

1. Data Types

Specification reference: 3.2.1

Every value handled by a program has a data type. Choosing the correct data type is the very first decision a programmer makes when writing a variable. AQA tests this knowledge in nearly every paper.

Definition: Data type

A data type defines the kind of values a variable can hold, the operations that can be performed on them, and how much memory the value occupies.

The five data types you must know

AQA uses these general names. Other languages may call them differently — in particular, Python calls a real number a float.

AQA name	Python type	Holds	Example
integer	int	Whole numbers (positive, negative, zero)	42
real	float	Numbers with a decimal point	3.14
Boolean	bool	True or False (only two possible values)	True
character	str (length 1)	A single character	'A'
string	str	A sequence of zero or more characters	'Hi'

Exam Tip

AQA may use either the general name (“real”) or the Python name (“float”). Both are accepted in mark schemes. If asked to state a suitable data type for a value, write the AQA name first and add the Python name in brackets, e.g. “real (float)”. This shows full understanding and never loses marks.

Choosing the right data type

Examiners frequently ask you to identify the most suitable data type for a piece of data and to justify your choice. Use this two-part structure: state the type, then state why.

Worked example: noughts and crosses board**PYTHON**

```
board = [
    ['X', 'O', 'X'],
    [' ', 'X', 'O'],
    ['O', ' ', 'X']
]

# Print the board nicely
for row in board:
    for cell in row:
        print(cell, end=' | ')
    print()
```

Exam-Style Question 6.2A — Code Writing [6 marks]

A school stores the marks of 4 students across 3 tests in a 2D list:

PYTHON

```
marks = [
    [78, 82, 91], # student 0
    [65, 70, 68], # student 1
    [88, 92, 85], # student 2
    [55, 60, 72] # student 3
]
```

Write a Python program that outputs the average mark for each student, one per line. [6]

Write your Python program

6.3 Records

A record groups related data of different types under one identifier. Unlike an array, each item has a name (called a field).

AQA pseudo-code uses RECORD ... ENDRECORD. For example:

```
RECORD Car
make : String
model : String
reg : String
price : Real
noOfDoors : Integer
ENDRECORD
```

Records in Python

Python has no built-in record type. There are three common ways to implement one. Any of these will be accepted in an exam:

11.4 Error types and debugging

AQA require you to identify two specific types of error — syntax errors and logic errors — and to be able to correct errors within algorithms and programs.

Definition: Syntax error

A syntax error is an error in the structure or grammar of the program code. The program will not run until it is corrected. Examples: missing colon, mismatched brackets, mis-spelt keyword, missing quote.

Definition: Logic error

A logic error is an error in the program's logic that causes it to produce incorrect or unexpected output. The program runs, but it does the wrong thing. Examples: using $>$ instead of $<$, off-by-one error in a loop, dividing by the wrong variable.

Worked example: find and fix the errors

The following program is supposed to print the largest of three numbers. It contains both a syntax error and a logic error. Find and fix them.

PYTHON

```
a = int(input('First: '))
b = int(input('Second: '))
c = int(input('Third: '))
largest = a
if b > largest:
    largest = b
if c < largest:
    largest = c
print(largest)
```

Errors:

- **Syntax error:** Line 1 is missing the closing bracket. Should be: `a = int(input('First: '))`
- **Logic error:** Line 8 uses `c < largest` when it should be `c > largest` to find the LARGEST value.

Exam Tip — Phrasing for full marks

When asked to identify an error, always state:

- The LINE the error is on
- The TYPE of error (syntax or logic)
- WHAT the error is, and
- HOW to fix it (write the corrected line).