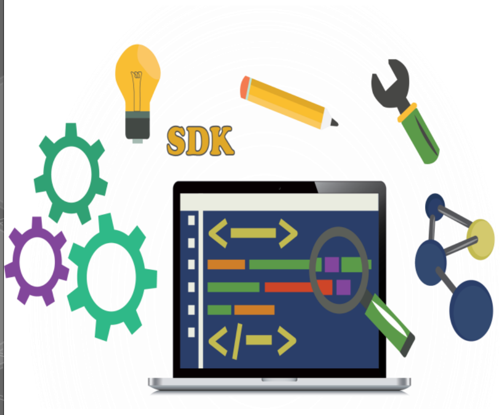
Developing Software: Introduction



YMC
Y-MAX COLLEGE
IT & Business Management Institute

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"Our Mission"

"The Advanced Technical Education For Professional Careers, Carried Out In A Real Professional Way."

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- PH : 09 793354335

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- PH : 09 261319178 , 09 972707373

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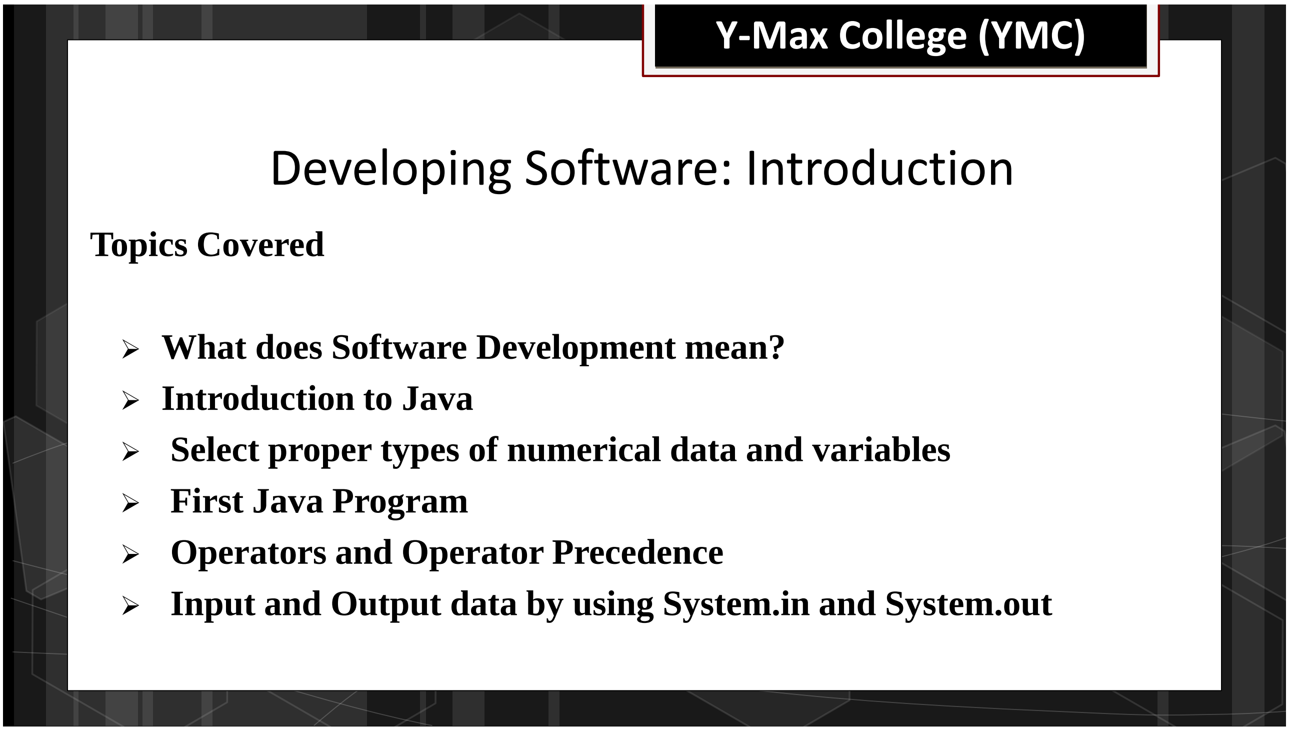

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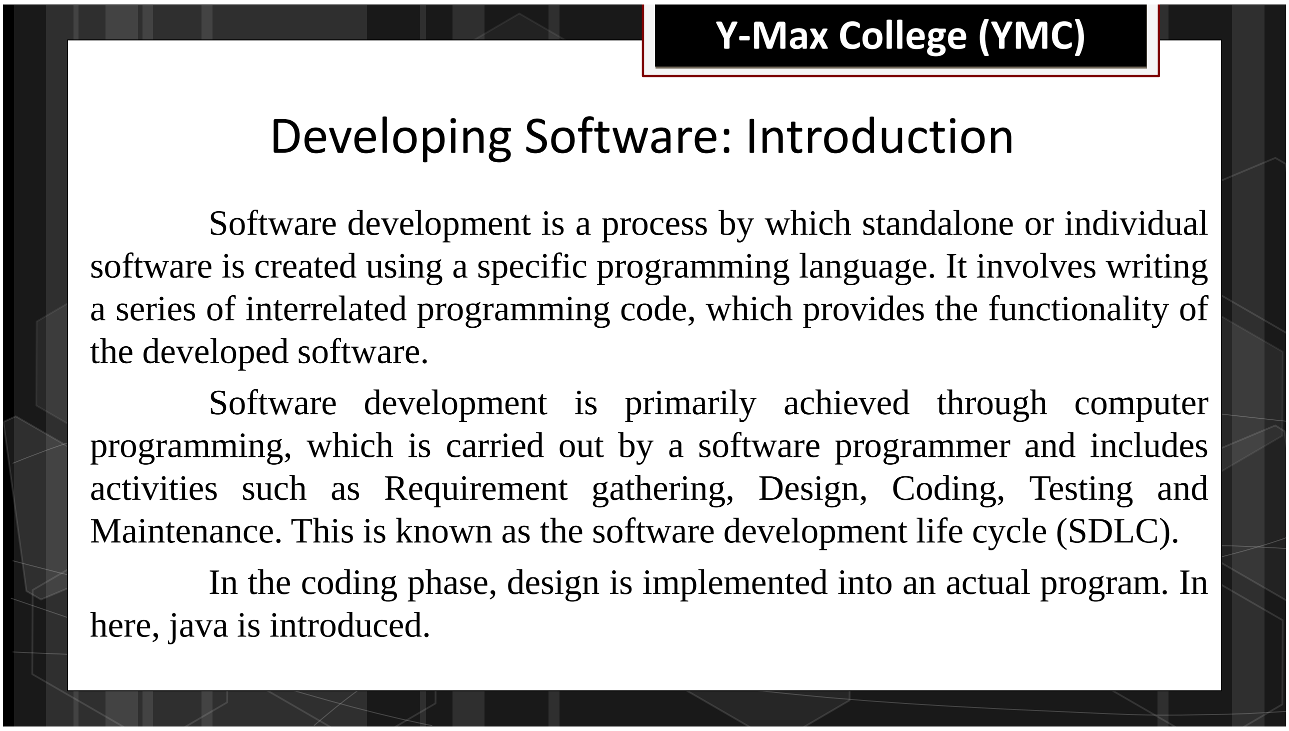
Developing Software: Introduction

