

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.

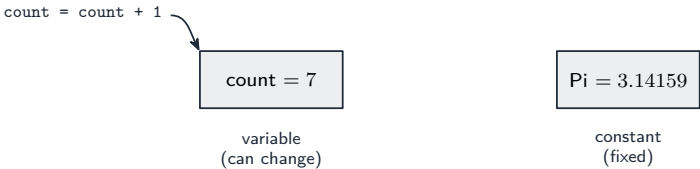
At AS we use variables carefully and break programs into reusable subroutines.

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`.

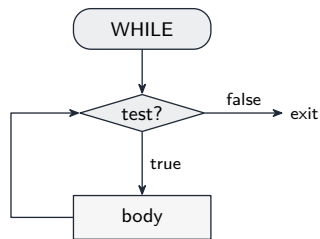


Worked example. `VAT ← 0.20` suits a constant (it rarely changes); `count ← count + 1` is assignment — it reads the old `count`, adds one, and stores the result back.

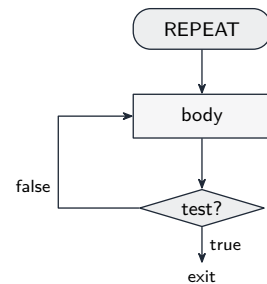
■ 2 The three constructs

- **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.

pre-condition (WHILE)



post-condition (REPEAT)



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

Worked example. To total 10 marks, use FOR $i \leftarrow 1$ 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).

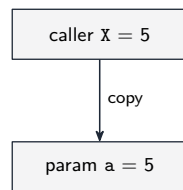
■ 3 Subroutines

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**.

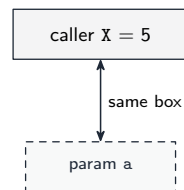
Values passed into a subroutine are **parameters** 参数.

pass by value (a copy)



change a → X stays 5

pass by reference (BYREF)



change a → X changes too

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 ($x \leftarrow \text{area}(3, 4)$); a procedure returns nothing, so $x \leftarrow \text{printReport}()$ makes no sense.

Practice

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

11.2 State what the assignment $\text{total} \leftarrow \text{total} + 5$ 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]