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Lab 2 – Binary Integers

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1.

55

2.

a) s/mag: 1110111

b) 1's comp: 1001000

c) 2's comp: 1001001

3.

a) s/mag: -(110111) = 010111 => 23

b) 1's comp: -(101000) = 01000 => 8

c) 2's comp: -(101001) = 001001 => 9

4.

a) s/mag: 111111 => -31

b) 1's comp: 100000 => -31

c) 2's comp:100000 => -32

5.

a) s/mag: $-(2^{n-1} - 1)$

b) 1's comp: $-(2^{n-1} - 1)$

c) 2's comp: -2^{n-1}

6.

        s/mag and 1's comp have two forms of zero

        s/mag: 000000 and 100000

        1's comp: 000000 and 111111

        2's comp: 000000

7.

        Taking the negative of the most negative number causes overflow only in 2's complement
        Taking the negative of the most positive number will not cause overflow in any of the 3 systems

8.

        $111011 + 001110 = 1001001$

        Since this is unsigned, there is not overflow, just a carry into the 64's column

9.

        $111000 - 001101 = 101011$

10.

        $13 - 30 = 001101 - 011110 = 001101 + 100010 = 101111 = 010001 = -17$

11.

        $-25 - 7 = -011001 - 000111 = 100111 + 111001 = 100000 = 100000 = -32$

12.

        $24 + 10 = 011000 + 001010 = 100010 = 011101 + 1 = 011110 = -30$ (overflow case)