Topics Covered

- **What does Software Development mean?**
- **Introduction to Java**
- **Select proper types of numerical data and variables**
- **First Java Program**
- **Operators and Operator Precedence**
- **Input and Output data by using System.in and System.out**



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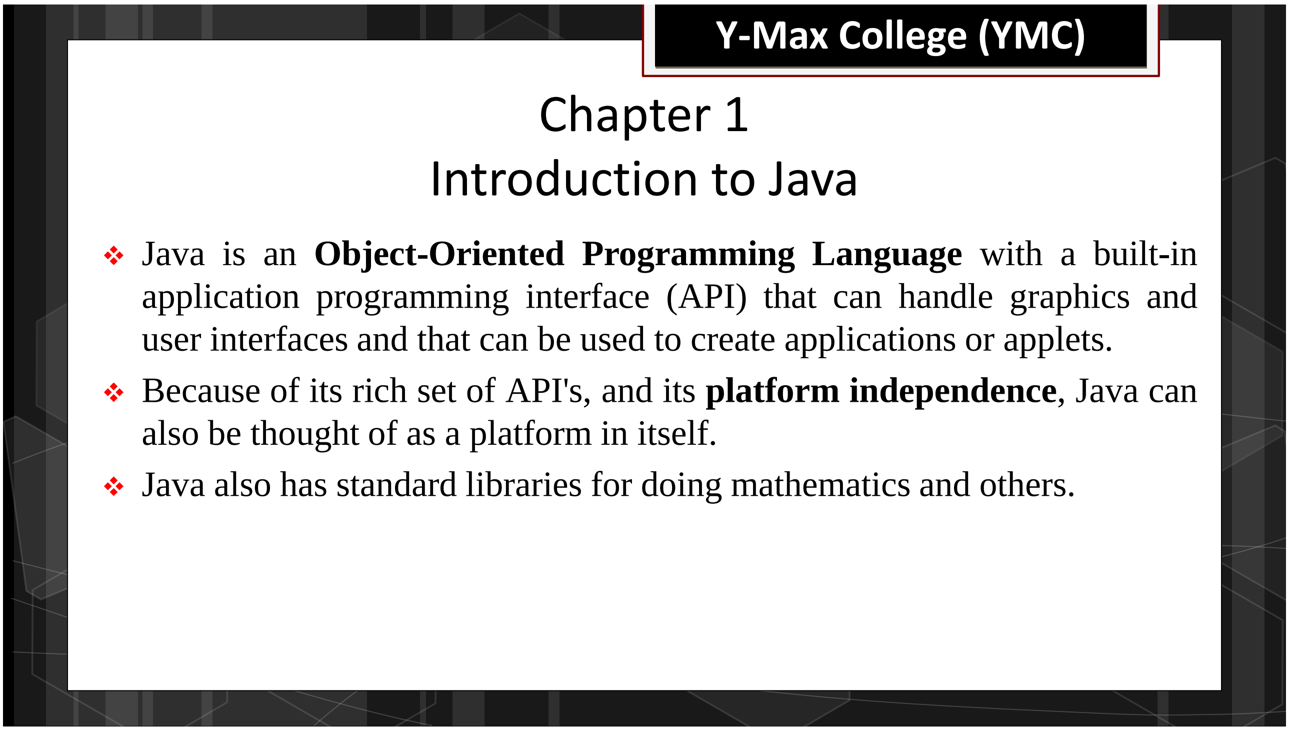
Developing Software: Introduction

Software development is a process by which standalone or individual software is created using a specific programming language. It involves writing a series of interrelated programming code, which provides the functionality of the developed software.

Software development is primarily achieved through computer programming, which is carried out by a software programmer and includes activities such as Requirement gathering, Design, Coding, Testing and Maintenance. This is known as the software development life cycle (SDLC).

In the coding phase, design is implemented into an actual program. In here, java is introduced.



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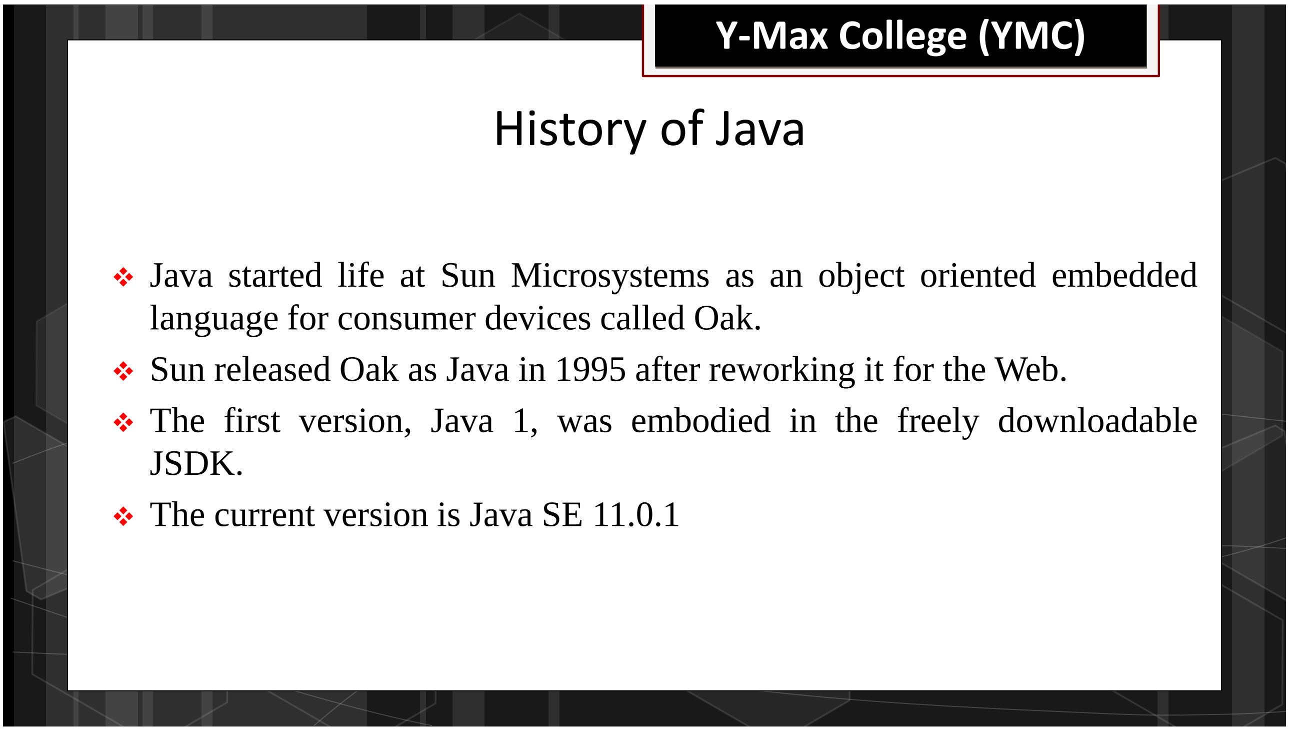
Chapter 1
Introduction to Java

- Java is an **Object-Oriented Programming Language** with a built-in application programming interface (API) that can handle graphics and user interfaces and that can be used to create applications or applets.
- Because of its rich set of API's, and its **platform independence**, Java can also be thought of as a platform in itself.
- Java also has standard libraries for doing mathematics and others.



