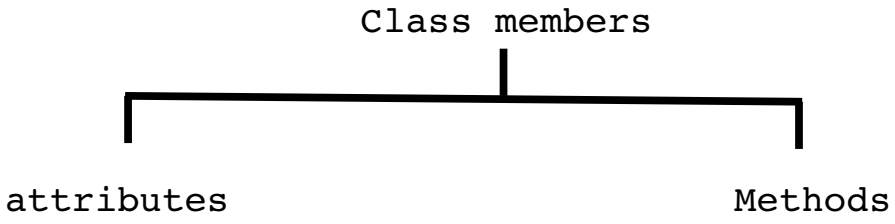
What is a class?

A class is a new type defined by the user, the programmer defines the class with attributes (proprieties) and methods (behaviors).



Attributes: to describe the proprieties of the class, for example if we have a class named Student, we can say the attributes are : is,name,GPA, hoursCompleted etc.
The class will give all attributes ***default*** values as follows:

- numbers → 0
- boolean → false
- String → null

Methods: to describe the behaviors of the class, for example if we have a class named Student, we can say the methods are:

- public void setGPA(double g)
- public Student()
- public double getGPA()

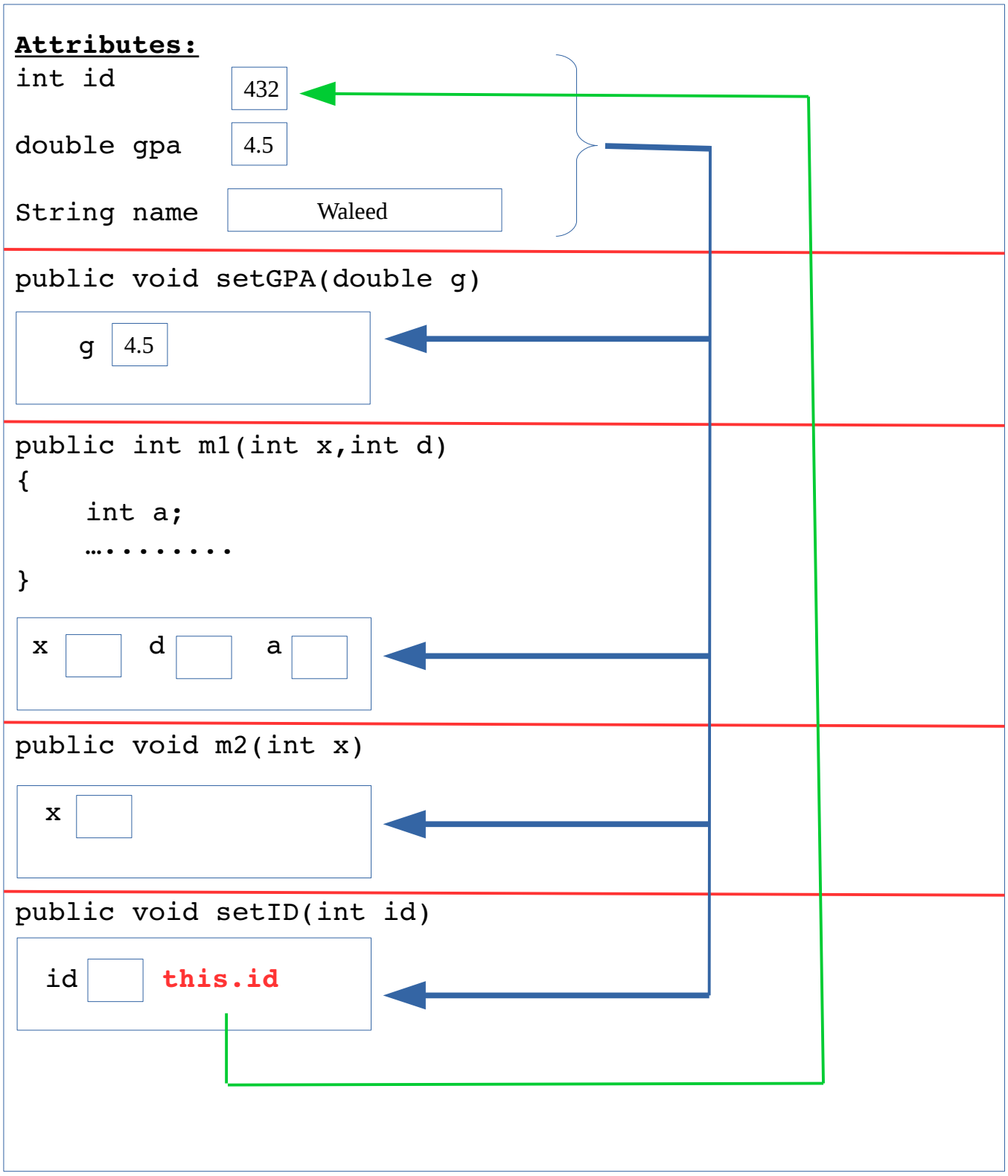
Access modifiers:

