$8734 \Rightarrow 8000 + 700 + 30 + 4$

$\Rightarrow 8 \times 10^3 + 7 \times 10^2 + 3 \times 10^1 + 4 \times 10^0$

Decimal No system $\Rightarrow [0, 1, 2, 3, 4, 5, 6, 7, 8, 9]$

Base - 8

Octal No. system $\Rightarrow [0-7]$

$(0132)_8 \Rightarrow 0 \times 8^3 + 1 \times 8^2 + 3 \times 8^1 + 2 \times 8^0$

$\Rightarrow 64 + 24 + 2$

$= (90)_{10}$

Base - 3

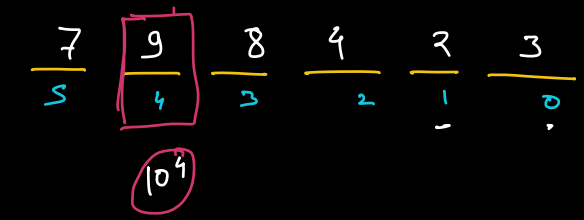
Ternay No system $\Rightarrow [0-2]$

$(1120)_3 \Rightarrow 1 \times 3^3 + 1 \times 3^2 + 2 \times 3^1 + 0 \times 3^0$

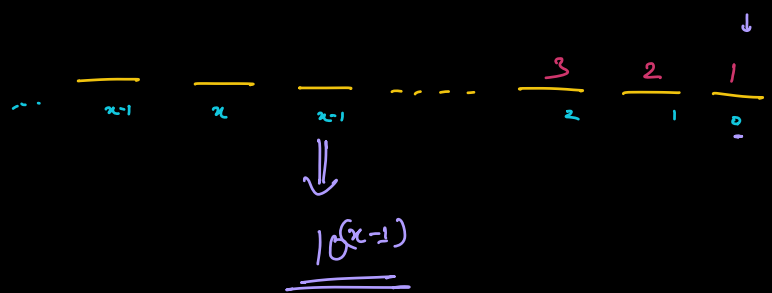
$27 + 9 + 6 + 0$

$= (42)_{10}$

Quiz 1



Quiz 2



Quiz 3

$(125)_8 \Rightarrow 1\times8^2 + 2\times8^1 + 5\times8^0$

$(85)_{10}$

Quiz 4

Incorrect octal representation

1 0 0 0 0 0 1 ✓

6582 ✗

Quiz 5

$(0\,2\,1\,0\,1)_3 \Rightarrow 2\times3^3 + 1\times3^2 + 0\times3^1 + 1\times3^0$

$54 + 9 + 0 + 1$

$(64)_{10}$

Binary Number System (2 unique digits)

[0, 1]

$(1\,0\,1\,1\,0)_2 \Rightarrow 1\times2^4 + 0\times2^3 + 1\times2^2 + 1\times2^1 + 0\times2^0$

$16 + 0 + 4 + 2 + 0$

$(22)_{10}$

Decimal to Binary

$(28)_{10} \Rightarrow$

2	28	0
2	14	0
2	7	1
2	3	1
2	1	1
	0	

$\Rightarrow (11100)_2$

Hexadecimal (16-Base) $\Rightarrow$ [0-9] + [A-F]

