Ejercicio 8:
Convertir los siguientes números decimales a formato IEEE 754 de precisión simple (normalizados):

a) 5678_{10} = 0 10001011 01100010111000000000000 b

Como es positivo, el bit de signo es 0.

Busco el exponente y la parte fraccionaria:

5678 = 2.2839 + 0
2839 = 2.1419 + 1
1419 = 2.709 + 1
709 = 2.354 + 1
354 = 2.177 + 0
177 = 2.88 + 1
88 = 2.44 + 0
44 = 2.22 + 0
22 = 2.11 + 0
11 = 2.5 + 1
5 = 2.2 + 1
2 = 2.1 + 0
1 = 2.0 + 1

Luego, 5678 = 1011000101110 × 2^0 b
= 1.011000101110 × 2^{12} b

(bias)
127 + 12 = 139 = 2.69 + 1
69 = 2.34 + 1
34 = 2.17 + 0
17 = 2.8 + 1
8 = 2.4 + 0
4 = 2.2 + 0
2 = 2.1 + 0
1 = 2.0 + 1

139 = 10001011 b

b) 306.59375_{10} = 0 10000111 00110010100110000000000 b

Como es positivo, el bit de signo es 0.

Busco el exponente y la parte fraccionaria:

306 = 2.153 + 0
153 = 2.76 + 1
76 = 2.38 + 0
38 = 2.19 + 0
19 = 2.9 + 1
9 = 2.4 + 1
4 = 2.2 + 0
2 = 2.1 + 0
1 = 2.0 + 1

0.59375 ×2 = 1.1875
0.1875 ×2 = 0.375
0.375 ×2 = 0.75
0.75 ×2 = 1.5
0.5 ×2 = 1

306.59375 = 100110010.10011 × 2^0 b
= 1.0011001010011 × 2^8 b

127 + 8 = 135 = 2.67 + 1
67 = 2.33 + 1
33 = 2.16 + 1
16 = 2.8 + 0
8 = 2.4 + 0
4 = 2.2 + 0
2 = 2.1 + 0
1 = 2.0 + 1

135 = 10000111 b

c) 723.125_{10} = 0 10001000 01101001100100000000000 b

Como es positivo, el bit de signo es 0.

Busco el exponente y la parte fraccionaria:

723 = 2.361 + 1
361 = 2.180 + 1
180 = 2.90 + 0
90 = 2.45 + 0
45 = 2.22 + 1
22 = 2.11 + 0
11 = 2.5 + 1
5 = 2.2 + 1
2 = 2.1 + 0
1 = 2.0 + 1

0.125 ×2 = 0.25
0.25 ×2 = 0.5
0.5 ×2 = 1

723.125 = 1011010011.001 × 2^0 b
= 1.011010011001 × 2^9 b

127 + 9 = 136 = 2.68 + 0
68 = 2.34 + 0
34 = 2.17 + 0
17 = 2.8 + 1
8 = 2.4 + 0
4 = 2.2 + 0
2 = 2.1 + 0
1 = 2.0 + 1

136 = 10001000 b

d) 18.1953125_{10} = 0 10000011 00100011001000000000000 b

Como es positivo, el bit de signo es 0.

Busco el exponente y la parte fraccionaria:

18 = 2.9 + 0
9 = 2.4 + 1
4 = 2.2 + 0
2 = 2.1 + 0
1 = 2.0 + 1

0.1953125 ×2 = 0.390625
0.390625 ×2 = 0.78125
0.78125 ×2 = 1.5625
0.5625 ×2 = 1.125
0.125 ×2 = 0.25
0.25 ×2 = 0.5
0.5 ×2 = 1

18.1953125_{10} = 10010.0011001 × 2^0 b
= 1.00100011001 × 2^4 b

127 + 4 = 131 = 2.65 + 1
65 = 2.32 + 1
32 = 2.16 + 0
16 = 2.8 + 0
8 = 2.4 + 0
4 = 2.2 + 0
2 = 2.1 + 0
1 = 2.0 + 1

131_{10} = 10000011 b

e) -3020.993_{10} = 1 10001010 01111001100111111100011 b

Como el número es negativo, el bit de signo es 1.

Busco el exponente y la parte fraccionaria:

3020 = 2.1510 + 0
1510 = 2.755 + 0
755 = 2.377 + 1
377 = 2.188 + 1
188 = 2.94 + 0
94 = 2.47 + 0
47 = 2.23 + 1
23 = 2.11 + 1
11 = 2.5 + 1
5 = 2.2 + 1
2 = 2.1 + 0
1 = 2.0 + 1

0.993 ×2 = 1.986
0.986 ×2 = 1.972
0.972 ×2 = 1.994
0.994 ×2 = 1.888
0.888 ×2 = 1.776
0.776 ×2 = 1.552
0.552 ×2 = 1.104
0.104 ×2 = 0.208
0.208 ×2 = 0.416
0.416 ×2 = 0.832
0.832 ×2 = 1.664
0.664 ×2 = 1.328

3020.992 = 101111001100.11111100011 × 2^0 b
= 1.0111100110011111100011 × 2^{11} b

127 + 11 = 138 = 2.69 + 0
69 = 2.34 + 1
34 = 2.17 + 0
17 = 2.8 + 1
8 = 2.4 + 0
4 = 2.2 + 0
2 = 2.1 + 0
1 = 2.0 + 1

138_{10} = 10001010 b

f) -0.000892_{10} = 1 01110100 11010011101011000100011 b

Como es negativo, el bit de signo es 1.

Busco el exponente y la parte fraccionaria:

0.000892 ×2 = 0.001784
0.001784 ×2 = 0.003568
0.003568 ×2 = 0.007136
0.007136 ×2 = 0.014272
0.014272 ×2 = 0.028544
0.028544 ×2 = 0.057088
0.057088 ×2 = 0.114176
0.114176 ×2 = 0.228352
0.228352 ×2 = 0.456704
0.456704 ×2 = 0.913408
0.913408 ×2 = 1.826816
0.826816 ×2 = 1.653632
0.653632 ×2 = 1.307264
0.307264 ×2 = 0.614528
0.614528 ×2 = 1.229056
1.229056 ×2 = 0.45912
0.45912 ×2 = 0.91824

0.91824 ×2 = 1.83648
0.83648 ×2 = 1.67296
0.67296 ×2 = 1.34592
0.34592 ×2 = 0.69184
0.69184 ×2 = 1.38368
0.38368 ×2 = 0.76736
0.76736 ×2 = 1.53472
0.53472 ×2 = 1.06944
0.06944 ×2 = 0.13888
0.13888 ×2 = 0.27776
0.27776 ×2 = 0.55552
0.55552 ×2 = 1.11104
0.11104 ×2 = 0.22208
0.22208 ×2 = 0.44416
0.44416 ×2 = 0.88832
0.88832 ×2 = 1.77664
0.7764 ×2 = 1.55328

0.000892 = 0.0000000000111010011101011000100011... × 2^0 b
= 1.11010011101011000100011 × 2^{-11} b

127 - 11 = 116 = 2.58 + 0
58 = 2.29 + 0
29 = 2.14 + 1
14 = 2.7 + 0
7 = 2.3 + 1
3 = 2.1 + 1
1 = 2.0 + 1

116_{10} = 01110100 b