Model 010: Representing Negative Values in Binary

1. Non-negative – 0
   Negative – 1
2. 3: 011, -8: 11000
3.

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

Model 1: Bit-Level Operations

1.

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

2. The odd, non-zero numbers.
3.

Model 2: Logical Operations

1. (0x3 && 0xC) -> 0x1
   (0x3 & 0xC) -> 0x0
2.

Model 3: Shifts, Multiplication and Division

1. 011b, 3 decimal
2. -1
3. -2 – 1110
   >>1 either 1111 (-1) or 0111 (7)
4. 0xA -> 0x5
5. rem = x & 0x1;
   x = x >> 1;

Model 1: What if floating point?

1. 1.5213e4

Model 2: Binary Scientific Notation

1. 1.0111*2^4
   1.0111*2^2
   1.0111*2^1
   1.0111*2^0

2. 1

Model 3: IEEE Notation

1. The sign bit. The number is negative.
2. 0111b
3. With no bias, the smallest value with exponent 0x1 would be 2, which is greater than 1.
4. E = exp – 127 = 0x1, exp = 128

Model 4: Extreme Exponents

1. 1.0000
2. No
3. Two, one positive and one negative
4. 0.0001

Model 5: Addition

1. 1.0011*2^4
2. 4 bits
3.

Model 6: Simple Floating-point

1. 15.5 (01101111), 0 (00000000)
2. 7, 0b111
3. 0x5C + 0x43 = 7 + 2.375 = 9.375 = 0x63 (9.5)
4. 0x5C * 0x43 = 7 * 2.375 = 16.625 = 0x70 (+inf)

Model I: Bit Puzzle

1. (assume unsigned arg)
   unsigned sign = arg >> 31;
   unsigned exp = (arg >>) & ;
   unsigned frac = arg & ;
2.
3.
4.

Model R: Review

1. Yes. 2^24
2. Does not terminate.