Sprint-2 [Day-1]

Time and Space Complexity-1

✓Veg → 1KG, 2KG

✓milk → 1L 1.5L

Hyd → BLR : 500km, 1000km

Computer memory

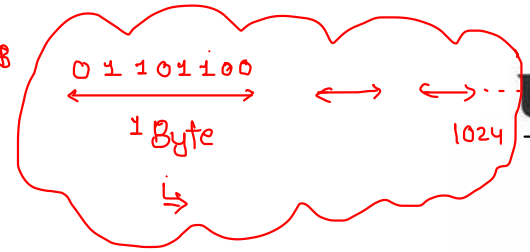
* Processor :
  - i3
  - i5
  - i7

RAM
- 4GB ✓
- 8GB ✓
- ↓
- 16GB

2° Mem / external
- ✓HDD
- ✓SSD
- HDD + SSD

1TB = 1024 GB

2GB Size / mv } 512 movies



Units of Computer Memory Measurements

1 Bit	=	Binary Digit ⇒ Bit
→ 8 Bits	=	1 Byte ✓
1024 Bytes	=	1 KB [Kilo Byte]
→ 1024 KB	=	1 MB [Mega Byte]
→ 1024 MB	=	1 GB [Giga Byte]
→ 1024 GB	=	1 TB [Terra Byte]
1024 TB	=	1 PB [Peta Byte]
1024 PB	=	1 EB [Exa Byte]
1024 EB	=	1 ZB [Zetta Byte]
1024 ZB	=	1 YB [Yotta Byte]
1024 YB	=	1 Bronto Byte
1024 Brontobyte	=	1 Geop Byte

Geop Byte is the Highest Memory.

$2^0 = 1$

$2^1 = 2$

$2^2 = 4$

$2^3 = 8$

$2^4 = 16$

$2^5 = 32$

$2^6 = 64$

$2^7 = 128$

$2^8 = 256$

$2^9 = 512$

$2^{10} = 1024$

1.5GB

2048 GAME

4096

Properties:- AP 7th/8th

Algo:- we use base-2 ($\log_2$)

✓ (1) $\log_2^{x^y} = y \cdot \log_2^x$

✓ (2) $\log_2(x * y) = \log_2^x + \log_2^y$

✓ (3) $\log_x^x = 1$ $\quad \log_2^2 = 1$ $\quad \log_7^7 = 1$

(1) let $n = 2^{100}$, $\log_2^n = ?$

Sol)

$$\log_2^{2^{100}} = 100 \cdot \log_2^2 = 100 \cdot 1 = 100$$

(2) let $n = 2^{1024}$, $\log_2 \cdot \log_2^{\frac{n}{2}} = ?$

Sol)

$$= \log_2 \log_2^{2^{1024}}$$

$$= \log_2^{1024} \cdot \log_2^2 = \log_2^{2^{10}}$$

$$= 10 \cdot \log_2^2$$

$$= 10 \checkmark$$

10th

AP

T.C. → 4

1st → 2nd

X X

↳.

✓ (1) $1 + 2 + 3 + \cdots + n = \frac{n(n+1)}{2}$

✓ (2) $1^2 + 2^2 + 3^2 + \cdots + n^2 = \frac{n(n+1)(2n+1)}{6}$

✓ (3) $1^3 + 2^3 + 3^3 + \cdots + n^3 = \frac{n^2(n+1)^2}{4}$

✓ (4) $n! = n \times (n-1) \times (n-2) \times \cdots \times 3 \times 2 \times 1$

↳ factorial

✓ (5) $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \cdots \to \frac{1}{n} = \log_{10} n$

Natural log.