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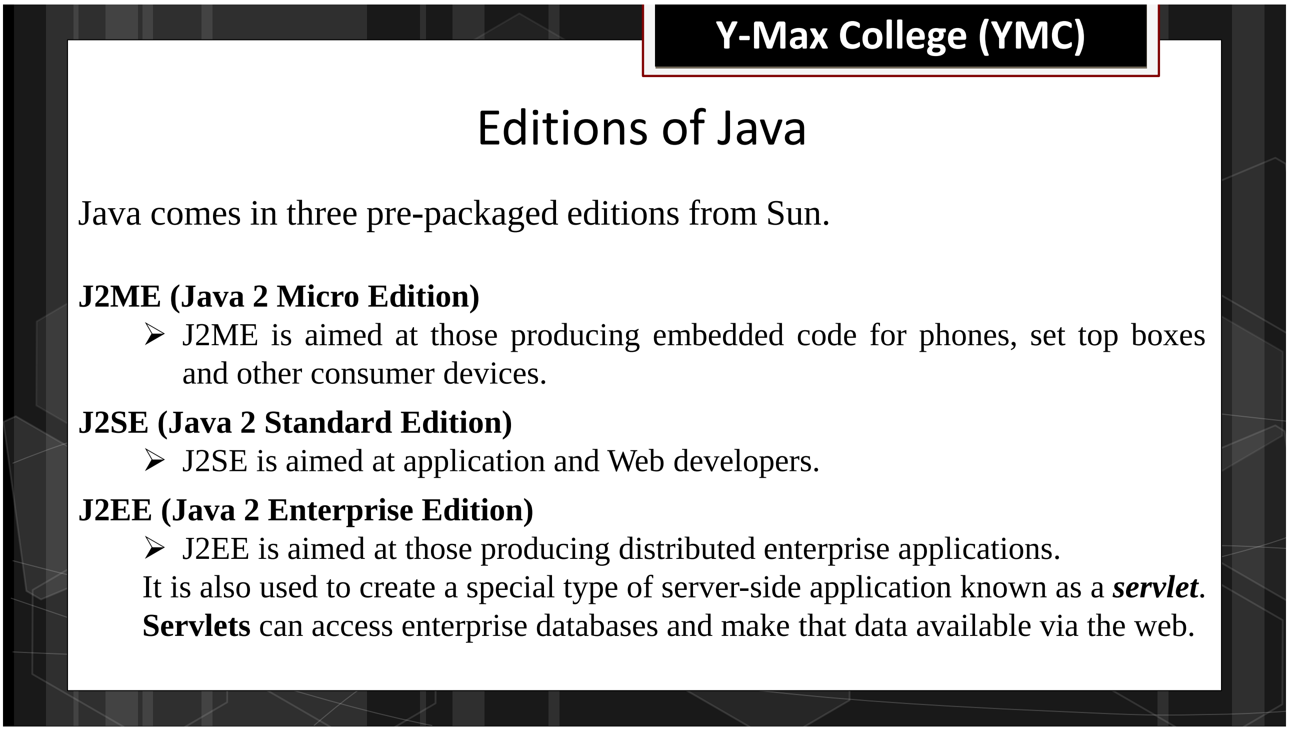
History of Java

- Java started life at Sun Microsystems as an object oriented embedded language for consumer devices called Oak.
- Sun released Oak as Java in 1995 after reworking it for the Web.
- The first version, Java 1, was embodied in the freely downloadable JSDK.
- The current version is Java SE 11.0.1



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Editions of Java

Java comes in three pre-packaged editions from Sun.

J2ME (Java 2 Micro Edition)

- ➢ J2ME is aimed at those producing embedded code for phones, set top boxes and other consumer devices.

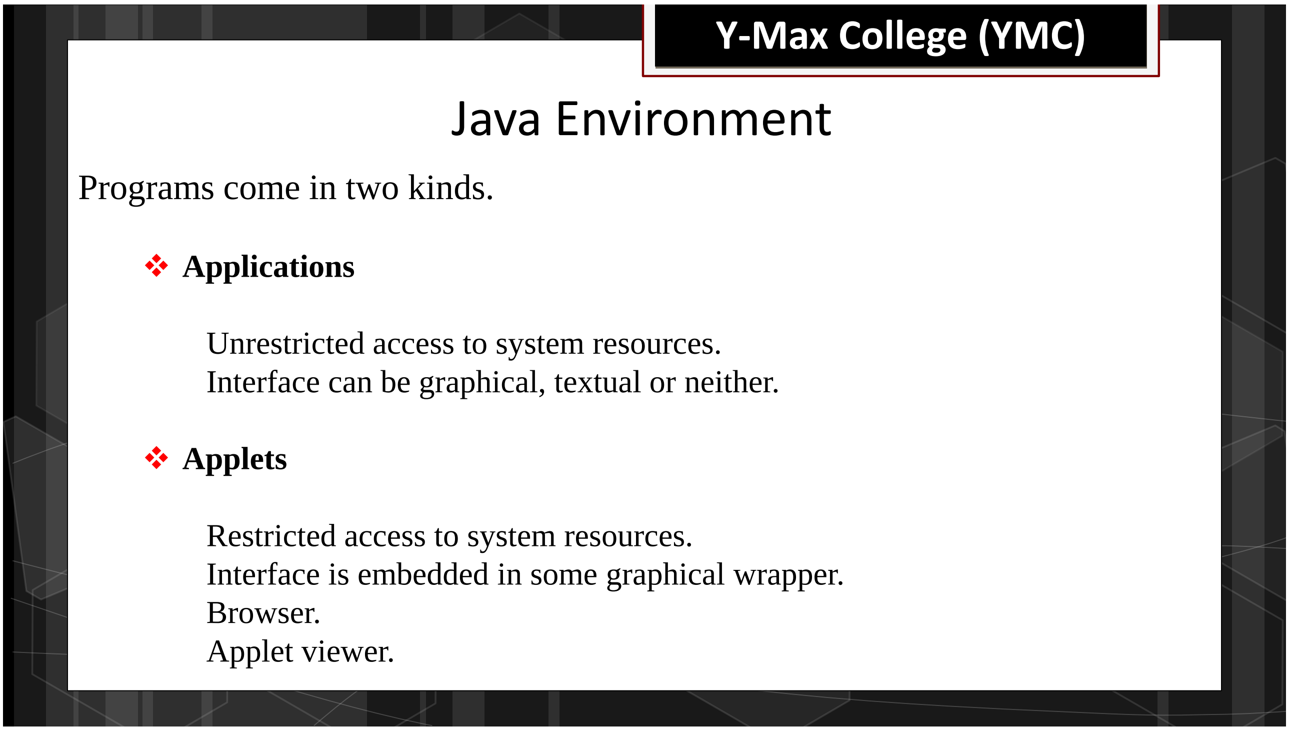
J2SE (Java 2 Standard Edition)

- ➢ J2SE is aimed at application and Web developers.

J2EE (Java 2 Enterprise Edition)

- ➢ J2EE is aimed at those producing distributed enterprise applications.

It is also used to create a special type of server-side application known as a ***servlet***.
Servlets can access enterprise databases and make that data available via the web.



