Homework 1 Solutions

1. a. 11111 = 1 + 2 + 4 + 8 + 16 = 31
   b. 1000000 = 64
   c. 1001101101 = 1 + 4 + 8 + 32 + 64 + 512 = 621
   d. 101111 = 1 + 2 + 4 + 8 + 32 = 47
   e. 10101010 = 2 + 8 + 32 + 128 = 170
   f. 000011110000 = 16 + 32 + 64 + 128 = 240
   g. 110011001100 = 4 + 8 + 64 + 128 + 1024 + 2048 = 3276
   h. 000000000000 = 0

2. a.

73 / 2 = 36	rem 1	1
36 / 2 = 18	rem 0	01
18 / 2 = 9	rem 0	001
9 / 2 = 4	rem 1	1001
4 = <u>100</u>		00000<u>100</u>1001

b.

127	128 > 127 > 64	1------
127 - 64 = 63 > 32		11-----
63 - 32 = 31 > 16		111----
31 - 16 = 15 > 8		1111---
15 - 8 = 7 = <u>111</u>		00000111<u>111</u>

c.

402 / 2 = 201	rem 0	0
201 / 2 = 100	rem 1	10
100 / 2 = 50	rem 0	010
50 / 2 = 25	rem 0	0010
25 / 2 = 12	rem 1	10010
12 / 2 = 6	rem 0	010010
6 / 2 = 3	rem 0	0010010
3 / 2 = 1	rem 1	10010010
1 / 2 = 0	rem 1	110010010

d. $512 = 2^9 =$ 001000000000

e.

1000 / 2 = 500	rem 0	0
500 / 2 = 250	rem 0	00
250 / 2 = 125	rem 0	000
125 / 2 = 62	rem 1	1000
62 / 2 = 31	rem 0	01000
31 = <u>11111</u>		00<u>11111</u>01000

f. 17 = 10001 000000010001

g. $4200 > 2^{12} = 4096$ Thus, can't represent in 12 bits

3.

	i.	ii.
a.	100 101 101 011	1001 0110 1011
	4553	96B
b.	010 110 100 000 101	0010 1101 0000 0101
	26405	2D05

c. We can first convert to binary or directly to octal by dividing by 8 and looking at the remainder.

791 / 8 = 98	rem 7	7
98 / 8 = 12	rem 2	27
12 / 2 = 1	rem 4	427
1 / 8 = 0	rem 1	1427

To then go to hex, we convert to binary, regroup and then convert to hex

1427_8 = 1 100 010 111 = 0011 0001 0111 = 317_{16}

d. First, we will concert to hex

1600 / 16 = 100	rem 0	0
100 / 16 = 6	rem 4	40
6 / 16 = 0	rem 6	640

640_{16} = 0110 0100 0000 = 011 001 000 000 = 3100_8