# Programming Fundamentals 1

Produced by

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# Recap of OO Concepts

Objects, classes, methods and more

Shop V1

Objects · Classes · Constructors · Methods · toString

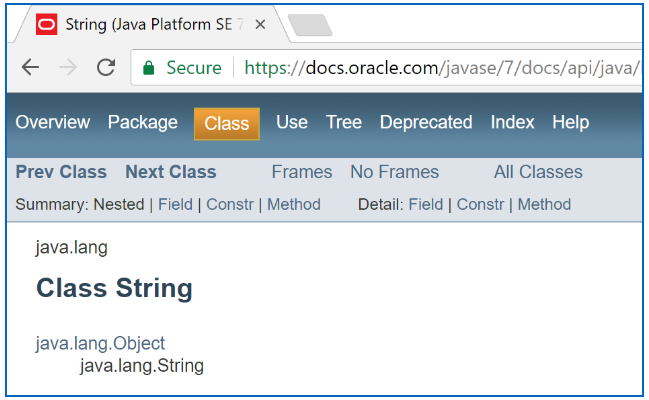
# RECAP Agenda

- ❑ Classes & Objects
- ❑ SHOP Version 1.0
- ❑ A `Product` Class
- ❑ Setters/Getters/Encapsulation…

# Classes & Objects

# Classes and Objects

- A class
  - defines a group of related **methods** (functions) and **fields** (variables / properties).



String (Java Platform SE 7 ×

Secure | https://docs.oracle.com/javase/7/docs/api/java/

Overview Package Class Use Tree Deprecated Index Help

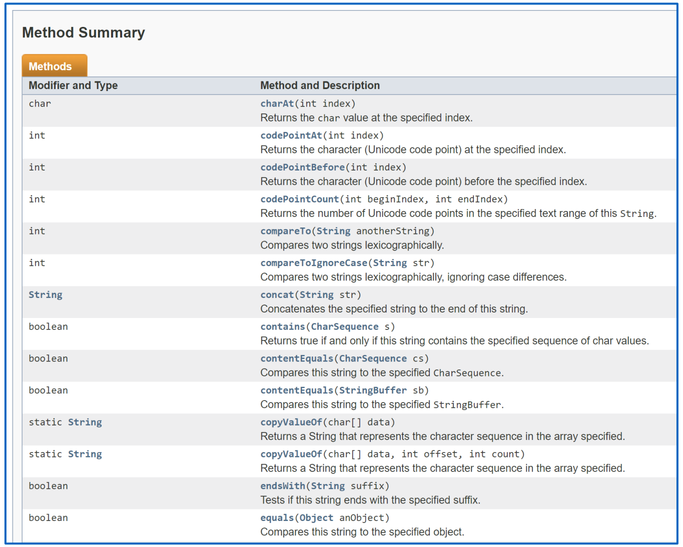
Prev Class Next Class Frames No Frames All Classes

Summary: Nested | Field | Constr | Method Detail: Field | Constr | Method

java.lang

**Class String**

java.lang.Object
    java.lang.String



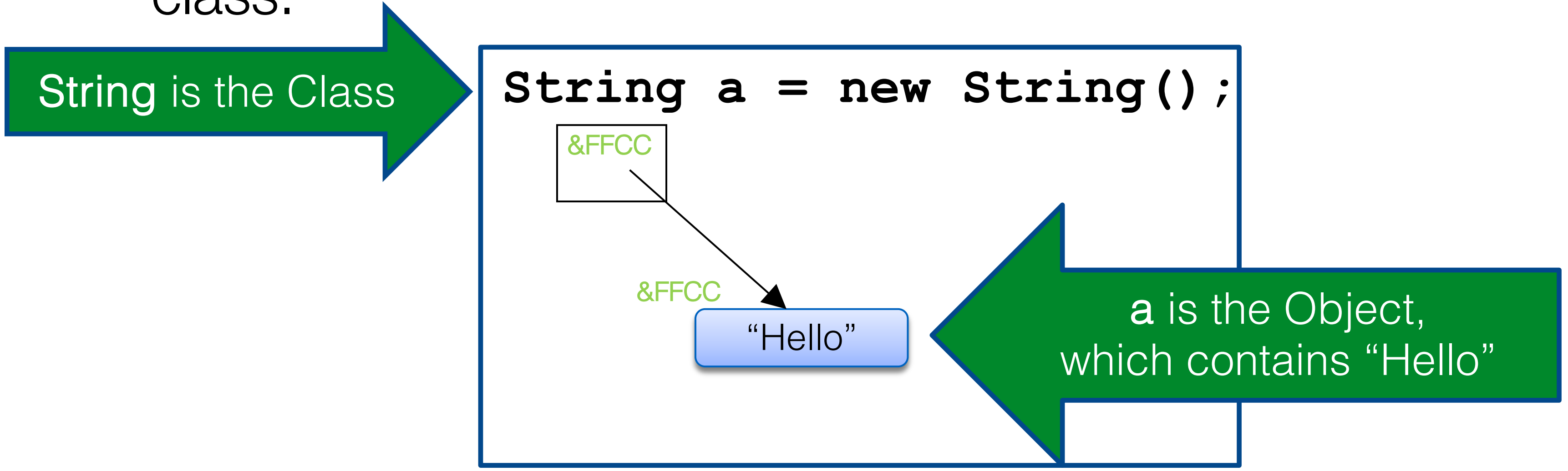
**Method Summary**

Methods

| Modifier and Type | Method and Description |
|---|---|
| `char` | `charAt(int index)` Returns the `char` value at the specified index. |
| `int` | `codePointAt(int index)` Returns the character (Unicode code point) at the specified index. |
| `int` | `codePointBefore(int index)` Returns the character (Unicode code point) before the specified index. |
| `int` | `codePointCount(int beginIndex, int endIndex)` Returns the number of Unicode code points in the specified text range of this `String`. |
| `int` | `compareTo(String anotherString)` Compares two strings lexicographically. |
| `int` | `compareToIgnoreCase(String str)` Compares two strings lexicographically, ignoring case differences. |
| `String` | `concat(String str)` Concatenates the specified string to the end of this string. |
| `boolean` | `contains(CharSequence s)` Returns true if and only if this string contains the specified sequence of char values. |
| `boolean` | `contentEquals(CharSequence cs)` Compares this string to the specified `CharSequence`. |
| `boolean` | `contentEquals(StringBuffer sb)` Compares this string to the specified `StringBuffer`. |
| `static String` | `copyValueOf(char[] data)` Returns a String that represents the character sequence in the array specified. |
| `static String` | `copyValueOf(char[] data, int offset, int count)` Returns a String that represents the character sequence in the array specified. |
| `boolean` | `endsWith(String suffix)` Tests if this string ends with the specified suffix. |
| `boolean` | `equals(Object anObject)` Compares this string to the specified object. |

# Classes and **Objects**

- An object
  - is a single instance of a class
  - i.e. an object is created (instantiated) from a class.



```
String a = new String();
```

