CODING BLOCKS

Chill brother!

OOPS
Class

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Before OOPs, A bit about Java

Why Java?

Platform Independence ?!

- platform ? Environment where ur code will run
- Web Dev : browsers
- Software : Operating System

Code in Binary ?

- No High level Language !
- Computer talks in English

In C and C++

Source Code to Compiler to Machine level exe code w.r.t OS

Can sun this EXE on other OS ?

Good Bye, share your code?! Bye service based Companies

Java Solves this!

Compiling in Byte Code!!
In Between machine and source Code!!
Same on each platform

Java Runtime > C and C++

But each platform understands different binary codes!

JVM = Java Virtual Machine
Byte to Machine Level Code

When u write a code, DO u send your scanner class and Array class too ?
Libraries !!

Java RunTime Environment = JVM + Libraries
Java Dev Kit = JRE + Compiler

Company ANd Client
JRE or JDK

Company = JDK
Client = JRE(min requirement)

We installed JDK

Drawback ?? Byte Code Slows things down

C# sharp for Game Dev is also Platform Independent

Already C then why C++ or Java ?

C = Procedural Language (everything is a function)

English =

Class function variable

Object Oriented Programming Language !

Class Student

```
String Name; // Data Members or Instance variables
int Age;
```

```
main {
    student s = new Student(); // Just like ….
}
```

Before Execution , find dependency of other class!!

Student’s blueprint is loaded into Heap memory

function in class

```
public void Intro() {

}
public void slap(String Name) {

}
```

Can also write Intro function without this
Then why this ?

- when we have a local variable
  (Same name of data member and local variable)
- this. or local variable ?

Constructor

2 ways to initialize data Members
Constructor!!

- method or function
- noo return type
- name same as class

Execution Steps

- Memory Allocating
  - (default values of data member)
- Parsing
  - Code flow changes one by one parsing
- Constructor calling
  - Then Constructor is called. Last

Show using Debugger
new student(); calling a constructor.

Create another constructor

Exception Handling

What if someone wants to set age as -10.
Invalid !!

How can be generate the error ? Dependent on my Class

One way to do it is :

- make data members **private (**Access Specifier**)**
- **Incapsulation!!**
- Can only be visible or user in person class !

How to use them ?

- Getters and setter. G to source to create them
- p1.setAge();

Some Types of Exception

NullPointer
file not ofund

IO

SQL

Index out of bounds

Exception Handling

Creation of Exception

```
if(age <0)
    throw new Exception("Age is -ve");
```

How to handle exception ? 2 ways

- Send the exception to the previous function : **Throws**
- Resolve it using : **try/catch**

Make even main throws Exception.
JVM gets that error and stop the code

Exception Handling

Resolving: so no Abrupt end

```
try {
            s4.setAge(-30);
// wont execute lines below
…..
      }
      catch (Exception e) {// will work only if there is an error
          System.err.println("catched the error");
          Syso(e.getMessage());
          e.printStackTrace();
      }
try {

if(age <0)
     throw new Exception(“Age is -ve”);
}
```

try Catch finally

```
try{ }
catch(Exception e) {

return
}
finally{
will always run before returning!!!
}
```

Tricky Question!!

Why no resolving in array index out of bounds!!

Exceptions
Checked : Handle your own ; Exception Object

- like in SQL
- In input output !

Unchecked

- Run time exceptions
- Throws new RuntimeException
- Deafult is Throws automatically

Inheritance !!

Client Says !!

1. Update an ICON in windows!!
    i. Copy everything? then change a few line of codes?!
        1. REDUNDANCY!! A BAD Practice
    ii. Inheritance solves it
    iii. Parent or Base Class = Stack!
    iv. Inherit it!! All data members and functions; Child class or Derived Class
    v. You can also add new functions and modify the existing functions

Code Demo

3 Classes

- Parent P
  - data members data1,data2
  - function fun1,fun2
- Child C
  - First Make it Empty
- Client
  - Obj. --- Will show the functions and data members of the class
  - If now C extends P , Now if you do
  - C Obj.--- all functions and data members of P;
    But P is NOT dependent on C
  - To Create Dependency ; write extends

Before Discussing Cases!!

