

ARRAYS

- Binary to Decimal
- Decimal to Binary
- Nth Magic Number

Computer
humans

→ 0,1 Base 2
→ 0,1,2,...9 Base 10

Hexadecimal Base-16

Binary

$\boxed{1} \ 0 \ \boxed{11} \ 0$
 $2^4 \ 2^3 \ 2^2 \ 2^1 \ 2^0$
 $16 \ 8 \ 4 \ 2 \ 1$

$$= 16 + 4 + 2 = \boxed{22}$$

1	-	0 0 1	(2^0)
2	-	0 1 0	(2^1)
3	-	0 1 1	$(2^1 + 2^0) = 2 + 1 = \textcircled{3}$
4	-	1 0 0	(2^2)
5	-	1 0 1	$(2^2 + 2^0)$
6	-	1 1 0	$(2^2 + 2^1)$
7	-	1 1 1	$(2^2 + 2^1 + 2^0)$
8	-	1 0 0 0	(2^3)
9	-	1 0 0 1	$(2^3 + 2^0)$
10	-	1 0 1 0	$(2^3 + 2^1)$

00000

N = X X X X X

32 16 8 4 2 1
 $\uparrow \uparrow \uparrow \uparrow \uparrow$
 $\sim P$

←

sum = 0 +

$\underline{1 \times 1} + 1 \times 2$
 $+ 0 \times 4$
 $+ 1 \times 8$
 $+ 1 \times 16$

= $1 + 2 + 8 + 16$

= 27

sum = 0

P = 1

2^0

while (N > 0) {

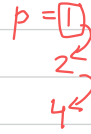
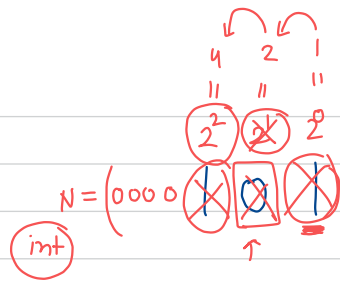
→ last-bit = $N \% 10$

→ $\text{sum} = \text{sum} + \text{last-bit} \times P$

→ $P = P \times 2$;

$N = N / 10$;

}



$$p = p \times 2;$$

```

while (N > 0) {
    last = N % 10
    Sum += last * p
    N = N / 10;
    p = p * 2
}

```

1
last

101
N

$N = 5$

```

    ↓
    0
    ↓
    0
    ↓
    0
    ↓
    0

```

{

}

$N \geq 0$ greater or equal to
↓
infinite loop

0-9
 $N = \boxed{1\ 2\ 3\ 4}$

0-1
 $1\ 0\ 1\ 0\ 1$
 $\uparrow\ \uparrow\ \uparrow\ \uparrow\ \uparrow$
 $2^4\ 2^3\ 2^2\ 2^1\ 2^0$
 $\leftarrow 16\ 8\ 4\ 2\ 1$

$P=1$

Sum
 $4+3+2+1$

while ($N > 0$) {
 \Rightarrow last-digit = $N \% 10$;
 \Rightarrow sum = sum + last-digit * P ;
 \Rightarrow $N = N / 10$;
 $P = P * 2$;
 }

online judge

Input
 $\rightarrow \boxed{10}\ 5$
 $\rightarrow \quad 3$
 $\rightarrow \quad 2$

output
 $\rightarrow 5$
 $\rightarrow 3$
 $\rightarrow 2$

No need to
 store all
 the inputs "

Given an integer A, find and return the Ath magic number. A magic number is defined as a number which can be expressed as a power of 5 or sum of unique powers of 5. First few magic numbers are 5, 25, 30(5 + 25), 125, 130(125 + 5),

Handwritten solution for finding the Ath magic number:

1	5	5^1	1
2	25	5^2	10
3	30	$5^2 + 5^1$	11
4	125	5^3	$5^3 5^2 5^1 5^0$
5	130	$5^3 + 5^1$	101

A

min power is 5^1 not 5^0

Base 5 No

Binary

1×100	1×5
$+ 0 \times 10$	$+ 0 \times 5^2$
$+ 1 \times 1$	$+ 1 \times 5^1$
<hr/>	<hr/>
100	130
$+ 00$	
$+ 1$	
<hr/>	<hr/>
101	

Decimal to Binary

$(12) \rightarrow 1100$

2	12		
2	6	0	\times
2	3	0	$\times 10$
2	1	1	$\times 100$
	0	1	$\times 1000$

1100

1000
 $+100$
 $+100$
 $+0$
 $\hline 1100$

12
 $\hookrightarrow 6$
 $\hookrightarrow 3$
 $\hookrightarrow 1$
 $\hookrightarrow 0$

Sum = 0;

$p = p \times 1$

while ($N > 0$) {

$\text{rem} = N \% 2;$

$\Rightarrow \text{sum} = \text{sum} + \text{rem} \times p;$

$N = N / 2; \quad p = p \times 10;$

}

\rightarrow
 $0, 0, 1, 1$

$\boxed{1100} \leftarrow$

```
static int decimalToBinary(int n){
    int p = 1;
    int sum = 0;
```

```
    while(n>0){
        ✓ int rem = n%2;
        ✓ sum = sum + rem*p;
        p = p*10; ✓
        n = n/2; ✓
    }
    return sum;
```

