MODULE C DATA REPRESENTATION · C2

Converting denary and binary: mark scheme

20 marks · Cambridge 0478 syllabus 1.1.2

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. 16-bit place values: 32768 16384 8192 4096 2048 1024 512 256 128 64 32 16 8 4 2 1, most significant bit on the left. A binary answer with the bits reversed is never credited. Binary answers must have the number of bits asked for. Where "Show your working" is asked, a correct answer with no working still gets full marks.

QUESTION	ANSWER	MARKS	GUIDANCE
1(a) 0478 1.1.2(a)	2 // base 2	**1**	Correct answer only.
1(b) 0478 1.1.2(a)	10 // base 10	**1**	Correct answer only.
2(a) 0478 1.1.2(b) (i)	115	**1**	64 + 32 + 16 + 2 + 1 = 115.
2(b) 0478 1.1.2(b) (i)	1024 + 256 + 128 + 16 + 4 + 2 // correct place values identified for each 1 1430	**2**	1 mark working, 1 mark answer. Correct answer with no working = 2.
3(a) 0478 1.1.2(b) (i)	10110101	**1**	128 + 32 + 16 + 4 + 1 = 181.
3(b) 0478 1.1.2(b) (i)	512 + 256 + 128 + 64 + 32 + 8 // 1000 − 512 = 488, − 256 = 232, − 128 = 104, − 64 = 40, − 32 = 8, − 8 = 0 // repeated division by 2 with remainders 0000001111101000	**2**	1 mark working, 1 mark answer. Correct answer with no working = 2. Answer must be 16 bits: 1111101000 = working mark only.
3(c) 0478 1.1.2(b) (i)	32768 + 4096 + 2048 + 1024 + 64 // 40000 − 32768 = 7232, − 4096 = 3136, − 2048 = 1088, − 1024 = 64, − 64 = 0 1001110001000000	**2**	1 mark working, 1 mark answer. Correct answer with no working = 2.
4(a) 0478 1.1.2(b) (i)	Shelf number: 00110100 Parcel count: 129 Distance travelled: 0001001110001000 Item code: 34817	**4**	1 mark per box. 32 + 16 + 4 = 52; 128 + 1 = 129; 4096 + 512 + 256 + 128 + 8 = 5000; 32768 + 2048 + 1 = 34817. Binary must be 8 bits / 16 bits as stated.

QUESTION	ANSWER	MARKS	GUIDANCE
5(a) 0478 1.1.2(b) (i)	Any three from: the bits are in reverse order // written backwards the place values were used from smallest to largest (from the left) // the most significant bit / 128 should be on the left 10110000 is actually 176 // 13 is 8 + 4 + 1 00001101	**3**	max 3. Third mark for the correct answer requires 00001101 exactly; do not accept 1101.
6(a) 0478 1.1.2(b) (i)	65535	**1**	1111111111111111. Do not accept 65536.
6(b) 0478 1.1.2(b) (i)	Any two from: the largest number in 16 bits is 65535 70000 is greater than 65535 // too large for 16 bits it would need more than 16 bits // 17 bits	**2**	max 2. 70000 in binary needs 17 bits.

Total: 20 marks