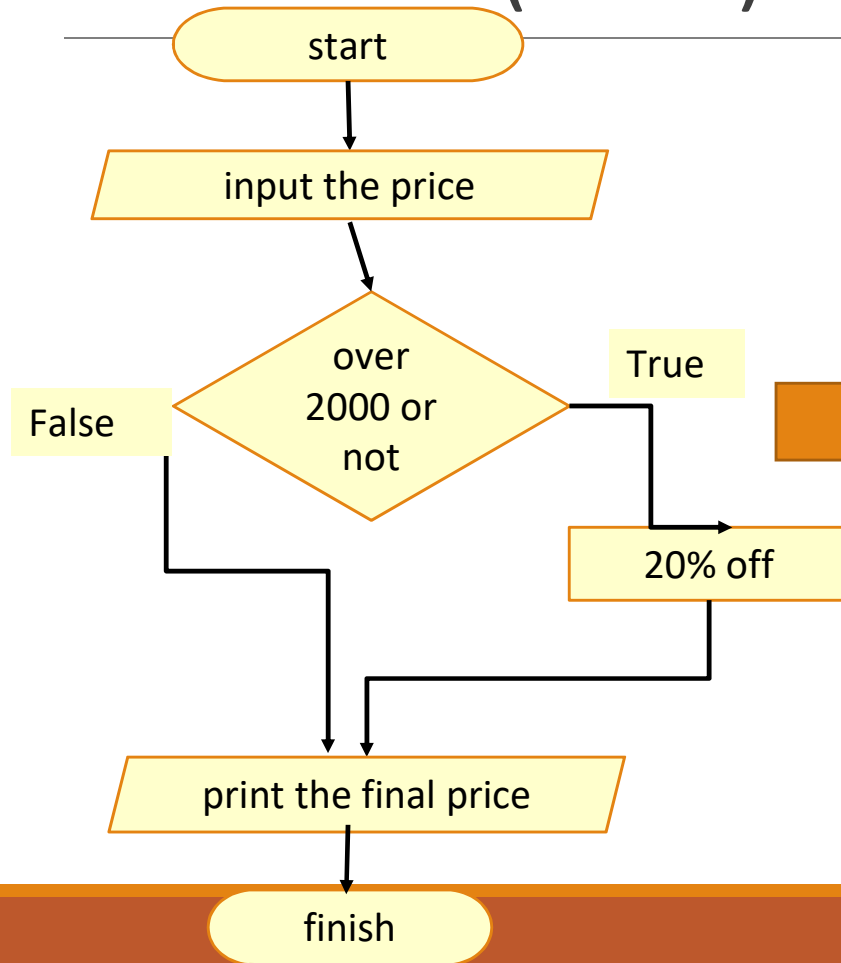
- The if statement causes one or more statements to execute only when the Boolean expression(condition) is True.

Question:
Users input the price and determine whether the price is over 2000. If true, 20% off. Print out the final price.



The decision structure

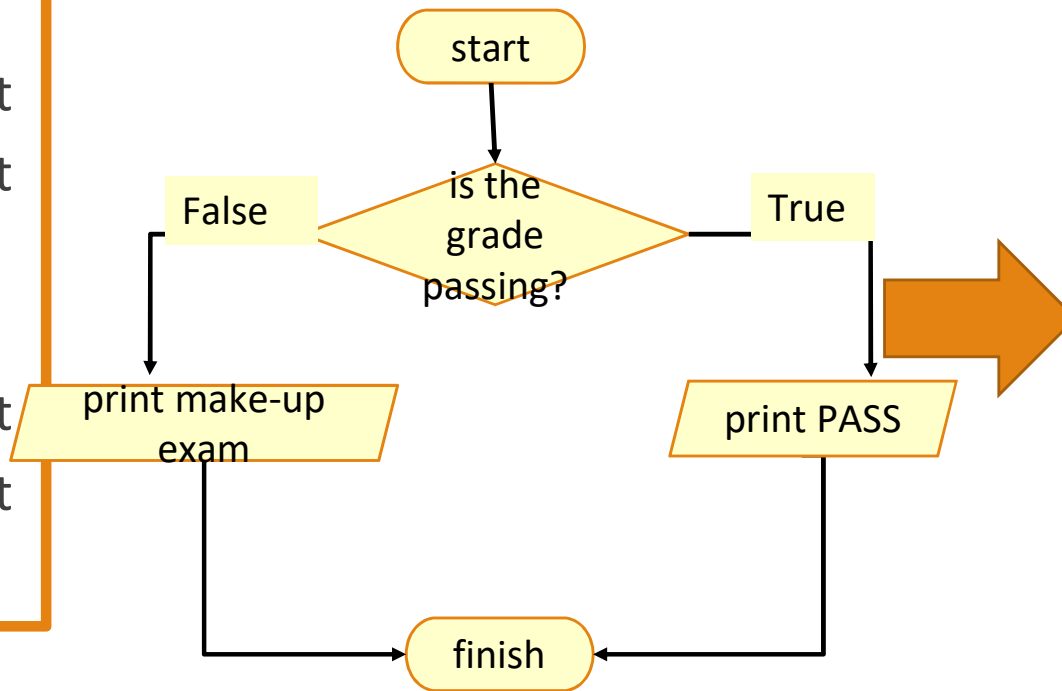
--- A single alternative decision structure: if statement(cont.)



```
money = int(input('input price: '))
if money > 2000:
    print('20%off') # statement
    money*=0.8     #statement
print("final price{:8.2f}".format(money))
```