## Classes and Objects – **Many Objects**

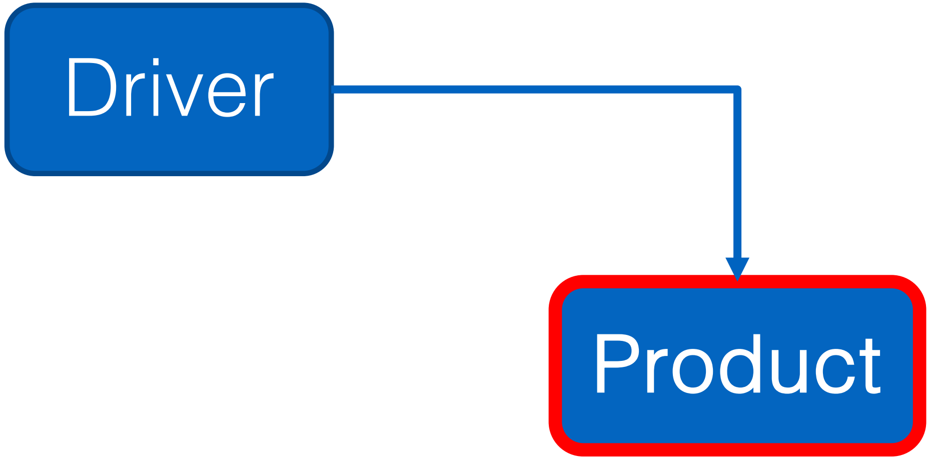
- Many objects can be constructed from a single class definition

- Each object must have a **unique** name within the program

## SHOP
## VERSION 1.0

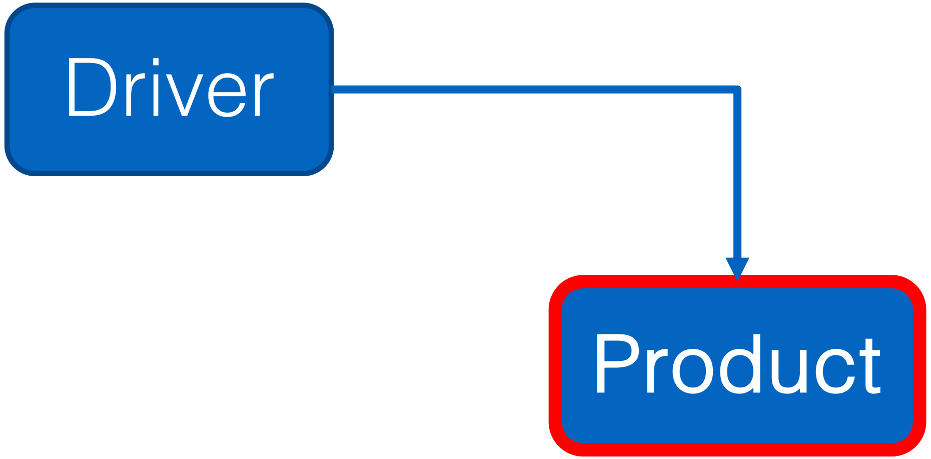
## Shop V1.0 - **Product**

- We will recap object oriented concepts through the study of a new class called Product

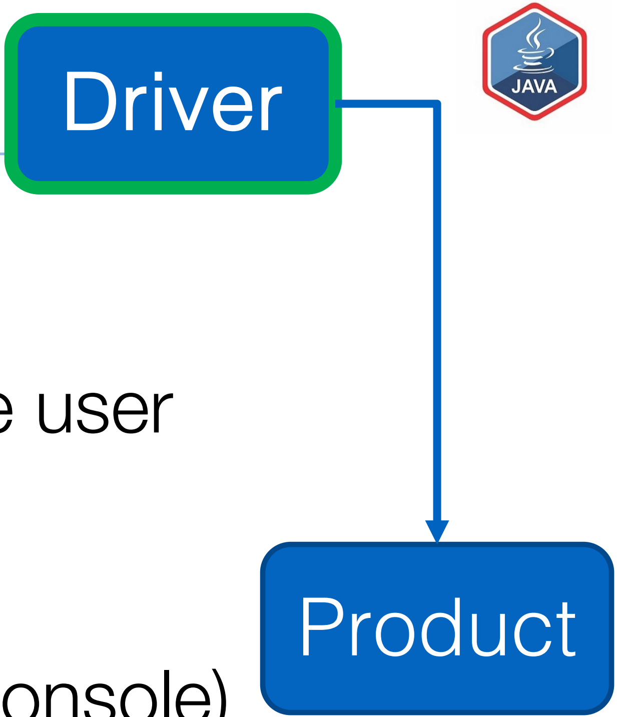


# Shop V1.0 - **Product**

- The Product class stores **details** about a product, e.g. `name`, `code`, `unit cost`, in the `current product line` or not?



## Shop V1.0 - **Driver**



- The `Driver` class
  - has the `main()` method.
  - **reads** the product details from the user (via the console)
  - **creates** a new Product object
  - **prints** the product object (to the console)

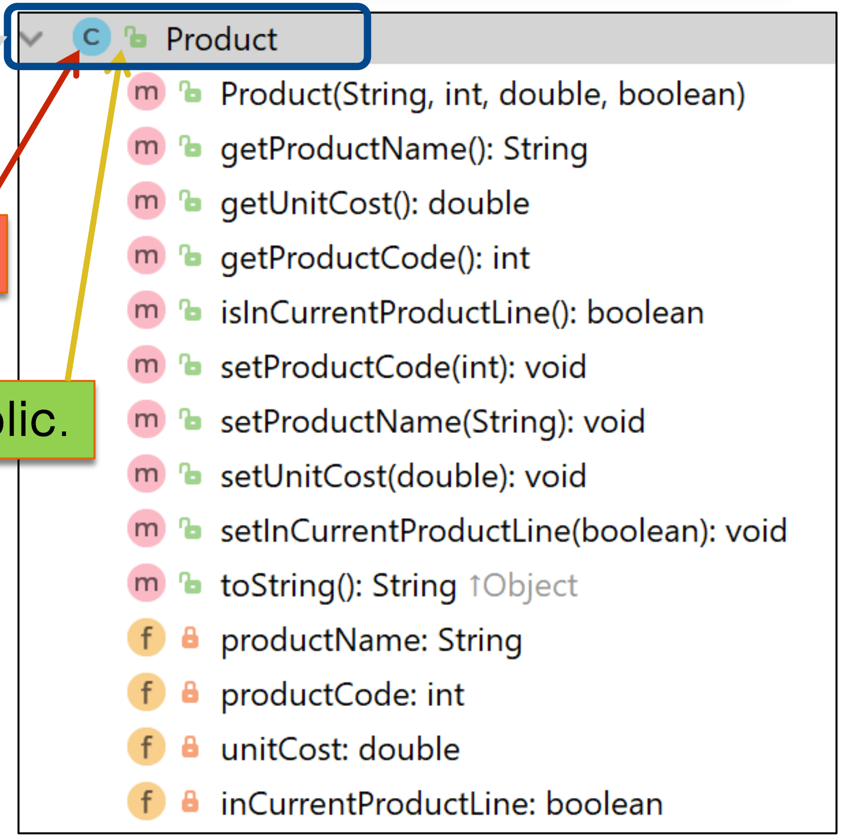
- `Driver` is covered in the next lecture

# A **Product** Class…

Object Type/ **Class** Name
i.e. Product

The **C** icon means it is a **Class**.

The open padlock means it is **public**.

