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COSCC 2406 - Assembly language.

(a)

1 10000001 1001 0100 0000 0000 0000 006

Sign bit = 1 (The number is -ve)

Exponent = 10000011

= 129 in decimal

∴ 129 - 127 = 2

Fraction = 1001 0100 0000 0000 0000 006

Formula = $(-1)^{sign} \times 1.mantissa \times 2^{exp-127}$

Mantissa = 1.1001 0100 0000 0000 0000 00

Binary to decimal

$1.100101_{(2)} = 1 \times 2^{0} + 1 \times 2^{-1} + 0 \times 2^{-2} + 0 \times 2^{-3} + 1 \times 2^{-4} + 0 \times 2^{-5} + 1 \times 2^{-6}$

$= 1 + 0.5 + 0.0625 + 0.015625$

$= 1.578125$ (approx)

$= (-1)^{sign} \times 1.mantissa \times 2^{exp}$

$= (-1)^{1} \times 1.578125 \times 2^{2}$

$= -1 \times 1.578125 \times 4$

$= -1 \times 1.578125 \times 4$

$= -1.578125 \times 4$

$= -6.3125$

2 3 3 2
1 5 7 8 1 2 5
× 4
6 3 1 2 5 0 0

(b) (1) Convert to Binary

422.32

422 = 110100110 (in binary).

.32 × 2 = 0.64 → 0
.64 × 2 = 1.28 → 1
.28 × 2 = 0.56 → 0
.56 × 2 = 1.12 → 1
.12 × 2 = 0.24 → 0
.24 × 2 = 0.48 → 0

.32 ≈ 0.01010....

0.48 × 2 = 0.96 → 0
0.96 × 2 = 1.92 → 1
0.92 × 2 = 1.84 → 1
0.84 × 2 = 1.68 → 1
0.68 × 2 = 1.36 → 1
0.36 × 2 = 0.72 → 0
0.72 × 2 = 1.44 → 1
0.44 × 2 = 0.88 → 0
0.88 × 2 = 1.76 → 1
0.76 × 2 = 1.52 → 1
0.52 × 2 = 1.04 → 1
0.04 × 2 = 0.08 → 0
0.08 × 2 = 0.16 → 0
0.16 × 2 = 0.32 → 0

$(0.32)_{10} = (0.01010001111010111000)_2$

Integral value is

$(422)_{10} = (110100110)_2$

$(422.32)_{10} = (110100110.01010001111010111000)_2$

$(422.32)_{10} = (1.10100110010100011110101110000)_2 \times 2^8$

Mantissa is :

10100110010100011110101111000

00000000000000000000000000

The no is positive, sign bit = 0

Exponent = bias + power of 2

= 1023 + 8

= 1031

$(1031)_{10} = (10000000111)_2$

Sign	Exponent	Mantissa
0	10000000111	10100110010100011110101111000 00000000000000000000000000

0100 0000 0111 1010 0110 0101 0001 1110

1011 1000 0000 0000 0000 0000 0000 0000

0X407A651EB8000000