$1 + 2 + \cdots + n = \frac{n(n+1)}{2}$

P1) $1 + 2 + 3 + \cdots + n-1 = ?$

Sol

$$\frac{(n-1)\cdot(n-1+1)}{2} = \frac{n(n-1)}{2}$$

P2) $\log 1 + \log 2 + \log 3 + \cdots + \log n$ $\quad \log(x \cdot y) = \log x + \log y$

Sol)

$$= \log(\underbrace{1 \cdot 2 \cdot 3 \cdots n}_{n!}) = \log n!$$

$1 \times 2 \times 3 \times 4$

$4 \times 3 \times 2 \times 1$ $\rightarrow$

$y = x^2$ $\quad f(x) = 2^x$

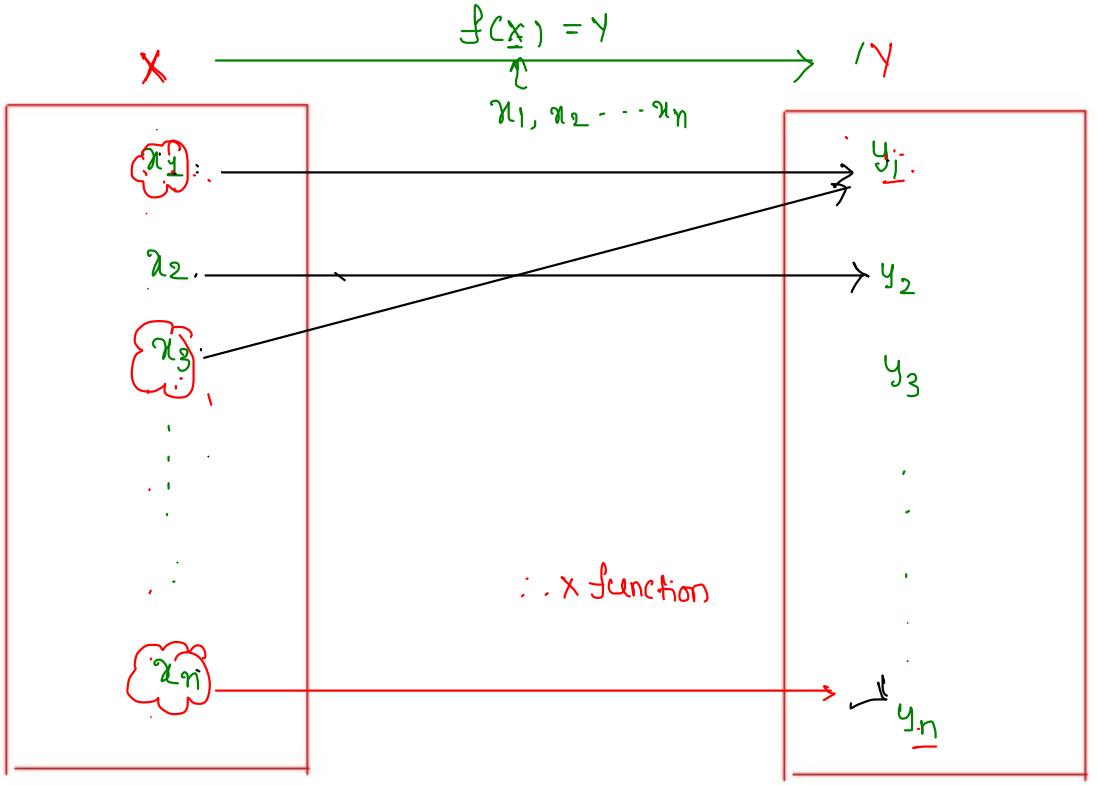
$1 = 2$

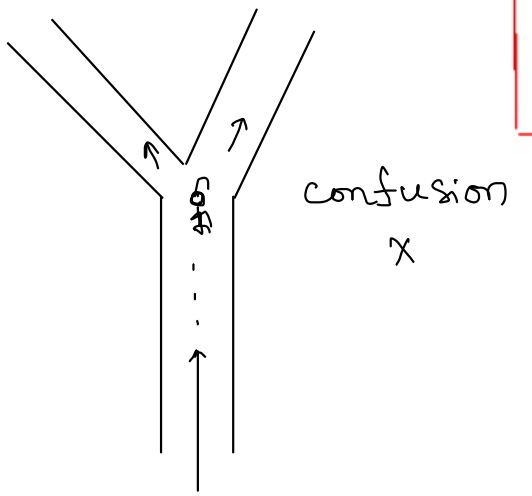
$f(2) = 4$

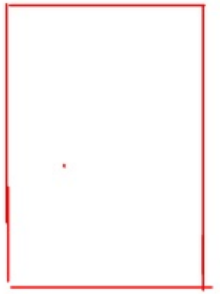
Function :-

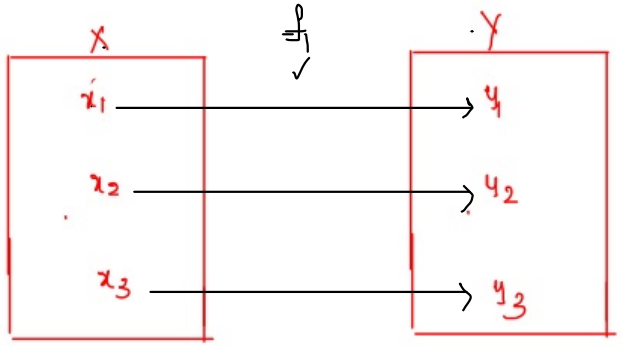
-> a function is an expression ✓