Compiler vs JVM

Write| Run

LHS | RHS

Cases

P : d and d1; fun and fun1
C : d and d2; fun and fun2

A data member is common

Case 1
P obj1 = new P();
obj1. ---

Cases for data members

Case 2

P obj2 = new C();// Just like List and ArrayList
Reference of P and Content/Object/Instance of C

obj2. d2 ??
error from compiler!!

new C(); // This allocates space to both Child and Parent Datamembers

to tell Compiler
(C) obj2.d2
obj2.d ?? Which variable !!

- Resolved using Reference basis !! P.d

(C) obj2.d = C.d

Cases For functions; Different from Data members!!!!

obj2.fun (); = C.fun

To run or resolve function!!

- Java will go into new Class (here Child) and find it, If not then will go above in Parent Class

(P) obj2.fun ? work ? No= C.fun
Why ?

- The reason we made a Child because we wanted to update the functionality
  Overriding
- **C function Overrides function of Parent P**

obj2.fun2();// error!!!
(c) obj2.fun2() will work!

Rest Cases

C obj3 = new P();
Will never WOrK in any LANGUAGE

Content is of P, but P is a subset of C.
obje3.d2 ? ? no space!!
Run Time error!!
Worse than Compilation error

Case 4:
C obj4 = new C();
obj4.d = C.d
(P) obj4.d = P.d
obj4.d1
obj4.d2

(P)obj4.fun = C.fun

Important Points

Compiler - LHS l writing Code
JVMM - THS| Run

Case 1:
P Obj1 = new P();
// P is independent of C
Case 2:
P Obj1 = new C();
Compiler assumes P; to access C functions type cast to C
Functions!! : resolve using RHS ; independent of Type Casing
Variables !! : Type Casting Working

Extra Inheritance

Not possible!! =Multiple(wrt classes!!)

Single Level

Multi level

Multiple Inheritance !! Not allowed in Java

C cannot have Parent P1 and P2

Design Pattern
(How are classes related to each other)

is a -> Inheritance
has a -> Object

Dynamic S is a Stack
Car has a Tyre ?
Char is a Tyre ?

Object Class and beyond!

1. System.out.println(obj);
2. obje.--- functions from Object Class!!
3. Object obj ; can be called!!

1. ArrayList; Prints so nicely!!
   a. Print(obj)= calls valueOf calls toString(if not null)
   b. To print Nicely!! @Override toString! return type String

Polymorphism
Method Overriding Method Overloading

P =fn
C =fn;

If prototype same; Name and type of arguments are same !!

@override , to insure i am actually doing this. and not an error

OverLoading (fns same name in same class)

Can only be done :
Number of Arguments
Type of Arguments

Not on :
Return Type
Static Non Static !!
Access Specifier(public private protected) !!

demo

```
public static int add(int a, int b) {
  return a+b;
}
public static int add(int a, int b,int c) {
  return a+b+c;
}
public static void add(String c) {
  return;
}
```

Students think , chafing return type is also Overloading!! but calling function is done only by the function name and number of variables !!
not on static , or access specifiers

Interfaces

Working in a group **parallelly**.
Our Codes depend in each other.
We have a prototype and how our code will look like

- Return type and number of functions.
- And if we have to implement an Interface we have to write all those functions and we connot change those properties
- Prototype should be the same.
- Have to give a body to each function in a class
  - implements
- You can always add new functions.

Interface Cont

- Cannot Instantiate an Interface
  - If possible, how to execute function ? no body
  - These functions are abstract, Only declaration no body
- No constructor possible
- All methods are Abstracts
- All variables are static and final!!
  - Interfacename.var in other classes
- interfaces can extend multiple interfaces!!, https://github.com/Lakshya-CB/NagarroBootcampMarJava/tree/main/Lec_52
  - DynamicI extends StackI,
    - StackI interface with abstract methods
    - If a class extends a DynamicI , then body to all abstract functions
- One Interface or class can extend other Interface!!
  - Unlike Classes, where Not allowed Multiple Inheritance

Static Story

Which element to make Static ?!!

