Terry Guan

IEEE 745	0x40C8000	0xbc4cccc	0xE1233333	0xBD800000
Sign Bit	0	1	0	1
Sign	1	−1	1	−1
Exponent Bit	1000 0001	0111 1000	1000 0010	0111 1011
Exponent	2^2	2^{-7}	2^3	2^{-4}
Significand Bit	1001 0000 0000	1001 1001 1001	0100 0110 0110	0000 0000
Significand	1.5625	1.5999	1.2749	1.0

$0x40C80000 = 0100 \ 0000 \ 1100 \ 1000 \ 0000 \ 0000 \ 0000 \ 0000$

$1000 \ 0010 = 128 + 2 = 130 - 127 = 3$

$0xbc4cccc = \boxed{1011} \ 1100 \ 0100 \ 1100 \ 1100 \ 1100 \ 1100 \ 1100$

$= 2^{-1} + 2^{-4} + 2^{-5} + 2^{-8} + 2^{-9} + 2^{-12} + 2^{-13} + 2^{-16} + 2^{-17} + 2^{-20} + 2^{-2}+1$

$= 1.5999$

1100 0001 0010 0011 0011 0011 0011 0011

C   1   2   3   3   3   3   3

0100 0110 0110 0110 0110 011

$1 + 2^{-2} + 2^{-6} + 2^{-7} + 2^{-10} + 2^{-11} + 2^{-14} + 2^{-15} + 2^{-18} + 2^{-19} + 2^{-22} + 2^{-23} = 1.2749$

$-4 + 127 = 123 = 0111 \ 1011$

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1a) 0x 4086 6666

0100 0000 1000 0110 0110 0110 0110 0110

Exponent $= 1000\ 0001 = 2^2$

Mantissa $= 0000\ 1100\ 1100\ 1100\ 1100\ 110$

$\quad = 2^{-5} + 2^{-6} + 2^{-9} + 2^{-10} + 2^{-13} + 2^{-14} + 2^{-17} + 2^{-18} + 2^{-21} + 2^{-22}$

$\quad = 1.0499999 \times 2^2$

$\quad = \boxed{4.2 \times 10^0}$

1b) 0x66ff0000

0110 0110 1111 1111 0000 0000 0000 0000

Exponent $1100\ 1101 = 2^{78}$

Mantissa $= 1111\ 1110\ 0000\ 0000\ 0000\ 000$

$\quad = 2^{-1} + 2^{-2} + 2^{-3} + 2^{-4} + 2^{-5} + 2^{-6} + 2^{-7}$

$\quad = 1.9921875 \cdot 2^{78} = \boxed{6.0210 \times 10^{23}}$

2a) $-1600.6666 =$ sign $= 1$

$1600 = 1\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0$
$\quad\quad\quad 1024\ 512\ 256\ 128\ 64\ 32\ 16\ 8\ 4\ 2\ 1$

$\frac{-1024}{576}$

$\frac{512}{64}$

.6666 $\cdot$ 2 $= 1.333 = 1010 1010$

.333 $\cdot$ 2 $= 0.6666$

.6666 $\cdot$ 2 $= 1.3333$

1.10 0100 0000.1010

1.10 0100 0000 1010 $\cdot 2^{10}$ $\quad\quad 10+127 = 137$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad 137 = 1000\ 1001$

1100 0100 1100 1000 0001 0101 0101 0101
C 4 C 8 1 5 5 5

$\boxed{0x C4C81555}$

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2b) -1.6×10^{19}

$x = \frac{y}{\log 2}$

$$10^{-19} = 2^x$$
$$-19 \log_{10} 10 = x \log_{10} 2$$
$$-19 = x \log_{10} 2$$
$$x = \frac{-19}{\log_2 10} = -63.1166$$

$= -1.6 \times 2^{-63.1166}$

$= -1.6 \times 2^{-.1166} \times 2^{-63}$

$= \boxed{-1}.4757 \times 2^{-63}$ $-63 + 127 = \quad 0100\ 0000$

Sign $= 1$

Mantissa $= .4757_{10} = 0111100111\ 0010\ 10\ 0001000$

$.4757 \cdot 2 = 0.9514$
$.9514 \cdot 2 = 1.9028$
$.9028 \cdot 2 = 1.8056$
$.8056 \cdot 2 = 1.6112$
$.6112 \cdot 2 = 1.2224$
$.2224 \cdot 2 = 0.4448$
$.4448 \cdot 2 = 0.8896$
$.8896 \cdot 2 = 1.7792$
$\vdots$

$1010\,0000\ 011/1100/1110/0101/0000/1000$
$\quad a \quad\ 0 \quad\ \ 3 \quad\ \ c \quad\ e \quad\ 5 \quad\ 0 \quad\ \ 8$

