INTRODUCTION TO JAVA

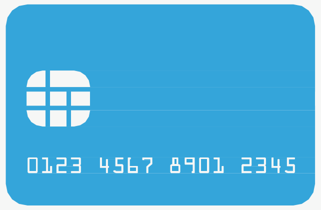
OBJECT ORIENTED PROGRAMMING IN DEPTH

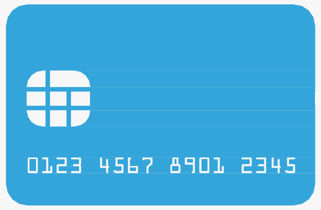
PRIMARY CONCEPTS: CLASS AND OBJECT

- Class describes template (blueprint) of something with state and behaviour
- Object is concrete instance of that class with set state

EXAMPLE: BANK CARD (STATE)

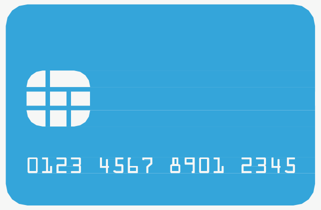
Class		Object
A. Bank Name	→	A. Citadele Banka
B. Payments Processor	→	B. Master Card
C. Name on Card	→	C. John Doe
D. Card Number	→	D. 5224 9989 7556 2871
E. Expiration Date	→	E. 12/2022
F. Security Code	→	F. 218

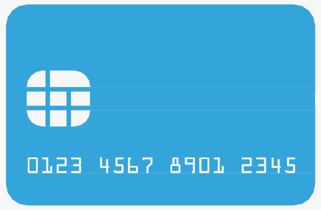




EXAMPLE: BANK CARD (BEHAVIOUR)

Class		Object
A. Get balance	$\longrightarrow$	A. Get balance
B. Deposit funds	$\longrightarrow$	B. Deposit funds
C. Withdraw funds	$\longrightarrow$	C. Withdraw funds

