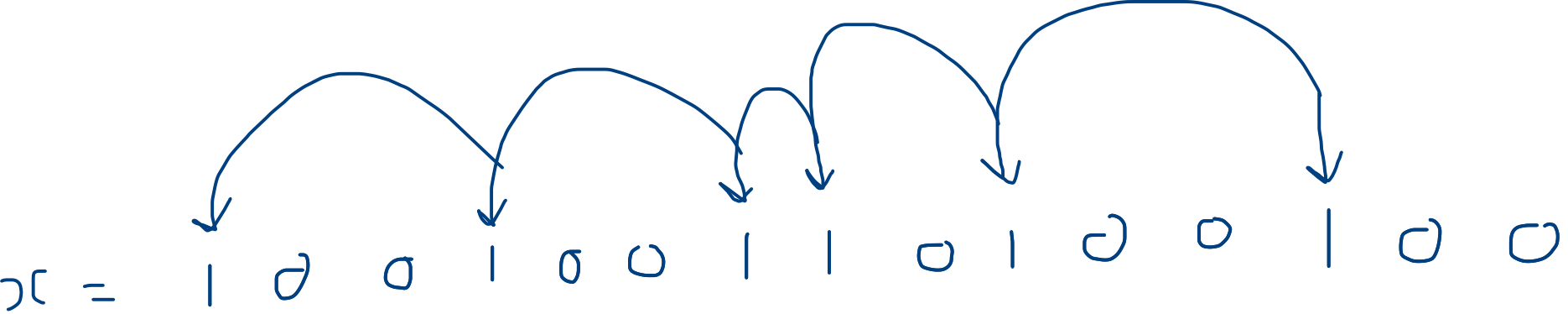
Kernighans Algorithm

count of set bits in a number

Brute
Force



$$= 1+1+1+1+1+1$$

$$= 6$$

x = 1 0 0 1 0 0 1 1 0 1 0 0 1 0 0

x_rotm = 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0

x - x_rotm = 1 0 0 1 0 0 1 1 0 1 0 0 0 0 0

