

Question	Answer	Marks																																
1(a)	<p>Working: one mark for calculation of the mantissa and one mark for calculation or use of the exponent</p> <p>Exponent: one from: = 0.11101×2^3 // 0.11101×2^{11} // 0.11101×10^3 // 0.11101×10^{11} = 1.00011×2^3 // 1.00011×2^{11} // 1.00011×10^3 // 1.00011×10^{11} = appropriate shifting of binary point for +7.25</p> <p>Mantissa: one from: = 111.01 (conversion to binary +7.25 – 10 bits) = 0111010000 (mantissa 10 bits for +7.25 = 1000101111(one's complement mantissa for –7.25) = 1000110000 (two's complement mantissa for –7.25)</p> <p>Correct Answer (Max 1)</p> <table><tr><td colspan="10">Mantissa</td><td colspan="6">Exponent</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td></tr></table>	Mantissa										Exponent						1	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	3
Mantissa										Exponent																								
1	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1																			
1(b)	<p>One mark for working out the exponent One mark for working out the mantissa One mark for the correct answer</p> <p>Example answers</p> <ul style="list-style-type: none">• = 1.011000111×2^7 (exponent is 7)• = 10110001.11 // $-128 + 32 + 16 + 1 + 0.5 + 0.25$ // convert to positive 01001110.01 (and add a minus sign to the answer)• –78.25	3																																
1(c)	<p>One mark for working One mark for correct mantissa One mark for correct exponent</p> <p>Example answers Number of places added to exponent for normalisation –6 for number to retain its value // mantissa moved 6 places left</p> <table><tr><td colspan="10">Mantissa</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr></table> <table><tr><td colspan="6">Exponent</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr></table>	Mantissa										0	1	1	1	0	0	0	0	0	0	Exponent						1	0	0	0	0	1	3
Mantissa																																		
0	1	1	1	0	0	0	0	0	0																									
Exponent																																		
1	0	0	0	0	1																													
1(d)(i)	<p>One mark for each correct marking point (Max 3)</p> <ul style="list-style-type: none">• Requires 11 bits / more than 10 bits to store (accurately) / reference to maximum (positive) number that can be stored = 511• Denary 513 in binary is 1000000001 // Normalised: 0.1000000001• Results in overflow	3																																

Question	Answer	Marks
1(d)(ii)	<p>One mark for each correct marking point (Max 2)</p> <ul style="list-style-type: none"> • The number of bits for the mantissa must be increased • 11/12 bits mantissa and 5/4 bits exponent 	2

Question	Answer	Marks
2(a)	One mark for each correct marking point (Max 2) <ul style="list-style-type: none"> To create a new data type (from existing data types) To allow data types not available in a programming language to be constructed // To extend the flexibility of the programming language 	2
2(b)(i)	TYPE SchoolDay = (Monday, Tuesday, Wednesday, Thursday, Friday)	1
2(b)(ii)	TYPE WeekEnd = (Saturday, Sunday)	1
2(c)	One mark for each marking point (Max 4) <ul style="list-style-type: none"> TYPE ClubMeet and ENDTYPE correct DECLARE FirstName and DECLARE LastName included with correct data types DECLARE Schoolday included with correct data types from part 2(b)(i) DECLARE Weekend included with correct data types from part 2(b)(ii) Example answer <pre> TYPE ClubMeet DECLARE FirstName : STRING DECLARE LastName : STRING DECLARE Schoolday : SchoolDay DECLARE Weekend : WeekEnd ENDTYPE </pre>	4

Question	Answer	Marks
1(a)(i)	<p>One mark for each correct marking point (Max 2)</p> <ul style="list-style-type: none"> • 010111000110 (correct mantissa) • 0111 (correct exponent) 	2
1(a)(ii)	<p>One mark for each correct consequence One mark for each correct justification</p> <p>Consequence</p> <ul style="list-style-type: none"> • The precision/accuracy of the number would be reduced <p>Justification</p> <ul style="list-style-type: none"> • ... because the least significant bits of the original number have been truncated/lost // the original number had 13 bits / 14 bits with sign but the mantissa can only store 12 bits 	2
1(b)	<p>One mark for each correct marking point (Max 3)</p> <ul style="list-style-type: none"> • To store the maximum range of numbers in the minimum number of bytes / bits • Normalisation minimises the number of leading zeros/ones represented • Maximising the number of significant bits // maximising the (potential) precision / accuracy of the number for the given number of bits • ... enables very large / small numbers to be stored with accuracy. • Avoids the possibility of many numbers having multiple representations. 	3

