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floatingpoint.pdf

For userid 'jmn4fms':

```
Your magic (32 bit) floating point number is 8.8125
This is the number that needs to be converted to (little endian) binary, and
expressed in hexadecimal.

Your other magic floating point number is, in hex, 0x00c01ec2
This is the number that needs to be converted to a (32 bit) floating point
number.
Note that the hexadecimal printed above is in little-endian format!
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8.8125

1.Big endian bit representation of 8 and 0.8125 (the decimal part)

$8_{10} = 1000_2$

$8125_{10} = 11010000000000000000_2$

$8.8125_{10} = 1000.11010000000000000000_2$

2. Move the decimal to the left and count the number of places the decimal moved

$1.00011010000000000000000_2$

- Moved 3 places

3. Add the number of times the decimal moved to 127 to get the exponent value

$127 + 3 = 130_{10}$

4. Convert the exponent to big endian binary representation

$130_{10} = 10000010$

5. If the number is positive the first bit for the floating-point representation will be 0. If the number is negative, then the first bit of the floating-point representation will be 1

- The first bit will be 0 because 8.8125 is positive

6. Add the sign bit before the exponent in binary form

- 0 + 10000010
- 010000010

7. Add the bits after the decimal point (23-bit mantissa) to the sign bit and exponent

- $010000010 + 00011010000000000000000_2$
- $01000001000011010000000000000000_2$

8. The big-endian floating-point representation is converted to little endian by reversing the bytes

- 01000001 00001101 00000000 00000000
- 00000000 00000000 00001101 01000001

9. Converted to little endian hexadecimal

$0x00000D41_{16}$

0x00c01ec2

1. Convert to big endian hexadecimal by reversing bytes

   $0xc21ec000_{16}$

2. Hexadecimal to binary

C	2	1	e	c	0	0	0
1100	0010	0001	1110	1100	0000	0000	0000

3. The sign is negative because the first bit is 1
4. Exponent (the next 8 bits after the sign first bit) is

   $2^7 + 2^2 = 128 + 4 = 132$

   $132 – 127 = 5_{10}$

5. Mantissa 001 1110 1100 0000 0000 0000

   $(1/2)^3 + (1/2)^4 + (1/2)^5 + (1/2)^6 + (1/2)^8 + (1/2)^9 + 1$

   $= 1.240234375$

6. Combine all components (sign + $2^{exponent}$ + Mantissa decimal)

   $-1 * 2^5 * 1.240234375$

   $= -39.6875$