MODULE C DATA REPRESENTATION · C1

# Why computers use binary: mark scheme

20 marks · OCR J277 spec 1.2.3

**How to use.** 1 mark per bullet up to the maximum shown. **/** separates alternative answers. Words in (brackets) are not needed for the mark. NE = not enough for the mark.

| QUESTION | ANSWER | MARKS | GUIDANCE |
|---|---|---|---|
| **1(a)** J277 1.2.3 | 0 and 1 | **1** | Both needed, either order. "On and off" alone = NE. |
| **1(b)** J277 1.2.3 | bit | **1** | Do not accept byte / nibble. |
| **1(c)** J277 1.2.3 | Billions of tiny switches (transistors) | **1** | More than one tick = 0. |
| **2(a)** J277 1.2.3 | Three states: False<br>Program instructions in binary: True<br>Images not converted: False<br>On = 1: True | **4** | 1 mark per correct row. More than one tick in a row = 0 for that row. Row 1: switches have only two states, on and off. Row 3: all data, including images, is stored in binary. |
| **3(a)** J277 1.2.3 | Images / video (from the camera)<br>Sound / audio (from the microphone)<br>Text / characters (messages on the screen) | **2** | Any two, 1 mark each. Accept numbers / program instructions. Two answers of the same type (e.g. "photos" and "video") = 1. |
| **3(b)** J277 1.2.3 | The sound must be converted into binary / 1s and 0s / bits<br>... because the processor is made of switches that can only be on or off / have two states<br>... so it can only process data in binary | **2** | Max 2. "It is recorded / saved" alone = NE. Sampling detail is not needed (C10), but accept a correct description of measuring the sound and storing the values in binary. |
| **4(a)** J277 1.2.3 | 2 switches: 4<br>3 switches: 8<br>8 switches: 256 | **3** | 1 mark per row. Working: doubling 2 → 4 → 8 → 16 → 32 → 64 → 128 → 256 ($2^8$ = 256). Do not accept 255 for 8 switches (that is the largest number, not the number of patterns). |
| **4(b)** J277 1.2.3 | byte | **1** | Do not accept nibble / bit. |

| QUESTION | ANSWER | MARKS | GUIDANCE |
|---|---|---|---|
| **5(a)**<br>J277 1.2.3 | Computers / processors are made of (billions of) switches / transistors / logic gates<br>... that have only two states / can only be on or off<br>The two states can be represented by 1 and 0 / binary<br>(So) all data must be in binary to be processed / stored | **2** | 1 mark per bullet, max 2. "Computers only understand binary" alone = NE. |
| **6(a)**<br>J277 1.2.3 | The statement gives no reason / does not say why / is too vague<br>A processor is made of (billions of) switches / transistors<br>Each switch has only two states / is on or off<br>On and off can be represented by 1 and 0 / binary digits<br>So all data (text, images, sound, instructions) must be converted into binary to be processed | **3** | 1 mark per bullet, max 3. Repeating "computers only understand binary" earns nothing. |

**Total: 20 marks**