Selected exercises for Chapter 3: 3.3 from 4th edition. 3.20, 3.21, 3,22, 3,23, 3.24

3.3 Overflow occurs when a result is too large to be represented accurately given a finite word size. Underflow occurs when a number is too small to be represented correctly a negative result when doing unsigned arithmetic, for example (The case when a positive result is generated by the addition of two negative integers is also referred to as underflow by many, but in this text book, that is considered an overflow). Assume A= 69, B=90.

3.3.1<3.2> Assume A and B are unsigned 8-bit decimal integers. Calculate A-B. Is there overflow, underflow, or neither?

3.3.1 Underflow (–21)

3.3.2<3.2> Assume A and B and signed 8-bit decimal integers stored in sign-magnitude format. Calculate A+B. Is there overflow, underflow, or neither?

3.3.2 Overflow (result = 159, which does not fi t into an 8-bit SM format)

3.3.3<3.2> Assume A and B are signed 8-bit decimal integers stored in 2's complement format. Calculate A-B. Is there overflow, underflow, or neither?

3.3.3 Neither (–21)

3.20 201326592 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 $\times 10^0$= 111111.01$\times 2^0$

normalize, move binary point 5 to the left

1.1111101 $\times 2^5$

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 -1.5625 $\times 10^{-1}$ =-.15625$\times 10^0$

=-.00101 $\times 2^0$

move the binary point 3 to the right, =-1.01 $\times 2^{-3}$

exponent =-3=-3+15 = 12, fraction =-.0100000000

answer: 1011000100000000

3.41

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

3.42 b+b+b+b=-1

b $\times$ 4 =-1

They are the same

3.43 0101 0101 0101 0101 0101 0101

No