Girls Who Code
Week 9

Object Oriented Programming Review

WIT Shout-Out of the Week: Katie Moussouris

- Katie Moussouris is an American computer security researcher, entrepreneur, and pioneer in vulnerability disclosure, and is best known for her ongoing work advocating responsible security research.
- She began programming when she was in the 3rd grade on a computer that her mom bought for her and their family and was the first girl at her high school to take AP computer science
- She pioneered Symantec Vulnerability Research in 2004 for the antivirus company Symantec, which became the first program to allow Symantec researchers to publish vulnerability research.
- Senior Security Strategist Lead at Microsoft, where she ran the Security Community Outreach and Strategy team for Microsoft as part of the Microsoft Security Response Center (MSRC) team
- She now owns her own company called Luta Security, a consultancy to help organizations and governments work collaboratively with hackers through bug bounty programs.

WIT Shout-Out of the Week: Katie Moussouris

https://www.linkedin.com/in/kmoussouris/

Videos

https://thehill.com/policy/cybersecurity/356983-qa-with-katie-moussouris-cybersecurity-professional

Warm Up Activity

Warm Up Activity

1. Get a user inputed string and print it out in reverse order

2. Write a c# program that takes in a string as input and then replaces all e’s with 3 and prints it back out
   a. Use a foreach loop

Object-Oriented Programming REVIEW

Students

Classes

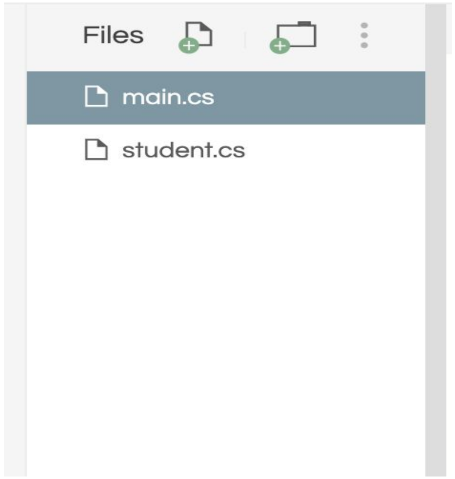
What is a Class?

- **Class** - a grouping of code used to represent an ***object***
    - Contains methods and attributes for ***object***
    - Way to model objects in code
        - Both reusable and distinct

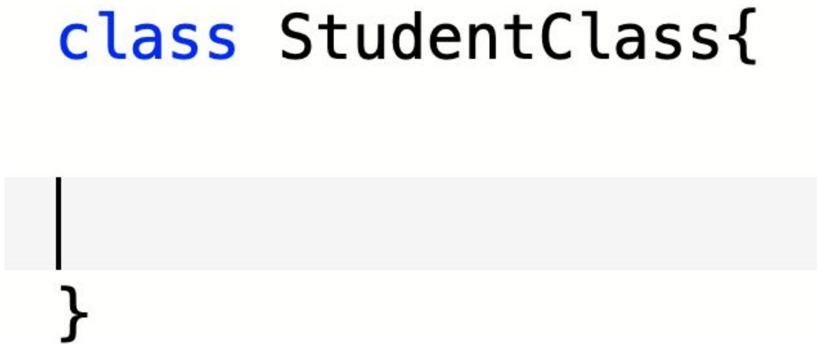
- MainClass
    - In C#, all code must be contained in a ***class***
    - MainClass is the ***driver program***
    - Contains ***main method***

How to Make a Class in Repl

- Create a **new file**
  - Name file same as class
  - Each class gets its own file
- Use class keyword
- Name class



Click the file tab to make a new file and name it student.cs to create your student class



```
class StudentClass{

}
```

