1. 5.75

$$5 = 2^0 + 2^2 = 101$$
$$.75 = 2^{-1} + 2^{-2} = .11$$
$$= 101.11_2$$

63/64

left side = 0   because value < 1

$$\frac{63}{64} = \frac{32}{64} + \frac{16}{64} + \frac{8}{64} + \frac{4}{64} + \frac{2}{64} + \frac{1}{64}$$

$$2^{-1} \quad 2^{-2} \quad 2^{-3} \quad 2^{-4} \quad 2^{-5} \quad 2^{-6}$$

$$1 \quad 1 \quad 1 \quad 1 \quad 1 \quad 1$$

$$= 0.111111_2$$

9.8125

left side = 9
$$9 = 2^0 + 2^3 = 1001$$
right side = .8125
$$= 0.5 + 0.25 + 0.0625$$
$$2^{-1} \quad 2^{-2} \quad 2^{-4}$$
$$= .1101$$
$$= 1001.1101_2$$

2. 34.890625

Sign bit is positive = 0

Convert 34 to binary = $2^5 + 2^1 = 100010$

Convert .890625 to binary = $0.5 + 0.25 + 0.125 + 0.015625$
$$2^{-1} \quad 2^{-2} \quad 2^{-3} \quad 2^{-6} = .111001$$

100010.111001

Move decimal 5 to the left

Exponent is 5 ⇒ in binary 5 = 101

0	00000101	00010111001000000000000
Sign	Exponent 8 bits	Mantissa 23 bits

3. 0 0111 1011   All zeros
   Sign   Exponent   Mantissa

Sign is 0 so # is positive

Exponent → convert to decimal
$$0111 1011 = 2^0 + 2^1 + 2^3 + 2^4 + 2^5 + 2^6$$
$$= 1 + 2 + 8 + 16 + 32 + 64$$
$$= 123$$

Mantissa is all 0's so there is no fractional portion
$$\text{so} \quad = 1.0 \times 10^{123}$$

4. A denormalized number can have any sign bit.
   The exponent must be 0 and the mantissa cannot be 0.

Largest denormalized number

   0   00000   1111111111
   Sign   Exponent   Mantissa

Smallest Normalized Number

   0   00000   0000000001
   Sign   Exponent   Mantissa