Answers to Homework 1

1) Convert the following numbers from the given base to the other listed bases in the table. It is important that you show the whole conversion methods used and not only the final result.

Decimal	Binary	Octal	Hexadecimal
369.3125	101110001.0101	561.24	171.5
189.625	10111101.101	275.5	BD.A
214.625	11010110.101	326.5	D6.A
62407.625	1111001111000111.101	171707.5	F3C7.A

An example from the second row:

Binary: 10111101.101 is given, find the decimal value
We can compose this into

$$1 * 2^7 + 1 * 2^5 + 1 * 2^4 + 1 * 2^3 + 1 * 2^2 + 1 * 2^0 + 1 * 2^{1} + 1 * 2^{3} = 189 + 5/8 = (189.625)_{10}$$

for octal combine the bits in groups of 3

$$010 \quad 111 \quad 101 \: . \: 101 \: = (275.5)_8$$

for hexadecimal combine the bits in groups of 4

$$1011 \quad 1101. \: 1010 \: = (BD.A)_{16}$$

2) Do the following arithmetic operations in the binary number system:
a)

```
   25                011001                011001
-                 -                      +
   40                101000                010111    (1's complement of 40)
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   ?                                       110000
```
no carry occurs, so the result is -(1's complement of 110000) = -001111 (which is -15)

b)

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   -28               1|1100100  (signed 2's complement)
-                   +
   36               1|1011100  (signed 2's complement)
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   ?                11|1000000   (result 1|1000000 is signed 2's complement of -64)
        discard the carry
```

3) Show the bit configuration that represents the decimal number 365 in:
a) Binary code   101101101
b) BCD code   0011 0110 0101
c) ASCII code   0110011 0110110 0110101