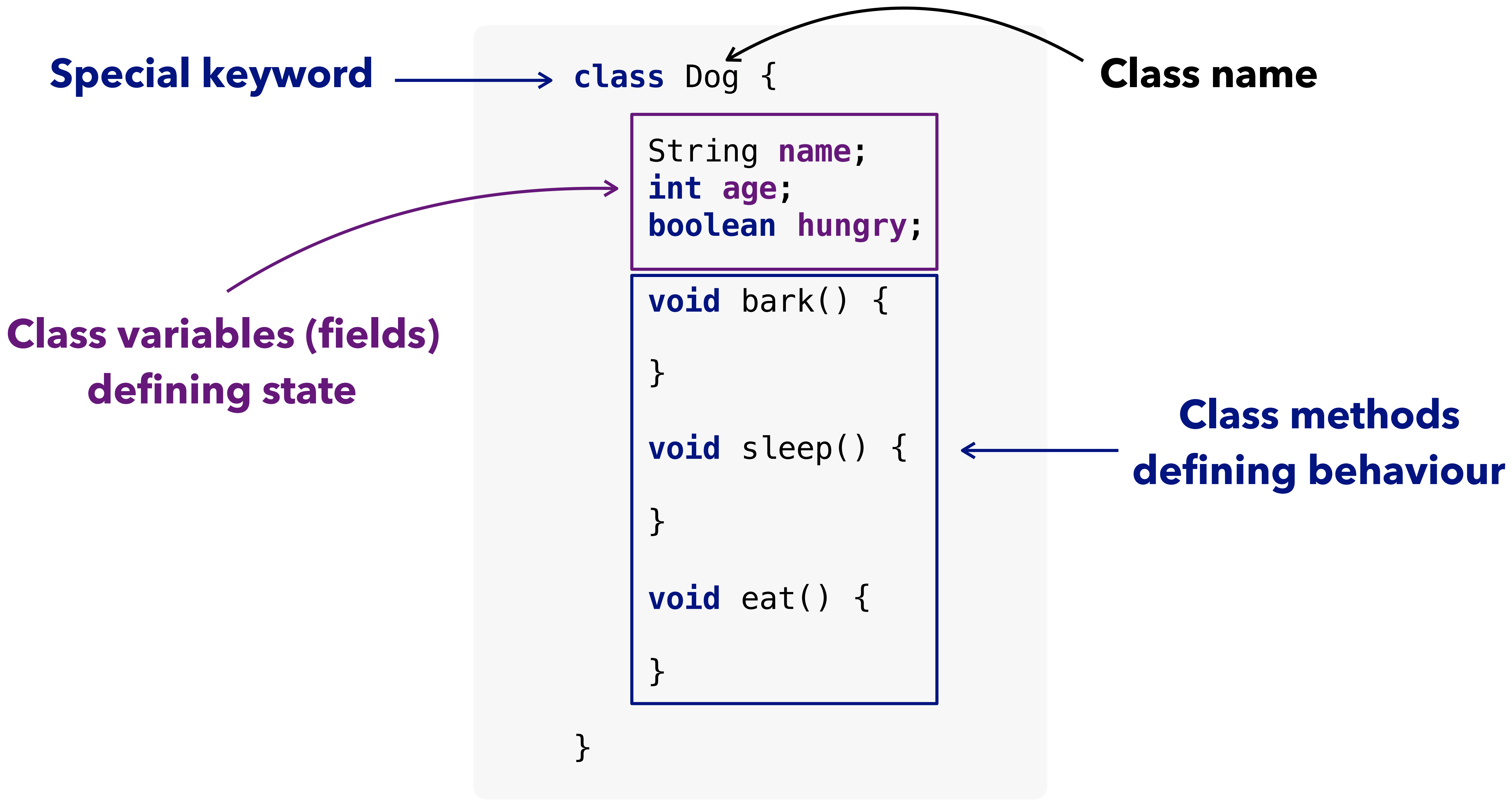




CLASS DECLARATION IN JAVA: SYNTAX

```
class ClassName {

    type variable1;
    type variable2;
    ...
    type variableN;

    method1() {}
    method2() {}
    ...
    methodN() {}

}
```

CLASS DECLARATION IN JAVA: EXAMPLE BREAKDOWN


Special keyword
Class name
Class variables (fields) defining state
Class methods defining behaviour

```
class Dog {
    String name;
    int age;
    boolean hungry;
    void bark() {

    }

    void sleep() {

    }

    void eat() {

    }
}
```

OBJECT INSTANTIATION IN JAVA: SYNTAX

- Object instantiation without assignment

```
new Class();
```

- Object instantiation with assignment

```
Class var = new Class();
```

OBJECT INSTANTIATION IN JAVA: SYNTAX

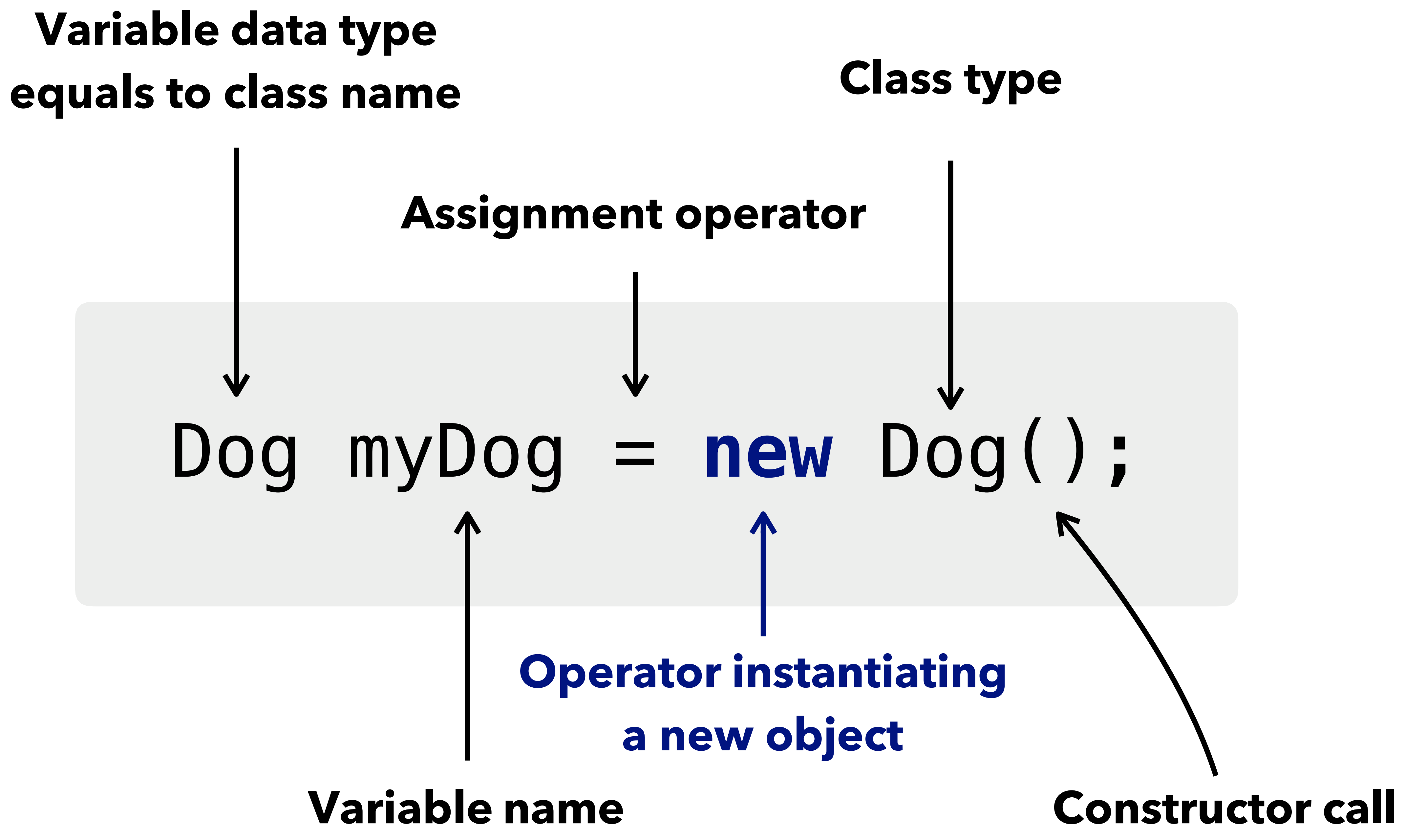
- Object instantiation without assignment

```
new  Dog();
```