public : any member in the class and in other class can use this member.
private : only members in the class can use this member.

Protected: only members in the class and in the same package can use this member.

Variables scope

Student class



Constructors:

The constructor method is called when creating an object from this class.
There is a default constructor for each class from java. This constructor will give the default values to all attributes.

To write your own constructor you have to follow the following rules:

- constructor name must be exactly same as class name.
- Has no return type ***(do not put void).***
- It should be public, if you put it private you can create object using this constructor.
- You can have as many as you need.
- You can use return in the constructor, but you can not return a value, only ***return;***

Example:

```
public Student()
{
    int id;
    double gpa;
    String name;

    public Student()
    {
        id = 0;
        gpa = 5;
        name = “Waleed”;
    }

    public Student(int id, double gpa, String name)
    {
        this.id = id;
        this.gpa = gpa;
        this.name = name;
    }
}
```

Setters

```
public void setGPA(double g)
{
    gpa = g;
}

public void setGPA(double g)
{
    if (g >= 0 && g <= 5)
        gpa = g;
}

public void setGPA(double g)
{
    if (g >= 0 && g <= 5)
    {
        gpa = g;
        System.out.println("GPA is set to : " + g);
    }
    else
    {
        gpa = 0;
        System.out.println("Wrong GPA is set to : 0");
    }
}

public boolean setGPA(double g)    //Best one
{
    if (g >= 0 && g <= 5)
    {
        gpa = g;
        return true;
    }
    else
        return false;
}
```

Getters:

```
public int getGPA()
{
    return gpa;
}
```

Read method:

```
public void read()
{
    //do import in the beginning of the class
    Scanner input = new Scanner(System.in);

    System.out.print("Enter id : ");
    setID(input.nextInt());

    System.out.print("Enter GPA : ");
    setGPA(input.nextDouble());

    System.out.print("Enter Name : ");
    setName(input.next());
}
```

Display method:

```
public void display()
{
    System.out.print("Id   : " + id);
    System.out.print("GPA  : " + gpa);
    System.out.print("Name : " + name);
}
```

What is an object?

The object is an instance of the class.

For example:

Student s1;

to use the object you have to do two steps:

Step 1 : define a reference to an object.

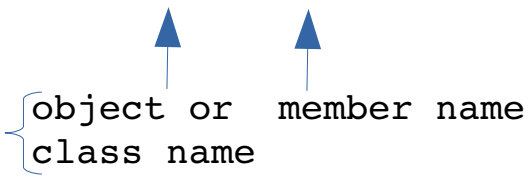
Step 2 : create the object using new.

```
Student s1;   ← this is step 1.
s1 = new Student(); ← this is step 2.

Student s1 = new Student(); ← step 1 and step 2
```

To use any member in the object you should use the dot operator.

```
s1.setId(4444);
```



if you put class name, then the member must be defined as static.

Examples:

```
s1.id = 4444; //error, id is private
Student.setID(44444);//error, setID is not static mothod

Student s1;
s1.setID(44444); //error, must create the object first.
S1.setHours(10); //error, member is not found.
```

NOTE:

The program is a collection of classes, each class has attributes and methods, ***you must one class with main method***.