Quiz 6 $(37)_{10} \Rightarrow$

2	37	1
2	18	0
2	9	1
2	4	0
2	2	0
2	1	1
	0	

$(100101)_2$

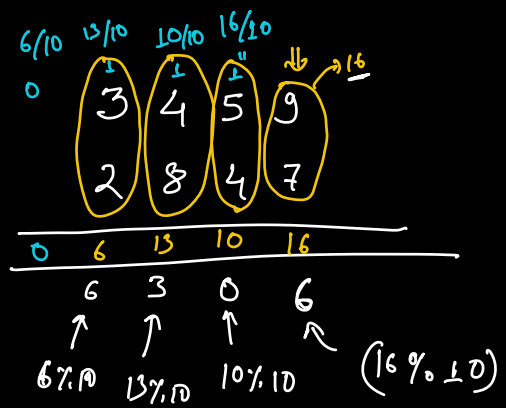
Quiz 7

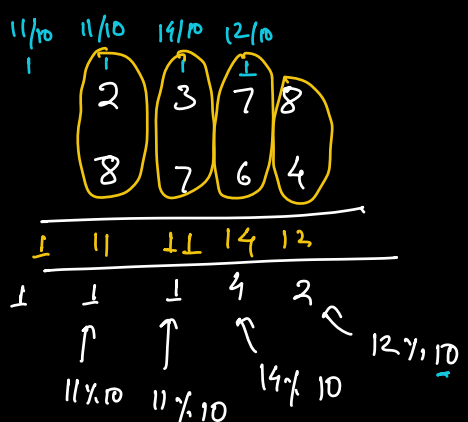
$(25)_{10} \Rightarrow$

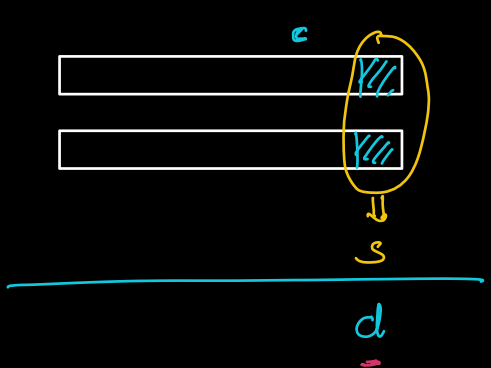
2	25	1
2	12	0
2	6	0
2	3	1
2	1	1
	0	

$(11001)_2$

Addition



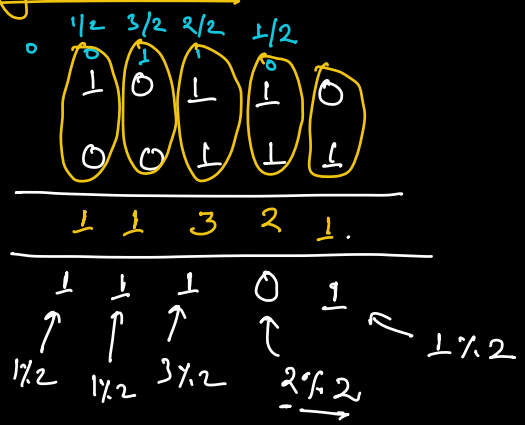


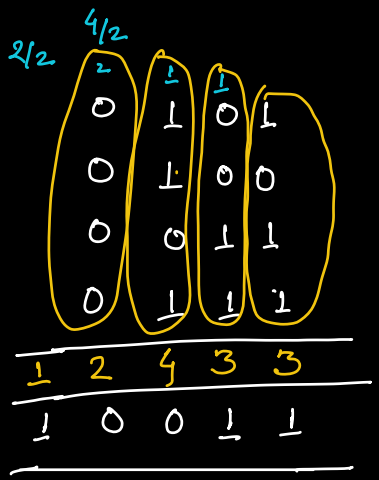


$d = S \% B$

$c = S / B$

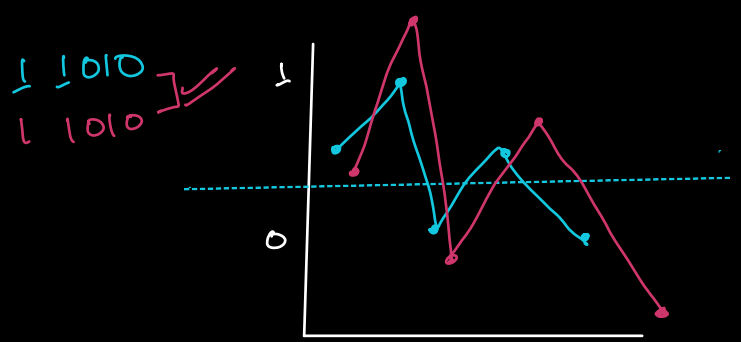
Binary Addition

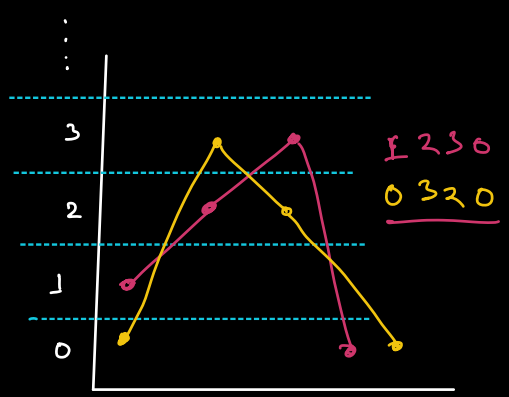




Quiz 8