- Object instantiation with assignment

```
Dog myDog = new Dog();
```

OBJECT INSTANTIATION BREAKDOWN



```java
Dog myDog = new Dog();
```

Variable data type equals to class name
Assignment operator
Class type
Variable name
Operator instantiating a new object
Constructor call

THREE-STEP PROCESS OF OBJECT CREATION

1. Declaration - object variable declaration of a class type
2. Instantiation - the process of creating an object with new operator
3. Initialisation - the process of object construction by setting its initial state

CONSTRUCTORS

- Every class has a constructor
- If explicit constructor(s) is not specified in code, Java Compiler will generate default constructor implicitly
- Each time a new object is created, at least one constructor will be invoked
- Each defined constructor must have unique signature (i.e. ordered number and type of arguments)

CONSTRUCTOR DECLARATION IN JAVA: EXAMPLE BREAKDOWN

```
public class Dog {

    private String name;

    public Dog() {

    }

    public Dog(String name) {
        this.name = name;
    }

}
```

Explicit default constructor without arguments →

← **Explicit constructor with argument and initialisation**

MEMORY OVERVIEW

MEMORY TYPES

- Java Heap Memory
  - Created objects are stored in the heap space
  - Lives from the start till the end of application execution
  - Objects stored in heap are globally accessible
- Java Stack Memory
  - Contains local primitive variables and reference variables to objects in heap space
  - Lives only within method execution, short-lived
  - Bound to the current execution thread

METHODS OVERVIEW

METHOD DEFINITION

- Java method is a collection of statements that are grouped together to perform an operation
    - Invoking *System.out.println()* method actually executes several statements in order to display a message on the console
- Describes behaviour of class or actions that object can perform
- Method either produces output or not

