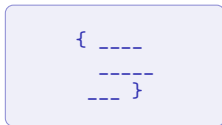


Programming Fundamentals

IGCSE Computer Science ■ Topic 8

IGCSE Computer Science



What we will cover

1 Variables, constants, data types

2 The three structures

3 Operators & strings

4 Procedures & functions

5 Arrays

6 File handling

age

16

a variable is a named box
that holds a value

Variables, constants, data types

- **variable** 变量: a named store whose value can **change**
- **constant** 常量: a named value that is **fixed**

Five **data types** 数据类型: INTEGER, REAL, CHAR, STRING, BOOLEAN.

Pick the **smallest precise** type: a whole count is INTEGER, a price is REAL, a yes/no is BOOLEAN.

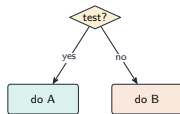
integer	whole number: 7
real	decimal: 3.5
char	one letter: 'A'
string	text: "hello"
boolean	true or false

The three basic structures

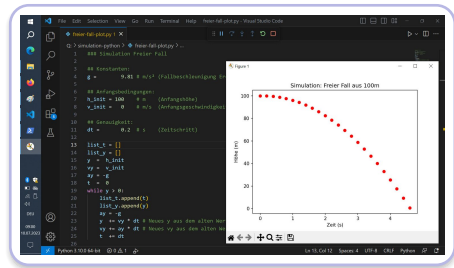
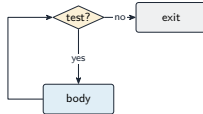
Sequence



Selection



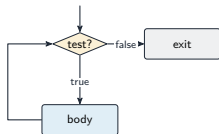
Iteration



python code

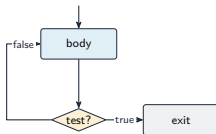
Loops and counting

WHILE
(pre-condition)

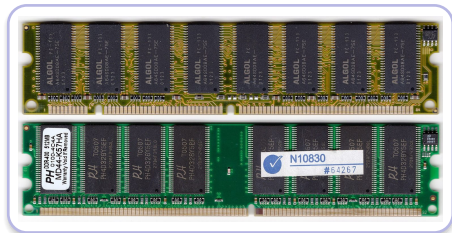


tested first $\Rightarrow$ may
run **zero** times

REPEAT
(post-condition)



tested last $\Rightarrow$ runs
at least once



ram

Operators

arithmetic

+ - × /
DIV (whole),
MOD (remainder)

comparison

= ≠ < > ≤ ≥

logical

AND, OR, NOT

17 DIV 5 = 3 (whole part), 17 MOD 5 = 2 (remainder) – MOD is how you test “is it even?”

String handling

- `LENGTH(s)` – number of characters
- `SUBSTRING(s, start, n)` – part of a string
- `UCASE` / `LCASE` – change case
- `&` – **concatenation** 拼接 (join)

String positions count from **1**, not 0. And a **nested** 嵌套 statement is just one structure **inside** another – an IF within a FOR.

Procedures and functions

- **procedure** 过程: a named block that **does an action**, returns nothing
- **function** 函数: a named block that **returns a value**

Library routines 库例程 are ready-made subroutines (ROUND, RANDOM).

A **function** call sits inside an expression (it gives a value back); a **procedure** call is a statement on its own.

Writing a maintainable program

meaningful names

score, not x

comments

explain *why*,
not the obvious

subroutines

split the work into
named blocks

Maintainable code is code the **next person** (or you, next month) can read and change without fear.

Arrays

index	1	2	3	4	5
scores	90	75	60	88	50

scores[2] is 75

1-D: a list, one index

	column		
	1	2	3
1			
2			
3			

grid[2,3]

An **array** 数组 holds many values of the **same type** under one name, picked out by an **index** 索引.

A 1-D array is a list (Marks[3]);
a 2-D array is a grid (Grid[2,3])
– perfect for a FOR loop over every element.

File handling

Store data on disk so it survives when the program ends:

- `OPENFILE` for `READ` / `WRITE`
- `READFILE` / `WRITEFILE`
- `CLOSEFILE` when done

Variables live in RAM and vanish at the end; a **file** keeps the data between runs. Always `CLOSEFILE` – unsaved writes are lost otherwise.

Topic 8 – key takeaways

1 Structures

sequence, selection, iteration

2 Loops

FOR known; WHILE before; REPEAT after

3 Subroutines

procedure acts; function returns a value

4 Arrays & files

array = same type by index; file survives runs

Check yourself

- 1 Which loop may run zero times?
- 2 What is $17 \text{ MOD } 5$?
- 3 Procedure or function: which returns a value?
- 4 From which index do string positions count?

```
{  
  ---  
  --- }
```

Answers 1. WHILE 2. 2 3. a function 4. 1