2	12		
2	6, 0	x	1
2	3, 0	x	10
2	1, 1		100
2	0, 1		1000

N = 12

12 > 0

0 x 1

1
¹⁰⁰
100 => got it
 1000

p = 1

sum = 0 + 0 x 1 + 0 x 10
 + 1 x 100


```

static int magicNo(int n){
    ✓int p = 5; //5^1
    ✓int sum = 0;

    while(n>0){
        int rem = n%2; ✓ ①
        → sum = sum + rem*p;
        → p = p*5; ←
        → n = n/2;
    }
    return sum;
}

```

N=9

625 125 25 5

1001

0 + 1 × 5

+ 0 × 25

+ 0 × 125

+ 1 × 625

630

2	9
2	4, ①
2	2, 0
2	1, 0
	0, 1
	↑
	Stop

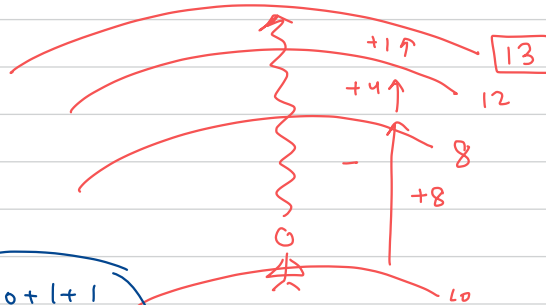
Live Challenge : There is fight going on at Level N above earth, there is superhero that wants to reach level N, but he can only jump in power of 2, what is min jumps he would need to reach level N.

↑
largest possible jump

2	13
2	6, (1)
2	3, (0)
2	1, (1)
0	(1)

1 + 0 + 1 + 1
= 3
jumps

13 = 1 ✓
6 → 0 ✓
3 → 1 ✓
1 → 1 ✓
0 stop



Sum = 0

while (N > 0) {

sum = sum + (n % 2);

n = n / 2;

3

Sum = 3

3 jumps

$$8 + 4 + 1 \Rightarrow \begin{matrix} (1) & (1) & 0 & (1) \\ 2^3 & 2^2 & 2^1 & 2^0 \end{matrix} = 13$$

Count sets in [N]

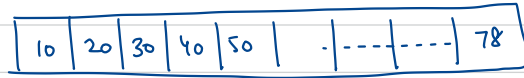
rem

ARRAY

marks = [20, 30, 15, 60, 48] Storage

int physics
chem
maths
:

Students = [10, 20, 30, -----, 78] 1000 students
↓



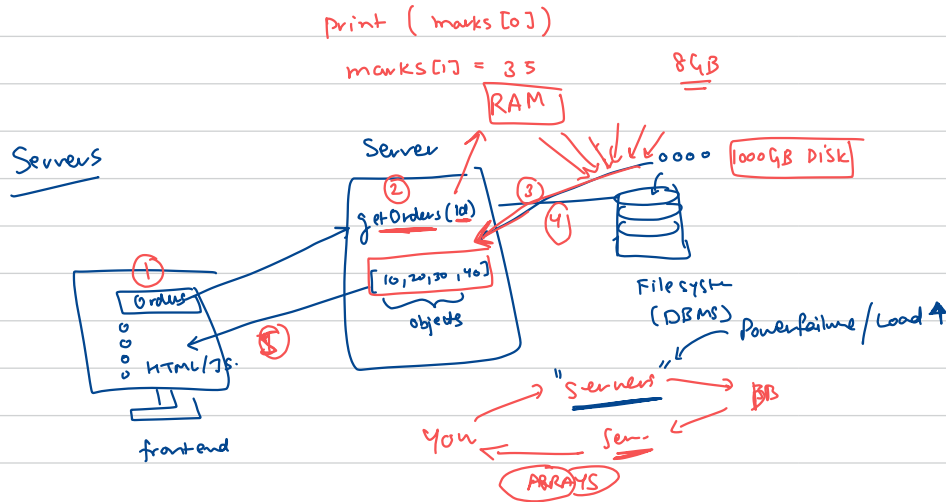
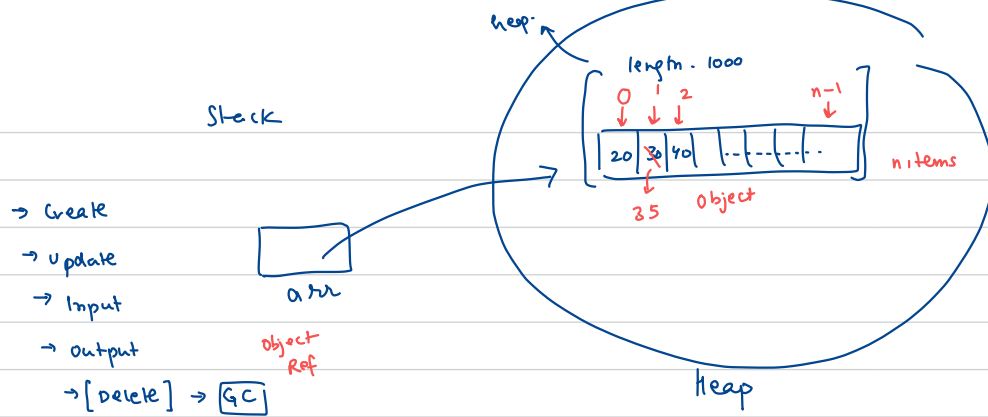
int [] marks
= new int [1000];

↑
marks

↑
object

Array → collections of buckets (same type) homogeneous

Arrays in Java → objects → heap



Pass By Value

Primitives are always copied

for objects, the object ref are copied.

↓
the actual object can be
modified from
outside fn.