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- $(-307.1875)_{10}$
- 000100110011.0011
- 1.001100110011*2^8
- S=1; E=8,E'=8+127=135=87H=10000111
- M=001100110011

1	10000111	001100110011 0

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- $0.125*2=0.25=0$
- $0.25*2=0.5 \rightarrow 0$
- $0.5*2=1.0 \rightarrow 1$

Fractions

If b is a binary vector, then we have seen that it can be interpreted as an unsigned integer by:

$$V(b) = b_{31}.2^{31} + b_{30}.2^{30} + b_{n-3}.2^{29} + ... + b_1.2^1 + b_0.2^0$$

This vector has an implicit binary point to its immediate right:

$b_{31}b_{30}b_{29}.................b_1b_0$ implicit binary point

Suppose if the binary vector is interpreted with the implicit binary point is just left of the sign bit:

implicit binary point $.b_{31}b_{30}b_{29}.................b_1b_0$

The value of b is then given by:

$$V(b) = b_{31}.2^{-1} + b_{30}.2^{-2} + b_{29}.2^{-3} + ... + b_1.2^{-31} + b_0.2^{-32}$$

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- $(10011101011.001)_2$
- $1.0011101011001*2$^10

- S=0; E=10; E′=137; M=0011101011001; E′=89H=10001001

0	10001001	00111010110010000000....0

Single precision format

- Fixed point
- 011111(+ve)
- 111111(-ve)
- 6.024*10^23
- 6.625*10^-34
- **+- 1.M*2^E**
- **Mantissa –fraction**
- **E exponent +ve/-ve**
- **E'=E'+127   0<E'<255**
- **1<E'<254**
- **E -126<E'<127**
- **2^-126 to 2^127**

Normalization

Consider the number: $x = 0.0004056781 \times 10^{12}$

If the number is to be represented using only 7 significant mantissa digits, the representation ignoring rounding is: $x = 0.0004056 \times 10^{12}$

If the number is shifted so that as many significant digits are brought into 7 available slots: $x = 0.4056781 \times 10^{9} = 0.0004056 \times 10^{12}$

Exponent of *x* was decreased by 1 for every left shift of *x*.

A number which is brought into a form so that all of the available mantissa digits are optimally used (this is different from all occupied which may not hold), is called a normalized number.

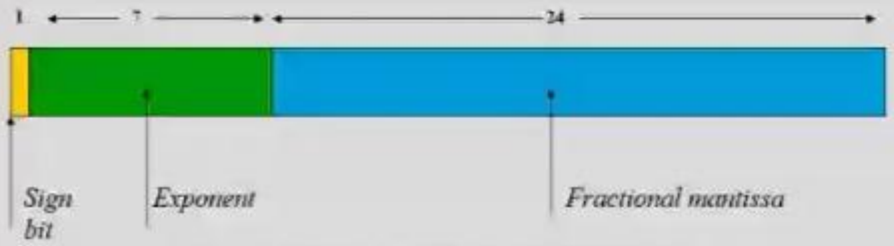
Same methodology holds in the case of binary mantissas

$$0001101000(10110) \times 2^{8} = 1101000101(10) \times 2^{5}$$

$(+1259.125)_{10}$

- 2 1259
- 2 629→1
- 2 314→1
- 2 157→0
- 2 78→1
- 2 39→ 0
- 2 19→1
- 2 9→1
- 2 4→1
- 2 2→0
- 1→ 0

A sample representation



- 24-bit mantissa with an implied binary point to the immediate left
- 7-bit exponent in 2's complement form, and implied base is 2.