Encapsulation

1. Definition:
    1. Encapsulation binds data and methods in a class.
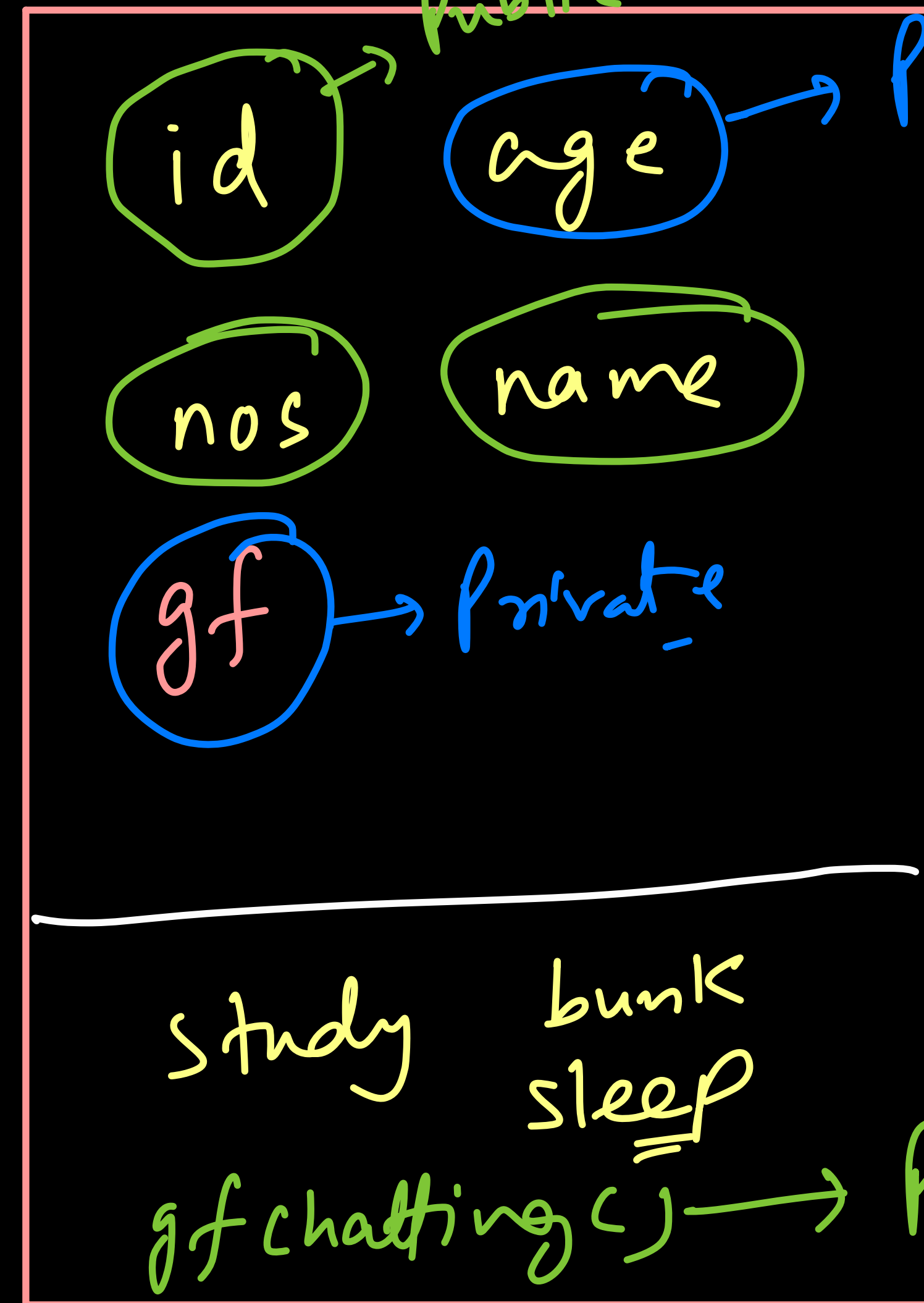   2. Like a capsule, it combines and binds them together.

2. Function of Encapsulation:
    1. Provides a secure layer.
    2. Hides internal implementation of code and data in a class.
    3. Exposes only necessary information to the external world.

3. As we are hiding data from outer classes or the world, Encapsulation is also known as Data hiding.
4. The goal is to implement classes in a way that prevents unauthorized access to or modification of the original contents of a class by its instances (or objects). The underlying algorithms of one class need not be known to another class. The two classes can still communicate, though.

