From Binary to Decimal

Fill in the table below with the binary number

s   exponent   fraction

1. Fill in the following values:

   - number of exponent bits: $k = $ _____
   - unsigned value of the exponent: $exp = $ _____
   - Bias value for exponent: $B = 2^{k-1} - 1 = $ _____

2. Is the exponent (exp):

   - All 1's ?
     - If the fraction is all 0's the value is $\pm\infty$
     - if the fraction is nonzero, the value is NaN
   - All 0's? ... **Denormalized**
     - Exponent is $e = 1-$ Bias $= $ _____
     - Fraction is $frac = 0.\{fractional\ Component\ from\ above\}$
     - **Your answer is:** $0.frac \times 2^e$
   - Something else: **Normalized**
     - $e = exp-$Bias $= $ _____
     - Fraction has implied leading one: $1.\{fractional\ component\ from\ above\}$
     - **Your answer is:** $1.frac \times 2^e$

From Decimal to Binary

Write down the binary equilivalent of your number (there should be a decimal point somewhere here)

Now shift the binary decimal point as necessary to create a leading 1:

1.| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | $\times 2$————

- Now fill in the following values:

    - Number of exponent bits avaliable $k =$_____
    - Now calculate your exponent:
        * The actual exponent as recorded above is $e =$_____
        * Your *Bias* is $B = 2^{k-1} - 1 =$ _____
        * The encoded exponent is $exp = e + b =$_____
        * Is your encoded exponent $exp \leq 0$? You are generating a **Denormalized value!**
            · Set your actual exponent to $e = 1 - B = 1-$_____
            · Set your encoded exponent $exp = 0$ to signify denormalization.
            · Shift over your binary point to be 2^{1-B}
            · Denormalization simply means that you do not have a leading zero infront of your fraction.
        * Write down your final exponent bits:

    - Number of fraction bits $f =$_____
        * Is your fraction larger than the max bits? You need to **round!**:
        * Mark off everything below the last bit can be kept, call this the fraction.
            · If the fraction is {less/greater} than 1/2 then round {down/up}
            · If the fraction is equal to 1/2 then round to even!
        * Renormalize (and possibly denormalize) as necessary!
        * Write down your final fractional bits:

You're all set! Now just write out the binary number as:
   Sign bit - exponent bits - fractional bits

Round to Even: Put a decimal place between the last bit you can keep and the first bit you have to throw away. You'll have $x.5$, you have to end up with $y.0$. Where y must be even. Just round towards the nearest even number. $2.5 \rightarrow 2.0$, $3.5 \rightarrow 4.0$, $.5 \rightarrow 0.0$.