Homework (Chapter 2 of the textbook, 3rd edition)

1. Given a (very) tiny computer that has a word size of 5 bits, what are the smallest negative numbers and the largest positive numbers that this computer can represent in each of the following representations?
a. One's complement b. Two's complement
Hint: show your answers in binary and decimal forms.
Ans.
a. Largest Positive: 01111_2 (15) Smallest Negative: 10000_2 (−15)
b. Largest Positive: 01111_2 (15) Smallest Negative: 10000_2 (−16)

2. Show how the floating point value of 26.625 would be stored using IEEE-754 double precision with excess-1023 exponent (be sure to indicate the sign bit, the exponent, and the significand fields):
Ans.
$26.625 = 1.1010101 \times 2^4$ 0 10000000011 1010101...0
4 + 1023 = 1027 = 10000000011

3. Suppose a computer uses 4-bit one's complement representation. Ignoring overflows, what value will be stored in the variable *j* after the following pseudocode routine terminates?

```
-2 → j // Store -2 in j.
6 → k // Store 6 in k.

while k ≠ -6
        j=j-1
        k=k+1
end while
```

Ans.

J	(Binary)	K	(Binary)
-2	1101	6	0110
-3	1100	7	0111
-4	1011	-7	1000
-5	1010	-6	1001

4. Convert 9.5 and 1.25 to unsigned binary, then compute the multiplication of the two value. Answer in 14-bit floating point model with bias-16 exponent.

Answer 9.5 = 1001.1 and 1.25 = 1.01
Compute 1001.1 x 1.01 = 1011.111