

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	unsigned	unsigned
254	01111110	01111111
11111110	+ 10000000	+ 01111100
signed	signed	signed
-2		
+ 11111111		
<u>-1</u>		
11111101		
-3		

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

	(e)	(f)
unsigned	unsigned	unsigned
11110011	10101010	10101010
- 10101010	- 11110011	
signed	signed	signed

- 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)
	01110111	11001010
	× 01010101	× 01101010
	<u>00110011</u>	
	00000000	
	00110011	
	00000000	
	00110011	
	00000000	
	00110011	
	00000000	
	<u>00110011</u>	
	00000000	
	<u>00000000</u>	
	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
```