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





(+) ⇒ O(1)

(−) ⇒ O(1)

(×) ⇒ O(1)

(÷) ⇒ O(1)

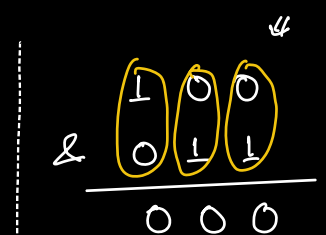
(%) ⇒ O(1)

Bit Manipulation (&, |, ~, ^, <<, >>)

a	b	a & b	a | b	a ^ b
0	0	0	0	0
0	1	0	1	1
1	0	0	1	1
1	1	1	1	0

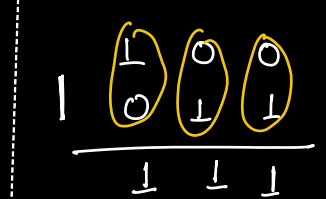
a = 4 , b = 3

a & b



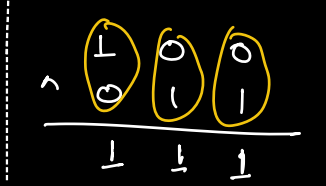
0

a | b



7

a ^ b



7

a = 13 : 1101

b = 10 : 1010

a & b = 1000 ⇒ 8

a | b = 1111 ⇒ 15

a ^ b = 0111 ⇒ 7

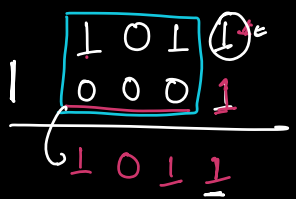
~ (Not)

