Selected exercises for Chapter 3: 3.3 from 4th edition. 3.20, 3.21, 3,22, 3,23, 3.24, 3.27, 3.29, 3.41, 3.42, 3.43

3.20

$0C000000_{16}$=0000 1100 0000 0000 0000 0000 0000 0000_2

201326592_{10}=

in both cases.

3.21 jal 0x00000000

3.22

0x0C000000 = 0000 1100 0000 0000 0000 0000 0000 0000

= 0 0001 1000 0000 0000 0000 0000 0000 000

sign is positive

exp = 0×18 = 24 - 127 = -103

there is a hidden 1

mantissa = 0

answer = 1.0×2^{-103}

3.23 63.25 = 10^0 =111111.01 × 2^0

normalize, move binary point 5 to the left

1.1111101×2^5

sign =positive, exp=127+5=132

Final bit pattern: 0 1000 0100 1111 1010 0000 0000 0000 000

= 0100 0010 0111 1101 0000 0000 0000 0000 = 0x427D0000

3.24 63.25 ×100= 111111.01×2^0

normalize, move binary point 5 to the left

1.1111101×2^5

sign = positive, exp =1023+5=1028

Final bit pattern:

0 100 0000 0100 1111 1010 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000

0000

=0x404FA00000000000

3.27 [20] <§3.5> IEEE 754-2008 contains a half precision that is only 16 bits wide. The leftmost bit is still the sign bit, the exponent is 5 bits wide and has a bias of 15, and the mantissa is 10 bits long. A hidden 1 is assumed. Write down the bit pattern to represent -1.5625×10^{-1} assuming a version of this format, which uses an excess-15 (not excess-16 in the textbook) format to store the exponent. Comment on how the range and accuracy of this 16-bit floating point format compares to the single precision IEEE 754 standard.

3.27 Given = $1.5625 * 10^{-1} = 0.15625_{10}$ ➠ 0.15625*2 = 0.3125 (0)

0.3125*2 = 0.626 (0)

0.625*2 = 1.25 (1)

0.25*2 = 0.5 (0)

0.5*2 = 1 (1)

Hence, = $-0.15625_{10} = -0.00101_2$

= $-1.01 * 2^{-3}$ <Hidden 1 => 1.XXXXX>

Sign = 1

Exponent = -3+15 = 12 = 01100_2

Fraction= $0100,0000,00_2$

IEEERepresentation: 1 01100 0100,0000,00

3.29 $2.6125 \times 10^1 + 4.150390625 \times 10^{-1}$

$2.6125 \times 10^1 = 26.125 = 11010.001 = 1.1010001000 \times 2^4$

$4.150390625 \times 10^{-1} = .4150390625 = .011010100111 = 1.1010100111 \times 2^{-2}$

For the second number, shift binary point 6 to the left to align exponents,

GR

1.1010001000 00

0.0000011010 10 0111 (Guard bit = 1, Round bit = 0, Sticky bit= 1)

1.1010100010 101 (Guard bit = 1, Round bit = 0, Sticky bit= 1)

In this case, the extra bit (G,R,S) is more than half of the least significant bit (0).

Thus, the value is rounded up.

$1.1010100011 \times 2^4 = 11010.100011 \times 2^0 = 26.546875 = 2.6546875 \times 10^1$

3.41

Answer	**sign**	**exp**	**Exact?**
1 01111101 00000000000000000000000	–	-2	Yes

3.42 b+b+b+b=-1

b × 4 =-1

They are the same

3.43

0.33333333333*2 = 0.666666666666666 the digit is 0

0.66666666666*2 =. 1.33333333333333 the digit is 1

0.33333333333*2 = 0.666666666666666…..the digit is 0

0.66666666666*2 = 1.3333333333333333 …the digit is 1

………………….. keep going.

1/3= $0.0101\ 0101\ 0101\ 0101\ 0101\ 0101\ldots\ldots_2$

The representation is not exact since 1/3 is not totally represented.