A dual alternative decision structure: if-else statement

```
if condition:  
    statement  
    statement  
    ...  
else:  
    statement  
    statement  
    ...
```

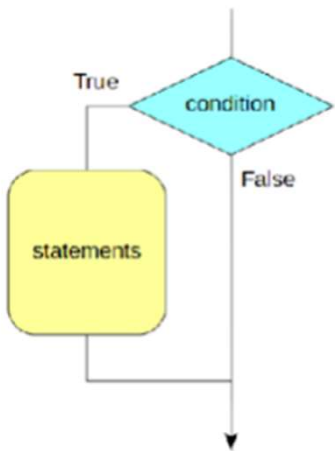


```
grade = float(input('input grade: '))  
if grade >= 60:  
    print('PASS')  
else:  
    print("make-up exam")
```

2. decision structure: if vs if-else

if condition(條件運算式):

statements



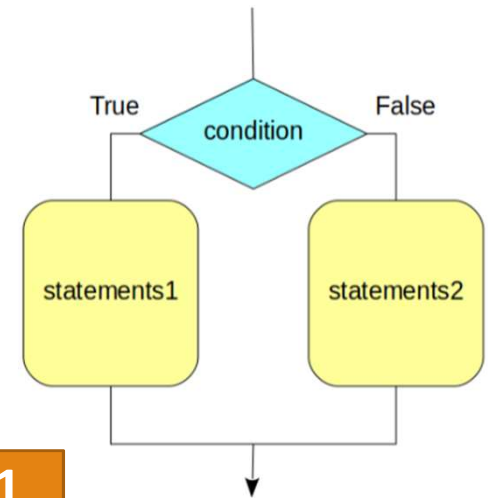
if condition:

statement1

else:

statement2

**either statement1
or statement2**



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 : 「==」
 - not equal to : 「!=」
 - greater than : 「>」
 - greater than or equal to : 「>=」
 - less than : 「<」
 - less than or equal to : 「<=」

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

if-else statement practice

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

Nested decision structure

```
if <condition1>:
```

```
    if <condition2>:
```

```
        statement1
```

```
    else:
```

```
        statement2
```

```
else:
```

```
    if <condition3>:
```

```
        statement3
```

```
    else:
```

```
        statement4
```

example: find the biggest number

a, b, c=3, 5, 7

```
x=0
```

```
if a < b:
```

```
    if b < c:
```

```
        x = c
```

```
    else: # (b>=c)
```

```
        x = b
```

```
else: # (a>=b)
```

```
    if a < c:
```

```
        x = c
```

```
    else: # (a>=c)
```

```
        x = a
```

```
print(x)
```


Multiple conditional expression

➤ and

- example : 「 a == b and 5 == c 」

➤ or

- example : 「 x != y or z == 3 」

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".