$\boxed{0x\ a03ce508}$

Terry Gwan

3a) 0x 448 0 0000

0x 3f00 0000

0x 4480 0000 = 0100 0100 1000 0000 0000 0000 0000 0000

0x 3f00 0000 = 0011 1111 0000 0000 0000 0000 0000 0000

Sign = 0

Exponent = 1000 1001 = 137 - 127 = 10

0111 1110 = 126 - 127 = -1

10 - (-1) = 11

Shift 3f00 0000's mantissa by 11 Places to right

0.00000000001.0000 0000 0000 0000 000

0.0000 0000 0010 0000 0000 0000

+1.0000 0000 0100 0000 0000 0000

1.0000 0000 0010 0000 0000 0000

= 0100 0100 1000 0000 0001 0000 0000 0000

= 4   4   8   0   1   0   0   0

Ox 4480 1000

3b) 0x 3C 0b bbbb = 0011 1100 0000 1011 1011 1011 1011 1011

0x 3c 11 1111 = 0011 1100 0001 0001 0001 0001 0001 0001

Sign = 0   Exponent = 0111 1000   Since exponents are the

0111 1000   same, no need to shift.

Mantissa = 1.0 001 011 011 011 011 011

+1.0 010 0010 0010 0010 0010 001

10.00 11 1001 1001 1001 1001 100 · 2^{-7}

= 1.000 11 1001 1001 1001 100.1 10 · 2^{-6} -6 = 0111 1001

0 0111 1100 1000 1110 0110 0110 0110 0110

3   C   8   e   6   6   6   6

Ox 3c 8e 6666

3c) 4 2c 80000

c 1f 8 0000

0100 0010 1100 1000 0000 0000 0000 0000

1100 0001 1111 1000 0000 0000 0000 0000

1000 0101 = 133 - 127 = 6

1000 0011 = 131 - 127 = 4

$1.1001\ 0000\ 0000\ 0000\ 0000\ 000 \times 2^6$

$-1.1111\ 0000\ 0000\ 0000\ 0000\ 000 \times 2^4$
_____

$=\ 1.1001\ 0000\ 0000\ 0000\ 0000\ 0000$

$-\ 0.0111\ 1100\ 0000\ 0000\ 0000\ 0000$
_____

$1.0001\ 0100\ 0000\ 0000\ 0000\ 0000 \times 2^6$

Mantissa = 0001 0100 0000 0000 0000 000

Exponent = 2^6 = 6 + 127 = 133 = 1000 0101

Sign = 0

0100 0010 1000 1010 0000 0000 0000 0000

  4   2   8   A   0   0   0   0

$\boxed{0 \times 428a0000}$

Terry Guan

4a) 0x3b6b bbbb
0x2cf0 0000

0x3b6b bbbb = [0011 1011] 0110 1011 1011 1011 1011 1011
0xc2f0 0000 = [1100 0010] 1111 0000 0000 0000 0000 0000
Sign = 1
Exponents = 0111 0110 = 118 - 127 = -9
1 0000 011 = 133 - 127 = 6

$$2^{-9} \cdot 2^6 = 2^{-3}$$

Significand = 1101 0111 0111 0111 0111 011
1110 0000 0000 0000 0000 000

1.1101 0111 0111 0111 0111 011   23
                                  +3
11101 0111 0111 0111 0100 011   26
111010 1110 1110 1110 1110 110
110101 1101 1101 1101 1101 100
1101011 1011 1011 1011 1011 000
= 11.011 1001 1111 1111 1110 101 · 2^{-3}

= 1.1011 1001 1111 1111 1110 101 × 2^{-2}

= 10 11/111 0/1 10/1 100/1 11/1 11/1 11/1 111

= [1011 1110 1101 1100 1111 1111 1111 1111]

= b e d c f f f f
[0xbedcffff]

4b) $0 \times 4400\ 0000$

$0 \times 3b00\ 0000$

$4400\ 0000 = 0100\ 0100\ 0000\ 0000\ 0000\ 0000\ 0000\ 0000$

$3b00\ 0000 = 0011\ 1011\ 0000\ 0000\ 0000\ 0000\ 0000\ 0000$

Sign $= 0$

Exponent $= 1000\ 1000 \quad = 136 - 127 = 9$

$\qquad\qquad\quad\ 0111\ 0110 \quad = 118 - 127 = -9$

$2^9 \cdot 2^{-9} = 2^0 \qquad\qquad 0 + 127 = 127 = 0111\ 1111$

Signified $= \dfrac{\begin{array}{r} 0 \\ \cdot\ 0 \end{array}}{0}$

$= 0\ 0111\ 1111\ 0000\ 0000\ 0000\ 0000\ 0000\ 000$

$= 0011\ 1111\ 1000\ 0000\ 0000\ 0000\ 0000\ 0000$

$= 3 \quad f \quad 8 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$

$\boxed{0 \times 3f80\ 0000}$

$\boxed{0 \times bed\ 8???}$