Agenda

Programming Paradigms
Why do we need OOPS ?
Define classes and objects
Constructor - default, parameterised
this keyword
Deep Copy & Shallow Copy Concept
Introduction + Use of Linked List over array.
Access kth index node

Code is last
↳
Median of 2 Sorted
arrays

→ tutorialle point ↴
→ Code with mosh ↴
→ Scaler topics

Note:- Only bawew of oops. → DSA
↳
LLD → module.

↴
chatgpt → a real good
prompt.

Programming Paradigms.

→ Mac D → taste same everywhere.

↓

standard , sop.

Standard for coding, rules, sop. →
→ No structure.
→ Hard to read and understand.
→ Hard to test
→ Difficult to maintain.

Object oriented programing paradigm :- OOPS
↳
JS , Java, python, , c++, ruby,
c#etc . . . .

→ marks of student based on their name.

A = { "chinki", "raju", "golu" }.

B = { 95, 60, 80 }   attendance.
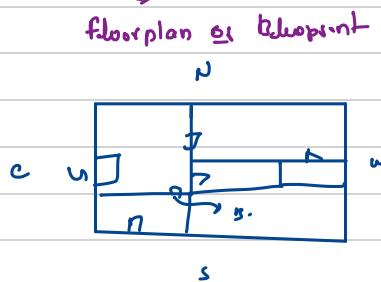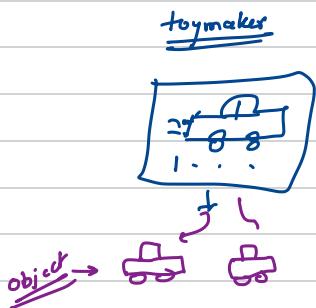
1) lakh of students → Scalability

2) maintainibility

3) Associating data.

class & objects

Build a house
⇃
floorplan or blueprint

object

toymaker

class Dog {
  eyes
  nose
  eyes
  limb
  color
} properties (attributes).

  actions/methods (behaviours).

  bark();
  bike(); jump(); run(); eat(), sleep(), poop(), pee().
}

1) attributes
2) behaviours.

⟶ Object using the class.

How to create a class

Syntax

```
class ClassName {
          ↳
        Upper case.
    // attributes
    // behaviours.


}
```

example : Book

```
class Book {          → Blueprint
    String title;
    String author;
    int pages;


    void read() {
        sopln ("reading a Book");
    }

    void bookmark() {
        print ("Bookmarking the book");
    }
}
```

Creating object

Syntax :-

```
ClassName varName = new classNome();
```

```
class Main {
    p s v main (⎯⎯) {
        // create a Book object.          ↗ Constructor
        Book java_b1 = new Book();


    }
}
```

#11AC

title
author
pages
read(), bookmark()

```python
// creating a class
class Book:
    title = ""
    aurthor = ""

    def read(self):
        return "Reading a book"

    def cover(self):
        return "Covering a book"

// creating an object

python_b1 = Book()
Set the values of attributes
python_b1.title = "Almanack"
python_b1.aurthor = "Naval"

print(python_b1.title) //Almanack
print(python_b1.aurthor) //Naval
```

Constructor

Create a class Student

class Student {   → Create object

    String name;
    int age;   Student st1 = new Student(); ←
    double psp;
    String email;   ↓

                                              Constructor
}

```java
// Online Java Compiler
// Use this editor to write, compile and run your Java code online

class Student{
  String name;
  int age;
  double psp;
  String email;
  // check is there any constructor --> No --> it will add default constructor

  // default constructor --> constructor without any arguments
}
public class Main {
  public static void main(String[] args) {
    System.out.println("Hello, World!");

    // create an object of class Student
    Student st1 = new Student();

  }
}
```

Constructor

↳ A special kind of method, whose name is similar to class Name.

↳ it is used to create object

↳ if No constructor is added by programmer, by default constructor is present.

↓

default Constructor.

top n button

Student st1 = new Student(); ←

↓ link

Constructor

Heap memory

Objects and Strings

memory

st1 = #11AC

#11AC   this = #11AC ⟵

name = null
age = 0
psp = 0.0
email = null

Stack memory

1. reserve a space in heap

1) Has No parameter (arguments)

2) sets default value to all attributes

3) _____

4) should always be public.