Encapsulation

$\rightarrow$ Student

Public

Private

id   age $\rightarrow$ Private

nos   name

gf $\rightarrow$ Private

---

study   bunk
sleep
gf chatting () $\rightarrow$ Private

study ( ) {

{
sham

}

int main ( )

{

Student A;

A.id ✓✓

A.gf ✗

Teacher
↓
A. sleep()

A. study ()

A. gf () ✗

}

Access Modifiers

1. Way to define access to the data and methods of a class.
2. **Public**
   1. Members declared as public are accessible from any part of the program.
   2. They can be accessed by objects of the class and external code.
3. **Private**
   1. Members declared as private are accessible only within the same class.
   2. They are not accessible from outside the class, including derived classes.
4. **Protected**
   1. Members declared as protected are accessible within the same class and by derived classes.
   2. They are not directly accessible from external code.

Access Modifiers
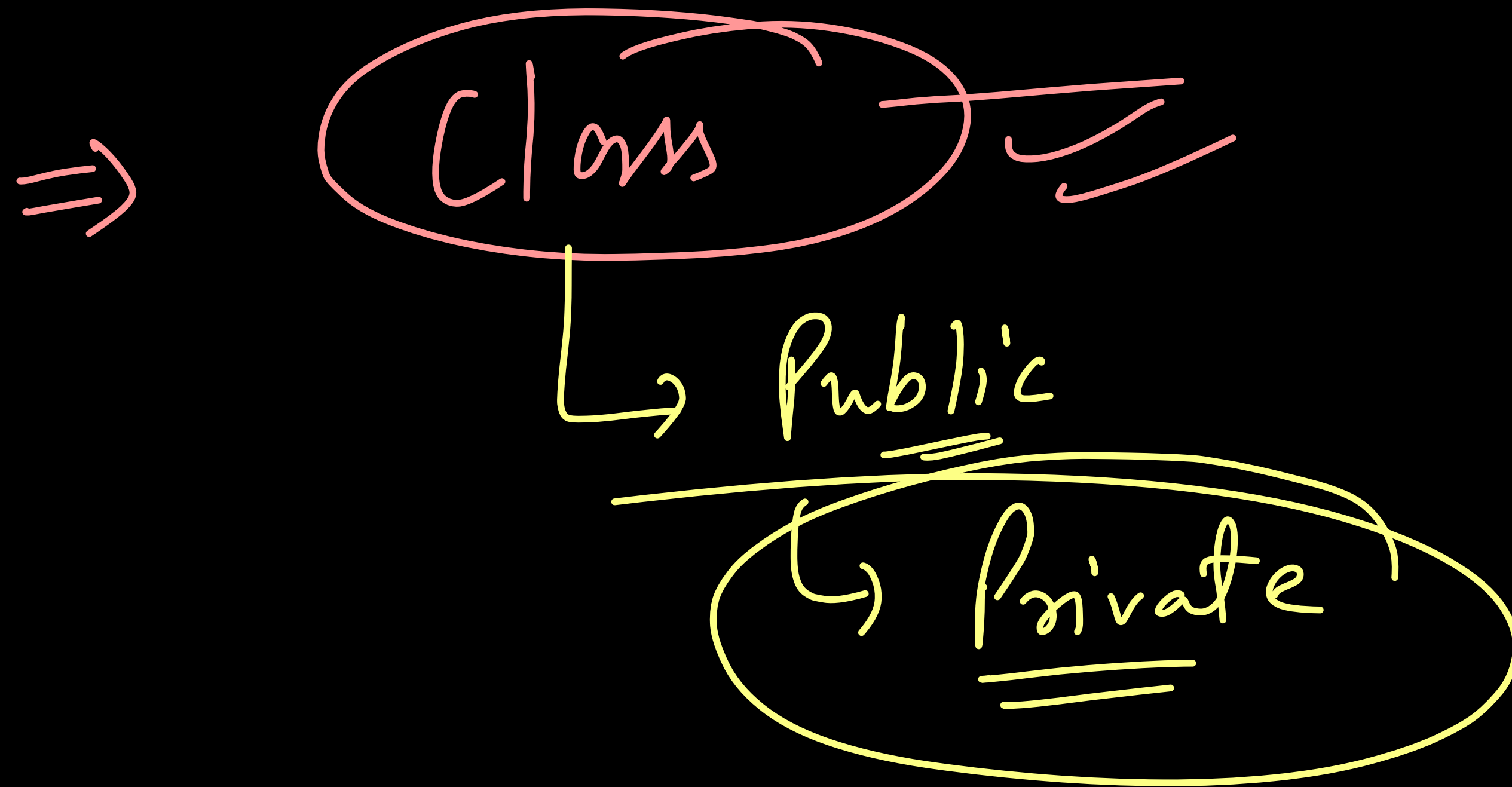
Perfect Encapsulation

1. If all data members / variables are private.

2. Handling Access to Encapsulated Data
   - Despite encapsulation, external interaction is necessary.
   - Implementation of public methods, such as getters and setters, allows external communication.
   - These methods enable controlled access to the encapsulated data.