Objects

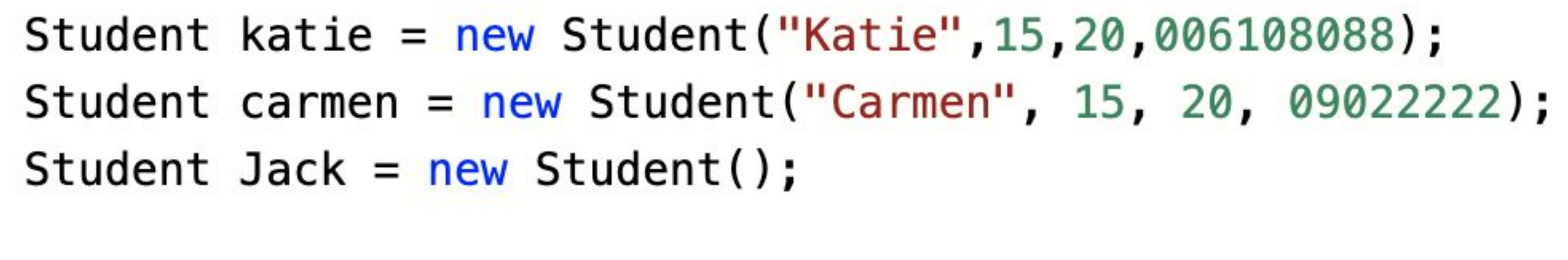
Objects Definition

- **Object** - ***instance*** of a class
  - An entity/item
  - Only one piece of a whole class of items
  - Contains all attributes defined in class
  - Student Class - a single student is an object

- **Instance** - a single piece of a larger picture

- Objects are able to access all code from corresponding class

Object Examples



```java
Student katie = new Student("Katie",15,20,006108088);
Student carmen = new Student("Carmen", 15, 20, 09022222);
Student Jack = new Student();
```

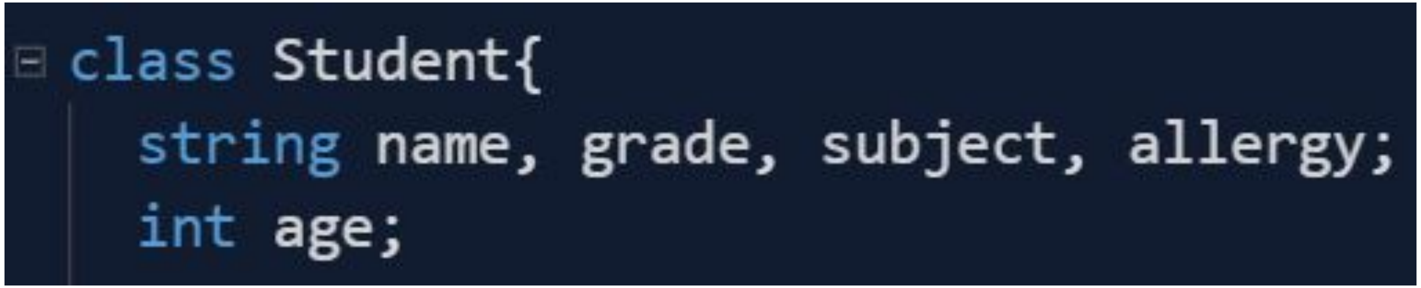
<u>How to create an object:</u>

NameOfClass object-variable = new NameOfClass(attributes);

Attributes

- **<u>Attribute</u>** - a property that applies to every object of a class

- Attributes are ***global variables*** within a class
    - **<u>Global variables</u>** - defined inside class, outside methods
    - Can create as many attributes as you need
    - Student Class - we decided the attributes



```
class Student{
    string name, grade, subject, allergy;
    int age;
```

Constructors

Constructors

- **Constructors** - special methods called to create an object
  - Define attributes of object
  - Can have 0 parameters (default constructor)
  - Can have multiple parameters

