

# OOP summary (in dart)

## Constructors

### What is a Constructor?

a Constructor is a special type of function *named with the same name of the class* that is *called by default* when an object of the class is defined.

### Why use a constructor?

when defining an object of a class that has some variables in it , like this:

```
class items{
  String? name;
  int? price;
  int? discount;
}

void main(){
  items x= items();
  x.name="Laptop";
  x.price= 100;
  x.discount=20;
}
```

you notice how you declare the value of the items manually one by one after defining the object....

do you really think your code needs more lines 😞

now see how a Constructor work with this problem :

```
class items{
  String? name;
  int? price;
  int? discount;

  items(String n, int p, int d){
    name=n;
    price=p;
    discount=d;
  }
}

void main(){
  items x= items("Laptop", 100, 20);
}
```

here , instead of defining every variable in that class one by one , we was able to initialize the values of them while defining the object it self

### Ways to write the Constructor and the difference between them:

- first is to write it as a function that receive data and then assign them to the properties in the class, that make the initializing for the variables required with the same order is is written in the function:

```
class items{
    String? name;
    int? price;
    int? discount;

    items(String n, int p, int d){
        name=n;
        price=p;
        discount=d;
    }
}

void main(){
    items x= items("Laptop", 100, 20);
}
```

- A shorter version of the first way , called the one line assigning , also make the initializing required and in the same order as the function:

```
class items{
    String? name;
    int? price;
    int? discount;

    items(this.name, this.price, this.discount);
}

void main(){
    items x= items("Laptop", 100, 20);
}
```

- some time , we don't need to initialize those variables but we want to keep the constructor ,just in case we want to initialize it , in summary , i want to be able to choose whether to initialize my variables or not , we put the constructor parameter in square braces [ ] , but we also still have to write it in order of the parameters in the constructor:

```
class items{
    String? name;
    int? price;
    int? discount;

    items([this.name, this.price, this.discount]);
}

void main(){
    items x1= items("Laptop", 100, 20);
    items x2= items();
}
```

- and now we come to my favorite way , which solve most of the problems in the previous ones , we can write the parameter in a shape of a map , (so what does it do when we write it in a shape of a map? ) this will make you call the parameter by name , without having to memorize where it was , and also you have the option of initializing the parameter :

```
class items{
    String? name;
    int? price;
    int? discount;

    items({this.name, this.price, this.discount});
}

void main(){
    items x1= items(price: 100, name: "Laptop", discount: 20);
    items x2= items();
}
```

- but what if i want one of the parameters to be required , like i want the name of the item to be non optional , but the price and the discount can be optional .  
no problem at all , all you have to do is to type the word required before the parameter , that will make it non-optional:

```
items({required this.name, this.price, this.discount});
```

## Named Constructors

- what if i want to have more than one constructor , would i call all of them the same as the class? -> of course not , because that would cause a collision when calling it while defining an object of the class , instead we type the name of the class like any other constructor then a dot then the name that i choose for said constructor, it would be in this format:  
Class\_name . Constructor\_name ( Parameters );

```
class items{
    String? name;
    int? price;
    int? discount;

    items(this.name);
    items.const1( {this.name, this.price, this.discount});
}

void main(){
    items x2= items("Laptop");
    items x1= items.const1(price: 100, name: "Laptop", discount: 20);
}
```

## Encapsulation

encapsulation general idea is like building a all around the data in the class and allowing the object to call them or to set them with the way that i want, this happens by:

- change the accessibility of the variable to be private so that no other class outside it can reach it :  
we change it by adding an underscore before the name : `_variable_name`;
- and then write functions that apply what variable will the other class access and how it will access it (its all totally under my control):

```
class items{
    String? name;
    int? price;
    int? _discount;

    items({this.name, this.price});

    setDiscount(int d){
        _discount=d;
    }

    getDiscount(){
        return _discount;
    }
}

void main(){
    items x= items(name: "Laptop", price:100);
    x.setDiscount(20);
    print(x.getDiscount())
}
```

## Set - Get

other ways to write setters and getter is using "set" and "get" key words:

### Set:

```
set *function_name>(*data_type* *variable name*){
    _private_variable= variable_name;
}
```

### get:

```
data_type get function_name => _private_variable;
```

```
class items{
    String? name;
    int? price;
    int _discount=0;

    items({this.name, this.price});

    int get disc => _discount;
}
```

```

    set disc(int value){
        _discount=value;
    }

}

void main(){
    items x= items(name: "Laptop", price:100);
    x.disc=20;
    print(x.disc);
}

```

## inheritance

when you hear the word inheritance , what is the first thing that comes to mind ?

for me I imagine some one that has all their father's thing given to them after he passes (that took a dark turn 🤔) , so the idea of inheritance in my opinion is the child has some thing of their own let's call them the child's properties , and then they inherit their parent property , so they now have their own things (properties) and their parent's.

this example also works in programming , a class have some properties (let's call it class1) , then comes another class (let's call it class2) that has it own properties , class2 inherit from class1 all of its properties , now class1 is called the parent and class2 is called the child , so the child has all of his and parent's properties

## Types of inheritance:

### Single-level inheritance :

this is the simplest type of inheritance , it happens when only one class inherit from another one .

so we have on parent and one child.

they go something like this :

class1 => class2

```

class Parent{
    String? name;
    String? age;

    Parent([this.name, this.age]);

    printName(){
        print(name);
    }

}

class Child extends Parent {}

void main(){

    Child ch1= Child();
    ch1.printName();

}

```

### Multi-level inheritance :

this happen when multiple classes inherit from the same class .

so we have one parent and multiple children inheriting from that parent.

they go something like this :

class2 <= class1 => class3

```
class Parent{
    String? name;
    String? age;

    Parent([this.name, this.age]);

    printName(){
        print(name);
    }
}

class Child1 extends Parent {
    String? job;
}

class Child2 extends Parent {
    String? state;
}

void main(){
    Child1 ch1= Child1();
    Child2 ch2= Child2();

    ch1.name= "Ali";
    ch2.name= "Ahmed";

    ch1.printName();
    ch2.printName();
}
```

## Hierarchical inheritance :

the idea of hierarchical inheritance is like a family heritage , a person would give something to their child and then for the child to give it to their own child(the grand child of the first person).

so we have class1, class2 and class3, class2 inherit from class1 and class3 inherit from class2, so class3 has properties of both class2 and class1.

so we have 2 parents (class1 parent to class2 , and class2 parent to class1), and 2 children (class2 child to class1, and class3 child to class2)

they go something like this :

class1 => class2 => class3

```
class Parent{
    String? name;
    String? age;

    Parent([this.name, this.age]);
```

```
    printName(){
        print(name);
    }

}

class Child extends Parent {
    String? job;
}

class GrandChild extends Child {}

void main(){
    Child ch1= Child();
    GrandChild ch2= GrandChild();

    ch2.printName();

    print(ch2.job);
}
```