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Java Environment

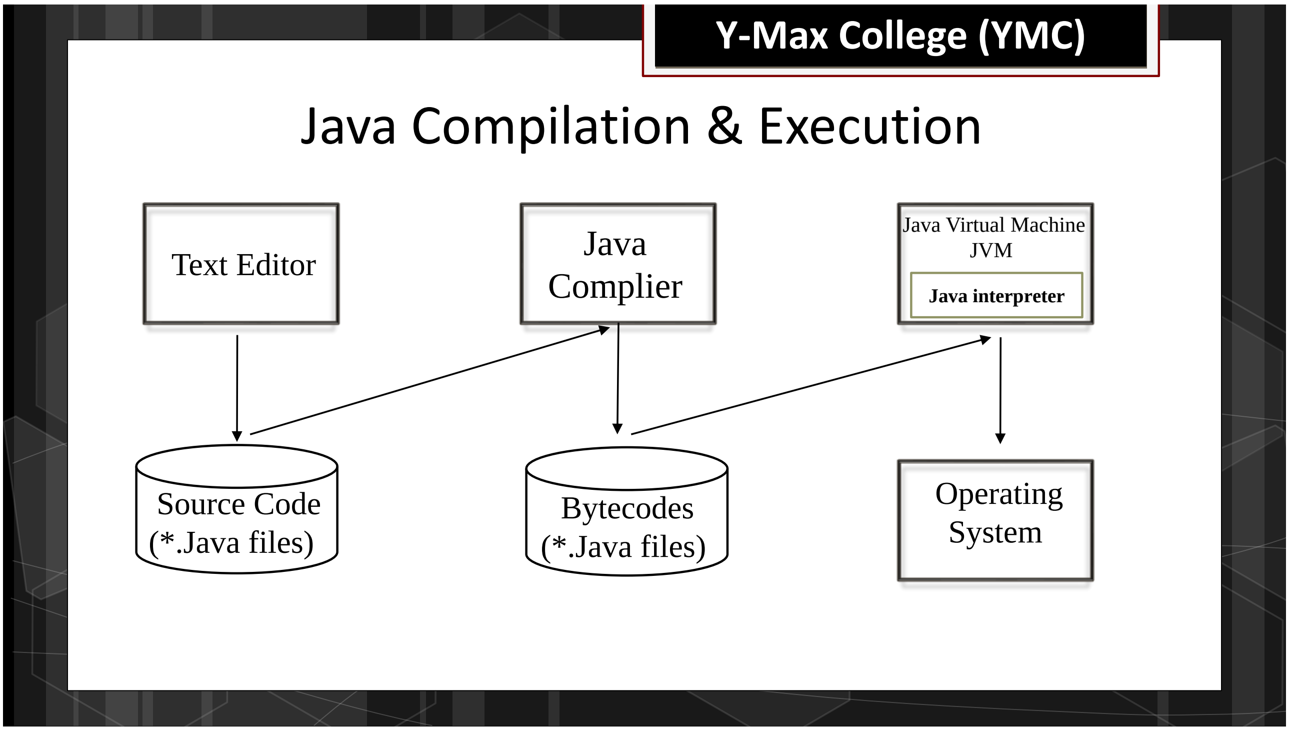
Programs come in two kinds.

- ❖ **Applications**

  Unrestricted access to system resources.
  Interface can be graphical, textual or neither.

- ❖ **Applets**

  Restricted access to system resources.
  Interface is embedded in some graphical wrapper.
  Browser.
  Applet viewer.



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Java Compilation & Execution

Text Editor

Java Complier

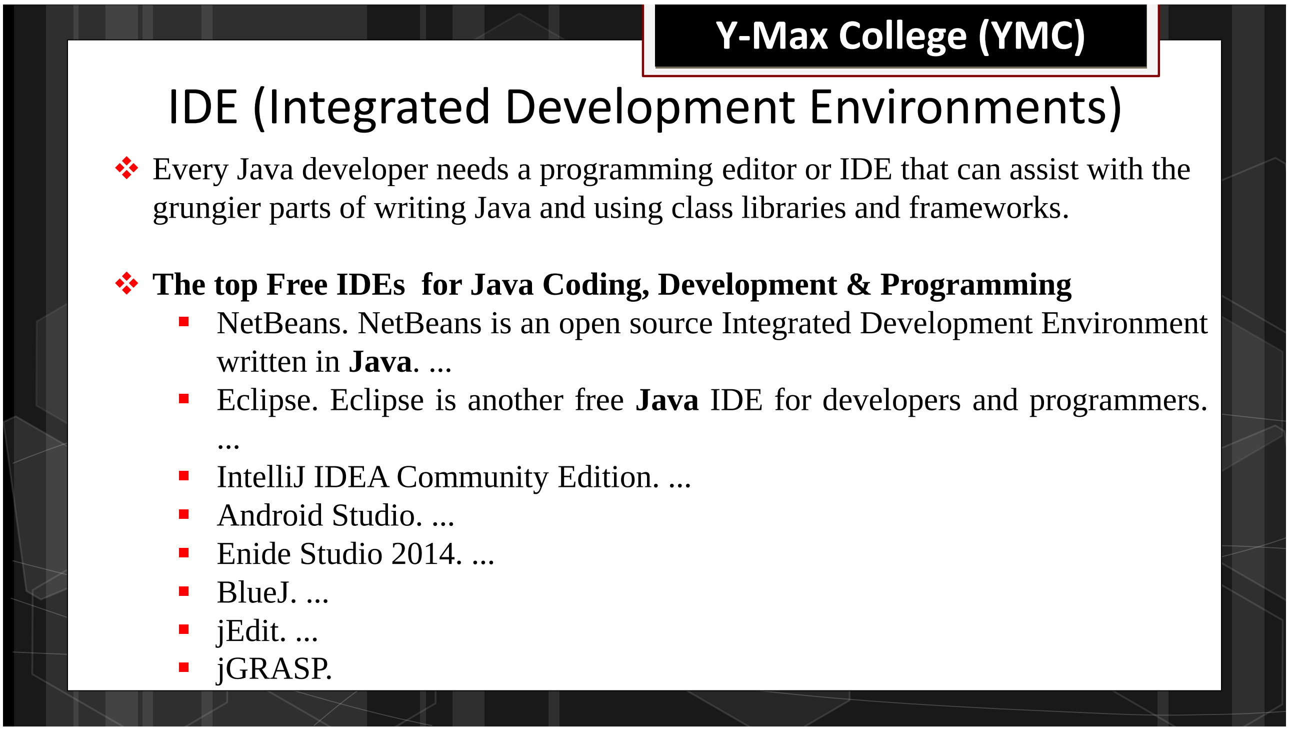
Java Virtual Machine JVM

Java interpreter

Source Code (*.Java files)

Bytecodes (*.Java files)

Operating System



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IDE (Integrated Development Environments)

- Every Java developer needs a programming editor or IDE that can assist with the grungier parts of writing Java and using class libraries and frameworks.

- **The top Free IDEs for Java Coding, Development & Programming**
  - NetBeans. NetBeans is an open source Integrated Development Environment written in **Java**. ...
  - Eclipse. Eclipse is another free **Java** IDE for developers and programmers. ...
  - IntelliJ IDEA Community Edition. ...
  - Android Studio. ...
  - Enide Studio 2014. ...
  - BlueJ. ...
  - jEdit. ...
  - jGRASP.