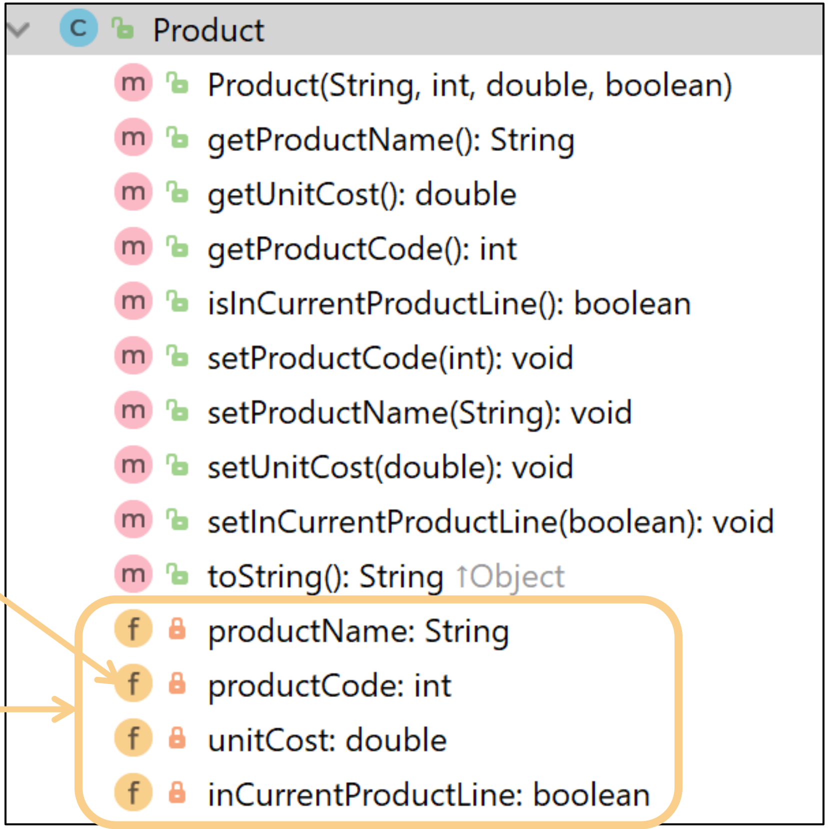


```
C Product
  m Product(String, int, double, boolean)
  m getProductName(): String
  m getUnitCost(): double
  m getProductCode(): int
  m isInCurrentProductLine(): boolean
  m setProductCode(int): void
  m setProductName(String): void
  m setUnitCost(double): void
  m setInCurrentProductLine(boolean): void
  m toString(): String ↑Object
  f productName: String
  f productCode: int
  f unitCost: double
  f inCurrentProductLine: boolean
```

# A **Product** Class…fields

The **f** icon means it is a **field**.

**Fields**
i.e. the **attributes / properties** of the class



```
Product
    Product(String, int, double, boolean)
    getProductName(): String
    getUnitCost(): double
    getProductCode(): int
    isInCurrentProductLine(): boolean
    setProductCode(int): void
    setProductName(String): void
    setUnitCost(double): void
    setInCurrentProductLine(boolean): void
    toString(): String ↑Object
    productName: String
    productCode: int
    unitCost: double
    inCurrentProductLine: boolean
```

# A **Product** Class…fields

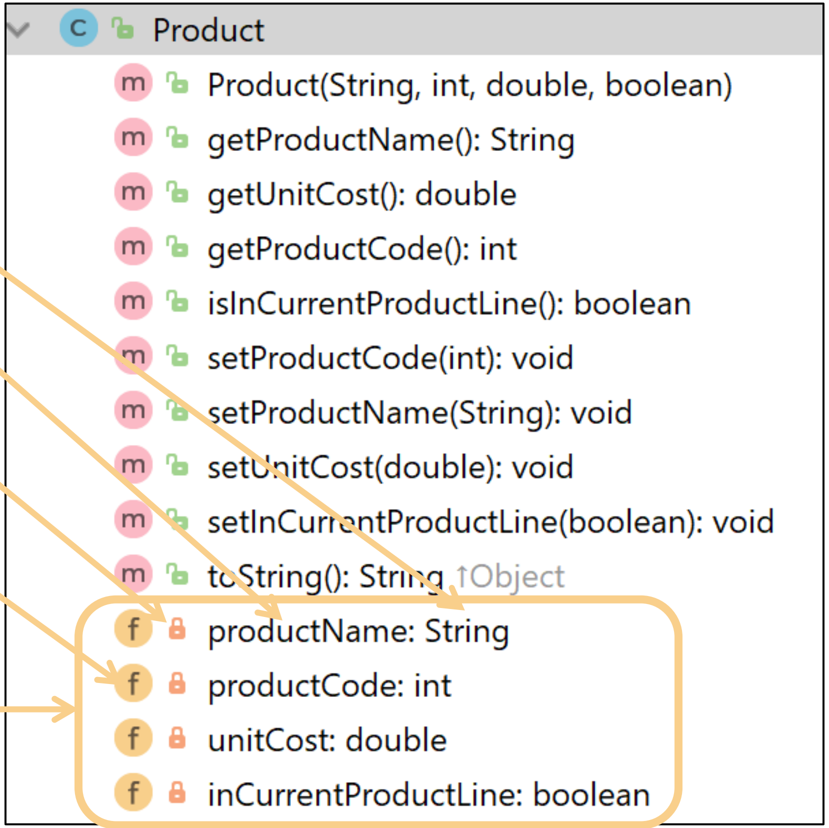
field **type**

field **name**

The closed padlock means it is **private**.

The **f** icon means it is a **field**.

**Fields**
i.e. the **attributes / properties** of the class



Product
- Product(String, int, double, boolean)
- getProductName(): String
- getUnitCost(): double
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- setInCurrentProductLine(boolean): void
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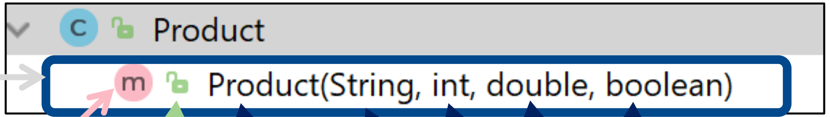
# A **Product** Class…constructor

Constructor
i.e. for building objects.



The **m** icon means it is a **method**.

The open padlock means it is **public**.

Constructors have same name as the class

Four **parameters**; one for each field.

