COSC2406 Lab 1 – Math, Part 1   Name: _Jeel Tikiwala_____

Submit this sheet with all calculations and all supporting work.
Convert the following decimal numbers to binary without converting into hexadecimal:
  (a) 125 ANS: 1111101
  (b) 42   ANS: 101010

Convert the following binary numbers to decimal without converting into hexadecimal:
  (a) 1001 0010 1101 1000   ANS: 37592
  (b) 1011 1010 1010 1111   ANS: 47727

Convert the following decimal numbers to hexadecimal without converting into binary:
  (a) 925   AND: 39D
  (b) 104   ANS: 68

Convert the following hexadecimal numbers to decimal without converting into binary:
  (a) 0x5F53DA ANS: 6272386
  (b) 0x54ABC2   ANS: 5977210

Convert the following binary numbers to hexadecimal without converting into decimal:
  (a) 1011 1000 0001 0000 ANS: B810
  (b) 1010 0100 0011 1100   ANS:A43C

Convert the following hexadecimal numbers to binary without converting into decimal:
  (a) 0x5CD6   ANS: 0101n1100 1101 0110
  (b) 0x2BCD   ANS: 0010 1011 1100 1101

Calculate the 2's complement of each of the following numbers:
  (a) 1000 0101 ANS: 0111 1011
  (b) 1001 1101   ANS: 0110 0011

Perform the following signed operations in binary. Do not convert the numbers to any other base. Remember to complement and add for signed subtraction.
  (a) 1101 1000 + 1000 1100
  (b) 1110 1010 – 0010 0100

Perform the following signed operations in hexadecimal. Do not convert the numbers to any other base. Remember to complement and add for signed subtraction.
  (a) 0x1F + 0xA9
  (b) 0x3B – 0x12

Fill in a truth table for the following functions. Follow the precedence order and show all steps. Note: + = OR, & = AND, ~ = NOT, xor = XOR
  (a) x + (y & ~z) xor y
  (b) (x + y) & ~z xor y

ⓐ 125   Decimal to Binary

                                                                    Rough

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

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        62
    2 | 125
        124
        ___
         1
```

up ↑

down to up

Down ↓

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.

ⓐ 1001 0010 1101 1000

$(1 \times 2^{15}) + (0 \times 2^{14}) + (0 \times 2^{13}) + (1 \times 2^{12}) +$

$(0 \times 2^{11}) + (0 \times 2^{10}) + (1 \times 2^{9}) + (0 \times 2^{8}) +$

$(1 \times 2^{7}) + (1 \times 2^{6}) + (0 \times 2^{5}) + (1 \times 2^{4}) +$

$(1 \times 2^{3}) + (0 \times 2^{3}) + (0 \times 2^{1}) + (0 \times 2^{0})$

$= 32768 + 0 + 0 + 4096 + 0 + 0 + 512 + 0 + 128 +$

$64 + 0 + 16 + 8 + 0 + 0 + 0$

$\boxed{= 37592}$

ⓑ 1011 1010 1010 1111

$= (1 \times 2^{15}) + (0 \times 2^{14}) + (1 \times 2^{13}) + (1 \times 2^{12}) +$

$(1 \times 2^{11}) + (0 \times 2^{10}) + (1 \times 2^{9}) + (0 \times 2^{8}) +$

$(1 \times 2^{7}) + (0 \times 2^{6}) + (1 \times 2^{5}) + (0 \times 2^{4}) +$

$(1 \times 2^{3}) + (1 \times 2^{2}) + (1 \times 2^{1}) + (1 \times 2^{0})$

$= 32768 + 0 + 8192 + 4096 + 2048 + 0 + 512 +$

$0 + 128 + 0 + 32 + 0 + 8 + 4 + 2 + 1$

$\boxed{= 47727}$

decimal to hexadecimal.

divide by
16.

(a) 925

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

hexadecimal no is 39D.

(b) 104

Decimal	Quotient	Reminder
104	6	8
6	0	6

hexadecimal no is 68.

hexadecimal to decimal :

(a) 0x 5F53DA

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

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

$$\boxed{= 6272386}$$

(b) 0x 54ABC2

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

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

$$\boxed{= 5977210}$$

Binary to hexadecimal

(a) 1011   1000   0001   0000

    1011   B
    1000   8
    0001   1
    0000   0

$$\boxed{B810}$$

(b) 1010   0100   0011   1100

    1010   A
    0100   4
    0011   3
    1100   C

$$\boxed{A43C}$$

Hexadecimal to Binary.

(a) 0x5CD6

5	C	D	6
0101	1100	1101	0110

(b) 0x2BCD

2	B	C	D
0010	1011	1100	1101

2^5 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 0101 1110 → 1 + 0101 1110

answer is positive.

decimal equivalent is 8

(b) 0x3B − 0x12 = 0x3B + 0x33 = 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	0	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

⑥ (x+y) & ~z x or y

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