Binary Numbers Exercises

Solve the following exercises.

- Assume for each problem that you are working with 8-bit twos-complement numbers.
- Any problems submitted without work shown will not receive full credit. Show how you arrived at your answer. You can handwrite your work and then scan it in or take a photo of the work and submit to this assignment.

Binary to Decimal/Hexadecimal Conversion

Convert the following two's complement binary numbers to decimal.

1. 00001101   2. 01100101

3. 10000001   4. 11010110

Convert the following two's complement binary numbers to hexadecimal (Base 16 Digits 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F)

1. 11101101   2. 11110101

3. 01011111   4. 01110001

Binary Addition

Solve the following arithmetic problems by first converting your inputs into binary and then solving them through binary addition.

1. 5 + 13 = ?

2. 92 + 10 = ?

3. 39 + 41 = ?

4. 110 + 84 = ?

Binary Subtraction

Solve the following arithmetic problems by first converting your inputs into binary and then solving them through binary subtraction where you add the negative form of the number

1. 5 - 1 = 5 + -1 = ?

2. -3 - 6 = -3 + -6 = ?

Masking and Bitwise Operators

Solve the following problems. Assume all operators behave like the bitwise operators in Java.

```
1.                                    2.    11101001
   ~10011100                             &  00111101
```

```
3.    10101001                        4.    10000111
   |  01011100                            ^  01010011
```

5. Given the binary number below, what mask and bitwise operator would you use to set the bit in the 3rd position to "on"? mask = _____ bitwise operator: _____

Binary Number	1	0	1	1	0	0	1	0
Bit Number	8th	7th	6th	5th	4th	3rd	2nd	1st

6 . Given the binary number below, what mask and bitwise operator would you use to set the bit in the 3rd position to "off"? mask = _____ bitwise operator: _____

Binary Number	1	0	1	1	0	1	1	0
Bit Number	8th	7th	6th	5th	4th	3rd	2nd	1st