METHOD DECLARATION IN JAVA: SYNTAX

Defines the access type of the method

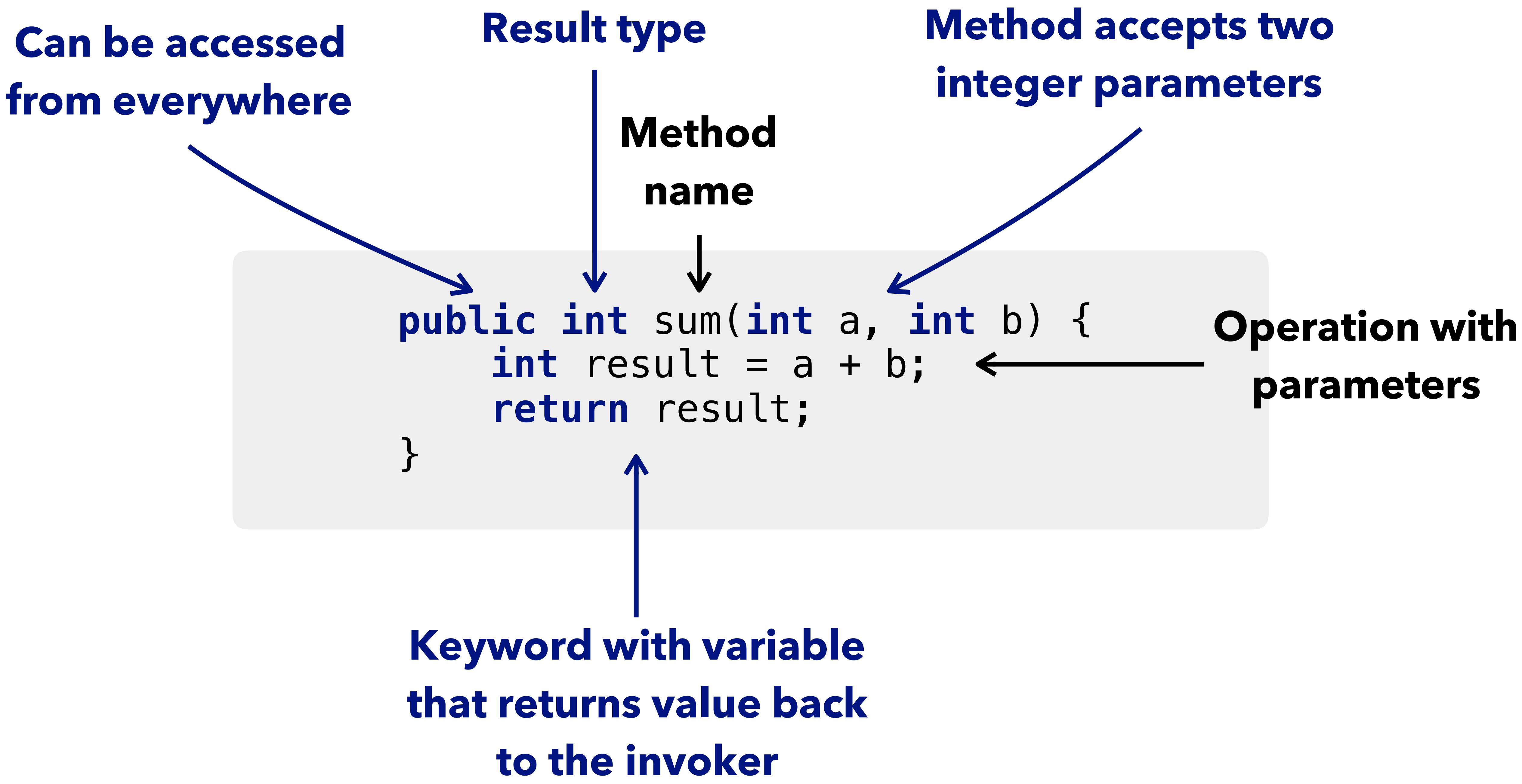
Defines method name

```
modifier returnType methodName (arg1, arg2, ..., argN) {
    //body
}
```

Specifies return type for methods producing output

List of parameters, it is type, order and number

METHOD DECLARATION IN JAVA: WITH RETURN EXAMPLE


Can be accessed from everywhere
Result type
Method name
Method accepts two integer parameters
Operation with parameters
Keyword with variable that returns value back to the invoker

```java
public int sum(int a, int b) {
    int result = a + b;
    return result;
}
```

METHOD DECLARATION IN JAVA: WITHOUT RETURN EXAMPLE

Method name

Keyword meaning no return value

Method accepts two integer parameters

```java
public void printSum(int a, int b) {
    int result = a + b;
    System.out.println("Sum of numbers is" + result);
}
```

