Homework 1

6) a) 1110
$2^3\ 2^2\ 2^1$
$8 + 4 + 2 = 14$

b) 1010
$2^3\ 2^1$
$8 + 2 = 10$

c) 11100
$2^4 2^3 2^2$
$16 + 8 + 4 = 28$

d) 1000
$2^4 = 16$

e) 10101
$2^4\ 2^2\ 2^0$
$16 + 4 + 1 = 21$

f) 11101
$2^4 2^3 2^2\ 2^0$
$16 + 8 + 4 + 1 = 29$

g) 10111
$2^4\ 2^2 2^1 2^0$
$16 + 4 + 2 + 1 = 23$

h) 11111
$2^4 2^3 2^2 2^1 2^0$
$16 + 8 + 4 + 2 + 1 = 31$

8) a) $2^2 - 1 = 3$

b) $2^3 - 1 = 7$

c) $2^4 + 1 = 15$

d) $2^5 - 1 = 31$

e) $2^6 - 1 = 63$

f) $2^7 - 1 = 127$

g) $2^8 + 1 = 255$

h) $2^9 - 1 = 511$

i) $2^{10} - 1 = 1023$

j) $2^{11} - 1 = 2047$

10) a) 0 = 000
1 = 001
2 = 010
3 = 011
4 = 100
5 = 101
6 = 110
7 = 111

b) 8 = 1000
9 = 1001
10 = 1010
11 = 1011
12 = 1100
13 = 1101
14 = 1110
15 = 1111

c) 16 = 10000
17 = 10001
18 = 10010
19 = 10011
20 = 10100
21 = 10101
22 = 10110
23 = 10111
24 = 11000
25 = 11001
26 = 11010
27 = 11011
28 = 11100
29 = 11101
30 = 11110
31 = 11111

d) 32 = 100000
33 = 100001
34 = 100010
35 = 100011
36 = 100100
37 = 100101
38 = 100110
39 = 100111
40 = 101000
41 = 101001
42 = 101010
43 = 101011
44 = 101100
45 = 101101
46 = 101110
47 = 101111
48 = 110000
49 = 110001
50 = 110010
51 = 110011
52 = 110100
53 = 110101
54 = 110110
55 = 110111
56 = 111000
57 = 111001
58 = 111010
59 = 111011
60 = 111100
61 = 111101
62 = 111110
63 = 111111

e) 64 = 1000000
65 = 1000001
66 = 1000010
67 = 1000011
68 = 1000100
69 = 1000101
70 = 1000110
71 = 1000111
72 = 1001000
73 = 1001001
74 = 1001010
75 = 1001011

13) a) $\frac{15}{2} = 7$ 1

$\frac{7}{2} = 3$ 1

$\frac{3}{2} = 1$ 1

$\frac{1}{2} = 0$ 1

1 1 1 1

b) $\frac{21}{2} = 10$ 1

$\frac{10}{2} = 5$ 0

$\frac{5}{2} = 2$ 1

$\frac{2}{2} = 1$ 0

$\frac{1}{2} = 0$ 1

10101

c) $\frac{28}{2} = 14$ 0

$\frac{14}{2} = 7$ 0

$\frac{7}{2} = 3$ 1

$\frac{3}{2} = 1$ 1

$\frac{1}{2} = 0$ 1

11100

d) $\frac{34}{2} = 17$ 0

$\frac{17}{2} = 8$ 1

$\frac{8}{2} = 4$ 0

$\frac{4}{2} = 2$ 0

$\frac{2}{2} = 1$ 0

$\frac{1}{2} = 0$ 1

100010

e) $\frac{40}{2} = 20$ 0

$\frac{20}{2} = 10$ 0

$\frac{10}{2} = 5$ 0

$\frac{5}{2} = 2$ 1

$\frac{2}{2} = 1$ 0

$\frac{1}{2} = 0$ 1

101000

f) $\frac{59}{2} = 29$ 1

$\frac{29}{2} = 14$ 1

$\frac{14}{2} = 7$ 0

$\frac{7}{2} = 3$ 1

$\frac{3}{2} = 1$ 1

$\frac{1}{2} = 0$ 1

111011

g) $\frac{65}{2} = 32$ 1

$\frac{32}{2} = 16$ 0

$\frac{16}{2} = 8$ 0

$\frac{8}{2} = 4$ 0

$\frac{4}{2} = 2$ 0

$\frac{2}{2} = 1$ 0

$\frac{1}{2} = 0$ 1

1000001

h) $\frac{73}{2} = 36$ 1

$\frac{36}{2} = 18$ 0

$\frac{18}{2} = 9$ 0

$\frac{9}{2} = 4$ 1

$\frac{4}{2} = 2$ 0

$\frac{2}{2} = 1$ 0

$\frac{1}{2} = 0$ 1

1001001

17) a) 11 (3) + 01 (+1) = 100 (4)

b) 10 (2) + 10 (+2) = 100 (4)

c) 11 / 101 (5) + 11 (+3) = 1000 (8)

d) 1 / 111 (7) + 110 (+6) = 1101 (13)

e) 1001 (9) + 101 (+5) = 1110 (14)

f) 11 1 / 1101 (13) + 1011 (+11) = 11000 (24)

19) 00000000 OR 11111111
using all zeros or all ones

28) a) 10011001
10011000
01100111
64 32 4 2 1 = -103

b) 01111100
01110011
10001100
128 8 4 = 140

c) 10111111
10111110
01000001
64 1 = -65

29)