1.4 Two's Complement Practise Questions

1. Two's complement can be used to represent negative binary numbers.

i. Convert the denary number -124 into an 8-bit two's complement binary number.

[1]

ii. State **one** other way to represent negative binary numbers.

[1]

2. Using the binary value 1001 1101, convert this into:

i. A positive denary number.

[1]

ii. A negative denary number using two's complement.

[1]

3. Negative binary values can be represented using either sign and magnitude or two's complement.

i. Convert the denary number **-107** to an 8-bit binary number using two's complement.

[1]

4.

i. Complete this binary subtraction. Both numbers are 8-bit integer values represented using two's complement.

Show the result in the same format and show your working.

0110 1101 –

0011 0100

[3]

5(a).

i. Convert the denary number 97 into an **8**-bit binary number.

[1]

ii. Convert the denary number –97 into an **8**-bit binary number using two's complement.

[1]

(b). State **one** advantage of using two's complement instead of sign and magnitude.

[2]

6.

i. Convert the denary number −119 to an 8-bit binary number with two's complement representation.

[1]

7. Convert the two's complement binary number 10011011 into a denary number.

[1]

8(a).

i. Convert the denary number −44 to an 8-bit binary number with two's complement representation.

[1]

9. Show a representation of denary -119 in 8-bits using:

i. Two's Complement

[1]

10. Express the denary number −43 in binary using 8-bit two's complement representation.

Show your working.

[4]

11(a).

i. Change the denary number -89 into a two's complement, 8 bit binary number.

[1]

ii. Change the denary number -72 into a two's complement, 8 bit binary number.

[1]

(b).

i. Add the two binary answers which you obtained, using 8 bit arithmetic.

You must show your working.

[2]

ii. Explain why your answer to the addition sum is wrong.

[2]

12. Demonstrate subtraction in binary using 8-bit two's complement using the equivalent of the denary calculation 47-23. You must show all working.

[4]

13. Using two's complement convert the denary number −43 into an 8 bit binary number. You must show your working.

[2]

END OF QUESTION PAPER

Mark scheme

Question			Answer/Indicative content	Marks	Guidance
1		i	1000 0100	1	
		ii	Sign and magnitude	1	
			Total	**2**	
2		i	157	1	
		ii	-99	1	
			Total	**2**	
3		i	• 1110 1011	1	
		ii	• Calculations are more easily **performed** on two's complement • Two's complement allows for a (negligible) larger range of numbers to be stored / by example • No additional hardware is required in two's complement / Addition and subtraction are carried out using only an adder • Two's complement has only one representation for 0	1	
			Total	**2**	
4		i	0011 1001 • One mark for correct left nibble • One mark for correct right nibble • One mark for working clearly shown	3	
			Total	**5**	
5	a	i	• 0110 0001	1	
		ii	• 1001 1111	1	

	b		• – Can be easily used in binary arithmetic or • – Increased range of numbers available	2	
			Total	**4**	
6		i	1000 1001	1	
			Total	**1**	
7			–101	1 AO2.1 (1)	
			Total	**1**	
8		i	11010100	1	
			Total	1	
9		i	1000 1001	1	
			Total	1	
10					
			• 43 in binary 0010 1011 (1) • −43 2's complement 11010101 (may be two steps to get this, negate bits plus 1) • 11010101	3	
			Total	**1**	