Operations with parameters

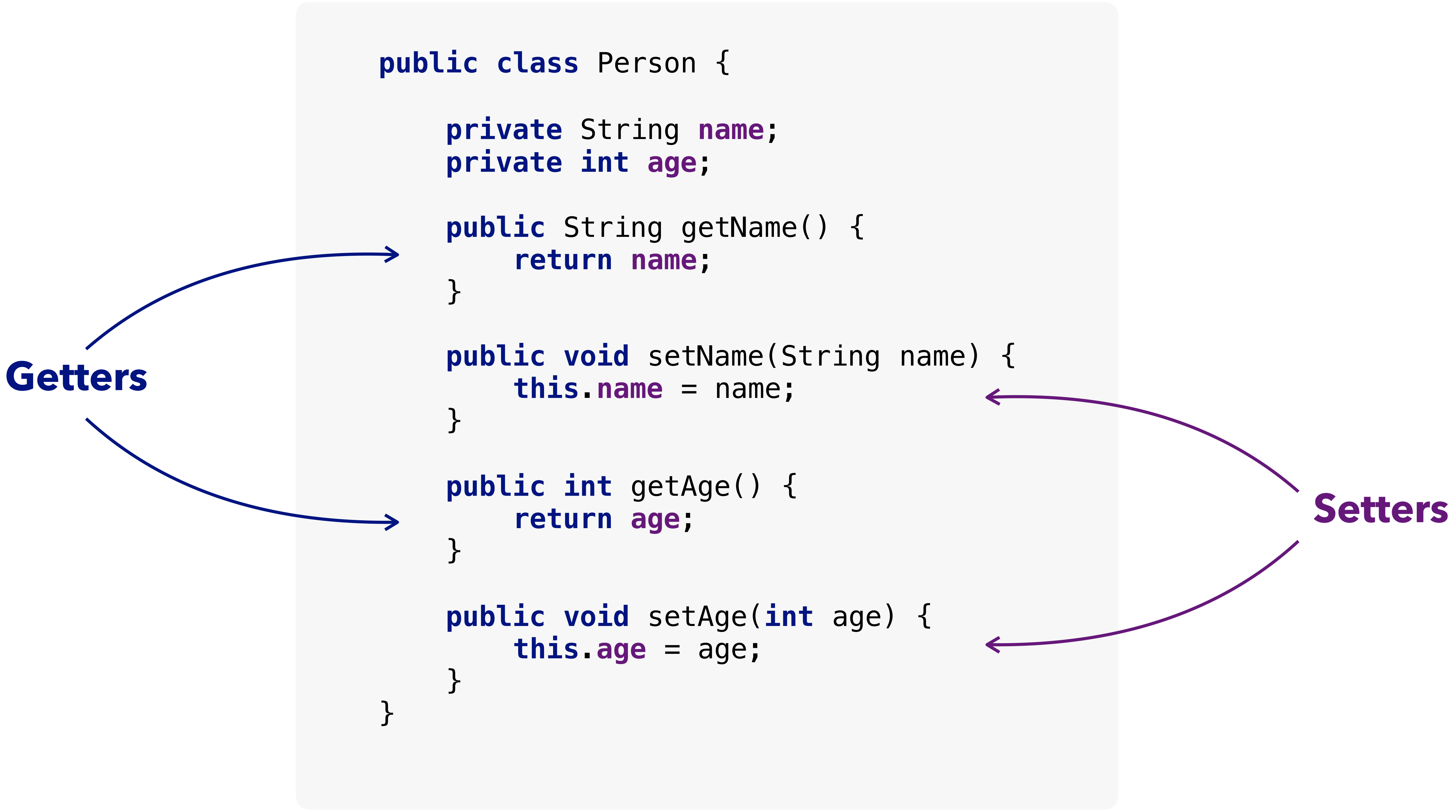
A BIT MORE ABOUT RETURNING RESULT

- After completion method returns to the code that invoked it
- Whether method returns value or not is declared in method signature
  - When type is void - return statement is unnecessary, however can be stated
  - Other type - return statement is necessary

ACCESSING AND CHANGING OBJECT STATE: GETTERS & SETTERS

- In OOP another party should not be able to access object state directly
- To keep things safe, one can
  - Retrieve object state via get methods (getters)
  - Change object state via set methods (setters)

GETTERS & SETTERS DECLARATION



```
public class Person {

    private String name;
    private int age;

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public int getAge() {
        return age;
    }

    public void setAge(int age) {
        this.age = age;
    }
}
```

