Emi S.

1. −162

1) Convert to binary

sign bit

$(162)_{10} \rightarrow$ 0 000 0000 1010 0010

2^{15} ... 2^0

1^s complement: sign bit

1111 1111 0101 1101

2^s complement:

1111 1111 0101 1101
+1

sign bit (−)

1111 1111 0101 1110

15 15 5 14

F F 5 E

Hexadecimal Answer: 0x FF5E

= −162 ✓

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2. 0XFFA2 → Final Answer: −94

1) Convert to binary

$0xF = (F)_{16} = \underset{2^3}{1}\ \underset{2^2}{1}\ \underset{2^1}{1}\ \underset{2^0}{1}$

$0xF = (F)_{16} = \underset{2^3}{1}\ \underset{2^2}{1}\ \underset{2^1}{1}\ \underset{2^0}{1}$ → $(FFA2)_{16}$ = 1111 1111 1010 0010

(−)

$0xA = (A)_{16} = \underset{2^3}{1}\ \underset{2^2}{0}\ \underset{2^1}{1}\ \underset{2^0}{0}$

$0x2 = (2)_{16} = \underset{2^3}{0}\ \underset{2^2}{0}\ \underset{2^1}{1}\ \underset{2^0}{0}$

decimal # will be (−)

2) Toggle the binary number: 1111 1111 1010 0010
(1^s complement)

0000 0000 0101 1101

3) 2^s complement

0000 0000 0101 1101
+1

0000 0000 0101 1110

4) Calculate decimal

$= 2^6 + 2^4 + 2^3 + 2^2 + 2^1$

$= 64 + 16 + 8 + 4 + 2 = 94$

since sign bit has 1: $\boxed{\text{Answer } -94}$

3. Convert 10.375 to single-precision IEEE floating point (hexadecimal) representation.

10.375

$10 \rightarrow \frac{1}{2^3}\ \frac{0}{2^2}\ \frac{1}{2^1}\ \frac{0}{2^0}$

$(10)_{10} = (1010)_2$

.375 → binary

operation	Result	remainder
.375 x2	.75	0
.75 x2	1.5	1
.5 x2	1.0	1
.0 x2	0	0
		0
		0
		0
		0

so $(.375)_{10} = (011)_2$

I) so, $(10.375)_{10} = (1010.011)_2$

II) write in scientific notation exp bias: 127

1010.011

carry decimal ③ places to the left

1.010011×2^{③}

III)

x	xxxxxxxx	xxxxxx
sign bit	8 exp bits	mantissa/fraction bits
		to right of decimal
0	127+3=130	010011
b/c it's positive	10000010	

combine : $\underbrace{010}_{2}\ \underbrace{0000}_{0}\ \underbrace{1001}_{9}\ \underbrace{0011}_{3}$

$\boxed{\text{So, hex : 0x2093}}$

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Note : scientific notation
$1.\underbrace{xxxxx}_{m} \cdot 2^{e}$

4. Convert 0xC18E8000 from single precision IEEE floating point to decimal representation

0xC18E8000 → binary

$(0xC)_{16} = \underset{2^3}{1}\,\underset{2^2}{1}\,\underset{2^1}{0}\,\underset{2^0}{0}$ } $(0x1)_{16} = \underset{2^0}{1}$ } $(0x8)_{16} = \underset{2^3}{1}000$ } $(0xE)_{16} = \underset{2^3}{1}\,\underset{2^2}{1}\,\underset{2^1}{1}\,\underset{2^0}{0}$

$\underbrace{1}_{\text{sign bit }(-)}\underbrace{100,0001,1}_{\text{exp bits}}\underbrace{000,1110,1000,0000,0000,0000}_{\text{fraction bits}}$

I] negative decimal

II] $\underbrace{(1000\,0011)_2}_{\text{exp bits}} \rightarrow 1\times2^0 + 1\times2^1 + \ldots + 1\times2^7 \rightarrow 1+2+128 = \underline{131}$

exp bias = 127

since 131 > exp bias so, $e = 131-127 = 4$

$e=4$

III] fraction bits: $\underset{2^{-1}}{0}\underset{2^{-2}}{0}\underset{2^{-3}}{0}\ \underset{2^{-4}}{1}\overset{2^{-5}}{1}\overset{2^{-6}}{1}\underset{2^{-7}}{0}\ \overset{2^{-8}}{1}000\ 0000\ 0000\ 0000\ \ldots$

$m = 0\times2^{-1} + 0\times2^{-2} + 0\times2^{-3} + 1\times2^{-4} + 1\times2^{-5} + 1\times2^{-6} + 0\times2^{-7} + 1\times2^{-8} \ldots$

$m = (2^{-4}) + (2^{-5}) + (2^{-6}) + (2^{-8})$

$= .0625 + .03125 + .015625 + .00390625$

$= .11328125$

IV] $(-1)^s \times (1+m) \times 2^e = (-1)^1 \times (1+.11328125) \times 2^4$

$= -1 \times 1.11328125 \times 16$

$= -17.8125$

$\boxed{\text{Decimal Answer: } -17.8125}$