## A Product Class…fields & constructor

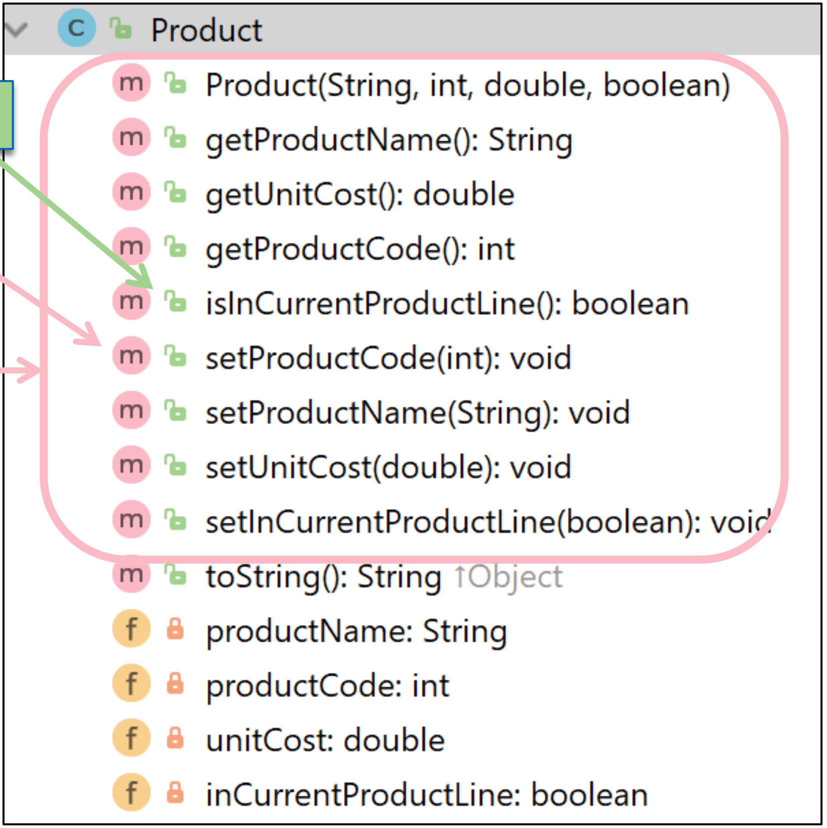
```
public class Product {

    private String productName;
    private int productCode;
    private double unitCost;
    private boolean inCurrentProductLine;

    public Product (String productName, int productCode,
                    double unitCost, boolean inCurrentProductLine){

        this.productName = productName;
        this.productCode = productCode;
        this.unitCost = unitCost;
        this.inCurrentProductLine = inCurrentProductLine;
    }
```

# A **Product** Class… methods

The open padlock means it is **public**.

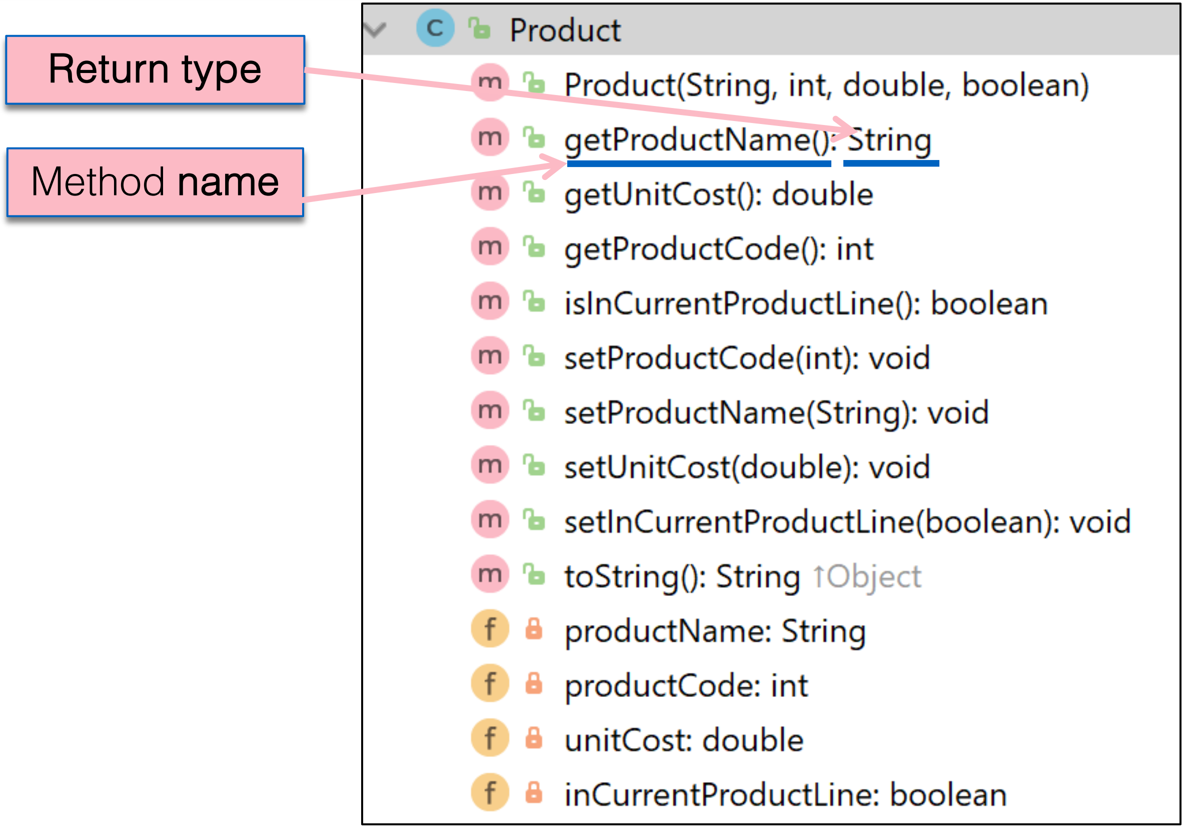
The **m** icon means it is a **method**.

Methods
i.e. the **behaviours** of the class



```
Product
  Product(String, int, double, boolean)
  getProductName(): String
  getUnitCost(): double
  getProductCode(): int
  isInCurrentProductLine(): boolean
  setProductCode(int): void
  setProductName(String): void
  setUnitCost(double): void
  setInCurrentProductLine(boolean): void
  toString(): String ↑Object
  productName: String
  productCode: int
  unitCost: double
  inCurrentProductLine: boolean
```

# A Product Class… methods



Product
- Product(String, int, double, boolean)
- getProductName(): String
- getUnitCost(): double
- getProductCode(): int
- isInCurrentProductLine(): boolean
- setProductCode(int): void
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- setUnitCost(double): void
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- toString(): String ↑Object
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- productCode: int
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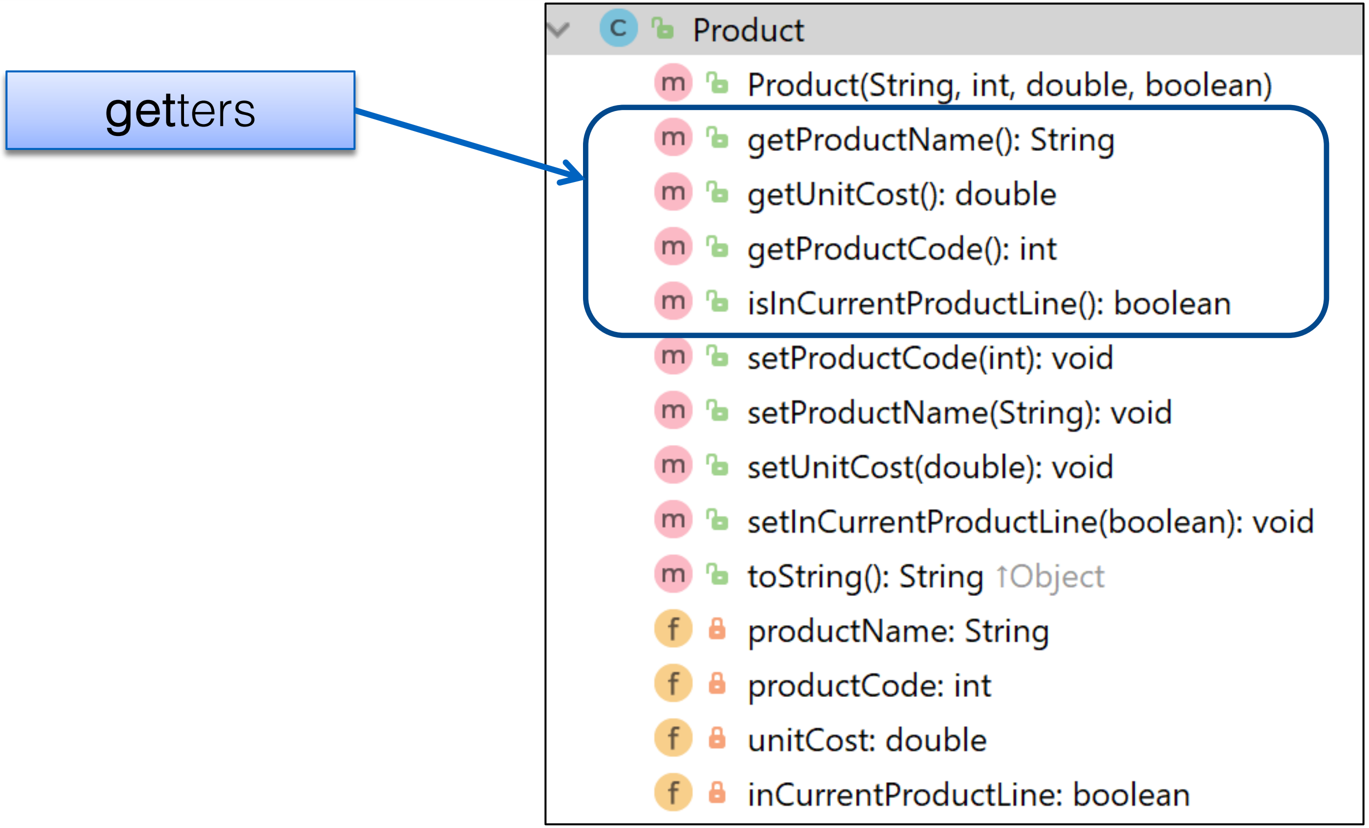
- inCurrentProductLine: boolean

