Practice problem 2.1:

Practice problem 2.1

A. 0x39A7F8 to binary

Solution

Hexadecimal	3	9	A	7	F	8
Binary	0011	1001	1010	0111	1111	1000

∴ (0011 1001 1010 0111 1111 1000)₂

B. Binary 1100100101111011 to hexadecimal

Solution:

1100	1001	0111	1011
12	9	7	11

∴ (C97B)₁₆

C. 0xB5E4C to binary

Solution:

Hexadecimal:	B	5	E	4	C
Binary:	1101	0101	1110	0100	1100

∴ (1101 0101 1110 0100 1100)₂

D. Binary 100110111001111011010l

Solution:

0010	0110	1110	0111	1011	0101
2	6	E	7	B	5

∴ (26E7B5)₁₆

Practice problem 2.2:

Practice Problem 2.2

Sl.No	n	2ⁿ (Decimal)	2ⁿ (Hexadecimal)
1	9	512	0x200
2	19	524,288	0x80000
3	14	16384	0x4000
4	16	65536	0x10000
5	17	131,072	0x20000
6	5	32	20
7	7	128	0x80

$$Sol^n 2: \quad 2^{19} = 524,288$$

```
        32768
  16 | 524,288
       524,288
           0
                      128
                  16 | 2048
                       2048
      2048                0
  16 | 32768                     6
       32768             4   16 | 8
           0         16 | 128    0
                          128    8
                            0

            0 0 0 0 4      (box)
```

Sol^n 3:

```
        1024
   16 | 16384
        16384
                    4
     64          16 | 64         0
  16 | 1024          64      16 | 4
       1024           0           0
          0                       4

            0 0 0 4    (box)
```

Soln 4: 0x 10000
$= 1 \times 16^4 = 65,536$

Soln 5:
$$16 \overline{\smash{)}131,072} \quad \begin{array}{r}8192\end{array}$$
$$\begin{array}{r}131\ 072\\ \hline 0\end{array}$$

0	0	0	0	2

$$16\overline{\smash{)}512}\quad\begin{array}{r}32\end{array}$$
$$\begin{array}{r}512\\ \hline 0\end{array}$$

$$16\overline{\smash{)}8192}\quad\begin{array}{r}512\end{array}$$
$$\begin{array}{r}8192\\ \hline 0\end{array}$$

$$16\overline{\smash{)}32}\quad\begin{array}{r}2\end{array}$$
$$\begin{array}{r}32\\ \hline 0\end{array}$$

$$16\overline{\smash{)}2}\quad\begin{array}{r}0\end{array}$$
$$\begin{array}{r}0\\ \hline 2\end{array}$$

Soln 6:
$$16\overline{\smash{)}32}\quad\begin{array}{r}2\end{array}$$
$$\begin{array}{r}3\ \ \\ \hline 0\end{array}$$

$$16\overline{\smash{)}2}\quad\begin{array}{r}6\end{array}$$
$$\begin{array}{r}0\\ \hline 2\end{array}$$

0	2

Soln 7: 0x 80 = $8 \times 16^1 = 128$

Practice problem 2.3

Practice Problem 2.3

SI.NO	Decimal	Binary	Hexadecimal
1	0	0000 0000	0x00
2	167	1010 0111	0x A7
3	62	111110	0x 3E
4	188.	1011 1101	0xBC
5	55	0011 0111	0x 37
6	136	1000 1000	0x 88
7	243	1111 0011	0x F3
8	82	0101 0010	0x 52
9	172	1010 1100	0x AC
10	231	1110 0111	0x E7

Soln 2: Decimal to binary
$$2\overline{\smash{)}167}\quad 1$$
$$2\overline{\smash{)}83}\quad 1$$
$$2\overline{\smash{)}41}\quad 1$$
$$2\overline{\smash{)}20}\quad 0$$
$$2\overline{\smash{)}10}\quad 0$$
$$2\overline{\smash{)}5}\quad 1$$
$$2\overline{\smash{)}2}\quad 0$$
$$2\overline{\smash{)}1}\quad 1$$