- Things which belong to the whole class not just instance
- Create 2 instances of class Student(name and roll number) then explain above point . All instances share the variable
- Ask Student A, B, C how many students are there?- 10
    - so 1 variable will solve the issue,
    - If i have multiple variables then changes in the size will be hard to maintain like in
    - Bank Account {account number , balance} What about rate of Interest?!!
    - Instead of going in each instance, make the ROI static
    - Q: in LinkedList if Head is static, then what problem (show by creating)
        - All LL will have same head address , that means only a single LL
    - Q : BST , sum of greater replace, isBlanaced , make it static ?!

Static Story Cont

Make Student Class with constructor with
static total number of students;
Then Explain using memory map

Before main is gonna run, Heap memory will have BluePrint of Student class

static variables are created when the class is loaded in heap memory with initialized with 0;

For each time you call a Constructor memory is allocated to non static members only

How to access Static variables ?

class_name.Variable_Name
s1.Variable_Name will also work, but a Static manner warning

Now change the constructor to have

```
students(){
total_students ++ ;
}
```

Static Functions

Access Static variables using Static Funtions
Create a linked list , call functions using context

All these non static functions using context
LL.disp();
“this” storing address of LL
Instance specific

Static function won't need Context, because you are working on static variables
Not Instance specific

```
Student.getTotal(); ||
    public static void getTotal(){
            return totalstudents
}
```

Can you access static function of a class without calling a constructor ?

Questions !!

- Can you access non static variables in a static function!!!?!?
  - NO!! NO context!! can be called without an instance
- Can you access non static function in static function?! Noo!!!
  - public static void getTotal(){
  - Introduce(); // non static function ?!
  - return totalstudents }
- Can you access static variables in a static fn ?!
  - Yes, of course thats the point!!
- Can you access static fn in a static fn ?!
  - yes, ofc no need for context “this”

wrt non static fn

- Can you access non static variables in non static fn!!!?!?
  - yeah, like introduce();
- Can you access non static function in non static fn?!
  - yeah
- Can you access static variables in non static fn ?!
  - Yes
- Can you access static fn in non static fn ?!
  - yes

In function class, we made everything static, unlike OOPS class

Main is static thats why we have to make everything static
JVM runs your cole like Classname.main();
if main not static then JVM will have to class a constructor.

Inner class can be made static!!! not outer!!

- Node n = new LinkedList.Node(10); if node static
- Node n = LL.new Node(10); if not static

Final Keyword! like const in C,C++

Use final

Variable

- Cannot be changed!! , either in parsing or in constructor!! Cannot do both!!
  - example food expiry date interval

Function

- These Function cannot be Override!!
- Constructor final ?

Class

- These classes cannot be Inherited!! like Math or Integer
- Can we make our interface final ?
  - Any use?!

What is String[] args

A String of array!! Comandline arguments

```
for(String val : args)
    Syso(val)
```

Nothing!!

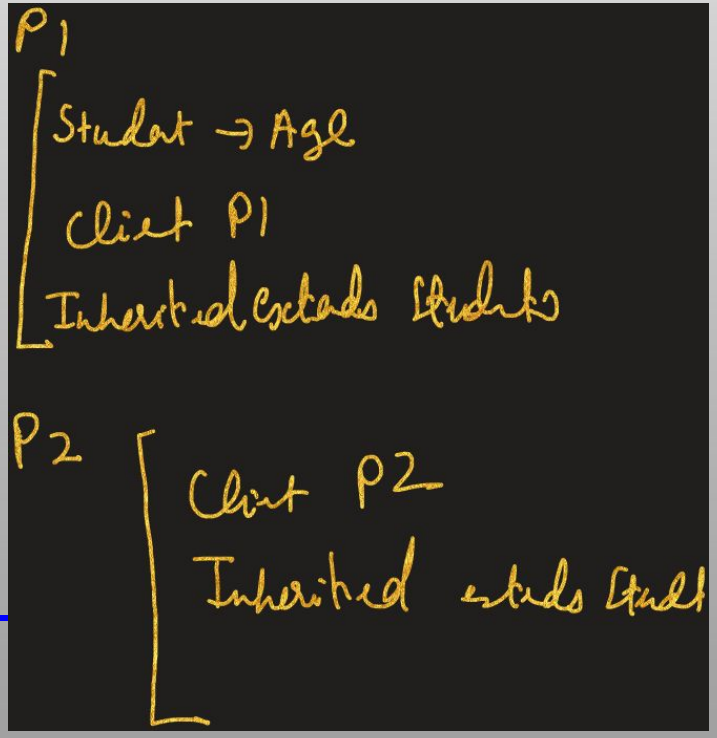
go to Run as Run configurations
    under Arguments tab
    in Program Arguments box!
        write anything " hello how are you "

