1) Decimal to Binary

a)

10	0
5	1
2	0
1	1

$\Rightarrow 1010$

b)

1369	1
684	0
342	0
171	1
85	1
42	0

21	1
10	0
5	1
2	0
1	1
0	

$= 10101011001$

c)

9234876	0
4617438	0
2308719	1
1154359	1
577179	1
288589	1
144294	0

72147	1
36073	1
18036	0
9018	0
4509	1
2254	0
1127	1
563	1
281	1
140	0
70	0
35	1
17	1
8	0
4	0
2	0
1	1

$= 10001100111010011011100$

d)

49263749	1
24631874	0
12315937	1
6157968	0
3078984	0
1539492	0
769746	0
384873	1

192436	0
96218	0
48109	1
24054	0
12027	1
6013	1
3006	0
1503	1

751	1
375	1
187	1
93	1
46	0
23	1
11	1
5	1

2	0
1	1
0	

$= 10111011111011010010000101$

Decimal to Binary using 2's complement

a) $-20 \Rightarrow 010100$ (w) $\Rightarrow 101011$ (v) $\xrightarrow{+1} 101100$

$-3925 \Rightarrow 011110101010 \xrightarrow{+1} 100001010110$

$-104596 \Rightarrow 011001100010010100 \Rightarrow 100110011101101011 \xrightarrow{+1} 100110011101101100$

b) $-10 \xrightarrow{10} 01010 \sim 10101 \xrightarrow{+} 10110$

Unsigned binary to hex

a) $\underbrace{1100}_{C}\underbrace{1111}_{F}\underbrace{0101}_{5}\underbrace{0110}_{6}\underbrace{0110}_{6}\underbrace{1110}_{E}\underbrace{1101}_{D}\underbrace{1000}_{8}\underbrace{0010}_{2}\underbrace{1001}_{9} = CF566ED829$

8905083351459	9
556567709446	2
34785481849	8
2174092261	D
135807 8	E

849269	6
53078	6
3317	5
207	F
12	C

$= CF566ED829$

b) $\underbrace{1000}_{8}\underbrace{0111}_{7}\underbrace{1000}_{8}\underbrace{1110}_{E}\underbrace{0011}_{3}\underbrace{1000}_{8}\underbrace{1110}_{E}\underbrace{0011}_{3}\underbrace{1111}_{F}\underbrace{0011}_{3} = 878E38E3F3$

580266780033	3
36387217375	F
2274248835	3
142116302	E
8883768	8
55523 5	3

34702	E
2168	8
135	7
8	8

$= 878E38E3F3$

1) 10101101010111000110010101001010101010 = ADSC6S4AAA

A D S C 6 S 4 A A A

744572484330	A
46536217770	A
2908513610	A
181782106	4
11361381	S
710086	6

44380	C
2773	S
173	D
10 =	A

ADSC6S4AAA

10100010101010101010101010111111111000000 = A2AAAAABFC0

A 2 A A A A B F C 0

6986480188800	0
436655011800	C
27279693823	F
1705683663	B
106660526	A
6662822	A

41642	A
2602	A
162	2
10 =	A

A2AAAABFC0

Binary to octal

11111100000111111000000011101010 11

neg +1

000000111110000111111100010101011 = -760376125

0 0 7 6 0 3 7 6 1 2 5

130163557	5
16268192	2
2033649	1
258206	6
31775	7

3971	3
496	0
62	6
7	7
0	

0 0101010101011111111111111110000000 = 2525777777600

2 5 2 5 7 7 7 7 6 0 0

2864769504	0
44761086	6
5695135	7
699391	7
87423	7
10927	7

1365	5
170	2
21	5
2	2
0	6
0	0

= 2525777777600

11100011100000011111111100000101010 +1 = -161760837 26

1 6 1 7 6 0 0 3 7 2 6

19126803426	6
2360100426	2
2907625 5	7
37345316	3
4668 16	0
58352	0
729 a	6
911	2

