MODULE A SYSTEMS ARCHITECTURE · A7 (IGCSE ONLY)

# Instruction sets and microprocessors: mark scheme

20 marks · Cambridge 0478 syllabus 3.1.1(b), 3.1.4

**How to use.** One mark per creditworthy point up to the maximum shown. **/** separates alternative words; **//** separates alternative answers. Words in (brackets) are not needed for the mark. Credit any other valid answer that shows the same understanding.

| QUESTION | ANSWER | MARKS | GUIDANCE |
|---|---|---|---|
| **1(a)** 0478 3.1.1(b) | Any one from:<br>A (type of) integrated circuit on a single chip // a CPU on a single chip | **1** | Must mention single / one chip. "A small processor" alone is too vague. |
| **1(b)** 0478 3.1.4 | Any two from:<br>A list of all the commands / instructions ...<br>... that can be processed by a CPU<br>The commands are (in) machine code / binary | **2** | max 2. "A set of instructions" alone is too vague (0 marks). |
| **2(a)** 0478 3.1.1(b), 3.1.4 | Integrated circuit on a single chip: True<br>Execute a command not in its set: False<br>Every CPU has the same set: False | **3** | One mark per correct row. Both boxes ticked in a row: 0 for that row. |
| **3(a)** 0478 3.1.4 | Machine code | **1** | Do not accept "binary" alone (given in the question). |
| **3(b)** 0478 3.1.4 | Any two from:<br>SUBTRACT is not in the CPU's instruction set<br>A CPU can only process / execute commands in its own instruction set<br>The CPU would not be able to decode it // would not recognise the (machine) code | **2** | max 2. |
| **3(c)** 0478 3.1.4 | Any three from:<br>LOAD 0 // LOAD 5 (as the starting value)<br>Use ADD repeatedly // repeated addition<br>... ADD 5 three times (after LOAD 0) // ADD 5 twice (after LOAD 5) // ADD 3 five times (after LOAD 0)<br>OUTPUT the accumulator / result (15) | **3** | max 3. Accept codes (00, 01, 11) in place of command names. Accept STORE used along the way. No mark for any step that uses a command not in the table. |
| **4(a)** 0478 3.1.4 (with 3.1.2(b)) | One mark for each correct word, in order:<br>RAM<br>decoded<br>control unit<br>executed | **4** | Accept CU for control unit. |

| QUESTION | ANSWER | MARKS | GUIDANCE |
|---|---|---|---|
| **5(a)**<br>0478 3.1.4 | Any two from:<br>Load<br>Store<br>Add<br>Subtract<br>Compare<br>Jump // branch<br>Input // output | **2** | max 2. Accept any other valid CPU operation, e.g. AND / OR / shift. Accept a description, e.g. "add two numbers". |
| **6(a)**<br>0478 3.1.4 | Any two from:<br>Different types of CPU can have different instruction sets<br>The machine code was written for the desktop CPU's instruction set<br>The phone's CPU can only execute commands from its own instruction set // may not recognise / decode the desktop CPU's commands | **2** | max 2. Do not credit answers about screen size or storage space alone. |

**Total: 20 marks**