Multiple (Overloaded) Constructors

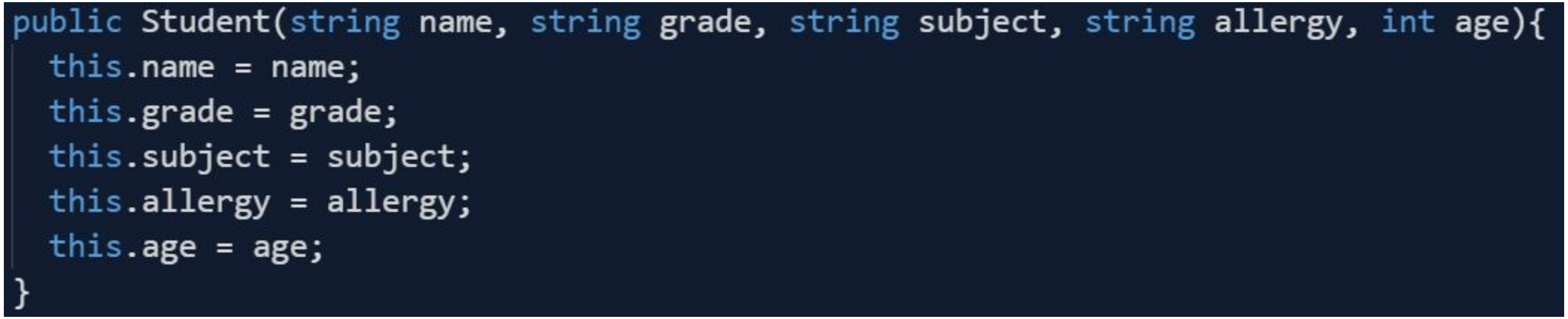
You can have multiple constructors as long as the parameters are different

```
public Student(){
   name = "Student";
   grade = "freshman";
   subject = "math";
   allergy = "none";
   age = 15;
}
```

```
public Student(string name,
string grade, string subject,
string allergy, int age){
   this.name = name;
   this.grade = grade;
   this.subject = subject;
   this.allergy = allergy;
   this.age = age;
}
```

What the heck is this?

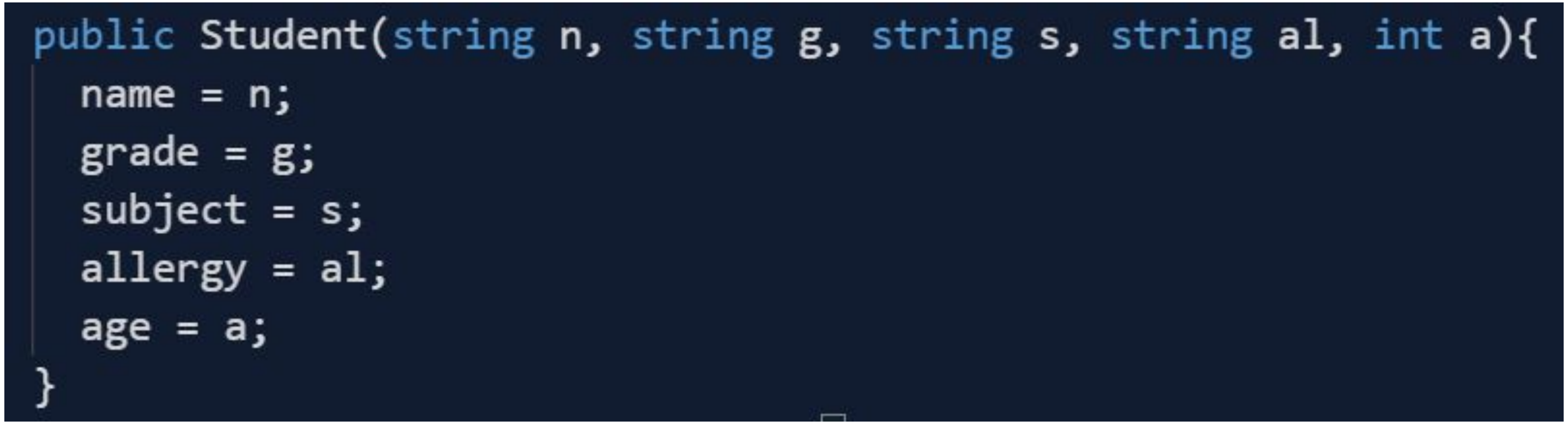
- this is a ***keyword*** used to clarify between global variables of a class and parameters of a method
- ONLY NEEDED if the parameter and global variable have the same exact name
- this refers to the ***global variables***, NOT the ***parameters***
  - Aka the attributes of the object



```
public Student(string name, string grade, string subject, string allergy, int age){
  this.name = name;
  this.grade = grade;
  this.subject = subject;
  this.allergy = allergy;
  this.age = age;
}
```

What the heck is this?