Break

10:25pm

↓

10:35pm

```java
class Student{
  String name;
  int age;
  double psp;
  String email;
  // check is there any constructor --> No --> it will add default constructor

  // default constructor --> constructor without any arguments

  // create our own constructor

  public Student(String name, int age, double psp, String email){
      this.name = name;
      this.age= age;
      this.psp = psp;
      this.email = email;
  }
```

Python

```python
class Student:
    # Without parameter
    def __init__(self):
        self.name = "Bikram"
        self.age = 40
        self.psp = 29.4
        self.univ_name = "Unknown"

    # With parameter
    def __init__(self, name, age, psp, univ_name):
        self.name = name
        self.age = age
        self.univ_name = univ_name
        self.psp = psp
```

Object creation with parameterised constructor
```python
python_b1 = Book("Salmaan Bhai", 20, "Holy", 55.6)
```
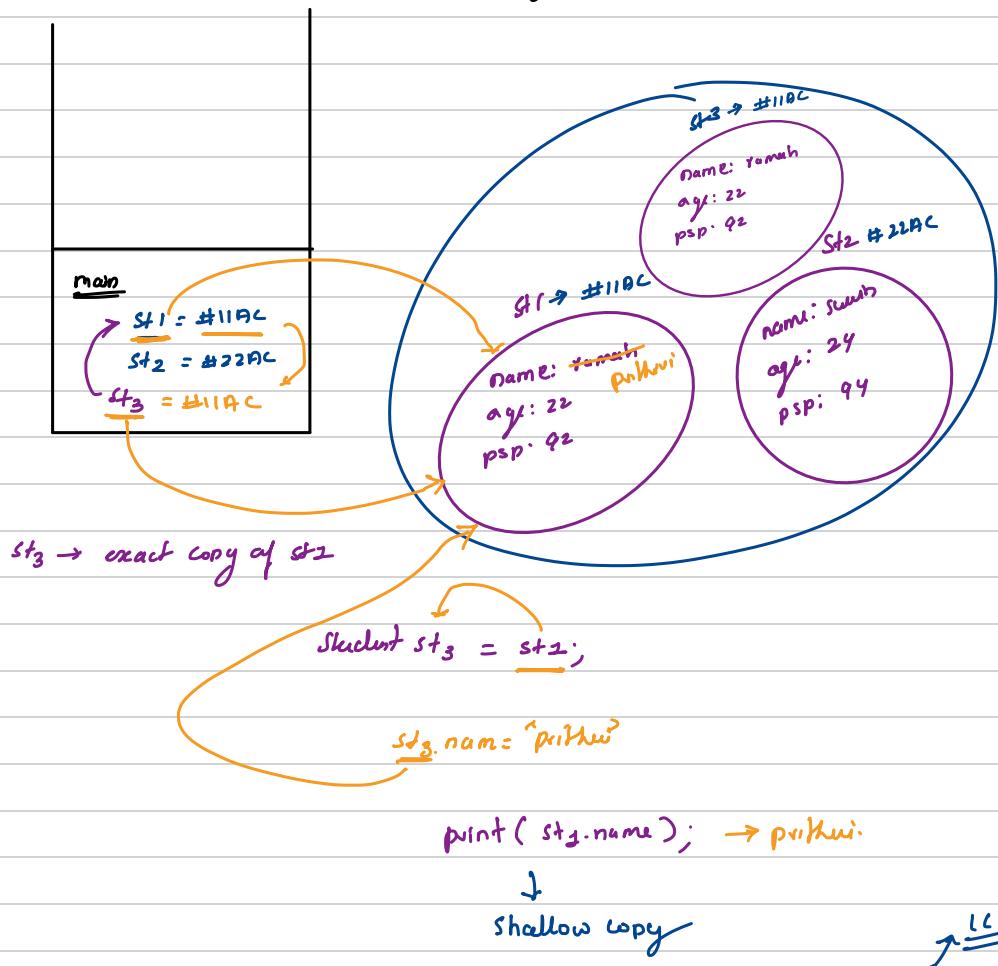
Self Keyword in Python
Self keyword is same as "this" keyword in Java.
But whether self is used or not inside the method, it is important to pass as a parameter to the methods of class.
We can also say that self helps in establishing connection between calling object and class methods.

Copy object

main

st1 = #11AC
st2 = #22AC
st3 = #11AC

st3 → #11AC

name: ramah
age: 22
psp: 92

St2 #22AC

st1 → #11AC

name: ramah   prithvi
age: 22
psp: 92

name: swati
age: 24
psp: 94

st3 → exact copy of st1

Student st3 = st1;

st3.nam = "prithvi"

print (st3.name);   → prithvi

↓

Shallow copy

LCD
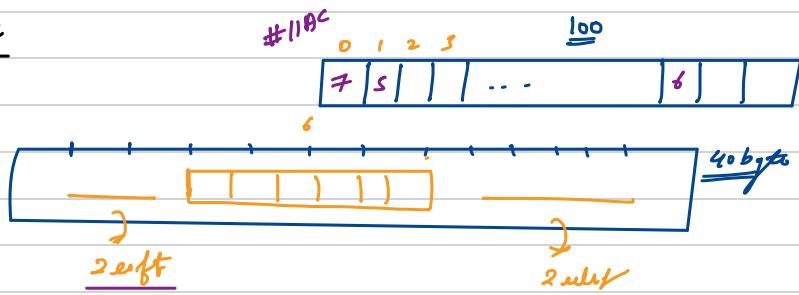
Deep copy →   Student st3 = new Student (st1.name , st1.age , st1.psp ,—);