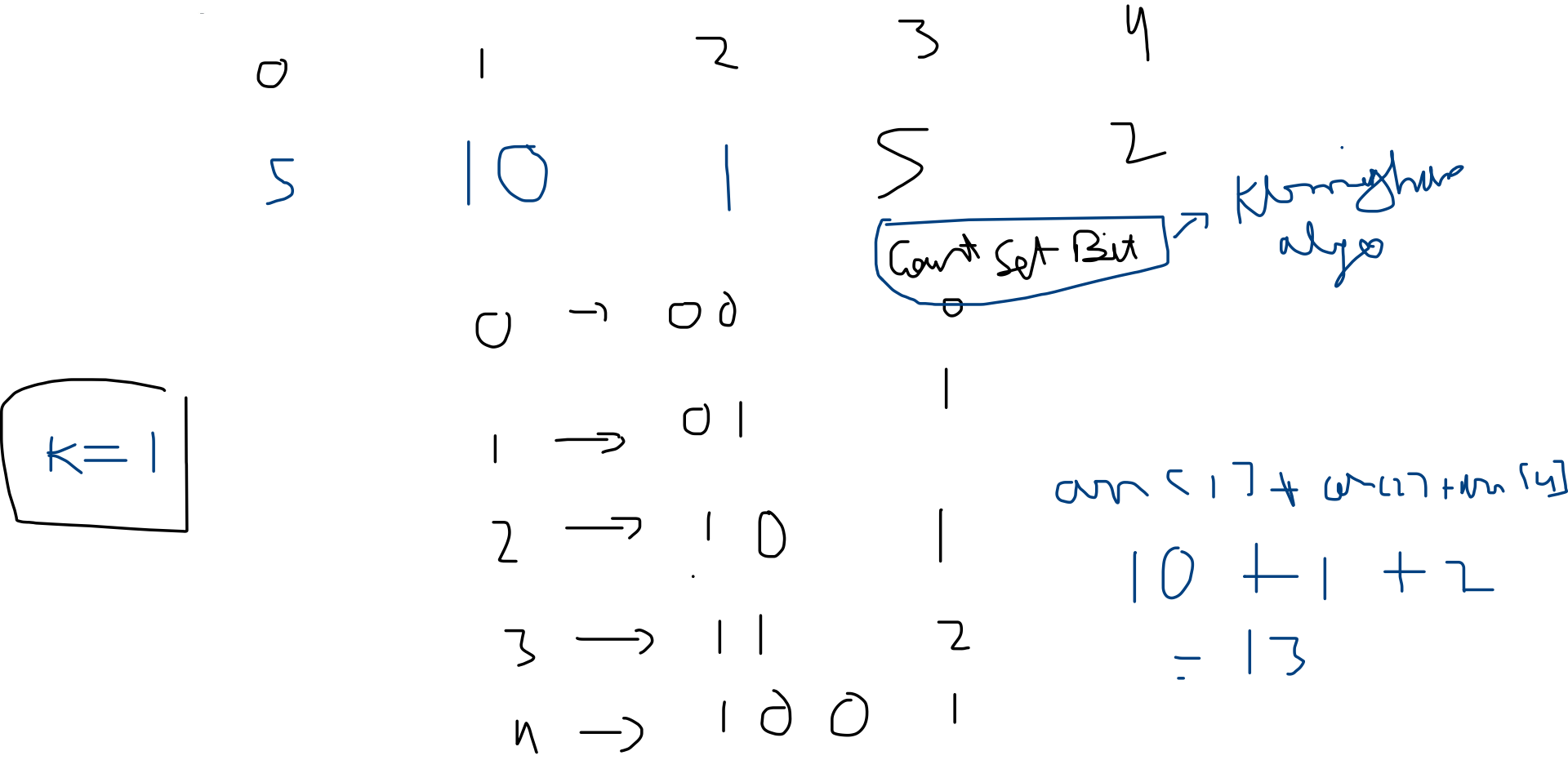
0 0 0 0 0 0 0 0 0 1 0 0 0 0 0

x - x_rotm ~~1~~ 0 0 1 0 0 ~~1~~ ~~1~~ 0 0 0 0 0 0 0

0 0 0 0

ans = 0 + 1 + 1

Sum of Values at Indices With K Set Bits



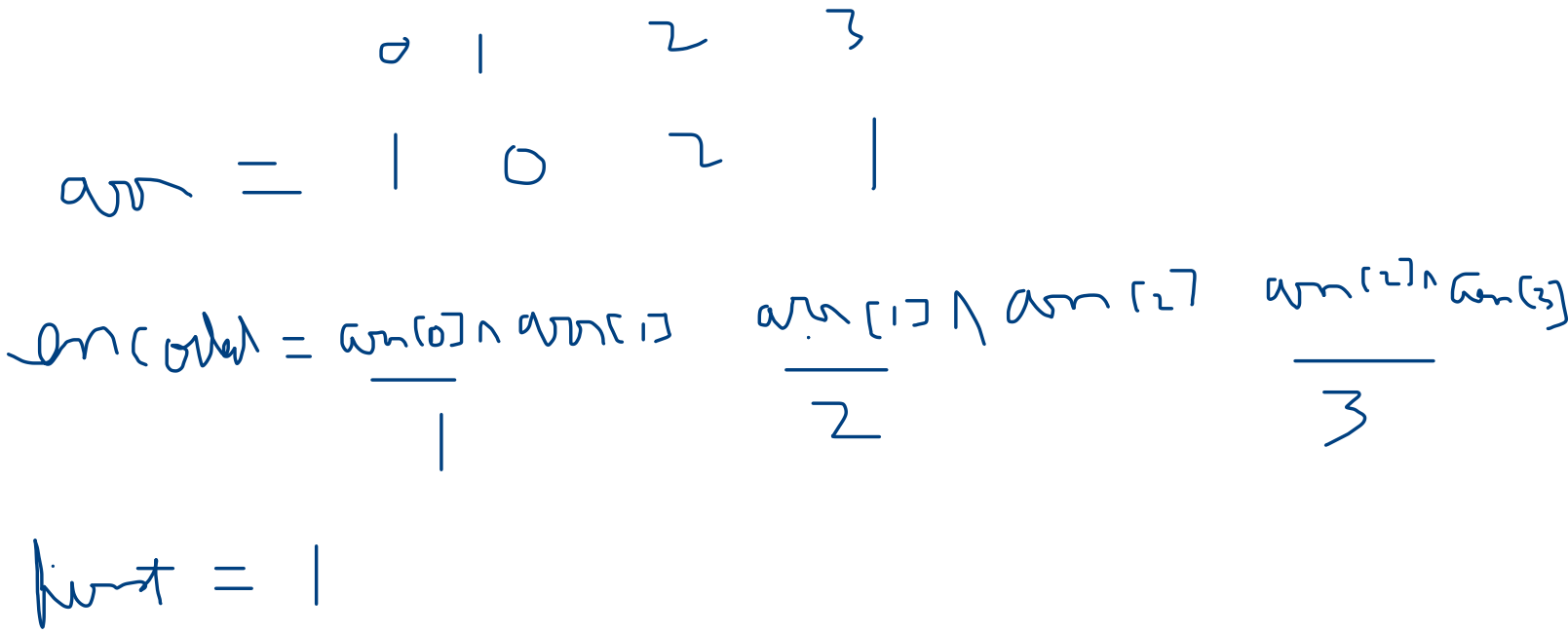
Decode XORed Array

Sample Input 0

```
3
1
2
3
1
```

Sample Output 0

