

Answer:

1. To represent smallest change in Floating point representation we use the concept of Precision i.e. measurement of nearness. The fractional part determines the precision of Floating-point number. Fractional part is called Mantissa in floating representation

For Example, 7 can be represented in 4 bits as 0.007×10^3 but it is not precise rather representing in 7×10^0 is more précised since there are three zeros in the right of 7 which says that if any extra error in actual result like 7.0007×10^0 will lead to only 0.01%error.

2. The base is 2 in computer systems as it works on binary representation of numbers.

Consider a 32bit representation, we have 1 sign bit, 8bits in exponent part and 23bits in fractional part of the representation.

A value is said to be normalized when the number is represented with having a single bit before the decimal.

e.g decimal number 123.5 is represented in binary as 1111011.1 When the number is normalised it is represented as 1.1110111×10^6 Subnormal numbers are under the denormal number category.

Subnormal Values: The interpretation of a subnormal a number is different. The content of the exponent part (e) is zero and the significand part (m) is non-zero. The value of a subnormal number is $(-1)^s \times 0.m \times 2^{-126}$ There is no implicit one in the significand.

3. IEEE754 standard defines five rounding rules:

(i). Rounding to nearest, ties to even: In this method, real number is rounded off to the nearest even number.

For example: 7.3 is rounded off to 8.0

(ii). Rounding to nearest, ties away from zero: In this method, real number is rounded off to the nearest integer number. If a real number falls in the middle of two integers, it is rounded to the nearest value above (for positive numbers) or below (for negative numbers).

For example: 7.3 is rounded off to 7.0

7.5 is rounded off to 8.0

-7.5 is rounded off to -8.0

(iii). Round towards zero: In this method real number is truncated to the nearest integer while going towards to zero.

For example: 7.5 is rounded off to 7.0

7.9 is rounded off to 7.0

-7.6 is rounded off to -7.0

(iv). Round toward $+\infty$: In this method real number is truncated to the nearest integer while going towards to $+\infty$.

For example: 7.5 is rounded off to 8.0

7.9 is rounded off to 8.0

-7.6 is rounded off to -7.0

(v). Round toward $-\infty$: In this method real number is truncated to the nearest integer while going towards to zero.

For example: 7.5 is rounded off to 7.0

7.9 is rounded off to 7.0

-7.6 is rounded off to -8.0