113	1
14	6
1	1
0	

1617600 3726

10101010101000001010101011111000

0 1 0 1 0 1 0 1 0 1 1 1 1 0 1 0 1 0 1 0 1 0 0 0 0 1 0 0 0 = -525372524 10

5 2 5 3 7 2 5 2 4 1 0

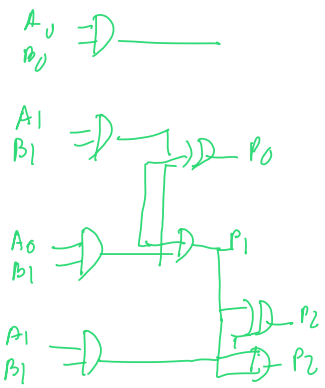
5729244429	0
716155553	1
89519444	4
11189930	2
1398741	5
174842	2
21855	7
2731	3

341	5
42	2
5	5
0	

$= -525372524_{10}$

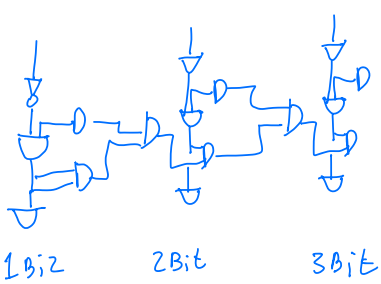
2) Boolean circuit

a) Multiplicatio of 2 2bit Numbers



A_1	A_2	B_1	B_2	P_3	P_2	P_1	P_0
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0
0	0	1	0	0	0	0	0
0	0	1	1	0	0	0	0
0	1	0	0	0	0	0	0
0	1	0	1	0	0	0	1
0	1	1	0	0	0	1	0
0	1	1	1	0	0	1	1
1	0	0	0	0	0	0	0
1	0	0	1	0	0	1	0
1	0	1	0	0	1	0	0
1	0	1	1	0	1	1	0
1	1	0	0	0	0	0	0
1	1	0	1	0	0	1	1
1	1	1	0	0	1	1	0
1	1	1	1	1	0	0	1

b) 2's Complement



A_2	A_1	A_0	
0	0	0	000
0	0	1	111
0	1	0	100
0	1	1	011
1	0	0	001
1	0	1	110
1	1	0	101
1	1	1	010

3) Multiplications in binary

a) -5×8

$-5 = 1011 = MD$

$8 = 01000 = Q$

$n = 6$

PD	Q	Q_1	Operation
0000	1000	0	
0000	0100	0	Shift
0000	0010	0	Shift
0000	0001	0	Shift
0101	0001	0	PD+MD
0010	1000	1	Shift

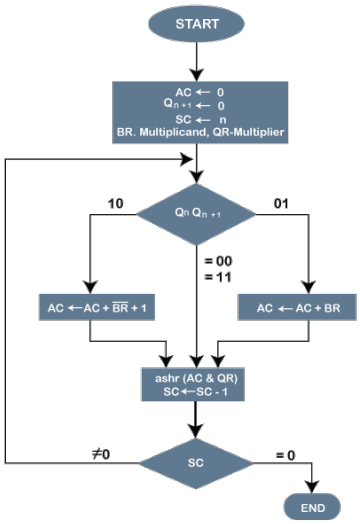
PD = PD − MD

0000

+ 0101

0101

$00101\ 10001 = -40$



b) $11 \times (-10)$

$11 = 01011$ $\quad -10 = 10110$

$-11 = 10101 = MD$

PD	Q	Q_1	Operation
00000	10100	0	
00000	01010	0	Shift
10101	01010	0	PD−MD
11010	10101	1	Shift
11101	01010	1	Shift
01000	01010	1	PD+MD
00100	00101	0	Shift
11001	00101	0	PD−MD
11100	10010	1	Shift

00000

+ 10101

10101

11101

+ 01011

X01000

00100

10101

11001

$11100\ 10010 = -110$

c) 2x3

2 = 010 −2 = 110
3 = 011 MD −3 = 101

PD	Q	Q_1	Operation
000	010	0	
000	001	0	shift
101	001	0	PD−MD
110	100	1	Shift
001	100	1	PD+MD
000	110	0	Shift

```
 000
 101
 ---
 101

 110
 011
 ----
 1001
```

000110 = 6

−4 x −8

4 = 0100 −4 = 1100
8 = 01000 −8 = 11000

PD	Q	Q_1	Operation
0000	1100	0	
0000	0110	0	Shift
0000	0011	0	Shift
1000	0011	0	PD−MD
0100	0001	1	Shift
0010	0000	1	Shift

```
 0000
 01000
 01000
```

00100000 = 32