```
1
0
2
1
```



Sample Input 0

```
3
1
2
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Sample Output 0

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1
0
2
1
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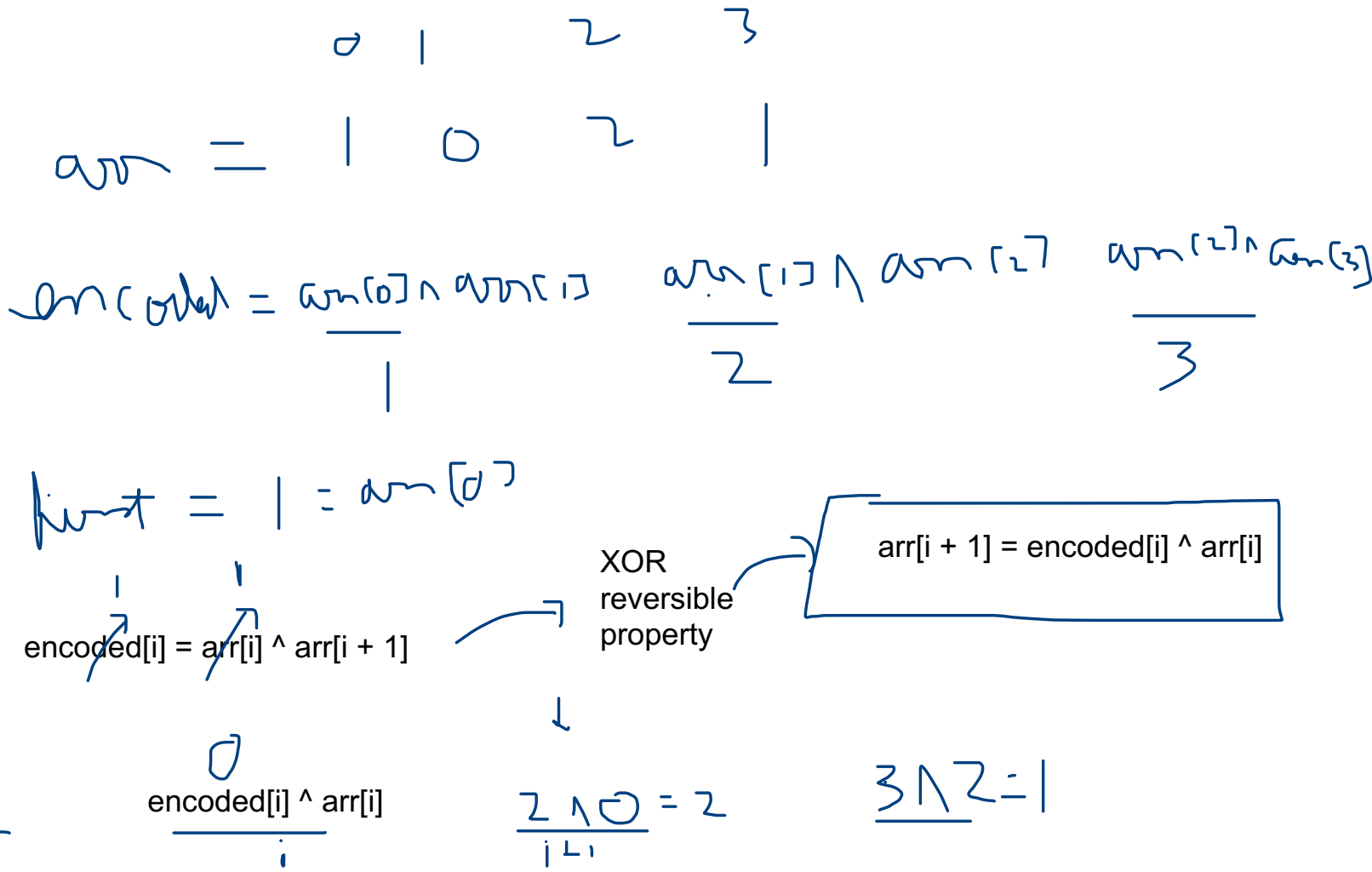


$\mathbb{Z}_6 R \Rightarrow$