# A `Product` Class… getters



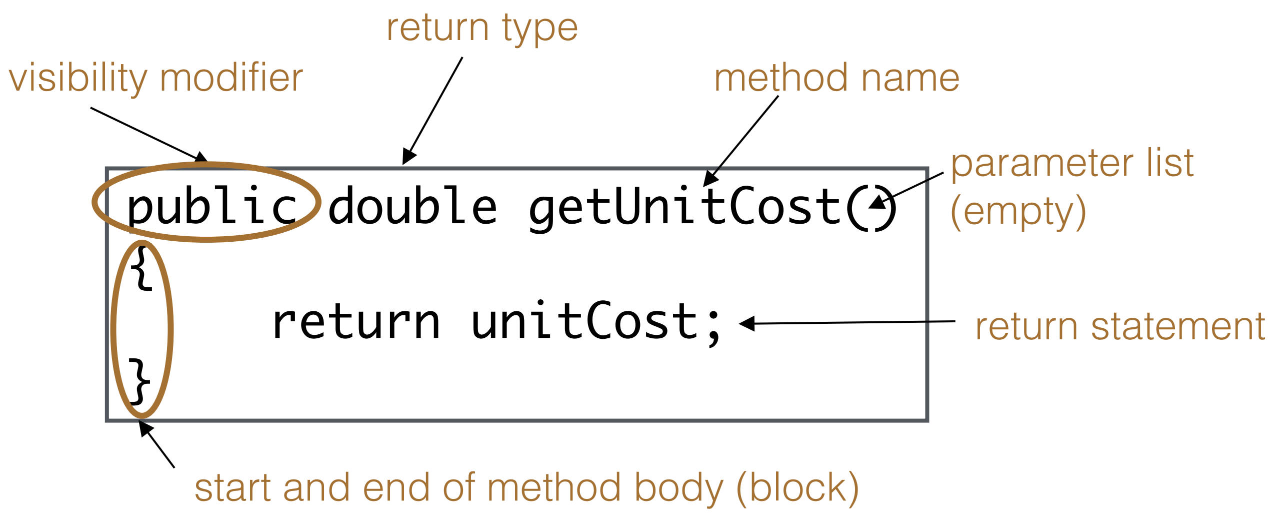
```
Product
  Product(String, int, double, boolean)
  getProductName(): String
  getUnitCost(): double
  getProductCode(): int
  isInCurrentProductLine(): boolean
  setProductCode(int): void
  setProductName(String): void
  setUnitCost(double): void
  setInCurrentProductLine(boolean): void
  toString(): String ↑Object
  productName: String
  productCode: int
  unitCost: double
  inCurrentProductLine: boolean
```

## Getters (Accessor Methods)

- Accessor methods
  - return information about the **state** of an object
    - i.e. **the values stored in the fields.**

- A ‘getter’ method
  - is a specific type of accessor method and typically:
    - **contains a return statement**
      (as the last executable statement in the method).
    - defines a **return type.**
    - **does NOT change the object state.**

## Getters

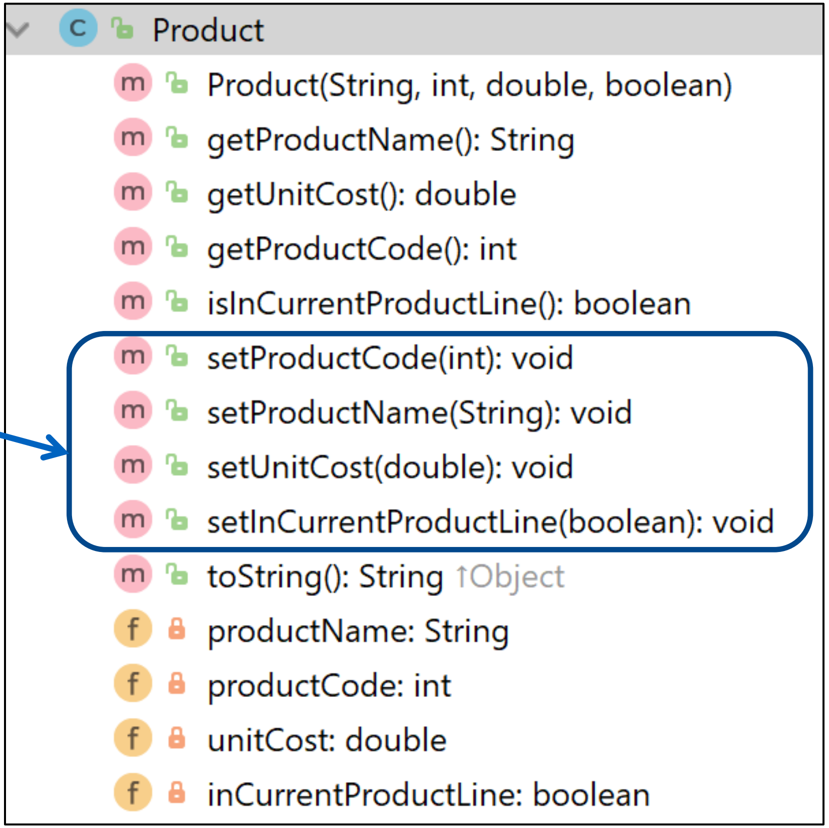

```
public double getUnitCost()
{
        return unitCost;
}
```