[Handwritten annotations:]

Person

Prive ← name, age
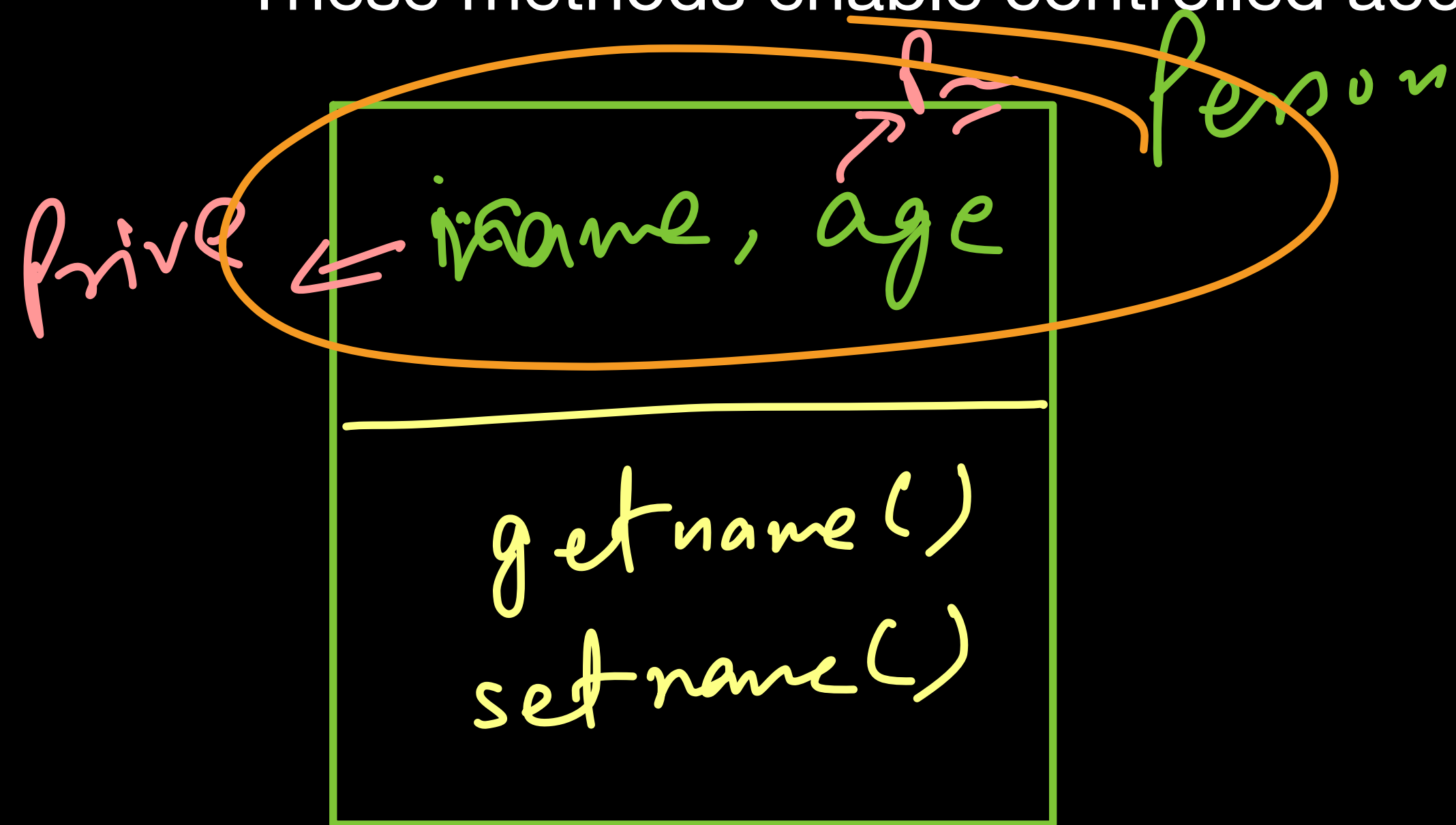
get name ( )
set name ( )

Person P1;
P1. getname ( ) ;

Implementing Encapsulation in C++

Implementing Encapsulation in Java

Class

$\Rightarrow$

Public

Private

Implementing Encapsulation in Java