$a \wedge 0 = a$

$a \wedge a = 0$

$a \wedge b \wedge a = b$

$4 \wedge 0 = 4$

$4 \wedge 4 = 0$

$4 \wedge 3 \wedge 4 = 3$

Rewrite =

$a \wedge b = c$

$b \wedge c = a$

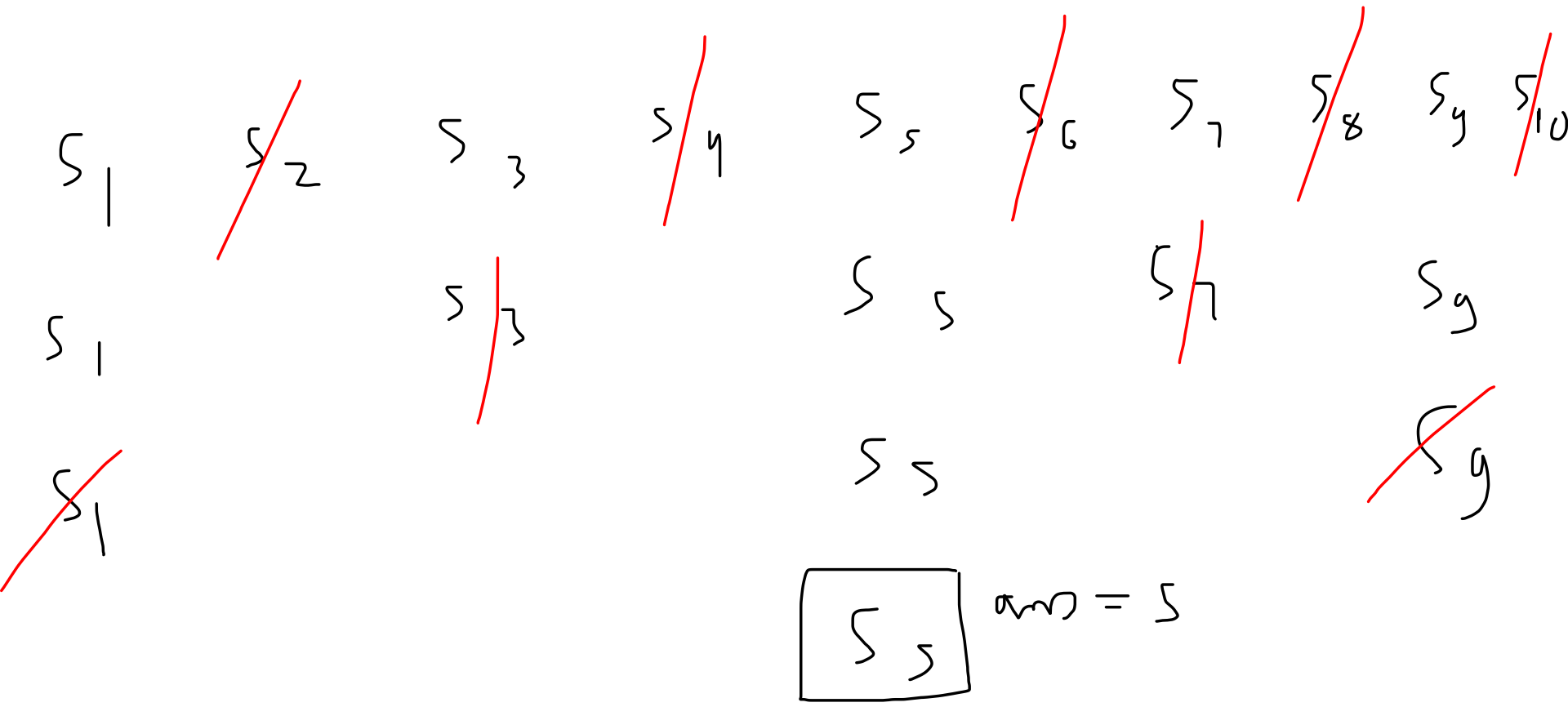
$1 \wedge 2 = 3$

$2 \wedge 3 = 1$

Josephus Special

$n = 10$