Linked List

Yeeeed

Issue with Arrays 2

#11AC 0 1 2 3   100
7 | 5 | | | . . . | 6 | |

6

40 byte

2 left   2 right
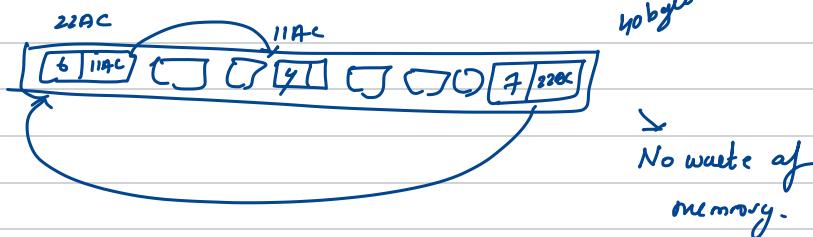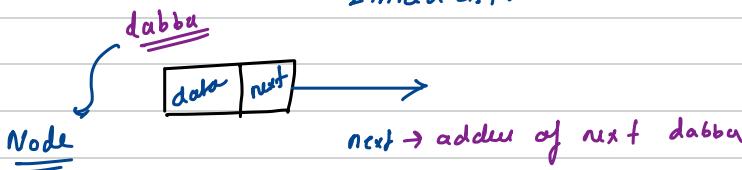
Can we create array of size 4. ✗
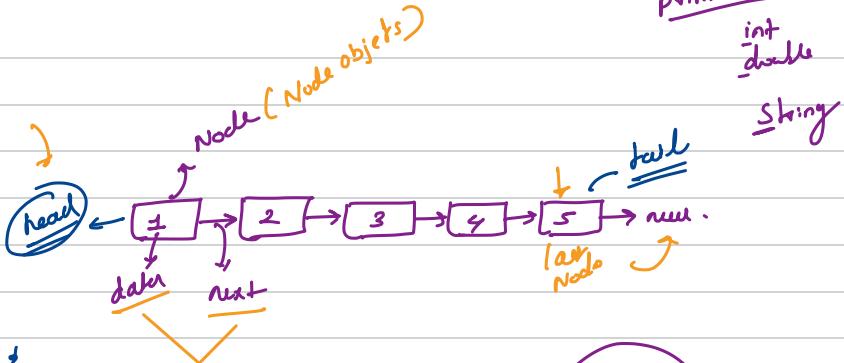
mem is available but is not continuous.
↳
memory is wasted.

Data structure ⟵
↳
where memory is not continuous.
↳
Linked List.

dabba

| data | next | ⟶

Node

next → address of next dabba

☐|→☐|→☐|→ null

22AC   11AC   40byte
| 6 | 11AC | ☐ ☐ | 4 | ☐ ☐ ☐ | 7 | 22AC |

↘
No waste of
memory.

Linke List

Node (Node objets)

tail

head ← 1 → 2 → 3 → 4 → 5 → null.

data   next

last
Node

attribute
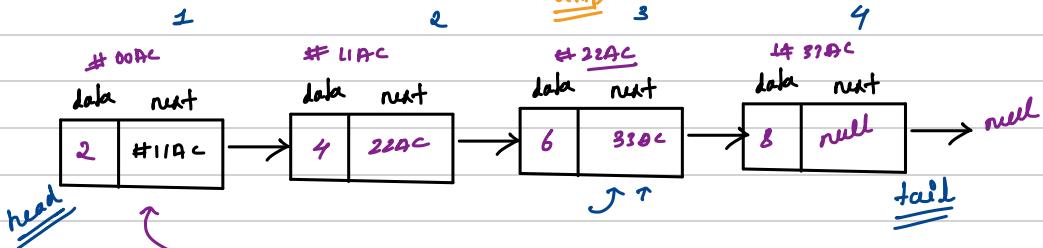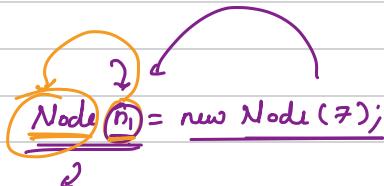
```
class  Node {
    int data;
    Node next;
    Node ( int x ) {
        data = x
        next = null;
    }
}
```

