

CS251 HW2_4d Answer

| | | | | | | | | | |
|---------------|-----------------|---------------|-----------------|---------------|---|--|-------|------------------|----------------|
| | | | 9-20 | 9-(-12)=9+12 | | | | | |
| | | | 01001 = 9 | 01001 = 9 | | | | | |
| | | | 10100 = 20 | 10100 = -12 | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Binary | Unsigned | Signed | Unsigned | Signed | | Note: Physical meaning of the table. | | | |
| 11111 | 31 | -1 ^ | | | | 1. ^ is subtraction | | | |
| 00000 | 0 | 0 ^ | | | | 2. v is addition | | | |
| 00001 | 1 | 1 ^ | | | | 3. Whenever unsigned integers are decremented from 0 to 31, overflow happens | | | |
| 00010 | 2 | 2 ^ | | | | 4. Whenever signed numbers are incremented from 15 to -16, overflow happens. | | | |
| 00011 | 3 | 3 ^ | | | | | | | |
| 00100 | 4 | 4 ^ | | | | For subtraction: | Bits | Unsigned integer | Signed integer |
| 00101 | 5 | 5 ^ | | | a | 1st operand | 01001 | 9 | 9 |
| 00110 | 6 | 6 ^ | | | b | 2nd operand | 10100 | 20 | -12 |
| 00111 | 7 | 7 ^ | | | c | 2's Comp of 2nd ope'd | 01100 | | |
| 01000 | 8 | 8 ^ | | | | Difference (a + c) | 11101 | 29 | -3 |
| 01001 | 9 | 9 * | | * | | cin MSB | =1 | | |
| 01010 | 10 | 10 | | v | | cout | =0 | | |
| 01011 | 11 | 11 | | v | | Overflow? | | overflow | overflow |
| 01100 | 12 | 12 | | v | | | | | |
| 01101 | 13 | 13 | | v | | | | | |
| 01110 | 14 | 14 | | v | | | | | |
| 01111 | 15 | 15 | | v | | | | | |
| 10000 | 16 | -16 | | v | | | | | |
| 10001 | 17 | -15 | | v | | | | | |
| 10010 | 18 | -14 | | v | | | | | |
| 10011 | 19 | -13 | | v | | | | | |
| 10100 | 20 | -12 | | v | | | | | |
| 10101 | 21 | -11 ^ | | v | | | | | |
| 10110 | 22 | -10 ^ | | | | | | | |
| 10111 | 23 | -9 ^ | | | | | | | |
| 11000 | 24 | -8 ^ | | | | | | | |
| 11001 | 25 | -7 ^ | | | | | | | |
| 11010 | 26 | -6 ^ | | | | | | | |
| 11011 | 27 | -5 ^ | | | | | | | |
| 11100 | 28 | -4 ^ | | | | | | | |
| 11101 | 29 | -3 ^ | | | | | | | |
| 11110 | 30 | -2 ^ | | | | | | | |
| 11111 | 31 | -1 | | | | | | | |