Lecture 4 Activity Solution

Model 1: What is floating point?

1. 1.5213×10^4
2. One possible representation: 8 digits. 15213104. But the answer may vary, depending how you want to represent the number.
3. 18213104. 8 digits.
4. 18213107. 8 digits
5. 10001100, which is 1.0001.
6. 99999999, which is $9.9999 * 99^9$
7. No.

Model 2: Binary Scientific Notation

1. 1
2. $1.0111 * 2^4, 1.0111 * 2^2, 1.0111 * 2^1, 1.0111$
3. 1

Model 3: IEEE Representation

1. Sign bit. The number is negative.
2. 0111
3. 1
4. With no bias, it would be 2, which is greater than 1.
5. $0b10000001$
6. $E = 1 - 127 = 126$. $f = 15213_{10}$
7. From -1022 to 1023

Model 4: Extreme Exponents

1. 1.0000
2. No.
3. Tow, one positive, one negative.
4. 0.0001
5. $+inf$. No.
6. Largest denormalized number has all 0 for exponent bits and all 1 for fraction bits. Smallest normalized number has all 0 except the lowest exponent bit to be one and all 0 for fraction bits.

Model 5: Addition and Multiplication

1. $1.0011 * 2^4$
2. 4
3. 0, 0, 1, 2
4. 1.00011, 1.00, 1; 1.00101, 1.01, 1.25; 1.111, 10.0, 2; 1.101, 1.11, 1.75
5. 1.00011, 1.001, 1.125; 1.00101, 1.001, 1.125; 1.111, 1.111, 1.875, 1.101, 1.101, 1.625
6. 2048
7. 2^{11}

Model 6: Simple Floating-point

1. 15.5 (01101111), 0 (00000000)
2. 01101111+ 00000000+ 11101111 = 01011110
3. 7, 111
4. 01011100+01000011 = 10011111
5. 01011100*01000011 = 01000000

Model 7: Review

1. Yes it will. Some large numbers will have precision that cannot be represented exactly in float. 2^{24}
2. It won't terminate.