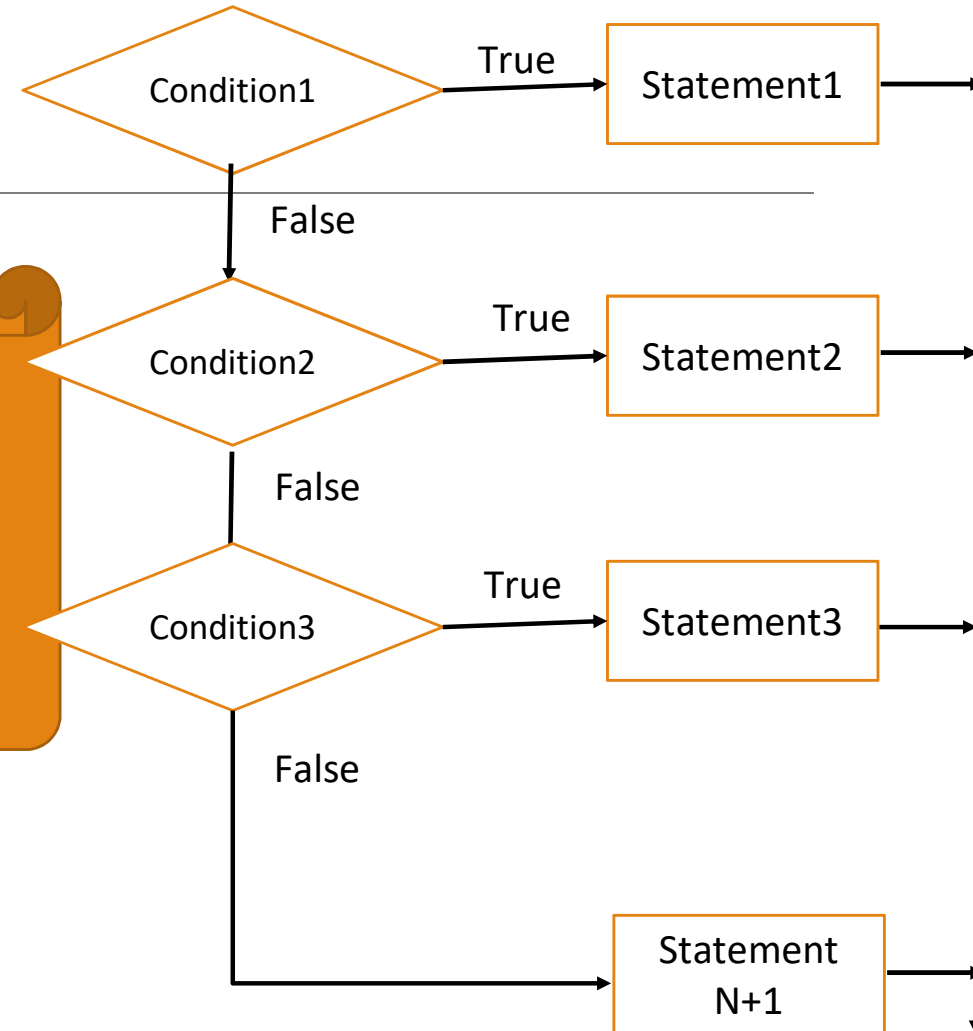
if-elif-else statement

program

```
if <condition1>:  
    statement1  
elif <condition2>:  
    statement2  
elif <condition3>:  
    statement3  
...  
else:  
    statement
```

elif = else if
1. elif : one, more than one or none.
2. else: one or none.

flowchart



if-elif-else statement practise

Practice

Write a Python program that require 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 user to input their score(0~100) and divide the score into A, B, C, D, E based on the following rule:
A:90 or more. B:89~80.
C:79~70. D:69~60. E:59 or less

```
score= eval(input("input a class score(0-100): "))
if score >=90:
    print('You got A')
else:
    if score >= 80:
        print('You got B')
    else:
        if score >= 70:
            print('You got C')
        else:
            if score >= 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 :

$$\text{BMI} = \text{weight}(\text{kg}) / \text{height}^2(\text{m}^2).$$

- 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: guest number

- Part1: Programmer gives an integer between 1 and 99 and let user guess. After (“input an integer(1-99):”), program begin to determine whether the number user inputs is greater than the one decided.
 - If true, print “the number you guess is too big”, print “the number you guess is too small”, or print “Congratulations, you’re right!”.
- Part2: Please use randint() function in random module

Hint: random.randint(a,b): Return a random integer N such that $a \leq N \leq b$.

additional program

if... elif... [elif...] else statement

- Write a Python program that determines whether the year is leap year.

(Leap year occurs once every four years, excluding years divisible by 100 but not 400.)

Review

- Textbook chapter4: 4.1, 4.2, 4.4