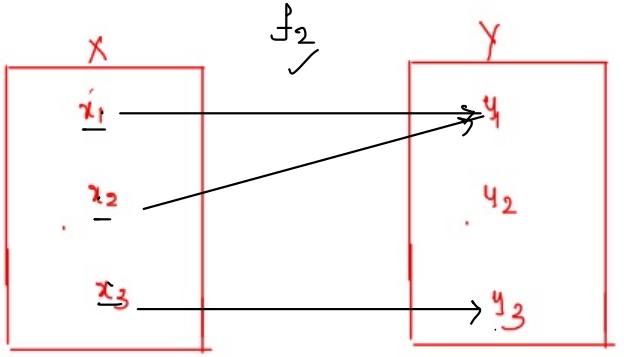
-> set X to set Y, assigns each element of X to the exactly one element of Y



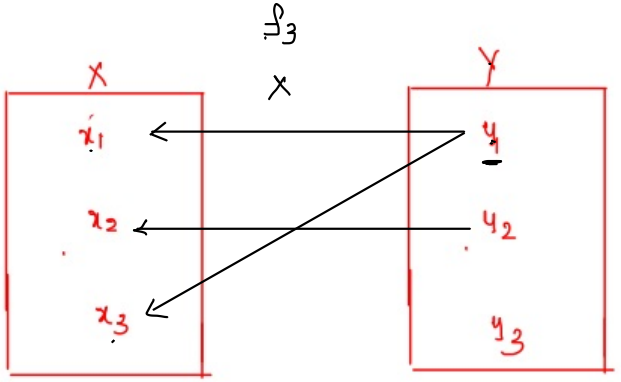


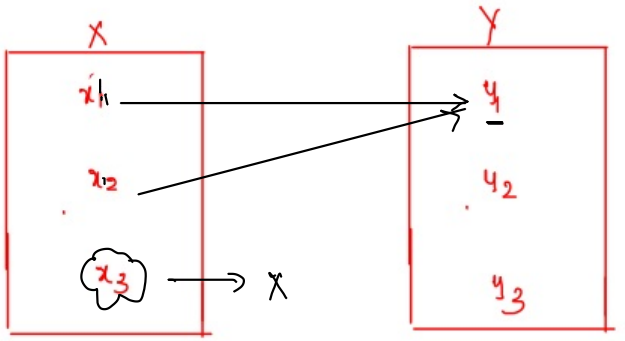






1. for every element mapping has to be there.
2. No confusion @ every element.





201/211

1. Algorithms, T.C is very much related to functions in math
2. The following functions are commonly used in Algorithms

Sno	Function Name	Function Expression
1	Constant	1
2	Logarithmic	log(n)
3	Square root	√n
4	Linear	n
5	Linearithmic	n.log(n)
6	Quadratic	n^2
7	Cubic	n^3
8	Exponential	2^n
9	Factorial	n!