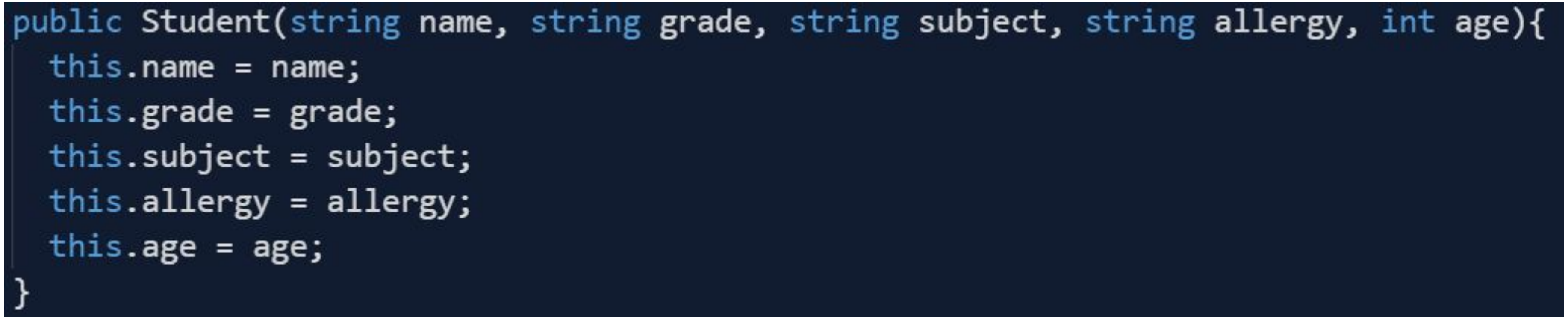
- Can avoid using this by naming parameters something else
- YOU WILL GET THE EXACT SAME RESULTS



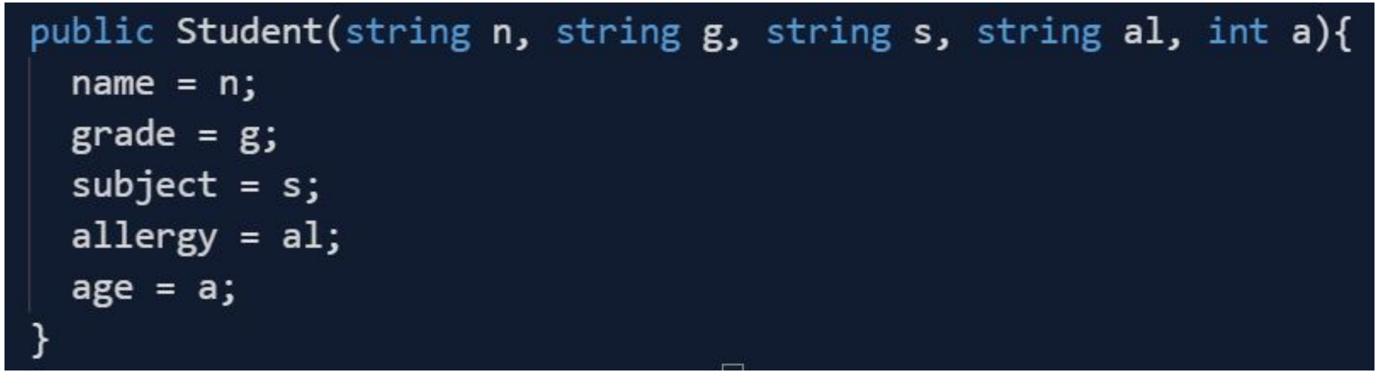
```
public Student(string n, string g, string s, string al, int a){
  name = n;
  grade = g;
  subject = s;
  allergy = al;
  age = a;
}
```

Creating a Constructor

- **Need:** access modifier, name of class, parameters
- Parameters are the attributes of the object



```
public Student(string name, string grade, string subject, string allergy, int age){
  this.name = name;
  this.grade = grade;
  this.subject = subject;
  this.allergy = allergy;
  this.age = age;
}
```

