

Determining Normalized, Denormalized, (Pos/Neg) Infinity, and NaN Values

Normalized Values:

exp = mix of 0's and 1's

M = 1 + fraction or 1.xxxxxxx


fraction

E = exp – Bias

Denormalized Values:

exp = all 0's

M = 0 + fraction or 0.xxxxxxx


fraction

E = 1 – Bias

Special Values:

exp = all 1's

Case 1:

fraction = all 0's

sign bit = 1 => **negative infinity**

or

sign bit = 0 => **positive infinity**

Case 2:

fraction = (mix of 0's and 1's) or (all 1's)

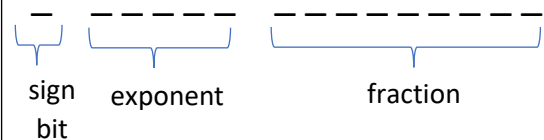
NaN

$$\text{Bias} = 2^{k-1} - 1$$

k = # of bits used in the exp

$$V = (-1)^S M 2^E$$

S = sign bit



Steps for solving for exp, bias, M, E, V:

1. Determine from the exp which value you have.
2. Solve for bias using formula
3. Depending on which value you have solve for E
4. Depending on which value you have solve for M
5. Now plug S, M, E into the V formula to calculate V

Note: types of values are highlighted