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Java Editor

Release	Rename name	Release Year
4.9	2018-09	2018
4.8	Photon	2018
4.7	Oxygen	2017
4.6	Neon	2016
4.5	Mars	2015
4.4	Luna	2014
4.3	Kepler	2013
4.2	Juno	2012

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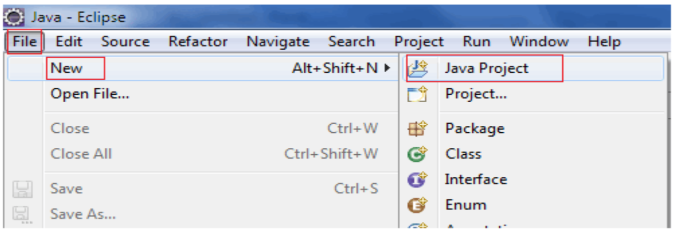
First Java Program

Java Hello World Example using Eclipse IDE

- Create Java Project
  Select from the menu file ⟶ **New** ⟶ **Java Project**



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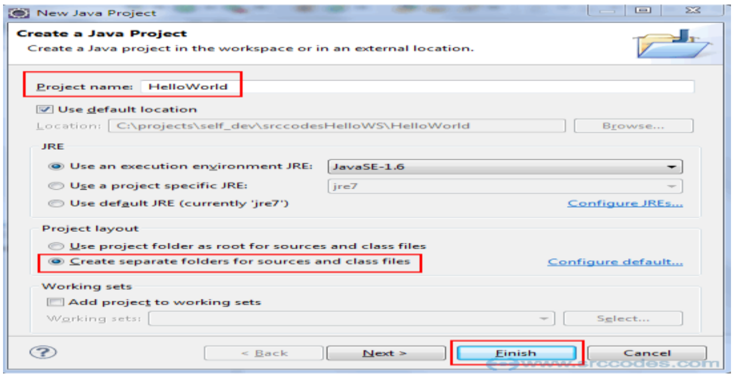
Create Java Project

- Enter “**HelloWorld**” as the Project name. Keep Rest of settings as it is as shown in the following screenshot.



New Java Project

Create a Java Project

Create a Java project in the workspace or in an external location.

Project name: HelloWorld

☑ Use default location

Location: C:\projects\self_dev\srccodesHelloWS\HelloWorld

JRE

● Use an execution environment JRE: JavaSE-1.6

○ Use a project specific JRE: jre7

○ Use default JRE (currently 'jre7')

Project layout

○ Use project folder as root for sources and class files

● Create separate folders for sources and class files

Working sets

□ Add project to working sets

Working sets:

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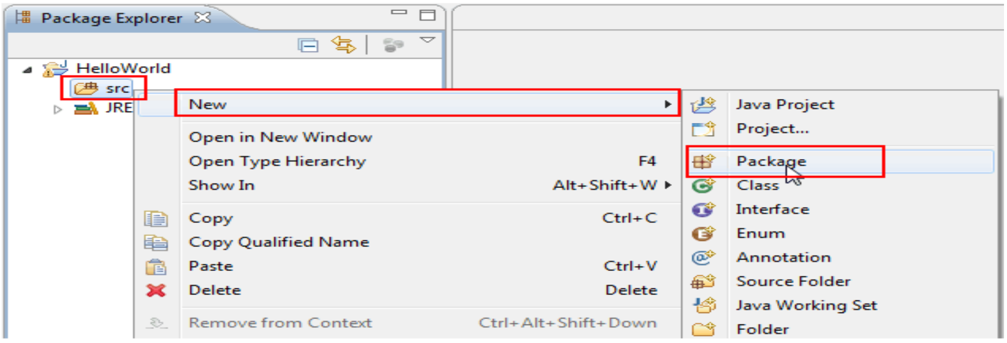
Create Java Packages

- Right Click on “src” folder and select from the context menu New⟶Package



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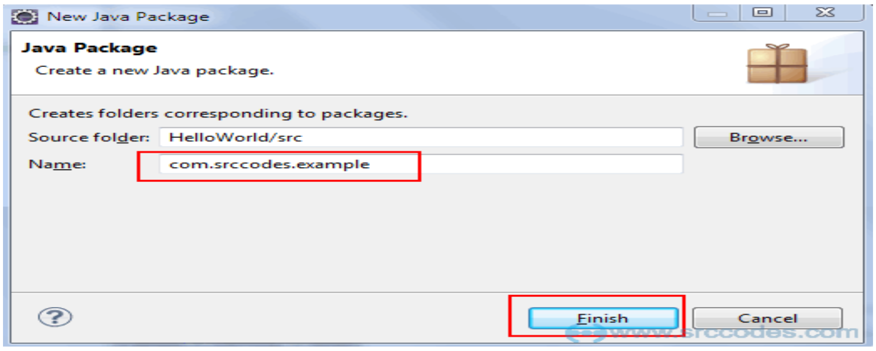
Create Java Package

- Write ‘**com.srccodes.example**’ in the ‘**Name**’ field and click ‘**Finish**’ button.



New Java Package

Java Package

Create a new Java package.

Creates folders corresponding to packages.

Source folder: HelloWorld/src

Name: com.srccodes.example

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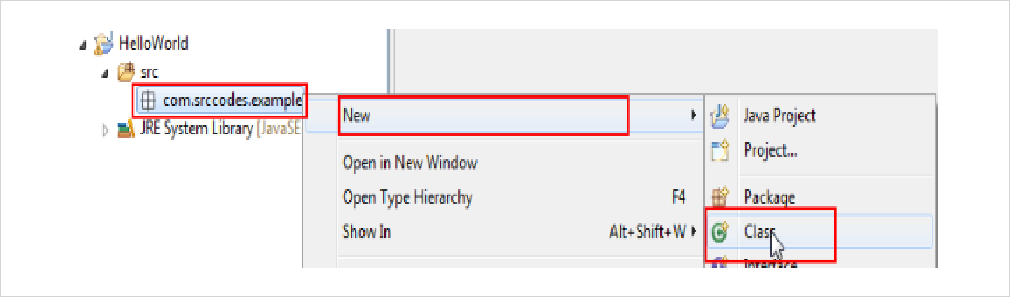
Create Java Class

- Write ‘**com.srccodes.example**’ package and select from context menu **New ⟶ Class**



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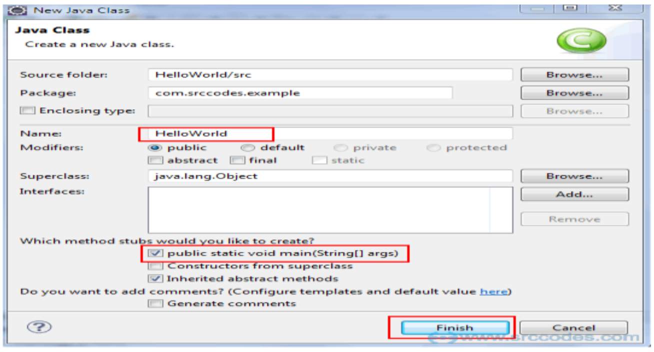
Create Java Class

- Write “**HelloWorld**” in the ‘**Name**’ field and select the check-box for ‘public static void main(String[] args)



New Java Class

Java Class

Create a new Java class.