## A **Product** Class… getters

```
public String getProductName(){
    return productName;
}

public double getUnitCost(){
    return unitCost;
}

public int getProductCode() {
    return productCode;
}

public boolean isInCurrentProductLine() {
    return inCurrentProductLine;
}
```

# A Product Class… setters

setters


Product
Product(String, int, double, boolean)
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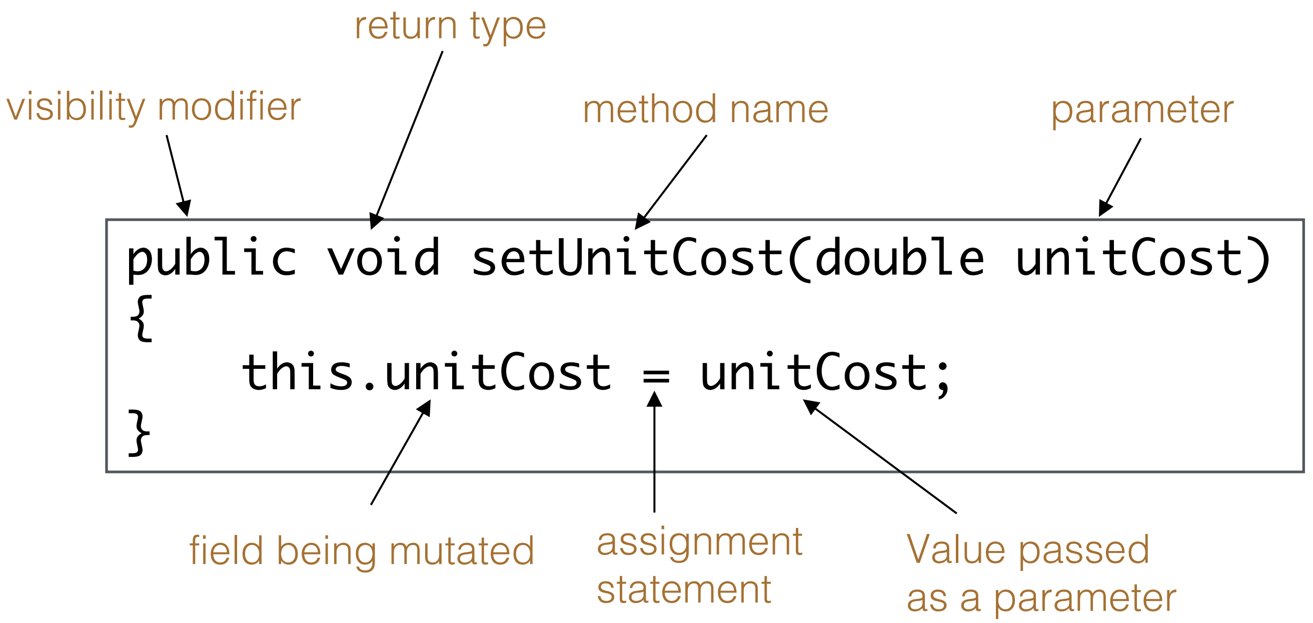
isInCurrentProductLine(): boolean
setProductCode(int): void
setProductName(String): void
setUnitCost(double): void
setInCurrentProductLine(boolean): void
toString(): String ↑Object
productName: String
productCode: int
unitCost: double
inCurrentProductLine: boolean

## Setters (Mutator methods)

- ❑ Mutator methods
  - ▪ change (i.e. mutate) an object’s state.
- ❑ A ‘setter’ method
  - ▪ is a specific type of mutator method and typically:
    - ◆ contains an **assignment statement**
    - ◆ takes in a **parameter**
    - ◆ **changes the object state.**

## Setters



```
public void setUnitCost(double unitCost)
{
    this.unitCost = unitCost;
}
```

## A Product Class… setters

```java
public void setProductCode(int productCode) {
    this.productCode = productCode;
}

public void setProductName(String productName) {
    this.productName = productName;
}

public void setUnitCost(double unitCost) {
    this.unitCost = unitCost;
}

public void setInCurrentProductLine(boolean inCurrentProductLine) {
    this.inCurrentProductLine = inCurrentProductLine;
}
```

## Getters/Setters

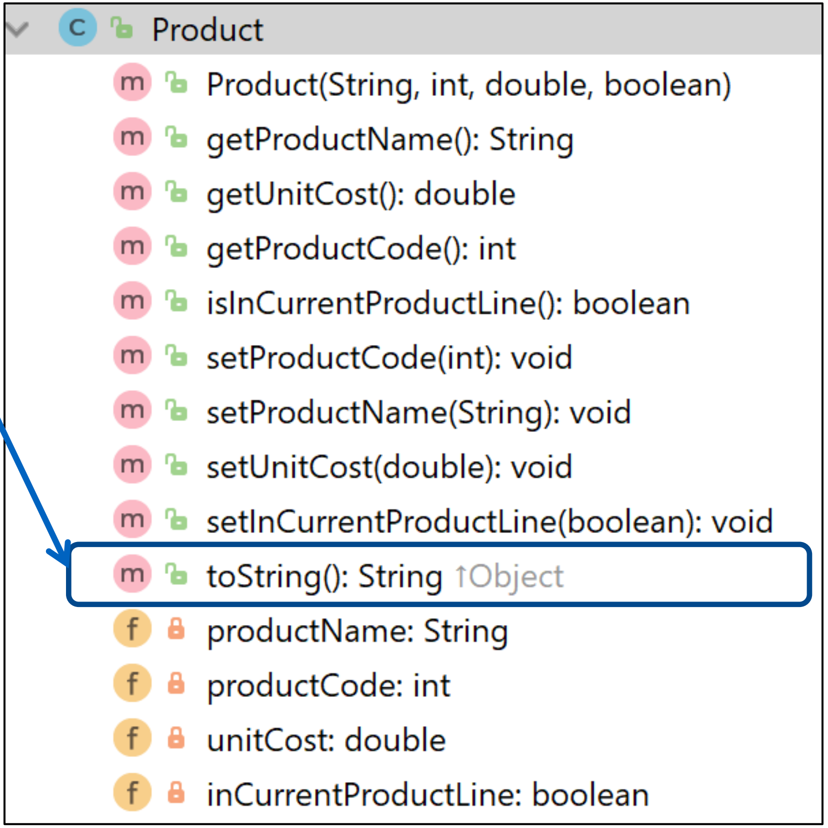
For each instance field in a class, you are normally asked to write:

- A **get**ter
  - Return statement
- A **set**ter
  - Assignment statement

# A **Product** Class… toString()

toString():

Builds and returns a String containing a user-friendly representation of the object state.



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  setInCurrentProductLine(boolean): void
  toString(): String ↑Object
  productName: String
  productCode: int
  unitCost: double
  inCurrentProductLine: boolean
```

# A **Product** Class… toString()

```
public String toString()
{
    return "Product description: " + productName
         + ", product code: " + productCode
         + ", unit cost: " + unitCost
         + ", currently in product line: " + inCurrentProductLine;
}
```

Sample Console Output if we printed a Product Object:

```
Product description: 24 Inch TV, product code: 23432, unit cost: 399.99,
currently in product line: true
```

## toString()

- This is a useful method and you will write a **toString()** method for most of your classes.
- When you print an object, Java automatically calls the toString() method ★
  e.g.