soldiers are in circle



Step 1 = $n = 2^{x} + l$

x = highest possible power of 2 to make n

$ans = 2l + 1$ = this soldier survived

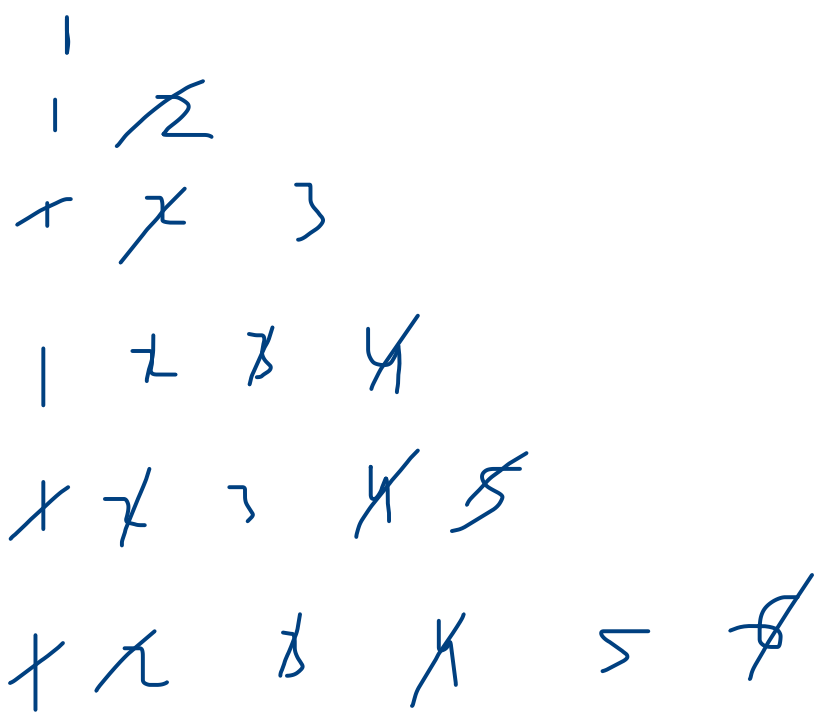
$5 = 2^2 + 1$

$7 = 2^2 + 3$

$10 = 2^3 + 2$

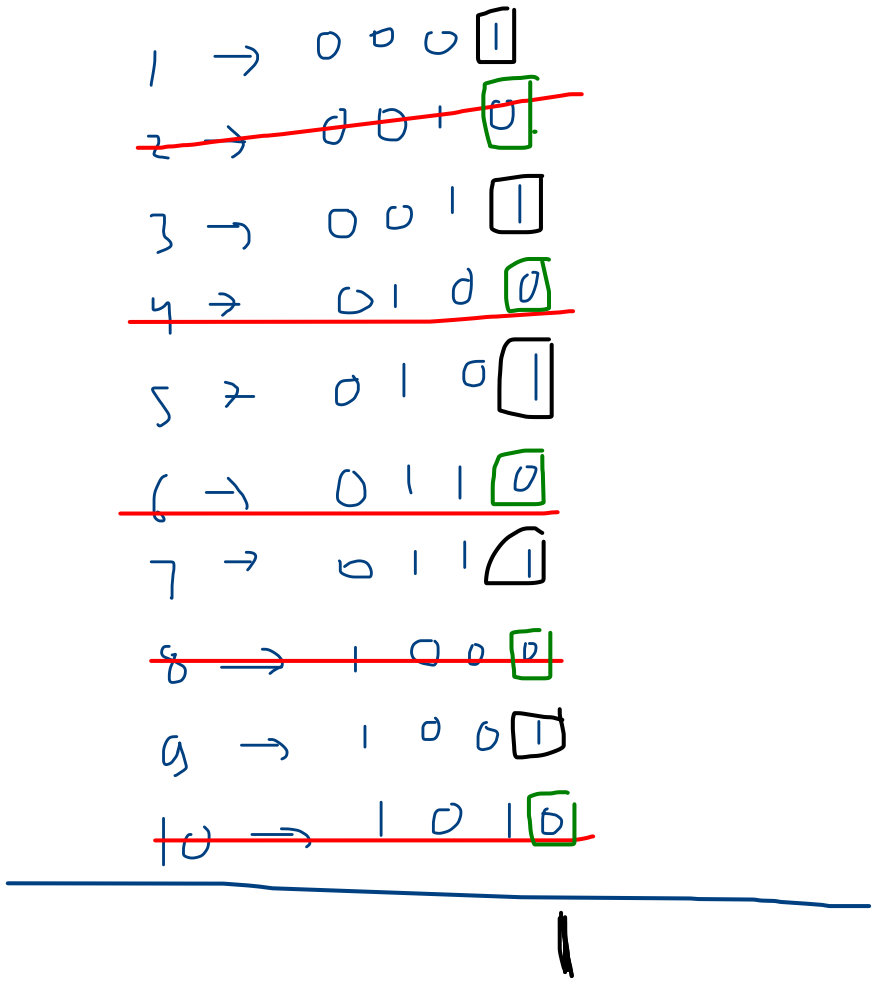
Step 2 $ans = 2 \times 2 + 1 = 5$