$f(n) = \log_2 n$

$f(n) = \sqrt{n}$

$f(n) = n^2$

$f(n) = 2^n$

$f(n) = n!$

let $n = 5$

$f(5) = 120$

$5 \times 4 \times 3 \times 2 \times 1$

T.C

S.C

201
401
501

* $f(x) = \sqrt{x}$ ✓

$x = 25 \Rightarrow 5$

* $f(x) = x^2$ ✓

$x = -3 \Rightarrow 9$

DSA ⇒ All about problem solving

for One problem Many Solution's are possible

Solution-1 ✓
Code

→ Solution-2 ✓
Code

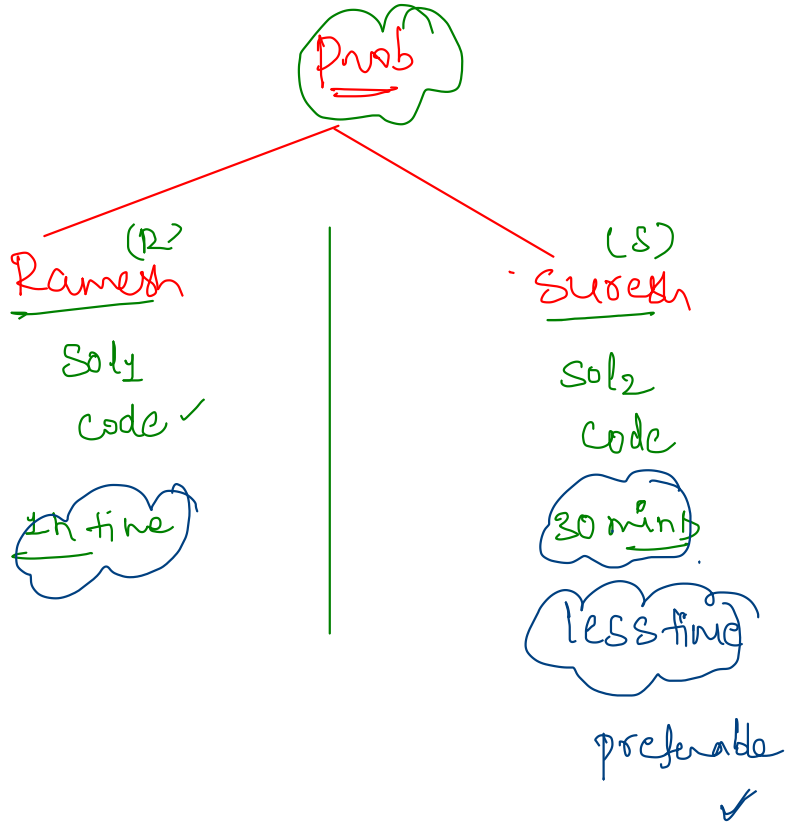
Solution-3 ✓
Code

.....

Solution-n
Code

1st step → Findout T.C of all the code's

2nd step → Analysis, Which is best



To represent T.C, we use mathetical functions

$f_1(n) = n^2$

n^2

n^2

1

f_1

$f_2(n) = n^4$

n^4

$n^4 \cdot n^2$

n^2

f_2

* Large value in n

2^{1024}

$2^{2^{1024}}$

$(2^{1024})^2 = 2^{2048}$

$\Rightarrow f_1$ is best

$f_1(n) = n \cdot \sqrt{n}$ | $f_2(n) = n \cdot \log_2^n$

$n \cdot \sqrt{n}$ | $n \cdot \log_2^n$

$\sqrt{n}$ | $\log_2^n$

$n^{1/2}$ | $\log_2^n$

Step 1 :- If Any common term's, then we've to cancel

Step 2 :- (optinal) Apply log for both function's

Step 3 :- take larger values of n

Ex: $n = 2^{1024}$

$n^{1/2}$ $\quad$ $\log_2^n$

Skip(2)

let $n = 2^{1024}$

2^{512} $\quad$ $\log_2^{2^{1024}}$

$1024 \cdot \log_2^2$

2^{512} $>$ 1024

f_1 $\quad$ f_2

$\therefore f_2$ is better

$n^{1/2}$ $\quad$ $\log_2^n$

$\star \log_2^{n^{1/2}}$ $\quad$ $\log_2 \cdot \log_2^n$

$\frac{1}{2} \cdot \log_2^n$ $\quad$ $\log_2 \cdot \log_2^n$

512

let $n = 2^{1024}$

$\log_2 \cdot \log_2^{2^{1024}}$ $= \log_2^{2^{10}} = 10$

512 $>$ 10 $\Rightarrow f_2$ is best.

f_1 $\quad$ f_2