```
Product product = new Product();

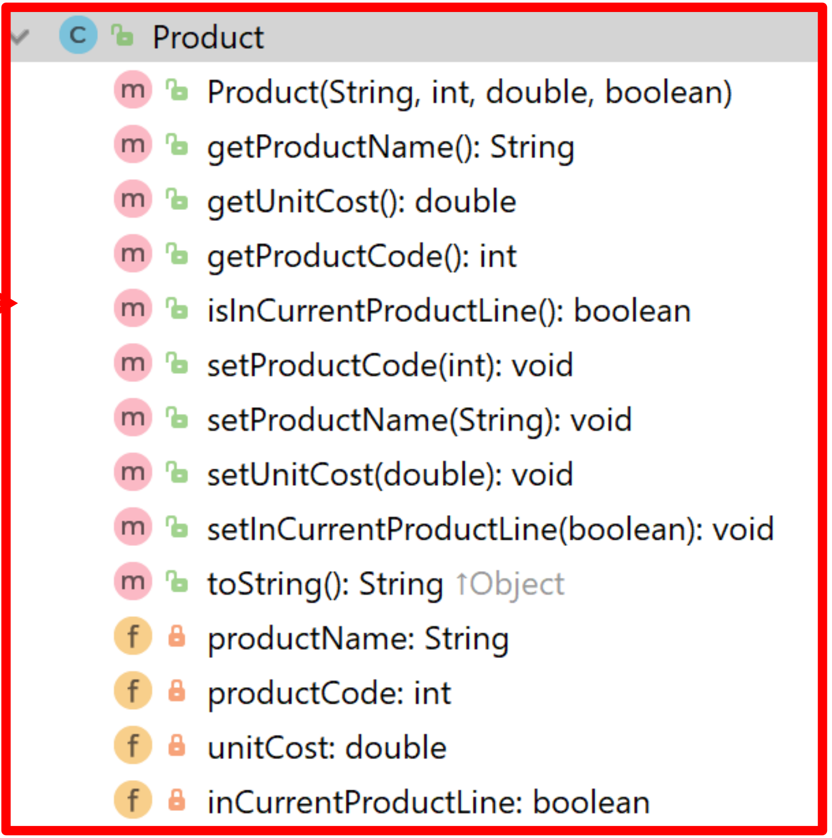
//both of these lines of code do the same thing
System.out.println(product);
System.out.println(product.toString());
```

# Encapsulation in Java – **steps 1-3**

| Encapsulation Step | Approach in Java |
|---|---|
| 1. Wrap the data (fields) and code acting on the data (methods) together as single unit. | `public class` *`ClassName`*<br>`{`<br>    *`Fields`*<br>    *`Constructors`*<br>    *`Methods`*<br>`}` |
| 2. Hide the fields from other classes. | **Declare the fields of a class as <u>private</u>.** |
| 3. Access the fields only through the methods of their current class. | **Provide <u>public</u> set**ter **and get**ter methods to modify and view the fields values. |

# A Product Class… An Encapsulated Class

1. Product class wraps the data (fields) and code acting on the data (methods) together as **single unit**.



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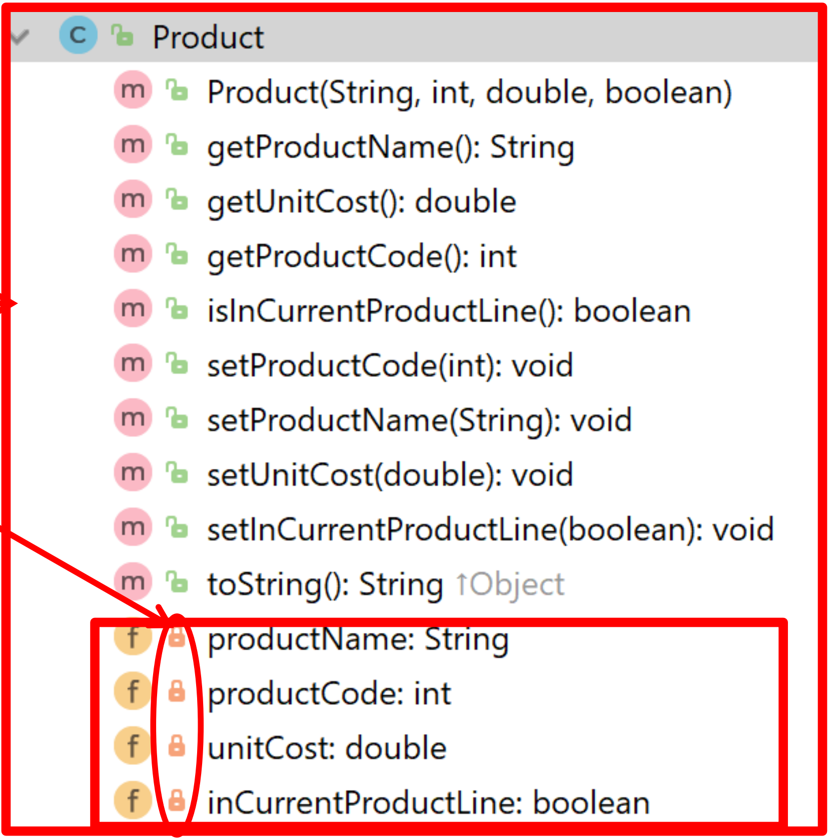
# A Product Class… An Encapsulated Class

1. Product class wraps the data (fields) and code acting on the data (methods) together as **single unit**.

2. Fields are hidden from other classes.



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```
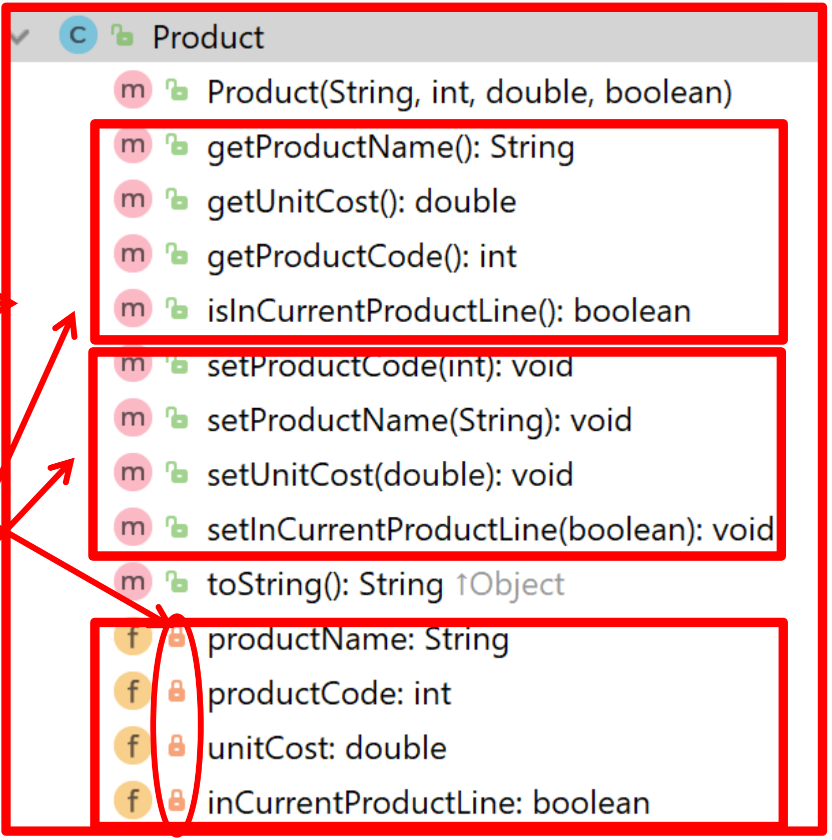

# A Product Class… An Encapsulated Class

1. Product class wraps the data (fields) and code acting on the data (methods) together as **single unit**.

2. Fields are hidden from other classes.

3. Access the fields only through the methods of Product (e.g. **get**ter and **set**ter methods).



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- setInCurrentProductLine(boolean): void
- toString(): String ↑Object
- productName: String
- productCode: int
- unitCost: double
- inCurrentProductLine: boolean

# Using the `Product` Class

1

