

## Lecture 3 Activity Solution

### Model 0 : Review of Addition / Positive

1. 10110
2. 5
3. Number of bits in the result is more than number of bits of operands
4. 0110

### Model 0: Review of Negative Integers

1. Sign-bit 0

2.

Bits	Most Positive	Most Negative
1	0	-1
2	1	-2
3	3	-4
4	7	-8

3.  $(2^{(N-1)}) - 1$

4.  $-(2^{(N-1)})$

5. Result is 10011111. Unsigned is expected result, but signed is not the expected result

6. Yes

### Model 1: Bit-Level Operations

1. 0x3501, 0xC3C3, 0xFFFF

2.

OP0	OP1	AND	OR	XOR
0	0	0	0	0
1	0	0	1	1
0	1	0	1	1
1	1	1	1	0

3.

Dec	Bin	X & 0x1
-2	1110	0000
-1	1111	0001
0	0000	0000
1	0001	0001
2	0010	0000

4. They are odd and non-zero numbers

5. Checks if the required FLAG bit is set in X

6. OR (!) sets the relevant bits in the file access modes

7. True for all

### Model 2: Logical Operations

1. 1 value is False and 15 values are True

2. False

3. Does not hold for -1 and 2

X	!X	!!X
-1	0	1
0	1	0
1	0	1
2	0	1

4. Yes. They differ. Now every  $(\sim(\sim X)) == X$

### Model 3: Multiplication and Division

1.

Value	<<	Result
0x30	0	0x60
0x5A	4	0x5A0
0x11D	31	0x80000000

2. Decimal – 6. Binary – 0110

3. Largest 3-bit integer – 7

Value squared – 49

No. of bits required – 6

4. 1

5.

Value	>>	Result
0x30	1	0x18
0x5A	4	0x5
0x11	3	0x2

6. Division by  $2^N$ , where N is the no. of bits to be shifted

7. -1 (when we shift right)

8. -2 = 1110

-2 >> 1 = 1111

9. 0xA >> 1 = 0x5

10.

```
while (x != 0)
{
int rem = x & 0x1 ;
x = x >> 1;
}
```