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1) Convert to binary

a.)

$$5 = 0101$$

$$\begin{array}{r} 0.75 \\ 1.50 \\ \hline 1.00 \end{array}$$

$$\boxed{0101.11}$$

$$b.) \frac{6^3}{64} \times 2 = \frac{126}{64} = 1 \frac{62}{64}$$

$$\frac{62}{64} \times 2 = \frac{124}{64} = 1 \frac{60}{64}$$

$$\frac{60}{64} \times 2 = \frac{120}{64} = 1 \frac{56}{64}$$

$$\frac{56}{64} \times 2 = \frac{112}{64} = 1 \frac{48}{64}$$

$$\frac{48}{64} \times 2 = \frac{96}{64} = 1 \frac{32}{64}$$

$$\frac{32}{64} \times 2 = \frac{64}{64} = 1 \frac{0}{64}$$

bits

1

1

1

1

1

1

$$\boxed{0.111111}$$

c.) 9.8125

$$9 = 1001$$

$$\boxed{1001.1101}$$

$$.8125 \times 2 = 1.6250$$

$$.6250 \times 2 = 1.2500$$

$$.2500 \times 2 = .5000$$

$$.5000 \times 2 = 1.00$$

1

1

0

1

$$2.) 34 = 100010$$

$$.890625 \times 2 = 1.781250$$

$$.781250 \times 2 = 1.562500$$

$$.562500 \times 2 = 1.125000$$

$$.125000 \times 2 = 0.250000$$

$$.250000 \times 2 = 0.500000$$

$$.500000 \times 2 = 1.00$$

1

1

1

0

0

1

$$34.890625 = 100010.111001$$

$$100010.111601 = 1.00010111601 \times 2^5$$

$$\text{sign} = 0$$

$$\text{exponent} = 5 = 00000101$$

$$\text{Mantissa} = 000101110010000000000000$$

$$\boxed{0.0000010100010111001000000000000000}$$

3.) sign 0 = positive

$$\text{exponent} = \underset{128}{0} \underset{4}{1111} \underset{4}{011} = 123$$

$$\text{mantissa} = 000\dots000 \rightarrow 1.600\dots000 \times 2^{123}$$

$$2^{123} = 1.0633824 \times 10^{37}$$

$$= \boxed{1.0633824 \times 10^{37}}$$

4.) 0 00000 111111111 - largest denormalized

0 00001 0000000000 - smallest normalized

largest denormalized has 0 exponent. Meaning in binary it is written like this

$$0.11111111$$

the normalized number on the other hand has an implied 1 and it has an exponent of 1

$$1.0000000000 \times 2^1$$