n	$2^n + n$	$2^0 + 1 = d$
1	$2^0 + 0$	1
2	$2^1 + 0$	1
3	$2^1 + 1$	3
4	$2^2 + 0$	1
5	$2^2 + 1$	3
6	$2^2 + 2$	5
7	$2^2 + 3$	7
8	$2^3 + 0$	1
9	$2^3 + 1$	3
10	$2^3 + 2$	5



$n = 10 = 2^3 + 2 \rightarrow a_n = 2 \times 2 + 1$ why? $2p+1$

Iteration 1

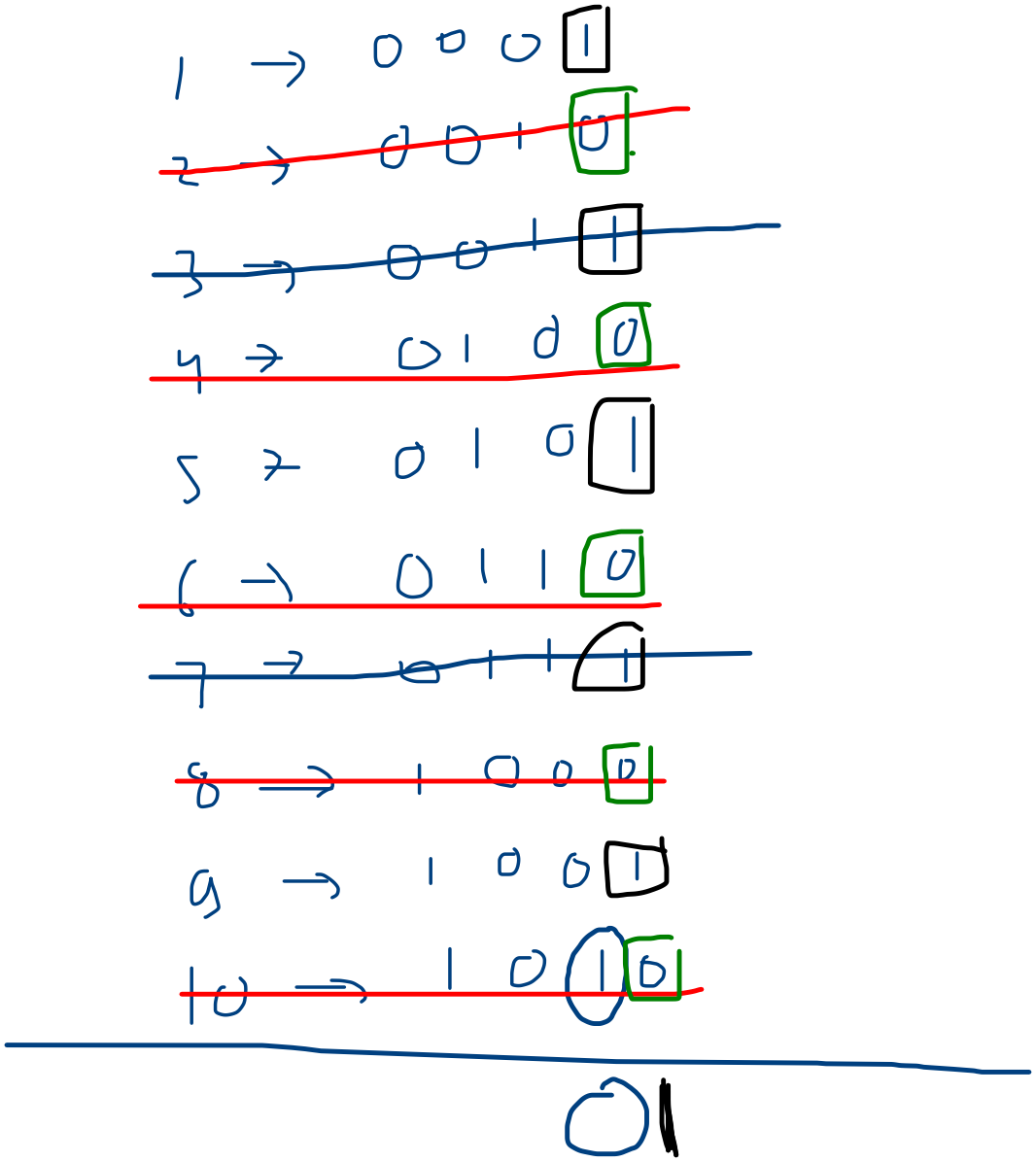


