

6. Convert the following 32-bit IEEE floating point numbers from hexadecimal into standard decimal notation.

- 0x40200000

Binary = 0100 0000 0010 0000 0000 0000 0000 0000

IEEE = 0 (1000 0000) (0100 0000 0000 0000 0000 000)

Decimal = 1.25

- 0x41020000

Binary = 0100 0001 0000 0010 0000 0000 0000 0000

IEEE = 0 (1000 0010) (0000 0100 0000 0000 0000 000)

Decimal = 3.015225

- 0xC1060000

Binary = 1100 0001 0000 0110 0000 0000 0000 0000

IEEE = 1 (1000 0010) (0000 1100 0000 0000 0000 000)

Decimal = -3.?????

- 0xBD800000

Binary = 1011 1101 1000 0000 0000 0000 0000 0000

IEEE = 1 (0111 1011) (0000 0000 0000 0000 0000 000)

Decimal = -123.0

7. Convert the following decimal numbers into 32-bit IEEE floating point notation.

7. a) 2.0

$2 \overline{) 2}$ $0.0 \times 2 = 0.0$
 $2 \overline{) 4} 0$ $0.0 \times 2 = 0.0$
 $0 \ 1$
 \downarrow
 $10.0000 \dots 0$
 $1.0000 \dots 0 \times 2^1$

Sign = 0
 Exponent = 1 = 0001
 Mantissa = 0000000

0(10000100)(000000000000000000000000)

b) 45.0

$2 \overline{) 45}$ $0.0 \times 2 = 0.0$
 $2 \overline{) 90}$ $0.0 \times 2 = 0.0$
 $2 \overline{) 180}$
 $2 \overline{) 360}$
 $2 \overline{) 720}$
 $2 \overline{) 1440}$
 $0 \ 1$
 \downarrow
 $101101.000 \dots 0$
 $1.01101000 \dots 0 \times 2^5$

Sign = 0
 Exponent = 5 = 0101
 Mantissa = 00000

0(10000100)(000000000000000000000000)

c) 61.01

$2 \overline{) 61}$ $0.02 \ 0.24 \ 0.88$
 $2 \overline{) 122}$ $0.04 \ 0.48 \ 1.96$
 $2 \overline{) 244}$ $0.08 \ 0.96 \ 1.52$
 $2 \overline{) 488}$ $0.16 \ 1.92 \ 1.04$
 $2 \overline{) 976}$ $0.32 \ 0.84 \ 0.08$
 $2 \overline{) 1952}$ $0.64 \ 1.68 \ 0.16$
 $2 \overline{) 3904}$ $1.28 \ 1.36 \ 0.32$
 $2 \overline{) 7808}$ $0.56 \ 0.72 \ 0.64$
 $0 \ 1$ $1.12 \ 1.44$
 \downarrow
 $111101.000000101000101010110000$
 $1.11101000000 \dots 0000 \times 2^5$

Sign = 0
 Exponent = 5 = 0101
 Mantissa = 11101000001010001010110000

0(10000100)(11101000001010001010110000)

d) -18.375

$2 \overline{) 18}$ 0.75
 $2 \overline{) 36}$ 1.5
 $2 \overline{) 72}$ 1.0
 $2 \overline{) 144}$ 0.0
 $2 \overline{) 288}$ 0.0
 $0 \ 1$ \vdots
 \downarrow
 $10010.01100000 \dots 0000$
 $1.001001100 \dots 00 \times 2^4$

Sign = 1
 Exponent = 4 = 0100
 Mantissa = 001001100000000000000000

1(10000100)(001001100000000000000000)

8. Are there any numbers that can be represented exactly as a 32-bit integer but not as a 32-bit IEEE floating point number? Why or why not?

Yes. Example: 0xFFFF FFFF (1111 1111 1111 1111 1111 1111 1111 1111)

Because Mantissa value is not possible to get all 1. It will be 0 at some point if it is multiple by 2