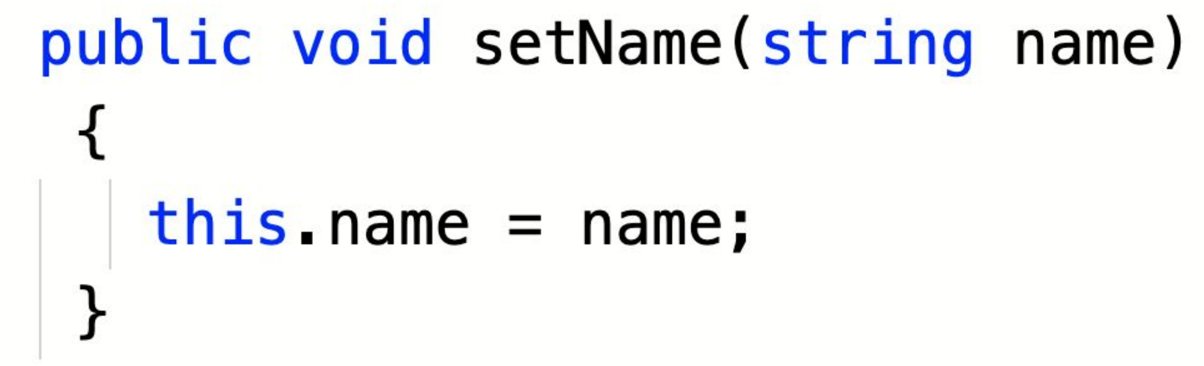


```
public Student(string n, string g, string s, string al, int a){
  name = n;
  grade = g;
  subject = s;
  allergy = al;
  age = a;
}
```

Accessing Attributes

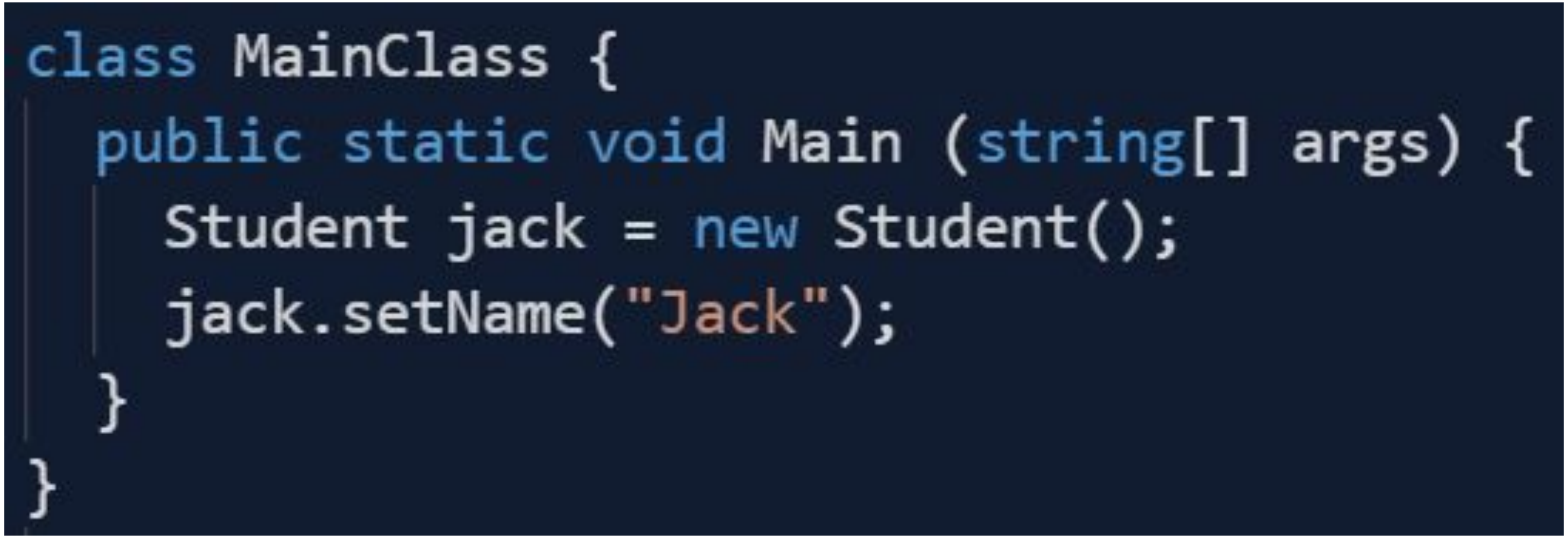
Set Methods (Setters)