Node n_1 = new Node (7);

n_1
variable

data=7
next=null

	1		2	temp	3		4
# 00AC		# 11AC		# 22AC		# 37AC	

data	next	data	next	data	next	data	next
2	#11AC	4	22AC	6	33AC	8	null	→ null

head

tail

k=3
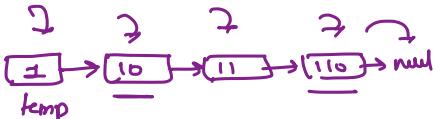
public class Solution {

public ___ solue (Node head, int k) {

Node temp = head;   never use head directly

for i → 1 to k-1) {   always copy in temp.

    temp = temp. next

}

$i: 1 \to 2 \to 3$

print (temp. data);

entire linked list

$$1 \rightarrow 10 \rightarrow 11 \rightarrow 110 \rightarrow null$$
temp

public void print LL (Node head) {   o/p → 1 , 10 , 11, vo

    Node temp = head;
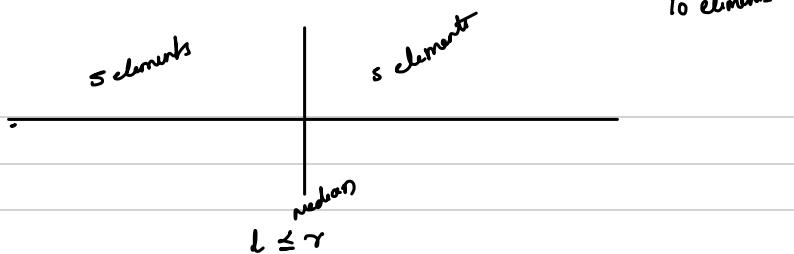
    while (temp.next != null) {   → Not print last element
   print (temp.data);   print the last
        temp = temp. next;   element.
    }

                       temp != null.

5 elements | s element

median

$l \le r$

A = { <u>1, 3, 4</u>) <u>7, 10, 12</u> }

$\frac{4+6}{2} = 5//$

B = { <u>2, 3</u> / <u>6, 15</u> }

max (l) → 4   min (r) → 6

How to apply BS →

No of element to be selected from 1st array
for 2 H.S of final merged sorted array.

l_1 $\overset{mid}{\underset{1}{7}}_{v1}$
   0   1   2   3

→ A = { 7, <u>12</u>, 14, 15 }

10 elements

l_2 v_2

   0   1   2   3   4   5

B = { <u>1</u>, 2, 3, <u>4</u>, 9, 11 }

N = 4 $\frac{N+M}{2} = 5$
M = 6

   0 ——— 3 ——— 4 ——— 5

$\frac{N+M}{2}$ LH-S $\frac{N+M}{2}$

B.S → no of elements to be in L.H.S for A[]

l	r	mid	is this a valid split			
0	4	$\frac{0+4}{2} = 2$	No	$l_1 > r_2$ move left		$r = mid - 1$
0	1	$\frac{0+1}{2} = 0$	No	$l_2 > r_1$	move right	$l = mid + 1$
1	1	$\frac{1+1}{2} = 1$	yes	$l_1 \le r_2$ $l_2 \le r_1$		$\frac{max(l_2, l_1) + min(r_1, r_2)}{2}$

$\frac{7+9}{2} = 8//$.

```
func medianoftwo ( a[ ], b[ ] ) {          ⌉ 1st    2nd

    n =   a.size()
    m =   b.size()


    if ( n > m ) {
        medianOfTwo ( b, a );
    }

    left = 0;  right = n
    while ( left ≤ right ) {
        m1 = (left + right) / 2;
        m2 = (n + m + 1) / 2 - m1;
        l1, r1, l2, r2                    // l2  and  r2

        if ( m1 == 0 ) {                  if ( m2 == 0 ) {
            l1 = Integer. MIN_value ;          l2 = Integer. MIN_value ;
        } else {                          } else {
            l1 =  a [m1-1];                    l2 = b [m2 -1];
        }                                 }

        if ( m1 == n ) {                  if ( m2 == m ) {
            r1 = Integer. MAX_value           r2 = Integer. MAX_value
        } else {                          } else {
            r1 =  a [m1];                     r2 = b [m2];
        }                                 }

        if ( l1 ≤ r2 && l2 ≤ r1 ) {
            if ( n + m % 2 == 0 ) {
                return (Math.max ( l1, l2) + Math.min ( r1, r2 )) / 2.0 ;
            } else {
                return  Math.max ( l1, l2 );
            }
        }

        if ( l1 > r2 ) {
            right = m1 - 1
        } else {
            left = m1 + 1;
```