Name: Anna Kurchenko

HW7: Floating point and real conversions (CS220-02)

1) Show your work to calculate the binary real valued equivalent of 3.17 with 5 bits of precision in the fractional portion of the result.

17 = 10001
100 = 1100100 -> convert to neg = 0011011 + 1 = 0011100 ->

```
                    0. 0 0 1 0 1
            --------------------------
1100100  | 1 0 0  0 1. 0 0 0 0 0
         +   0 0  1 1  1 0 0
           ------------------------
            0 1  0  0 1 0 0 0 0
```

3 = 11
3.17 = 11.00101

2) Show your work to calculate the binary real valued equivalent of 21.9 with 5 bits of precision in the fractional portion of the result.

9 = 01001
100 = 1100100 -> convert to neg = 0011011 + 1 = 0011100

```
                    0. 0 0 0 1 0
            --------------------------
1100100  | 0 1 0  0 1. 0 0 0 0 0
         +   1 1 0 0   1 0 0
           ------------------------
               1  0 1  1 0 0 0
```

21 = 10101
21.9 = 10101.00010

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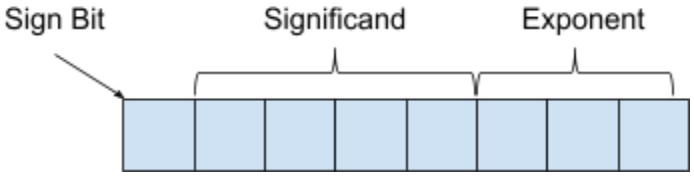
For problems 3 through 11, assume a generic 8 bit floating point representation with the layout shown below…



3-6) Given the floating point binary pattern, 00110101_2, what is the decimal equivalent (fractions are preferred [e.g., $-4\frac{7}{8}$]) for each significand and exponent interpretation below?

Exponent \ Significand	Denormal	Normal
Unbiased	+ 0.011 E -3 101 -> 010+ 1 = 011 = 3 +0.000011 +3/64	+ 1.0011 E - 3 +0.00010011 + 19/ 256
Bias = -3	+ 0.011 E -6 +0.000000011 +3/512	+ 1.0011 E -6 +0.000000011 +3/512

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7-10) Given the floating point binary representation, determine the bit pattern used to store the binary value -11.01101_2 for each of the significand and exponent representations in the table below. -11.01101 = -1.101101 E+ 1

11 = 3
.01101 = 13/32

Exponent \ Significand	Denormal	Normal
Unbiased	1 1101 001	1 1011 001
Bias = -5	1 1101 110 E = exp + B 1 = exp + -5 exp = 6 = 110	1 1011 110

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11) For the floating point representation provided using a denormalized significand and unbiased exponent. **SHOW WORK (or at least show all equivalent binary scientific notation)** to determine how many ways one can represent the exact value +1 ½.

1 = 1
0.5 = 50/100

100 = 1100100 -> 0011011 + 1 = 0011100
50 = 110010

```
                  00000.1 0 0 0 0
              ----------------------------
1100100 | 1 1 0 0 1 0. 0 0 0 0 0
            1 1 0 0 1 0 0
            -----------------------
            0 0 0 0 0
```

0.5 = .100000 =
1.5 = 1.1 E0
0 = 000 -> 111+ 1 = 1000= (truncate) 000

	denorm	norm
unb	1 1100 000	1 1000 000
b	1 1100	1 1000

(no bias so actually only 2 ways)

: 1 1100 000 and 1 1000 000