Name _____

Lab Day _____

1) Perform the following operations in binary and give the 8-bit binary result. (Ignore any carries.) Convert each number (including the 8-bit result) to decimal assuming both unsigned and signed. Circle each decimal result that is incorrect. The first is done as an example.

		(a)		(b)

unsigned		signed	unsigned		signed	unsigned		signed
254	11111110	-2		01111110			01111111	
255	+ 11111111	-1		+ 10000000			+ 01111100	
(253)	11111101	-3						

	(c)			(d)			(e)	
unsigned		signed	unsigned		signed	unsigned		signed
	11111000			10111000			00011101	
	+ 00000011			+ 01011101			+ 01101011	

	(f)			(g)			(h)	
unsigned		signed	unsigned		signed	unsigned		signed
	11110011			10101010			11100110	
	- 10101010			- 11110011			- 01110101	

2) Perform the following 8-bit by 8-bit multiplications in binary and give the 16-bit result. Assume the numbers are unsigned. The first answer is given so you can check your method.

	(a)		(b)

```
              00110011                    01110111                    11001010
            × 01010101                  × 01010101                  × 01101010
              00110011
              00000000
              00110011
              00000000
              00110011
              00000000
              00110011
              00000000
          0001000011101111
```

3) on back side

3) Given the following

```
x = 0b00111101;                    // assumed signed values
y = 0b10001110;
```

perform each operation and give the 8-bit binary result to the left of each problem. The first is already done as an example. Multiplication, division and modulo can be converted to decimal before performing, but all other operations should be done in binary. Show any work required.

00111110   x + 1
           x + y
           y - x
           x - y
           x * 2
           x / 8
           x % 8
           x / 10
           x % 10
           +x
           -x
           -y
           ~x
           ~y
           !x
           x << 2
           y << 2
           x >> 2
           y >> 2
           x & y
           x | y
           x ^ y
           1 && 0
           x && 0
           x && 1
           x && y
           x || 1
           x || y
           1 == 0
           x == 61
           x == y
           x != 12
           x != y
           x < y
           x <= y
           x > y
           x >= y