GETTERS & SETTERS USAGE

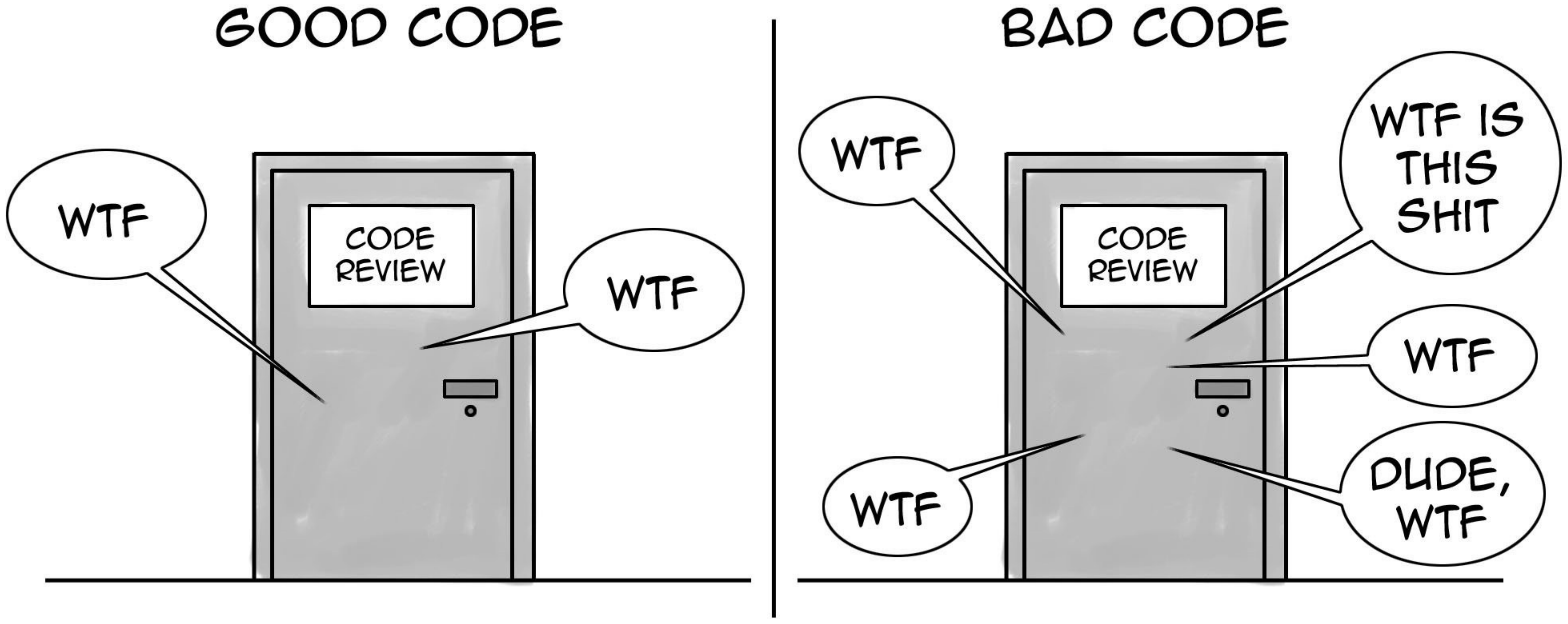
```java
public class PersonTest {

    public static void main(String[] args) {

        Person person = new Person();
        person.setName("JohnDoe");
        person.setAge(32);

        String personName = person.getName();
        int personAge = person.getAge();

        System.out.println("Hisname  is " + personName);
        System.out.println("He is " +personAge  + " years old");

    }

}
```

CLEAN CODE PRACTICES

ANY FOOL CAN WRITE CODE THAT COMPUTER UNDERSTAND.

GOOD PROGRAMMERS WRITE CODE THAT HUMANS CAN UNDERSTAND.

Martin Fowler



THE ONLY VALID MEASUREMENT OF CODE QUALITY: WTFs/MINUTE

BAD CODE AND GOOD CODE

Bad

```java
public class Cat {

    privateString n;

    public String getN() {
        return n;
    }

    public void setN(String n) {
        this.n = n;
    }

    public void v() {
        System.out.println("Meow");
    }

}
```

Good

```java
public class Cat {

    privateString name;

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public void voice() {
        System.out.println("Meow");
    }

}
```

REFERENCES

- https://docs.oracle.com/javase/tutorial/java/javaOO/methods.html
- https://www.tutorialspoint.com/java/java_methods.htm