11 Programming – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
variable	变量			
constant	常量			
assignment	赋值			
selection	选择			
iteration	迭代			
array	数组			
subroutines	子程序			
procedure	过程			
function	函数			
parameters	参数			
local variable	局部变量			
scope	作用域			

Recall

At IGCSE you wrote simple programs with input, output and `IF`. Bring this with you:

- A program follows your instructions in order.
- You used `IF` to make choices and loops to repeat.

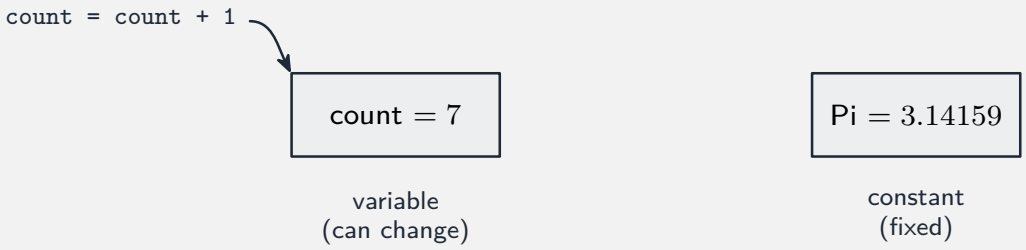
At AS we use variables carefully and break programs into reusable subroutines.

New ideas

Read these first. Each idea has a short worked example. Then do the Practice.

1 Variables, constants and assignment

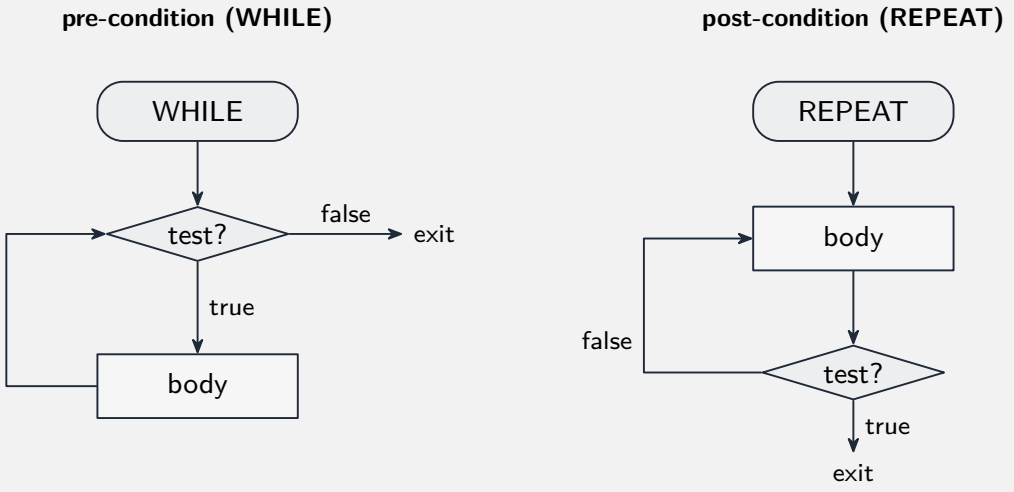
- a **variable** 变量 is a named store whose value can change; a **constant** 常量 keeps the same value all through the program.
- **assignment** 赋值 puts a value into a variable, written with an arrow: `count ← count + 1`.



Worked example. `VAT ← 0.20` suits a constant (it rarely changes); `count ← count + 1` is assignment —it reads the old `count`, adds one, and stores the result back.

2 The three constructs

- **selection** 选择 (`IF` / `CASE`) chooses between paths.
- **iteration** 迭代 repeats: a count-controlled loop (`FOR`) repeats a fixed number of times; a condition-controlled loop (`WHILE`) repeats until a condition changes.



An **array** 数组 is often processed with a `FOR` loop, one element at a time.

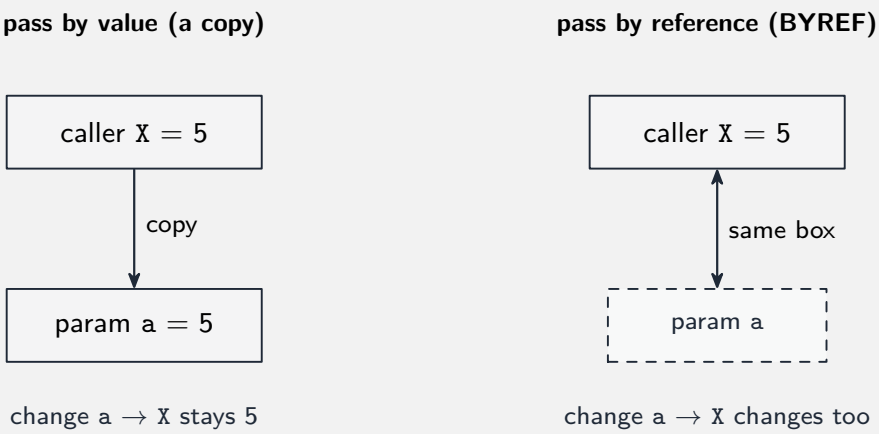
Worked example. To total 10 marks, use `FOR i ← 1 TO 10` (you know it is 10); to keep asking for a password, use `WHILE wrong` (you do not know how many tries it takes).

■ 3 Subroutines

Break a large program into named **subroutines** 子程序:

- a **procedure** 过程 carries out a job;
- a **function** 函数 carries out a job **and returns a value**.

Values passed into a subroutine are **parameters** 参数.



A **local variable** 局部变量 exists only inside its own subroutine —that area is its **scope** 作用域.

Worked example. `area(w, h)` is a function: it takes parameters `w` and `h` and *returns* `w * h`; `printReport()` is a procedure: it does a job but returns nothing.

> **Watch out:** a function *returns* a value you can use (`x ← area(3, 4)`); a procedure returns nothing, so `x ← printReport()` makes no sense.

Practice

11.1 State one difference between a variable and a constant. [2]

11.2 State what the assignment `total ← total + 5` does. [1]

11.3 State when you would use a `FOR` loop rather than a `WHILE` loop. [2]

11.4 State one difference between a procedure and a function. [2]

11.5 Explain what is meant by the scope of a local variable. [1]

11.6 Explain one advantage of breaking a large program into subroutines. [2]

11.7 Challenge. Write pseudocode for a function `bigger(a, b)` that returns the larger of the two numbers. [3]