

Bring this homework to class on Thursday Oct.4.

#1. Write the following numbers as binary fractions with 4 fractional bits (0.0001 precision)

a. 16.1 10000.0001

Integer part (backwards) 16 (even->0) /2 = 8 (even->0) /2 = 4 (->0) /2 = 2 (->0) /2 = 1(odd->1)

Fraction 0.1 *2 = 0.2 (<1 -> 0) *2 = 0.4 (<1 -> 0) *2 = 0.8 (<1 -> 0) *2 = 1.6 (>=1 ->1) -1= 0.6

b. 0.1875 0.0011

Fraction 0.1875 *2 = 0.375 (<1 -> 0) *2 = 0.75 (<1 -> 0) *2 = 1.5 (>= 1 -> 1) -1 = 0.5 *2

= 1.0 (>= 1 -> 1) -1= 0.0 (all additional bits would be zeroes)

#2. Write the missing integer numbers in binary, hex, and decimal representations.

Decimal	Hex	Binary
314	13A	1 0011 1010
122	7A	0111 1010
181	B5	10110101
243	F3	1111 0011
195	C3	1100 0011
95	5F	01011111

#3. Express or decode the following binary floating point numbers. The fraction part (mantissa) should be normalized to five-bit accuracy (to 0.1xxxx where only the four bits xxxx are stored in memory, but show all here). The exponent should be a 5-bit number in 2's-complement representation.

Decimal Number	Sign Bit	Mantissa (fraction)	Exponent
2.125	0	0.10001	00010
88	0	0.10101	00111
-0.11328	1	0.11101	11101
-0.05698	1	0.11101	11100

88 = 0101 1000.0 shift radix point left 7 bits to get 0.1010111 mantissa,

Ones Complement exponent: 7 = 00111

Exponent 11101 = -1 * [invert all bits, add one] (00010 + 00001) = (-) 00011 = -3 \geq *(2⁻³) = 1/8

Mantissa 0.11101 = 0x1D/(2⁵) = 29/32 = 0.90625 value = 0.90625 /8 = 0.11328

#4. Show how you would do the following calculations using 2's complement 10-bit binary numbers when A = 181 and B=202. Show the operations in binary, and the results in binary and decimal

	Binary	Decimal
A	_____ 00 1011 0101 _____	_____ 181 _____

B	_____ 00 1100 1010 _____	_____ 202 _____
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-A	[invert all bits (11 0100 1010) , add 00 0000 0001, ignore carry]	
	_____ 11 0100 1011 _____	_____ -181 _____

-B	11 0011 0101 + 00 0000 0001	
	_____ 11 0011 0110 _____	_____ -202 _____

A - B	00 1011 0101 +A 11 0011 0110 -B <hr style="width: 100px; margin-left: 0;"/> 11 1110 1011	181 -202 <hr style="width: 100px; margin-left: 0;"/> -21
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B - A	11 0100 1011 -A 00 1100 1010 +B <hr style="width: 100px; margin-left: 0;"/> 00 0001 0101	-181 +202 <hr style="width: 100px; margin-left: 0;"/> 21
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(-A) + (-B)	11 0100 1011 -A 11 0011 0110 -B <hr style="width: 100px; margin-left: 0;"/> 10 1000 0001	-181 -202 <hr style="width: 100px; margin-left: 0;"/> -383
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