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COSC 2406 lab 1 - Math, Part 1.
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ⓐ 125

Decimal to Binary

Rough

$$2 \overline{)125}$$ quotient 62, 124, remainder 1

Decimal	Quotient	Reminder
125	62	1
62	31	0
31	15	1
15	7	1
7	3	1
3	1	1
1	0	1

up ↑ Down — down to up

Binary no is : 1111101

ⓑ 42

Decimal	Quotient	Reminder
42	21	0
21	10	1
10	5	0
5	2	1
2	1	0
1	0	1

Binary no is : 101010

Binary to decimal.

(a) 1001 0010 1101 1000

$= (1 \times 2^{15}) + (0 \times 2^{14}) + (0 \times 2^{13}) + (1 \times 2^{12}) +$
$(0 \times 2^{11}) + (0 \times 2^{10}) + (1 \times 2^{9}) + (0 \times 2^{8}) +$
$(1 \times 2^{7}) + (1 \times 2^{6}) + (0 \times 2^{5}) + (1 \times 2^{4}) +$
$(1 \times 2^{3}) + (0 \times 2^{3}) + (0 \times 2^{1}) + (0 \times 2^{0})$

$= 32768 + 0 + 0 + 4096 + 0 + 0 + 512 + 0 + 128 +$
$64 + 0 + 16 + 8 + 0 + 0 + 0$

$= 37592$

(b) 1011 1010 1010 1111

$= (1 \times 2^{15}) + (0 \times 2^{14}) + (1 \times 2^{13}) + (1 \times 2^{12}) +$
$(1 \times 2^{11}) + (0 \times 2^{10}) + (1 \times 2^{9}) + (0 \times 2^{8}) +$
$(1 \times 2^{7}) + (0 \times 2^{6}) + (1 \times 2^{5}) + (0 \times 2^{4}) +$
$(1 \times 2^{3}) + (1 \times 2^{2}) + (1 \times 2^{1}) + (1 \times 2^{0})$

$= 32768 + 0 + 8192 + 4096 + 2048 + 0 + 512 +$
$0 + 128 + 0 + 32 + 0 + 8 + 4 + 2 + 1$

$= 47727$

decimal to hexadecimal.

(a) 925

divide by 16.

Decimal	Quotient	Reminder
925	57	13 (D)
57	3	9
3	0	3

hexadecimal no is 390.

(b) 104

Decimal	Quotient	Reminder
104	6	8
6	0	6

hexadecimal no is 68.

hexadecimal to decimal.

(a) 0x5F53DA

$= (6 \times 16^5) + (15 \times 16^4) + (5 \times 16^3) + (3 \times 16^2) + (13 \times 16^1) + (10 \times 16^0)$

$= 5242880 + 983040 + 20480 + 768 + 208 + 10$

$= 6272386$

(b) 0x54ABC2

$= (5 \times 16^5) + (4 \times 16^4) + (10 \times 16^3) + (11 \times 16^2) + (12 \times 16^1) + (2 \times 16^0)$

$= 5242880 + 655360 + 40960 + 2816 + 192 + 2$

$= 5977210$

Binary to hexadecimal

(a) 1011 1000 0001 0000

1011	B
1000	8
0001	1
0000	0

B810

(b) 1010 0100 0011 1100

1010	A
0100	4
0011	3
1100	C

A43C

Hexadecimal to Binary :

(a) 0x5CD6

5	C	D	6
0101	1100	1101	0110

(b) 0x2BCD

2	B	C	D
0010	1011	1100	1101

2's complement.

(a) 1000 0101

0111 1010 + 1 = 0111 1011

(b) 1001 1101

0110 0010 +1 = 0110 0011

(a) 1101 1000 + 1000 1100

= 11010 0100

MSB is 1

0101 1100, sign bit is 0

decimal equivalent is 92.

(b) 1110 1010 - 0010 0100

1110 1010 + 1101 1100 = 1 1100 0110

MSB is 1

Sign bit is 0.

Decimal equivalent is 58.

(a) $0x1F + 0xA9. = 0xC8$

MSD is C

Sign digit is 0

Answer is positive.

decimal equivalent is 8

(b) $0x3B - 0x12 = 0x3B + 0xEE = 0x129$

MSD is 1

2's complement of 29 to get D7

answer is negative.

decimal equivalent is -41.

(a) $x + (y \& \sim z)$ xor y

Table :-

x	y	z	~z	y & ~z	x + (y & ~z)	x + (y & ~z) xor y
0	0	0	1	0	0	0
0	0	1	0	0	0	0
0	1	0	1	1	1	0
0	1	1	0	0	0	1
1	0	0	1	0	1	1
1	0	1	0	0	1	1
1	1	0	1	1	1	0
1	1	1	0	0	1	0

(b) $(x+y)\ \&\ \sim z$ xor y

x	y	z	$\sim z$	$x+y$	$(x+y)\ \&\ \sim z$	$(x+y)\ \&\ \sim z$ xor y
0	0	0	1	0	0	0
0	0	1	0	0	0	0
0	1	0	1	1	1	0
0	1	1	0	1	0	1
1	0	0	1	1	1	0
1	0	1	0	1	0	0
1	1	0	1	1	1	0
1	1	1	0	1	0	1