1c - Number System (Decimal rep. 2's comp)

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Decimal to binary

eg: 23 -> (i) div by 2

$q = 14$, $r = 1$

(ii) repeat dividing by 2

2 | 29	1
2 | 14	0
2 | 7	1
2 | 3	1
1	

11101

$2^4\ 2^3\ 2^2\ 2^1\ 2^0$

11101

$= 16 + 8 + 4 + 0 + 1$

$= 29$ - Ans.

Q 35 to binary

2 |	35	
2 |	17	1
2 |	8	1
2 |	4	0

100011

2 | 2 | 0
1 | 0

2's Compliment : negative to binary.

(i) Compliment every bit : 0 → 1
1 → 0

(ii) Add 1 to final no.

Q/ 2's comp of 0 100

0 1 00 ⟶ 1 0 1 1 $\xrightarrow{+1}$ 1 1 0 0

Q/ Represent 5 in 2's comp system.

$(5)_{10} = (0101)_2$

2's Comp

(i) +ve no. ↓

(ii) -ve no. ↓

Represent in binary

Use 2's compliment

Most Significant Bit (MSB)

i) 0 => positive

ii) 1 => negative.

Q. Represent -5 as 2's complement

Take 2's comp.

$\therefore 5 \rightarrow 0101 \xrightarrow[\text{compliment}]{2\text{'s}} 1010$

$+1$

1011

MSB (left most) is 1.
So we know no. is -ve.

NOTE: 5 can not be represented in 3 bits in 2's comp system as it is 101.

And MSB here is 1. But 5 is +ve.
So we take 0101.

Q In 16-bit 2's complimented representation, the decimal no. is -28.

$(28)_{10} \Rightarrow (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 1\ 1\ 0\ 0)_2$

↓ 2's comp

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1 1 1 1 1 1 1 1 1 1 1 0 0 0 1 1
                          +     1
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1 1 1 1 1 1 1 1 1 1 1 0 0 1 0 0
```

— Ans.

Q 43 in 2's comp. representation.

$(43)_{10} \Rightarrow (1\ 0\ 1\ 0\ 1\ 1)_2$ ← Add a 0 in front ∵ in 2's comp if there is 1 at MSB it represents (-)ve.

↓

0 1 0 1 0 1 1

Q 2's comp representation of 15.

$(15)_{10} \Rightarrow 1111 \xrightarrow{2\text{'s comp}} 10000$