BIASED EXPONENTS

In some of the standard formats for storing floating point numbers, the exponent is held in biased form. This is an alternative way of representing negative numbers with binary codes.

For the purpose of this example, we will use a four bit code.

Binary Code	Decimal	Two's Comp	Biased
0000	0	0	-7
0001	1	1	-6
0010	2	2	-5
0011	3	3	-4
0100	4	4	-3
0101	5	5	-2
0110	6	6	-1
0111	7	7	0
1000	8	-8	1
1001	9	-7	2
1010	10	-6	3
1011	11	-5	4
1100	12	-4	5
1101	13	-3	6
1110	14	-2	7
1111	15	-1	8

The reason why two's comp isn't used for storing the exponents is because the binary codes don't really run in numerical sequence, whereas with the biased format, they do. This makes constructing the floating point circuitry in the arithmetic / logic unit easier.

The bias constant is calculated as $2^{k-1}-1$, where k is the number of bits being used.

So for a four bit code, the bias constant is $2^{4-1}-1 = 7$.

To find out what the value of a binary code is, in biased form:

1. Work out the normal decimal value for the binary code.
2. Subtract the bias constant from it.
3. Gives you the value of the binary code in bias form.

To find out what the equivalent biased code is, for a given two's complement code:

1. Take the two's complement code.
2. Add the bias constant to it.
3. Gives you the code for the same number in bias format.