Source folder: HelloWorld/src

Package: com.srccodes.example

□ Enclosing type:

Name: HelloWorld

Modifiers: ● public ○ default ○ private ○ protected

□ abstract □ final □ static

Superclass: java.lang.Object

Interfaces:

Which method stubs would you like to create?

☑ public static void main(String[] args)

□ Constructors from superclass

☑ Inherited abstract methods

Do you want to add comments? (Configure templates and default value here)

□ Generate comments

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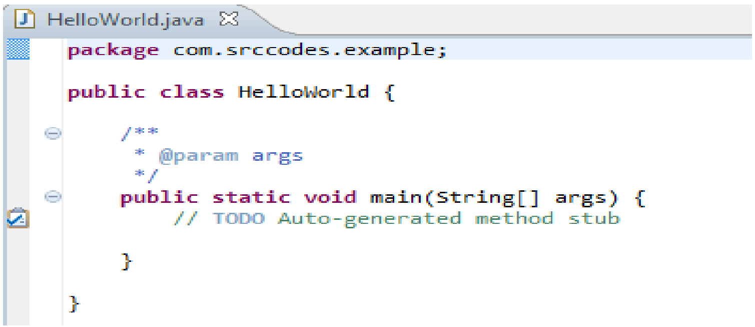
Create Java Class

- Eclipse will generate a java class and open the same in the java editor as shown below.



```
package com.srccodes.example;

public class HelloWorld {

	/**
	 * @param args
	 */
	public static void main(String[] args) {
		// TODO Auto-generated method stub

	}

}
```

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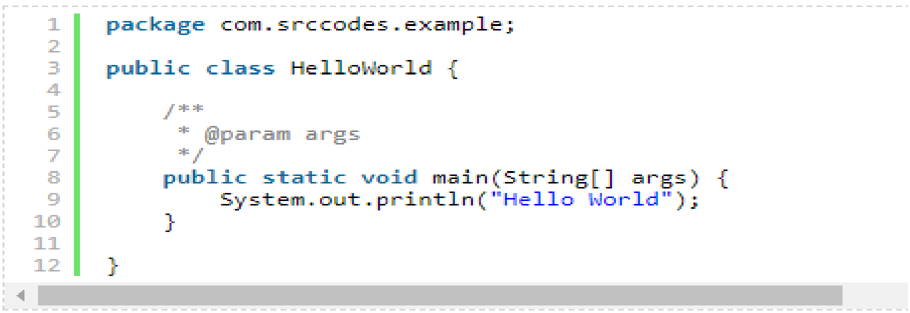
Create Java Code

- Edit the generated ‘**HelloWorld**’ java class as per the following code.

File : HelloWorld.java



```
package com.srccodes.example;

public class HelloWorld {

    /**
     * @param args
     */
    public static void main(String[] args) {
        System.out.println("Hello World");
    }

}
```

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public static void main(String args[])

- **Public**: The keyword “Public” is an access specifier that declares the main method as unprotected.
- **Static**: It says this method belongs to the entire class and NOT a part of any objects of class. The main must always be declared static since the interpreter uses this before any objects are created.
- **Void**: The type modifier that states that main does not return any value.
- A program must include a *method* called **main** where the program starts. The argument to main must always be a string array (containing any command line arguments).

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System.out.println(“HelloWorld”);

- java.lang.*

  All classes in “lang” package of java package.
- System is really the java.lang.System class.
- This class has a public static field called out which is an instance of the java.io.PrintStream class. So when we write System.out.println(), we are really invoking the println() method of the “out” field of the java.lang.System class.

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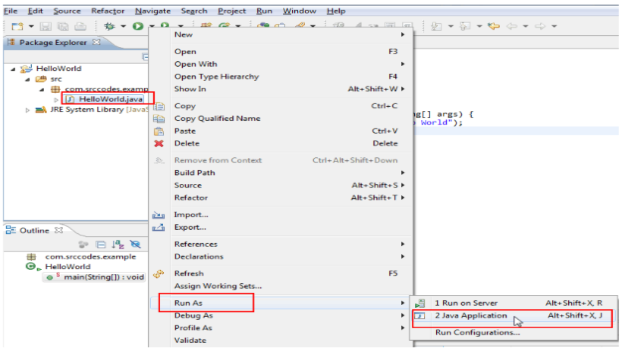
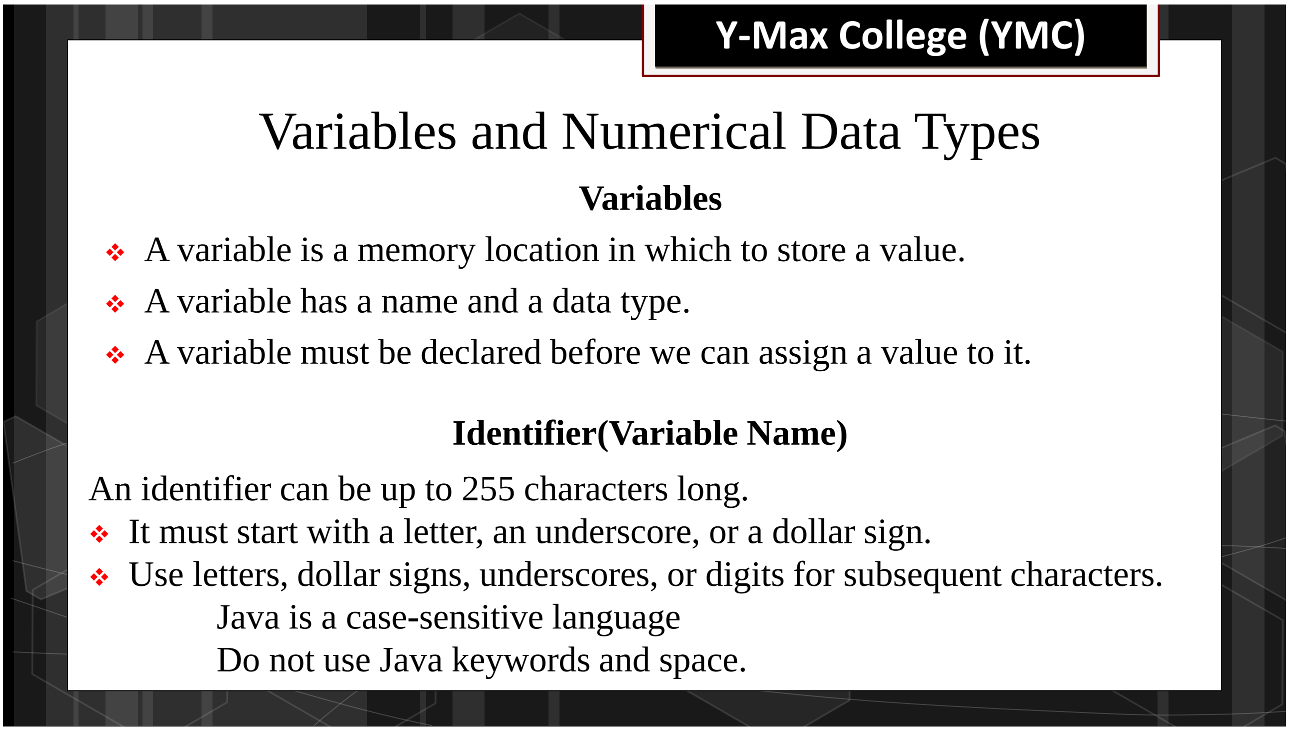
Run Your Code

- Right click on ‘HelloWorld.java’ and select from context menu ‘Run As’’ ➡ Java Application’.