1 st iteration --> even soldiers get killed whose LSB = 0

Soldiers have LSB = 1 get survived

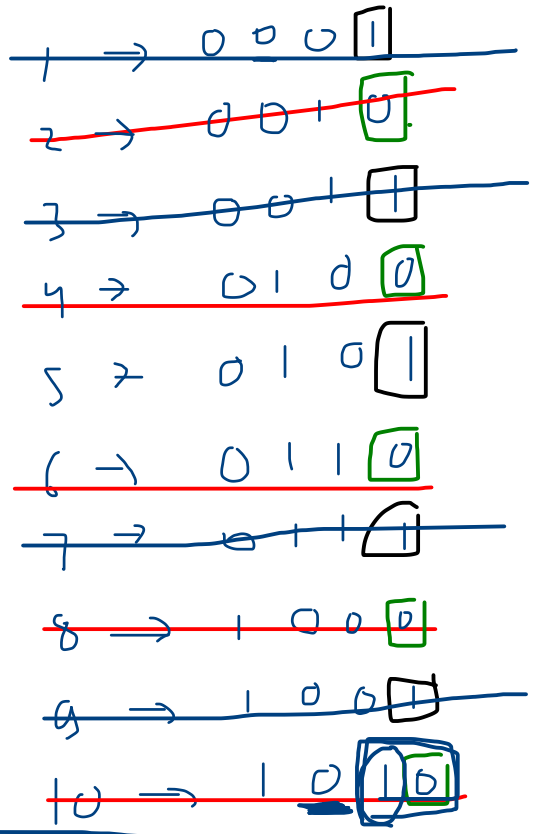
iteration 2

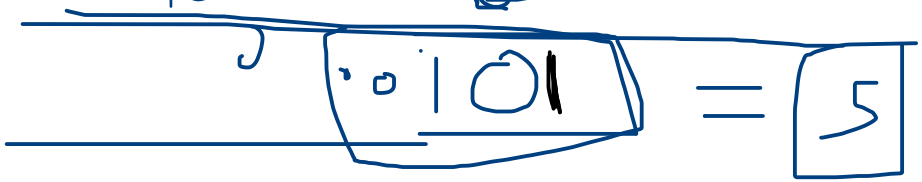
all soldiers have bit = 1 get killed

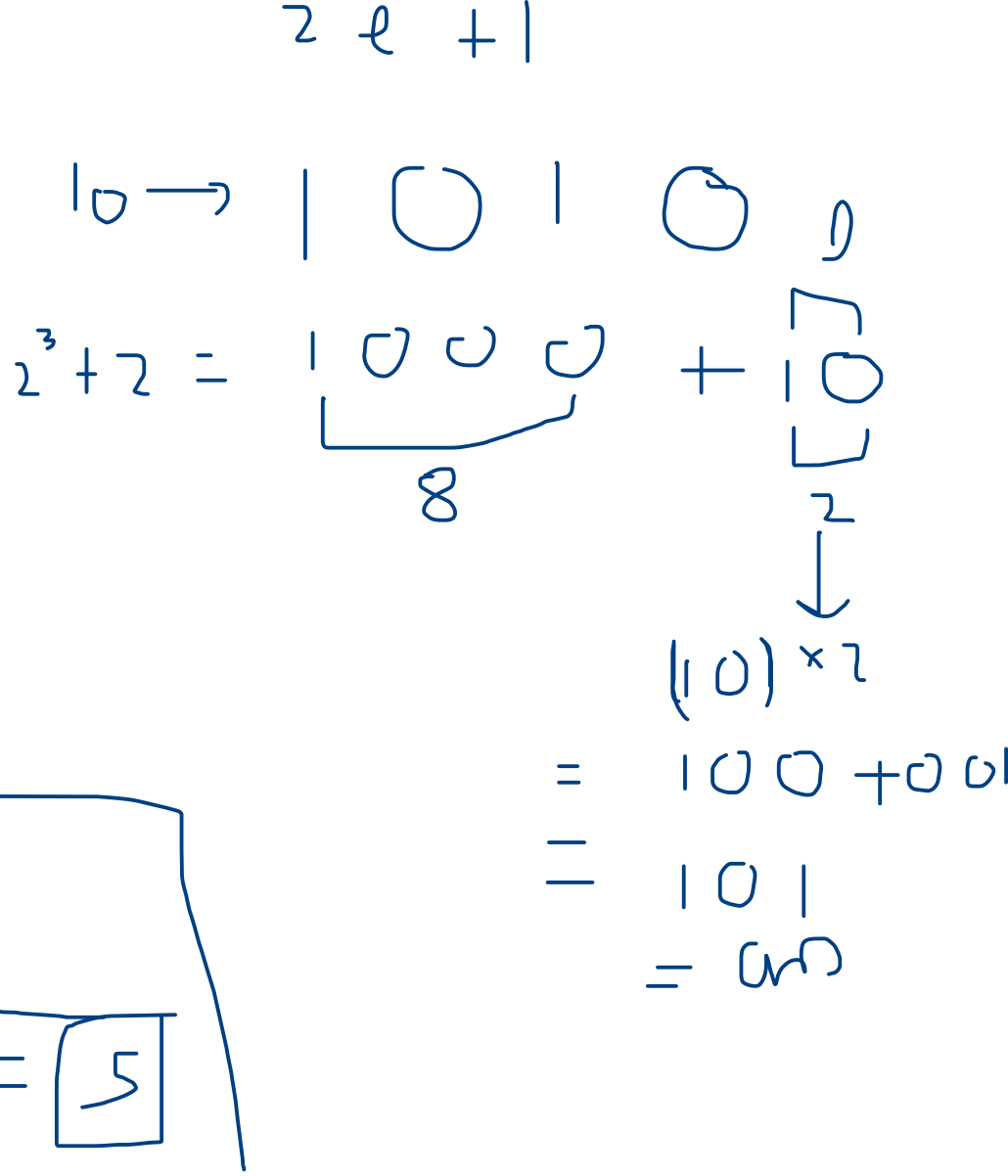


iteration 3

