Emily List

Homework #1

2.2 → 53

6) (a) 1110 → $2^3 + 2^2 + 2^1$ ~~2°~~ $= 8+4+2 = \boxed{14}$

(b) 1010 → $2^3 + 2^1 = 8+2 = \boxed{10}$

(c) 11100 → $2^4 + 2^3 + 2^2 = 16+8+4 = \boxed{28}$,

(d) 10000 → $2^4 = \boxed{16}$

(e) 10101 → $2^4 + 2^2 + 2^0 = 16+4+1 = \boxed{21}$

(f) 11101 → $2^4 + 2^3 + 2^2 + 2^0 = 16+8+4+1 = \boxed{29}$

(g) 10111 → $2^4 + 2^2 + 2^1 + 2^0 = 16+4+2+1 = \boxed{23}$

(h) 11111 → $2^4 + 2^3 + 2^2 + 2^1 + 2^0 = 16+8+4+2+1 = \boxed{31}$

8) (a) two → 2^1

(b) three → ~~~~ $2^1 + 2^0$

(c) four → 2^2

(d) five → $2^2 + 2^0$

(e) six → $2^2 + 2^1$

(f) seven → $2^2 + 2^1 + 2^0$

(g) eight → 2^3

(h) nine → $2^3 + 2^0$

(i) ten → $2^3 + 2^1$

(j) elvm → $2^3 + 2^1 + 2^0$

10) (a) 0 = 000 (b) 8 = 1000 (c) 16 = 10000   26 = 11010
     1 = 001   9 = 1001   17 = 10001   27 = 11011
                   10 = 1010   18 = 10010   28 = 11100
     2 = 010   11 = 1011   19 = 10011   29 = 11101
     3 = 011   12 = 1100   20 = 10100   30 = 11110
     4 = 100   13 = 1101   21 = 10101   31 = 11111
     5 = 101   14 = 1110   22 = 10110
     6 = 110   15 = 1111   23 = 10111
       = 111   24 = 11000
                                  25 = 11001

2.3

13) (a) $\boxed{15 = 1111}$

$\frac{15}{2} = 7 \; r1$

$\frac{7}{2} = 3 \; r1$

$\frac{3}{2} = 1 \; r1$

$\frac{1}{2} = 0 \; r1$

(b) $\frac{21}{2} = 10 \; r1$ $\boxed{21 = 10101}$

$\frac{10}{2} = 5 \; r0$

$\frac{5}{2} = 2 \; r1$

$\frac{2}{2} = 1 \; r0$

$\frac{1}{2} = 0 \; r1$

(c) $\frac{28}{2} = 14 \; r0$ $\boxed{28 = 11100}$

$\frac{14}{2} = 7 \; r0$

$\frac{7}{2} = 3 \; r1$

$\frac{3}{2} = 1 \; r1$

$\frac{1}{2} = 0 \; r1$

(d) $\frac{34}{2} = 17 \; r0$ $\boxed{34 = 100010}$

$\frac{47}{2} = 8 \; r1$

$\frac{8}{2} = 4 \; r0$

$\frac{4}{2} = 2 \; r0$

$\frac{2}{1} = 1 \; r0$

$\frac{1}{2} = 0 \; r1$

(e) $\boxed{40 = 101000}$

2	20	r0
2	10	r0
2	5	r0
2	2	r1
2	1	r0
2		r1

(f) $\frac{54}{2} = 24 \; r1$ $\boxed{54 = 111011}$

$\frac{24}{2} = 14 \; r1$

$\frac{14}{2} = 7 \; r0$

$\frac{7}{2} = 3 \; r1$

$\frac{3}{2} = 1 \; r1$

$\frac{1}{2} = 0 \; r1$

$\boxed{73 = 1001001}$

(g) 65

2	32	r1
2	16	r0
2	8	r0
2	4	r0
2	2	r0
		r0
2	1	r1

$\boxed{65 = 1000001}$

(h) $\frac{73}{2} = 36 \; r1$

$\frac{36}{2} = 18 \; r0$

$\frac{18}{2} = 9 \; r0$

$\frac{9}{2} = 4 \; r1$

$\frac{4}{2} = 2 \; r0$

$\frac{2}{2} = 1 \; r0 \rightarrow \frac{1}{2} = 0 \; r1$

2.4

15) (a)
```
  11
+ 01
————
 100
```

(b)
```
  10
+ 10
————
 100
```

(c)
```
  11
+ 11
————
1000
```

(d)
```
  111
+ 110
————
(loled)
```

(e)
```
  1001
+  101
————
  1110
```

(f)
```
  1101
+ 1011
————
11000
```

2.5

19) Two ways of representing zeroes in 1's complement form is by a positive or negative number. Positive 1's complements are represented as positive sign-magnitude numbers. Negative numbers are represented by the corresponding positive numbers as the 1's complement.

2.6

28)
(a)
$$-2^7\ 2^6\ 2^5\ 2^4\ 2^3\ 2^2\ 2^1\ 2^0$$
$$1\ 0\ 0\ 1\ 1\ 0\ 0\ 1$$
$$= -128 + 16 + 8 + 1 = \boxed{-103}$$

(b)
$$-2^7\ 2^6\ 2^5\ 2^4\ 2^3\ 2^2\ 2^1\ 2^0$$
$$0\ 1\ 1\ 1\ 0\ 1\ 0\ 0$$
$$= 64 + 32 + 16 + 4 = \boxed{116}$$

(c)
$$-2^7\ 2^6\ 2^5\ 2^4\ 2^3\ 2^2\ 2^1\ 2^0$$
$$1\ 0\ 1\ 1\ 1\ 1\ 1\ 1$$
$$= -128 + 32 + 16 + 8 + 4 + 2 + 1 = \boxed{-65}$$

$$= 129 - 2 = 127$$

29)

1	10000001	01001001100010000000000000
(a) S	E	F

$$n = (-1)^S (1+F)(2^{E-127}) = (-1^1)(1+F)\ 2 \times 2^2 = -1.01001001110001 \times 2^2$$
$$\boxed{n = (-1.01001001110001)_2,\ (-4.0400y)}$$

$$2^5 + 2^4 = 48$$

(b)

S	E	F
1	0011 0000 00	0 1100 0000 0000 0000 0000 0000

$$n = (-1)^S (1 + F)(2^{E-127})$$

$$n = -1(1.01100)(2^{48-127})$$

$$n = -1(1.01100)(2^{-79})$$

$$n = -1.011(2^{-79})$$

$$\boxed{n = -1.67 \times 10^{-24}}$$