- If you create an object and want to change an attribute later, you do so using “setter” methods
    - Setters are methods made within the object class
    - They take a parameter and assign that parameter to the corresponding attribute



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

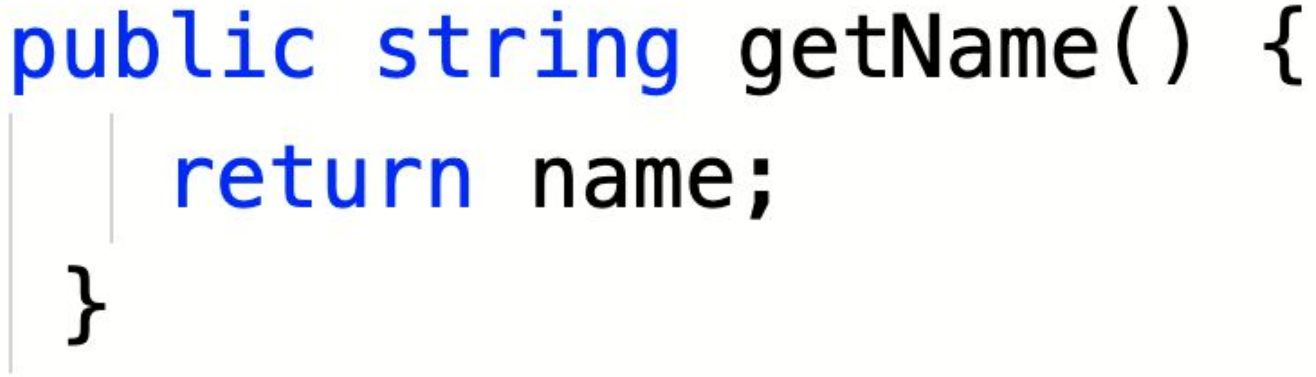
How to set an attribute with the setter method



```
class MainClass {
  public static void Main (string[] args) {
    Student jack = new Student();
    jack.setName("Jack");
  }
}
```

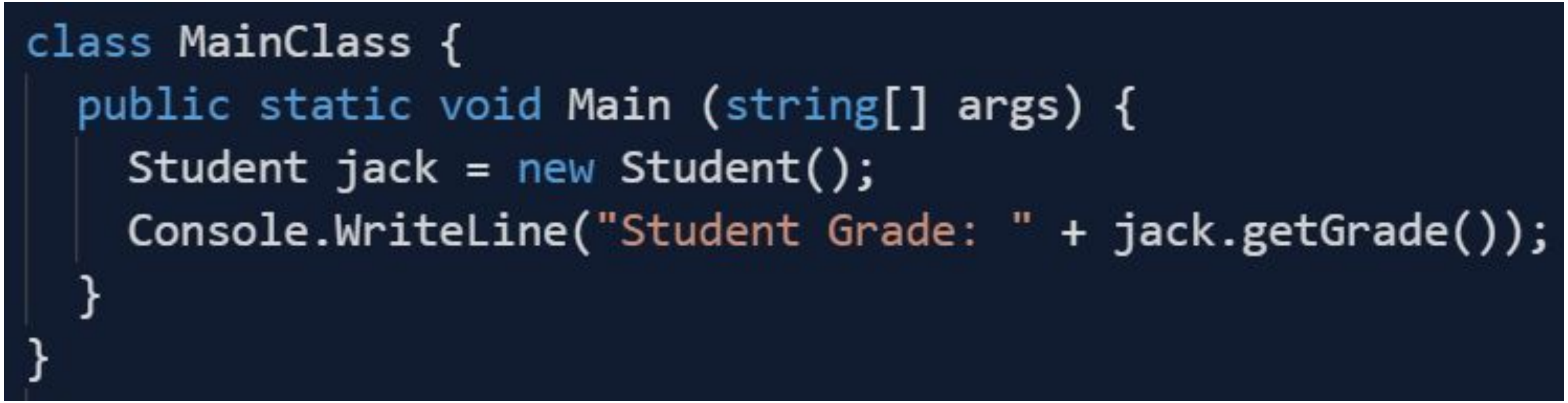
Get Methods (Getters)

- If you create an object and want to display an attribute, you do so using "Getter" methods
  - Getters are methods made within the object class and return an attribute



```
public string getName() {
    return name;
}
```