```java
private Product product;
```

Declaring an object `product`, of type `Product`

`product`

$\boxed{\text{null}}$

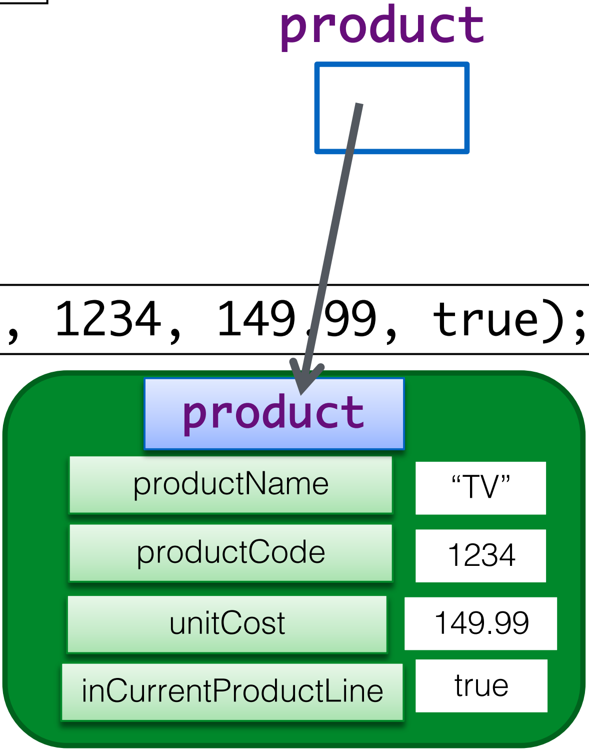
# Using the `Product` Class

1
```
private Product product;
```

Declaring an object **`product`**, of type `Product`

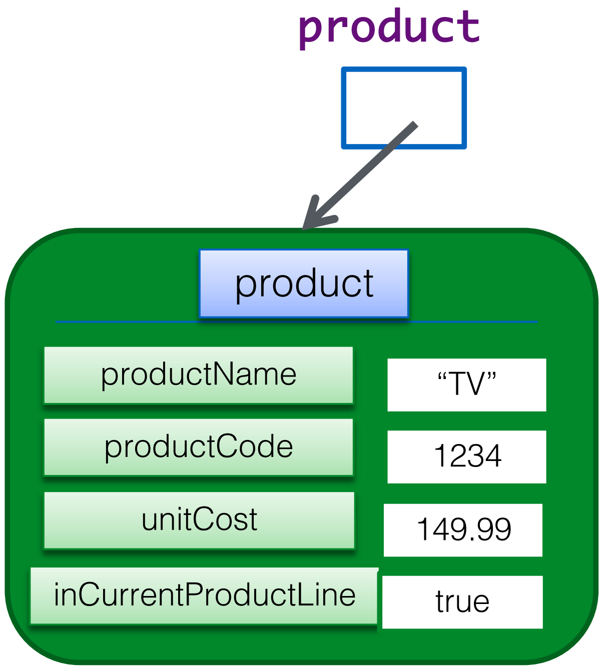
2
```
product = new Product("TV", 1234, 149.99, true);
```

Calls the `Product` *constructor* to build the **`product`** object in memory.



# Multiple Product objects

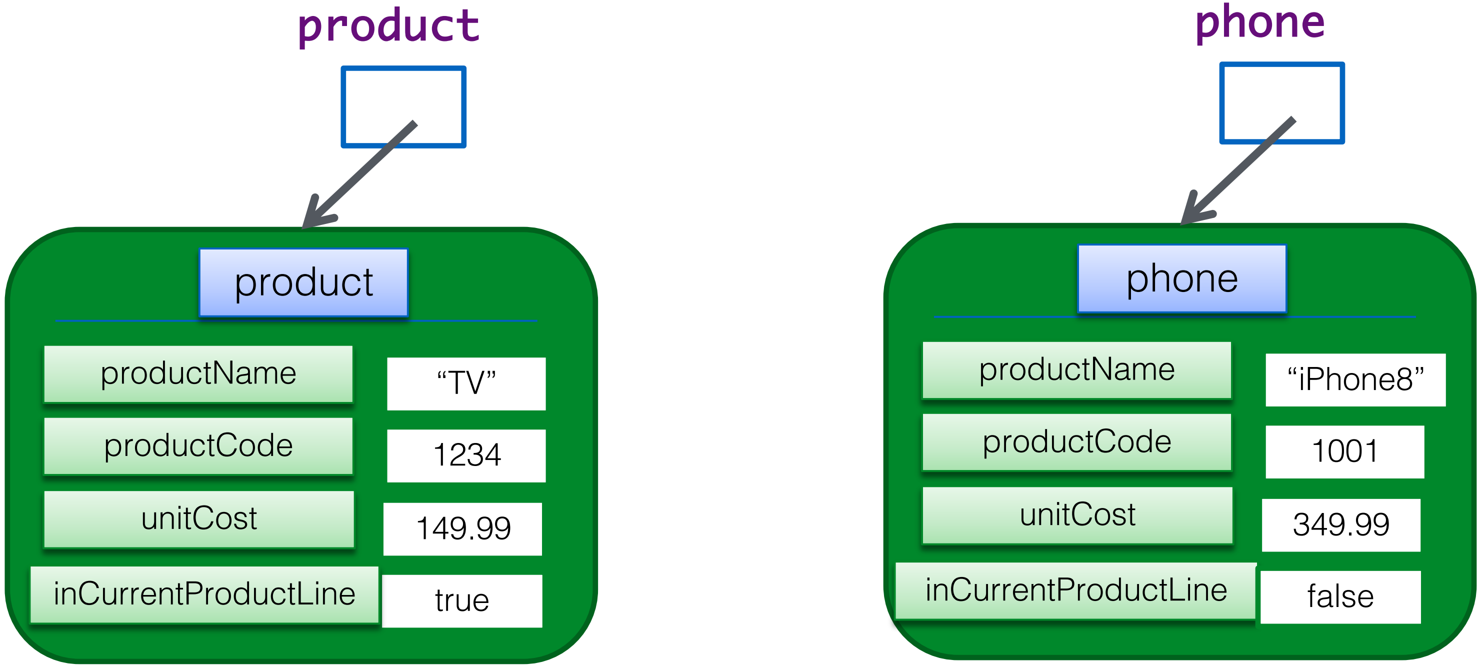
```
private Product product = new Product("TV", 1234, 149.99, true);
```



# Multiple Product objects

```
private Product product = new Product("TV", 1234, 149.99, true);
```

```
private Product phone = new Product("iPhone8", 1001, 349.99, false);
```



# Questions?

Thanks.