Question	Answer	Marks
3(a)	<p>One mark for each marking point (Max 2)</p> <ul style="list-style-type: none"> • TYPE Parts = • (Monitor, CPU, SSD, HDD, LaserPrinter, Keyboard, Mouse) <p>Complete answer TYPE Parts = (Monitor, CPU, SSD, HDD, LaserPrinter, Keyboard, Mouse)</p>	2
3(b)	<p>One mark for each marking point (Max 2)</p> <ul style="list-style-type: none"> • TYPE SelectParts = ^ • correct data type chosen Parts <p>Complete answer TYPE SelectParts = ^Parts</p>	2

Question	Answer	Marks
5(a)	<p>One mark for each correct marking point (Max 4)</p> <ul style="list-style-type: none"> • In both serial and sequential files records are stored one after the other ... • ... and need to be accessed one after the other • Serial files are stored in chronological order • Sequential files are stored with ordered records • ... and stored in the order of the key field • In serial files, new records are added in the next available space / records are appended to the file • In sequential files, new records are inserted in the correct position. 	4
5(b)	Direct (access)	1
5(c)	Sequential (access)	1

Question	Answer	Marks
1(a)	LibraryBook.Title ← "A Level Computer Science" LibraryBook.Fiction ← FALSE	2
1(b)(i)	DECLARE NumberOfCopies : 1 .. 10	1
1(b)(ii)	<u>DECLARE AccessionNumber : ARRAY[1:NumberOfCopies] OF INTEGER</u>	2
1(c)	<p>Any two from</p> <ul style="list-style-type: none"> • A data type constructed by a programmer // not a primitive data type • A data type that references at least one other data type... • ... the data types can be primitive, or user defined <p>One mark for an example</p> <ul style="list-style-type: none"> • Class / object / set 	3

Question	Answer	Marks																
1(a)	<p>Two marks for working One mark for correct answer</p> <p>Working: Conversion to binary + 202 = 11001010 // repeated division by 2 // 128 + 64 + 8 + 2 Appropriate shifting of binary point for + 202 = 0.1100101 × 2⁸ // exponent = 8</p> <p>Answer: = 01100101 00001000 (stored as mantissa and exponent)</p>	3																
1(b)	<p>Two marks for working One mark for correct answer</p> <p>Working:</p> <ul style="list-style-type: none">• Appropriate method of conversion e.g. = 10011010 (one's complement of 8-bit mantissa) = 10011011 (two's complement of 8-bit mantissa) -256 + 32 + 16 + 4 + 2• Realisation that the exponent doesn't change // value of exponent = 8 // appropriate shifting of binary point <p>Answer: = 10011011 00001000 (stored as mantissa and exponent)</p>	3																
1(c)(i)	<p>The mantissa does not begin with 01/10 (as its most significant bits) // the mantissa begins with 00 // first two digits are the same.</p>	1																
1(c)(ii)	<p>One mark for each point:</p> <ul style="list-style-type: none">• Correct mantissa• Correct exponent <div><div><p>Mantissa</p><table><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td></tr></table></div><div><p>Exponent</p><table><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td></tr></table></div></div>	0	1	1	1	1	0	0	0	0	0	0	1	0	1	1	0	2
0	1	1	1	1	0	0	0											
0	0	0	1	0	1	1	0											

Question	Answer	Marks
3(a)	A (user-defined non-composite) data type with an ordered list of possible values.	1
3(b)	A user-defined non-composite data type used to reference a memory location .	1
3(c)	<p>Marks as shown in the square brackets:</p> <p>TYPE Quarter1 = (January, February, March)</p> <p>TYPE Quarter1 = [1]</p> <p>(January, February, March) [1]</p>	2
3(d)(i)	DECLARE Pet1 : Pet	1

Question	Answer	Marks
3(d)(ii)	<p>One mark for each point:</p> <ul style="list-style-type: none"> • Correct assignment of all string data values • Correct assignment of char data value • Correct assignment of integer data value <p>Example answer:</p> <pre>Pet1.PetName ← "Tibbles" Pet1.AnimalType ← "Cat" Pet1.PetAge ← 8 Pet1.PetGender ← 'M' Pet1.OwnerName ← "Jasmine Smith"</pre>	3