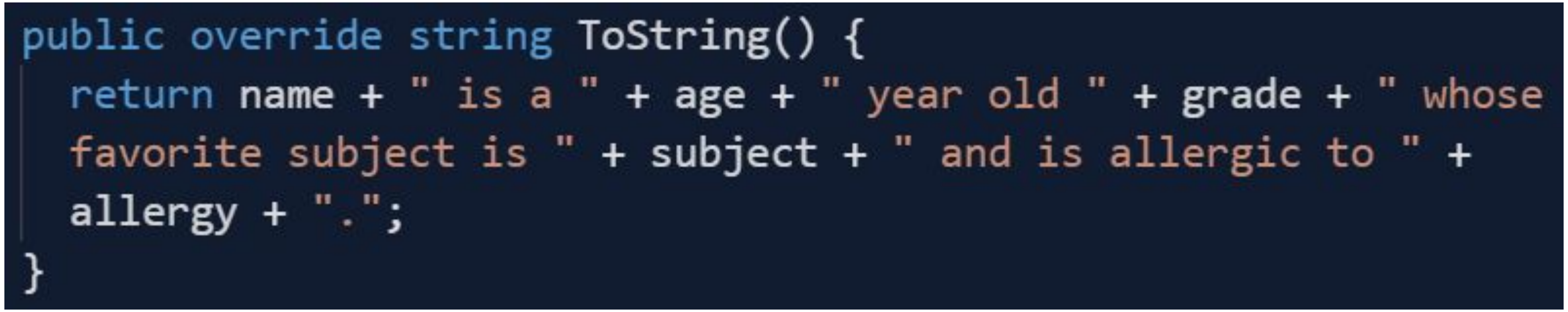
How to call the getter method to return an attribute



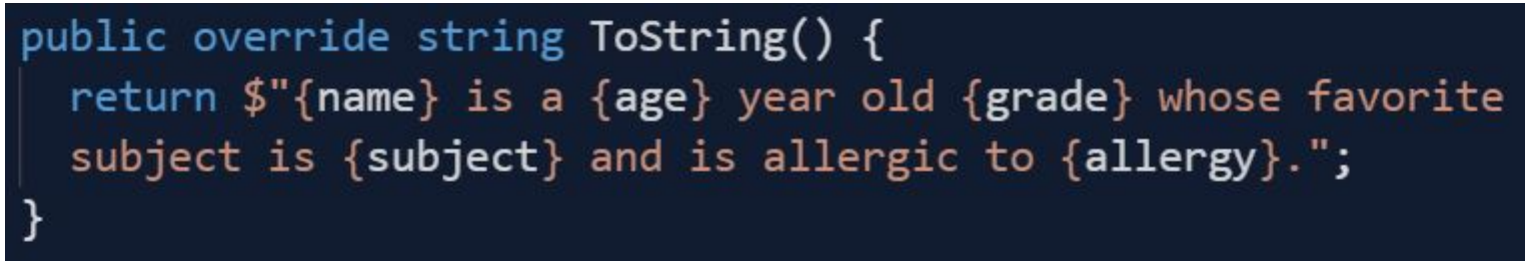
```
class MainClass {
  public static void Main (string[] args) {
    Student jack = new Student();
    Console.WriteLine("Student Grade: " + jack.getGrade());
  }
}
```

ToString()

You can also create a method for your object that prints all the attributes. Typically, this is done by **overriding** an existing method known as ToString();



```
public override string ToString() {
  return name + " is a " + age + " year old " + grade + " whose
  favorite subject is " + subject + " and is allergic to " +
  allergy + ".";
}
```



```
public override string ToString() {
  return $"{name} is a {age} year old {grade} whose favorite
  subject is {subject} and is allergic to {allergy}.";
}
```

Student Class

Practice

Create a Teacher class

- Create a teacher class with attributes for the last name of the teacher, the subject they teach, and their age.
- Make sure you add getters and setters
- Make sure you add a ToString override method so that you can print out the object

Create a Parent class

- Create a parent class with attributes for their first name, last name, name of child, name of spouse, and age.
- Make sure you add getters and setters
- Make sure you add a ToString override method so that you can print out the object