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Variables and Numerical Data Types

Variables

- A variable is a memory location in which to store a value.
- A variable has a name and a data type.
- A variable must be declared before we can assign a value to it.

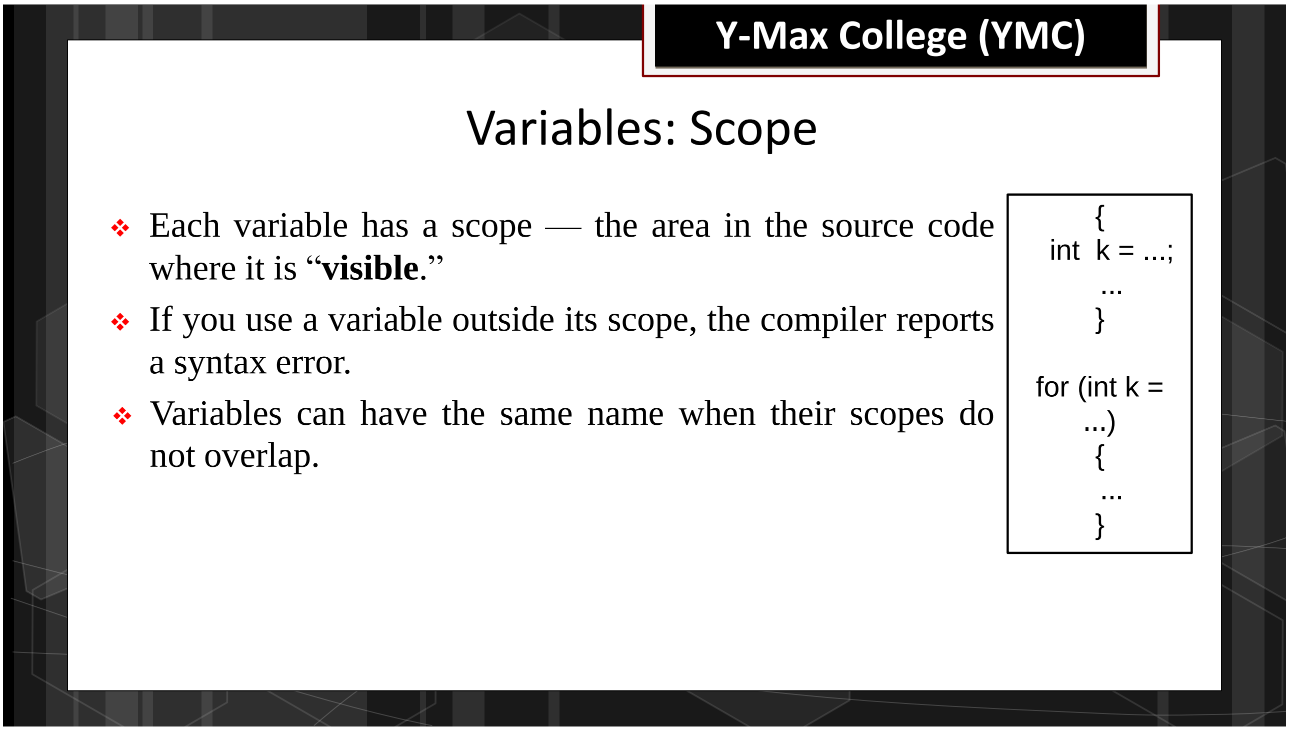
Identifier(Variable Name)

An identifier can be up to 255 characters long.

- It must start with a letter, an underscore, or a dollar sign.
- Use letters, dollar signs, underscores, or digits for subsequent characters.

Java is a case-sensitive language

Do not use Java keywords and space.



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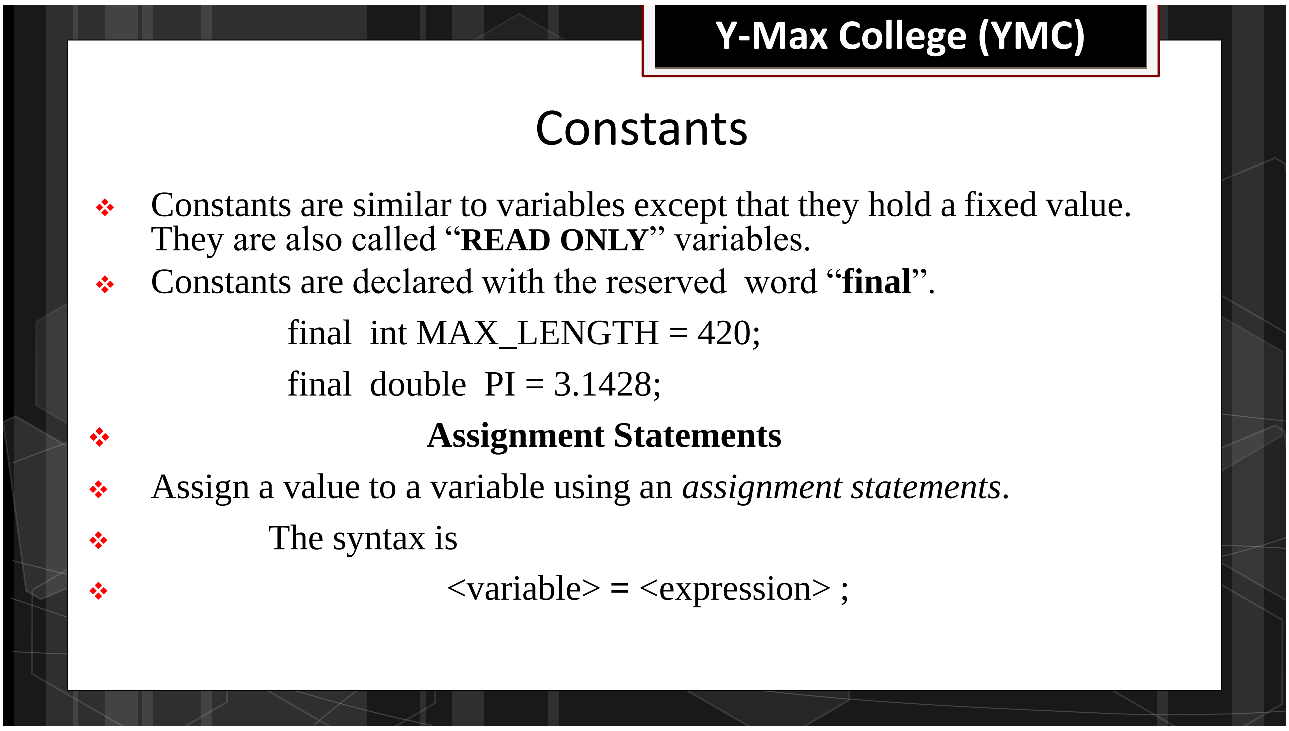
Variables: Scope

