MODULE C DATA REPRESENTATION · C2

Converting denary and binary: mark scheme

20 marks · OCR J277 spec 1.2.4

How to use. One mark per bullet up to the maximum shown. **/** separates alternatives. Words in (brackets) are not needed for the mark. Place values are 128 64 32 16 8 4 2 1, MSB on the left. A binary answer with the bits in the wrong order (written backwards) is never credited. Where a question says "Show your working", a correct final answer with no working still gets full marks; working marks are there to reward a sound method with a slip. For 8-bit answers, accept the value without leading zeros only where stated.

QUESTION	ANSWER	MARKS	GUIDANCE
1(a) J277 1.2.4	128	**1**	Accept 2^7.
1(b) J277 1.2.4	255	**1**	11111111 = 128+64+32+16+8+4+2+1 = 255. Do not accept 256.
2(a) J277 1.2.4	45	**1**	32 + 8 + 4 + 1 = 45.
2(b) J277 1.2.4	210	**1**	128 + 64 + 16 + 2 = 210.
2(c) J277 1.2.4	11	**1**	Headings 8 4 2 1: 8 + 2 + 1 = 11. Do not accept 13 (read backwards).
3(a) J277 1.2.4	Working: e.g. 77 − 64 = 13, 13 − 8 = 5, 5 − 4 = 1, 1 − 1 = 0 / 64 + 8 + 4 + 1 / headings with 1s under 64, 8, 4, 1 01001101	**2**	1 mark working, 1 mark answer. Correct answer with no working = 2. Accept repeated division by 2 with remainders read in the correct order. Answer must be 8 bits; 1001101 = working mark only. 10110010 (reversed) = 0 for the answer mark.
3(b) J277 1.2.4	Working: e.g. 200 − 128 = 72, 72 − 64 = 8, 8 − 8 = 0 / 128 + 64 + 8 11001000	**2**	1 mark working, 1 mark answer. Correct answer with no working = 2. 00010011 (reversed) = 0 for the answer mark.
3(c) J277 1.2.4	00000110	**1**	4 + 2 = 6. Must be 8 bits: do not accept 110.

QUESTION	ANSWER	MARKS	GUIDANCE
4(a) J277 1.2.4	Fan speed: 100 Window opening: 10101010 Light level: 254 Water timer: 00100001	**4**	1 mark per box. 64 + 32 + 4 = 100; 128 + 32 + 8 + 2 = 170; 128+64+32+16+8+4+2 = 254; 32 + 1 = 33. Binary answers must be 8 bits: do not accept 100001.
5(a) J277 1.2.4	The bits are written backwards / in reverse order The place values have been put the wrong way round / the 128 column (MSB) should be on the left / the smallest place value has been put on the left 10011100	**3**	1 mark per bullet, Max 3. Correct binary must be given for the third mark: 128 + 16 + 8 + 4 = 156. Accept "they used 1 2 4 8 ... from the left" for MP2. Do not accept "they added wrongly" or "they got the 1s and 0s wrong" on its own. (00111001 is actually 57.)
6(a) J277 1.2.4	31	**1**	11111 = 16 + 8 + 4 + 2 + 1 = 31. Do not accept 32.
6(b) J277 1.2.4	The largest number in 8 bits is 255 / 11111111 300 is larger than 255 / 300 needs more than 8 bits / needs 9 bits / needs a 256 column	**2**	1 mark per bullet, Max 2. Accept "300 is bigger than the maximum 8-bit number" for MP2 only. 300 = 100101100 (9 bits).

Total: 20 marks