

1.  $V = 110\ 111 = 57$

2a.  $-V$  in Signed Mag:  $1\ 110\ 111 = -57$

2b.  $-V$  in 1's:  $0\ 001\ 000 = -8$

2c.  $-V$  in 2's:  $0\ 001\ 001 = -9$

3a. Signed Mag:  $1\ 110\ 111 = -23$

3b. 1's Complement:  $1\ 001\ 000 = -8$

3c. 2's Complement:  $1\ 001\ 001 = -9$

4a. Most negative 6-bit Signed Mag:  $(1\ 111\ 111) = -63$

4b. 1's:  $1\ 000\ 000$

4c. 2's:  $1\ 000\ 001$

5a. Most negative n-bit in Signed Mag:  $-(2^{n-1})$

5b. 1's:  $(100000\dots)$  aka  $-(2^{(n-1)} - 1)$

5c. 2's:  $(100000\dots000)$  the most negative number in 2's complement is its own negative.

Aka  $-(2^{(n-1)})$

6. Signed Mag and 1's have two representations of 0. Signed Mag 0 can be 0000 or 1000. In 1's Complement, 0 is written as 1111 or  $\sim 0000$ .

7. In two's complement, taking the negative of the most negative number causes overflow. Overflow does not occur in any system when taking the negative of the most positive number.

8.  $111\ 011 + 001\ 110 = 73$  in base 10, which requires 7 digits to represent, so yes, overflow occurs.

9.  $111\ 001 - 001\ 101 = 101\ 110$  ( $59 - 13 = 46$ )

10.  $13 - 30 = 001\ 101 - 011\ 110 = 001\ 101 + 100\ 010 = 101\ 111$  (because we didn't get overflow, we take the 2's complement of the answer, remembering to keep a  $(-)$ )  $= -010\ 001 = -17$

11.  $-25 - 7 = -011\ 001 - 000111 = 100\ 111 + 111\ 001$  (converted both to 2's cause they were negative)  $= 1\ 100\ 000 = -32$

12.  $24 + 10 = 011\ 000 + 001\ 010 = 100\ 010 = 34$ .