all soldiers have bit = 1 get killed



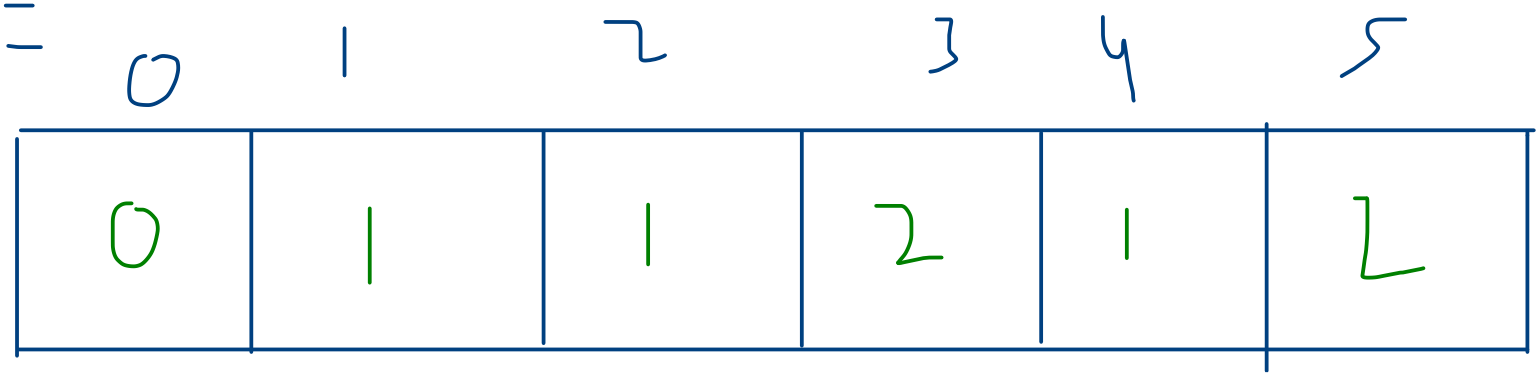




Counting Bits 2

$n = 5$

O/P =



Count set bit

Kernighan algo

Single Number

arr = 4 8 4 8 1 2 3 3

ans = 2 ⟶ present one time in arr

XOR

a ^ a = 0

a ^ 0 = a

arr = 4 ^ 8 ^ 4 ^ 8 ^ 1 ^ 2 ^ 3 ^ 3

2 ^ 0 = 2 = ans