print = hello ,how ,are, u

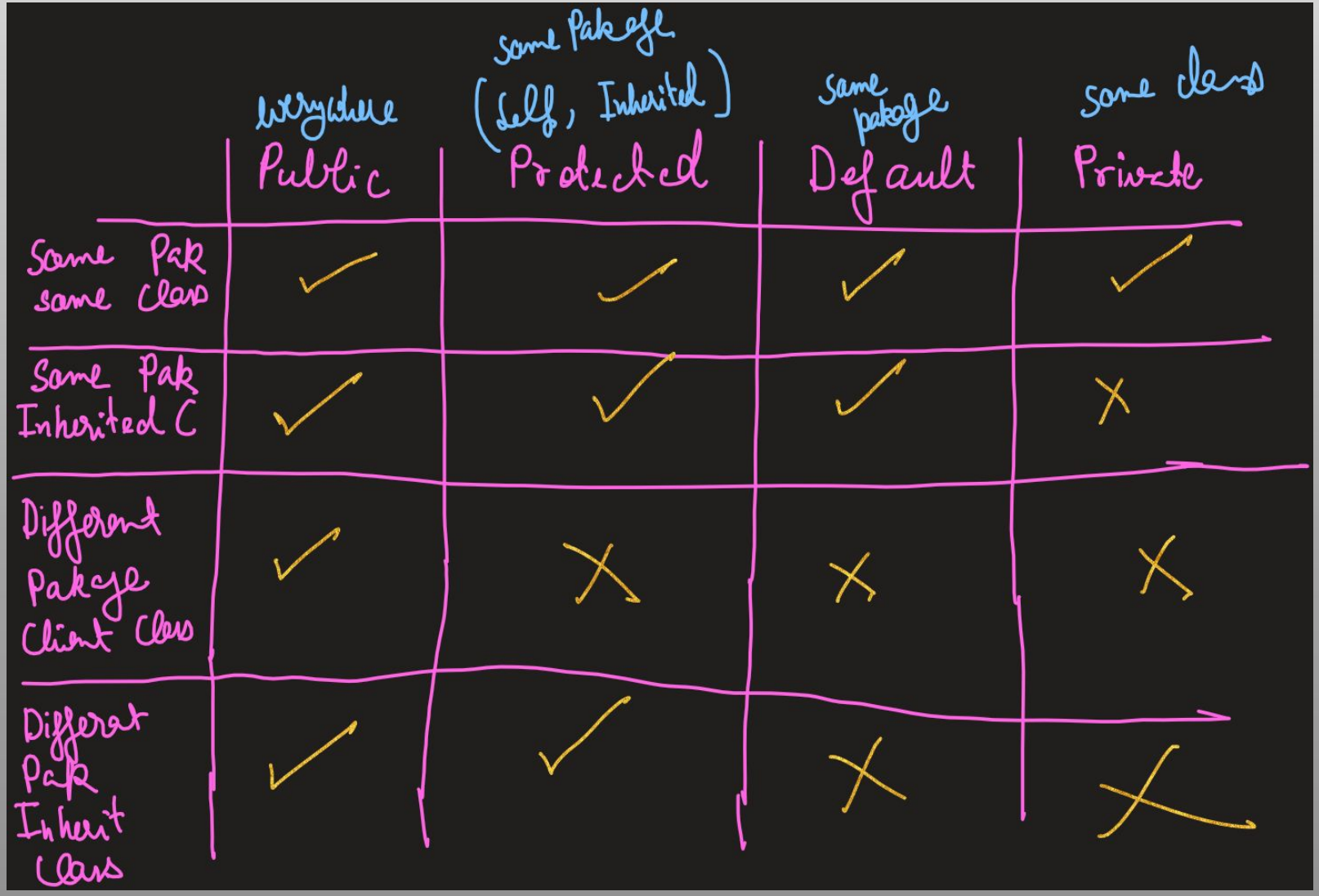
Access Specifiers

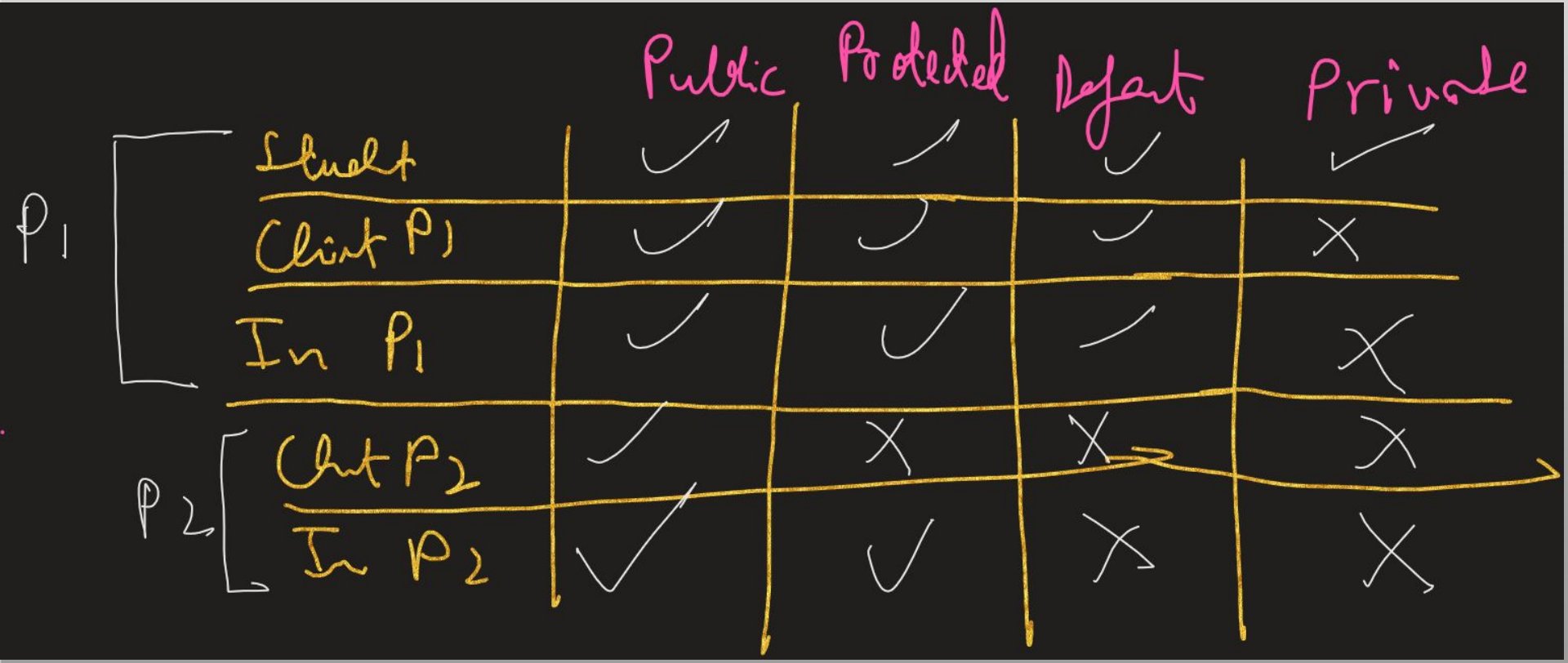
Make 2 packages within a package

and lets make table with respect to Age variable



https://github.com/Lakshya-CB/NagaMarJava/tree/main/Lec_53


everywhere
Public
same Package
(self, Inherited)
Protected
same package
Default
same class
Private
Same Pak same class
Same Pak Inherited C
Different Pakage Client Class
Differat Pak Inherit Class


Public
Protected
Default
Private
P1
Student
Client P1
In P1
P2
Client P2
In P2

Extra

Design patterns
Wild Card
Abstract classes
Abstraction
lamda function
Marker Interface
Types of OverLoading