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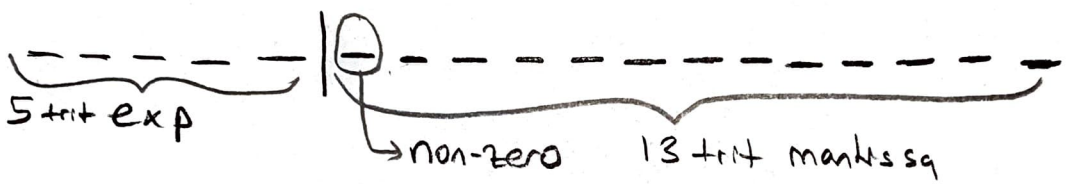
Q2.3) In order to be able to represent numbers uniquely, (as in binary floating point representation), I also required the numbers to be normalized.

In order to achieve this, I restricted my mantissa's left-most bit to be non-zero. Because when it is zero, a number can have 2 different representations;

exponent: 00010, mantissa: 0,11 $\Rightarrow \left(\frac{1}{3}+\frac{1}{9}\right) \cdot 3^3 \Rightarrow 12$

exponent: 00011, mantissa: 0,011 $\Rightarrow \left(\frac{1}{9}+\frac{1}{27}\right) \cdot 3^4 \Rightarrow 12$

So my design looks like the following:



In binary floating point representation, we use denormalized values for 2 reasons:

1- To represent 0

2- To represent values that are very close to 0 (the ones that we cannot represent with normalized convention)

As I showed in question 2.4, we can already uniquely represent 0. Also, the minimum positive value we can represent ($0{,}166 \cdot 3^{-121}$) is already smaller than the smallest denormalized number we can represent in binary floating point format ($2^{-126} \cdot 2^{-23}$). The same goes for negative numbers. Hence, there is no reason for me to allow denormalized numbers in my design.