$(10100111)_2$

Binary to Hexadecimal
$$\begin{array}{cc}1010 & 0111 \\ A & 7\end{array} = (A7)_{16}$$

Soln 3: Decimal to Binary
$$2\overline{\smash{)}62}\quad 0$$
$$2\overline{\smash{)}31}\quad 1$$
$$2\overline{\smash{)}15}\quad 1$$
$$2\overline{\smash{)}7}\quad 1$$
$$2\overline{\smash{)}3}\quad 1$$

$(111110)_2$

Binary to Hexadecimal
$$\begin{array}{cc}0011 & 1110 \\ 3 & E\end{array} = (3E)_{16}$$

Solⁿ 4 : 2 | 186   0
        2 | 94   0
          | 47   1
        2 | 23   1
        2 | 11   1
          | 5   1
        2 | 2   0
          | 1

$(10111100)_2$

Binary to Hexadecimal
1011   1100
 B   A $= (BA)_{16}$

Solⁿ 5 :   0011   01111
          3   7

$0x37_2$

Practice problem 2.4:

Solⁿ 7 : 1111   0011
          F   3 $= 0xF3_{16}$

        : 1111 0011

        : 1 + 2 + 16 + 32 + 64 + 128 = $(243)_{10}$

Solⁿ 7 :   0x52
          5   2
          0101   0010 $= (0101 0010)_2$

Practice Problem 2.4

A. 0x503C + 0x8

        503C
        + 8
        5044 $= 0x5044_2$

B. 0x503C - 0x40

        503C
         40
        4FFC $= 0x4FFC$

        503   16 + 3 = 19
                   19 - 4 = 15

Practice problem 2.6:

C. 0x503C + 64

```
  503C                    C = 12
+ 64                      C = 12 + 4 = 16
─────                     ∴ 16 - 16 = 0.
  50 A 0 %
      ∴ 0x50A0 //
```

D. 0x50ea - 0x503c

```
  50 E A
- 50 3 C                  = 0x00AE //
─────────
  00 A E //
```

Practice Problem 2.6.

A. 0x0035914)

0	0	3	5	9	1	4	4	1
0000	0000	0011	0101	1001	0001	0100		0001

= (0000 0r00 0011 0101 1001 0001 0100 0001)₂

0x4A5b64504y

4	10	5	6	4	5	0	4
0100	1010	0101	0110	0100	0101	0000	0100

(0100 1010 0101 0110 0100 0101 0000 0100)₂

B. shift these two string relative to one another to maximize the number of matching bits. How bits match?

i) 0000 0000 0011 0101 1001 0001 0100 0001

λ>>L

0000 0000 00000000 0011 0101 1001 0001.

ii) 0100 1010 0101 0110 1000 0100 0100.

λ>>L

0000 0000 0100 1010 0101 0110 0100 0101.

compare:

0000	0000	0000	0000	0011	0101	1001	0001
0000	0000	0100	1010	0101	0110	0100	0101
1111	1111	1011	0101	1001	1100	0010	1011

∴ number of matching bits = 21.

G. What parts of the string do not match?
=> We find all bits of the integer embedded in the floating point number, except for the most significant bit having value 1. such in the case for the example in the text as well. In addition, the floating point number has same zero high-order bits that do not match those of the integer.

Practice problem 2.8:

Practice Problem 2.8

operation	Result
a	01101001
b	01010101
~a	10010110
~b	10101010
a & b	01000001
a | b	01111101
a ^ b	01000001

* a & b
```
  01101001
& 01010101
  01000001
```

*
```
  01101001
| 01010101
  01111101
```

*
```
  01101001
^ 01010101
  01000001
```

Practice problem 2.16:

Practice Problem 2.16

x

Hex	Binary
0xC3	11000011
0x75	01110101
0x87	10000111
0x66	01100110

x << 3

Binary	Hex
00011000	0x18
10101000	0xA8
00111000	0x38
00110000	0x30

Logical
x >> 2

Binary	Hex
00110000	0x30
00011101	0x1D
00100001	0x21
00011001	0x19

Arithmetic
x >> 2

Binary	Hex
11110000	0xF0
01011101	0x1D
11100001	0xE1
00011001	0x19