a	~a
0	1
1	0

~(100) ⇒ 011

Quiz 9

11 | 1 = 11

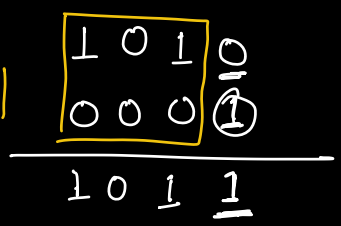


0 | 0 = 0

1 | 0 = 1

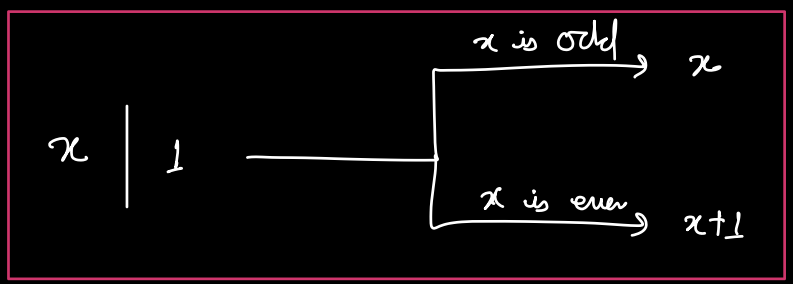
Quiz 10

10 | 1



12 | 1 => 13

13 | 1 => 13



Quiz 13

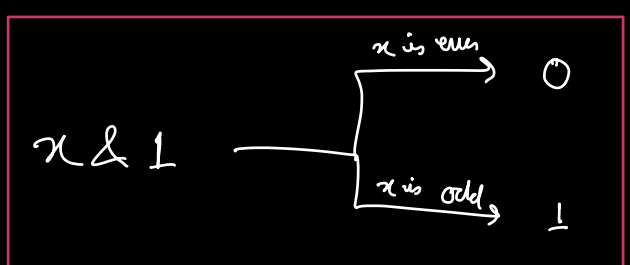
x & 1

11 & 1

```
  1011
& 0001
------
  0001
```

10 & 1

```
  1010
& 0001
------
  0000
```



Quiz 14

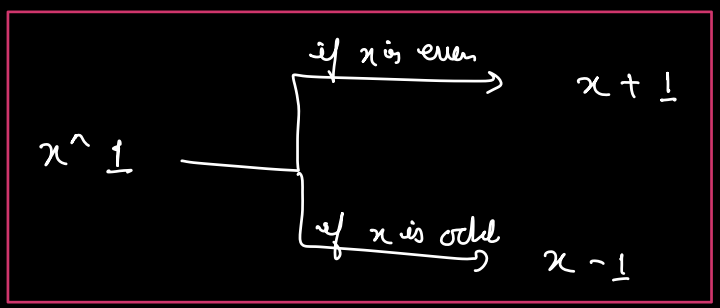
x ^ 1

(11 ^ 1)

```
  1011
^ 0001
------
  1010   => 10
```

(10 ^ 1)

```
  1010
^ 0001
------
  1011   => 11
```



$a \mid a \Rightarrow a$

$a \& a \Rightarrow a$

$a \wedge a \Rightarrow 0$

```
  101100
  101100
--------
  101100
```

```
  10111011
^ 10111011
----------
  00000000
----------
```

$a \wedge 0 \Rightarrow a$

$1 \wedge 0 = 1$
$0 \wedge 0 = 0$

```
    101101
⇒ ^ 000000
----------
  101101
```

$a \wedge b = b \wedge a$

$a \mid b = b \mid a$

$a \& b = b \& a$

$4 \wedge 0 = 4$

$120 \wedge 0 = 120$

$110 \wedge 110 = 0$

$a + b = b + a$

$a - b = b - a$ ✗

$a \times b = b \times a$

$$a \wedge b \wedge c = (a \wedge b) \wedge c = (b \wedge c) \wedge a = (c \wedge a) \wedge b$$ Same

$$120 \wedge 3 \wedge 5 \wedge 3 \wedge 120 \wedge 5$$

$$\Rightarrow (120 \wedge 120) \wedge (3 \wedge 3) \wedge (5 \wedge 5)$$

$$\Rightarrow 0$$

If $a \wedge b = k$

$a \wedge k = b$ ✓ and $b \wedge k = a$ ✓

$a \wedge b = k$

$\wedge b$ both side

$a \wedge b \wedge b = k \wedge b$

$a \wedge 0 = k \wedge b$

$a = k \wedge b$

$\Rightarrow \boxed{b \wedge k = a}$

$\wedge a$ both side

$a \wedge b \wedge a = k \wedge a$

$a \wedge a \wedge b = k \wedge a$

$0 \wedge b = k \wedge a$

$b = k \wedge a$

$\boxed{a \wedge k = b}$

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Oyo

Q Given an array where all the numbers appear even no. of times except one no. which appears odd no. of times.

Find the odd-time appearing no.

A: 2, 8, 3, 1, 2, 2, 3, 2, 8, 1, 1

1

O(N) → TC

O(1) → SC (Extra)

$$\begin{bmatrix} 2 \wedge 2 \wedge 2 \wedge 2 & = 0 \\ 8 \wedge 8 & = 0 \\ 3 \wedge 3 & = 0 \end{bmatrix}$$

$$1 \wedge 1 \wedge 1 = 1$$

2 ^ 8 ^ 3 ^ 1 ^ 2 ^ 2 ^ 3 ^ 2 ^ 8 ^ 1 ^ 1

```
ans = 0;
for(i=0; i<N; i++) {
    ans = ans ^ a[i]; ⇒O(1)
}
ret ans;
```

TC: O(N)
SC: O(1) (Extra)

+ ⇒ O(1)

(Key ⇒ ^ 6)

int a, b;

32 ⇒ O(1)