MODULE C DATA REPRESENTATION · C4

Converting binary and hexadecimal: mark scheme

20 marks · OCR J277 spec 1.2.4

How to use. 1 mark per bullet up to the maximum shown. **/** separates alternative answers. Words in (brackets) are not needed for the mark. Working is shown for the teacher. A correct final answer with no working gets full marks, including where the question says "Show your working" (OCR credits the answer; there is no separate working mark on these questions). Never credit hex digits in the wrong order, a reversed bit pattern, or a denary value (e.g. 10) written in place of a hex digit.

QUESTION	ANSWER	MARKS	GUIDANCE
1(a) J277 1.2.4	4 (bits)	**1**	Accept "a nibble". Correct answer only.
1(b) J277 1.2.4	9 (left nibble 1001 = 8 + 1 = 9) D (right nibble 1101 = 8 + 4 + 1 = 13 = D)	**2**	Answer 9D. 1 mark per correct digit in the correct position. D9 = 0. 913 = 1 mark (9 only). Denary 157 = 0.
1(c) J277 1.2.4	7 (0111 = 4 + 2 + 1) 0 (0000 = 0)	**2**	Answer 70. "7" alone = 1 mark (the all-zero nibble is still a digit). 07 = 0. Denary 112 = 0.
2(a) J277 1.2.4	0100 (4 = 4) 1100 (C = 12 = 8 + 4)	**2**	Answer 0100 1100 / 01001100. 1 mark per correct nibble in the correct position. 100 1100 (leading 0 missing, so not 8 bits) = 1 mark. Reversed pattern = 0.
2(b) J277 1.2.4	1111 (F = 15) 0011 (3 = 2 + 1)	**2**	Answer 1111 0011 / 11110011. 1 mark per correct nibble in the correct position. 1111 11 (3 not padded to 4 bits) = 1 mark.
3(a) J277 1.2.4	0010 1011 → 2B E8 → 1110 1000 1111 1111 → FF 06 → 0000 0110	**4**	1 mark per row. 2B: 0010 = 2, 1011 = 8 + 2 + 1 = 11 = B. E8: E = 14 = 8 + 4 + 2 = 1110, 8 = 1000. FF: 1111 = 15 = F twice. 06: 0 = 0000, 6 = 4 + 2 = 0110. Binary must be 8 bits (110 alone = 0). Do not accept 211 for 2B or 1515 for FF.

QUESTION	ANSWER	MARKS	GUIDANCE
4(a) J277 1.2.4	Wrote the denary value 10 instead of the hex digit A (for the first nibble 1010)	**1**	Accept: did not convert 10 to A / did not use a letter for 10 to 15. Do not accept "it is wrong" or "converted to denary" with no reference to 10 / A / the first nibble.
4(b) J277 1.2.4	A1	**1**	1010 = 8 + 2 = 10 = A; 0001 = 1. 1A = 0.
5(a) J277 1.2.4	Split the 8 bits into two nibbles / two groups of 4 bits Convert each nibble to denary using place values 8, 4, 2, 1 Write each nibble as one hex digit, using A to F for 10 to 15, keeping the left nibble first A correct worked example, e.g. 1011 0110 → 11 and 6 → B6	**3**	Max 3. The example mark needs a fully correct conversion. Also accept the method: convert the 8 bits to denary, divide by 16; the whole-number result is the first digit and the remainder the second, each written in hex (e.g. 1011 0110 = 182 = 11 × 16 + 6 → B6). One mark per correct step of either method.
6(a) J277 1.2.4	C7	**1**	1100 = 12 = C; 0111 = 7. (7C reverses the nibbles; CF = 1100 1111.) 2+ ticks = 0.
6(b) J277 1.2.4	FF	**1**	1111 1111 = FF (= 255 in denary). Do not accept 255 or 1515.

Total: 20 marks