

1.3 -5.375 as a 16bit Fp with 1 bit sign, 4 bit biased exponent, 11 bit Fraction & 7 bit bias offset

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$5/2 = 2$ R1	$\uparrow$	$.375 \cdot 2 = 0.75$	Step 1 convert to binary
$2/2 = 1$ R0	$\vdots$	$.75 \cdot 2 = 1.50$	
$1 \rightarrow 1$	$\vdots$	$.50 \cdot 2 = 1.00$	

101  $\vdots$  011

101.011

biased exponent = exponent + bias

Step 2 convert to Scientific Notation

$$101.011 \times 10^2$$

$$1.01011 \times 10^2 = 101.011$$

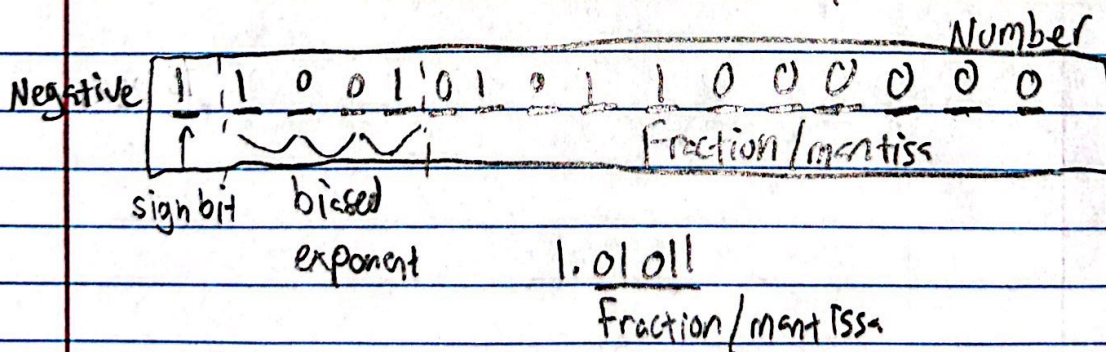
$9 = 2 + 7$

Step 3 Calculate Biased exponent in binary

$9/2 = 4$ R1	$\uparrow$
$4/2 = 2$ R0	$\vdots$
$2/2 = 1$ R0	$\vdots$
$1 \rightarrow 1$	

biased exponent = 1001

Step 4 build IEEE 754





1.4

Real Number equivalent to FP 0x3400, 1 bit sign  
4 bit biased exponent, 11 bit Fraction  $\frac{1}{2}$  bias offset = 7

3 4 0 0 step 1 convert to  
0011 0100 0000 0000 binary

0 0 1 1 0 1 0 0 0 0 0 0 0 0  
↑ Fraction

sign bit biased exponent = 0110 = 6 Step 2 Calculate  
8 4 2 1 Biased Exponent

exponent = biased exponent - bias  
6 - 7

Step 3 Calculate  
Exponent

exponent = -1

1. mantissa or Fraction  
↓ 1 0 0 0 0 0 0 0 0 0 0 0  $\times 10^{-1}$

Step 4 convert to  
Scientific Notation

0.11  
 $2^{-1} + 2^{-2}$

0.5 + 0.25 = 0.75

converts From binary  
to Real Number



1.5 Real number equivalent to FP 0x3400 with 1 bit sign, 4 bit biased exponent, 11 bit fraction, & bias offset = 8

$\begin{array}{c} 3 \quad 4 \quad 0 \quad 0 \\ 0 \ 0 \ 1 \ 1 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \end{array}$   
 ↑    ↑  
 sign   biased   Fraction / mantissa  
 bit   exponent   1 0 0 0 0 0 0 0 0 0

Step 1 Convert to binary

$$\text{biased exponent} = 0110 = 6 \quad \text{exponent} = \text{biased exponent} - \text{bias}$$

$$\uparrow \quad \quad \quad 8 \ 4 \ 2 \ 1 \quad \quad \quad -2 = 6 - 8$$

$$\quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \uparrow$$

Step 2 calculate biased exponent

Step 3 calculate exponent

$$100 \ 0000 \ 0000 \times 10^{-2}$$

$$= .011$$

$$2^{-1} + 2^{-2} + 2^{-3}$$

$$0.5 + 0.25 + 0.125 = \boxed{0.375}$$

Step 4 convert to Scientific Notation

1.14 What is a Von Neumann architecture bottleneck?  
 A Communication bottleneck between a faster CPU & slower memory.