- Each variable has a scope — the area in the source code where it is "**visible**."
- If you use a variable outside its scope, the compiler reports a syntax error.
- Variables can have the same name when their scopes do not overlap.

```
{
  int  k = ...;
  ...
}

for (int k =
...)
{
  ...
}
```



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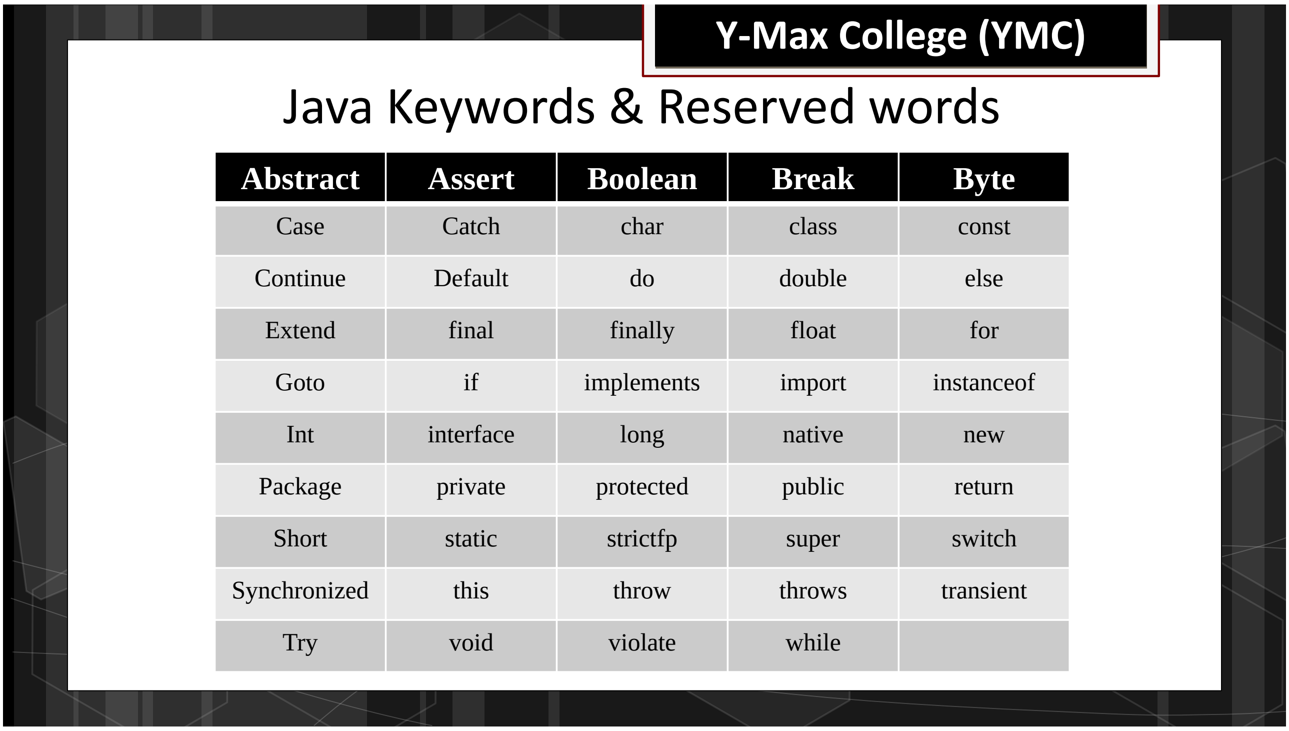
Constants

- Constants are similar to variables except that they hold a fixed value. They are also called “**READ ONLY**” variables.
- Constants are declared with the reserved word “**final**”.

```
final  int MAX_LENGTH = 420;
final  double  PI = 3.1428;
```

- **Assignment Statements**
- Assign a value to a variable using an *assignment statements*.
- The syntax is
- <variable> = <expression> ;



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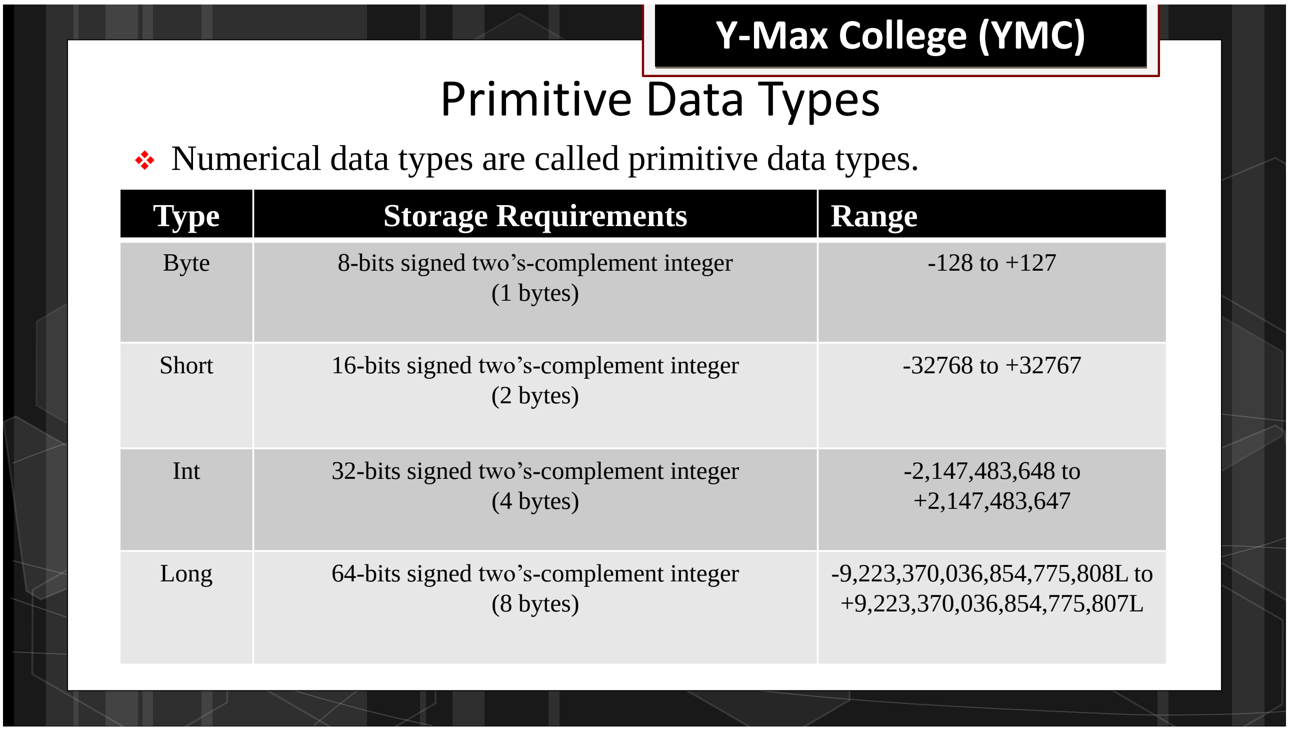
Java Keywords & Reserved words

Abstract	Assert	Boolean	Break	Byte
Case	Catch	char	class	const
Continue	Default	do	double	else
Extend	final	finally	float	for
Goto	if	implements	import	instanceof
Int	interface	long	native	new
Package	private	protected	public	return
Short	static	strictfp	super	switch
Synchronized	this	throw	throws	transient
Try	void	violate	while	



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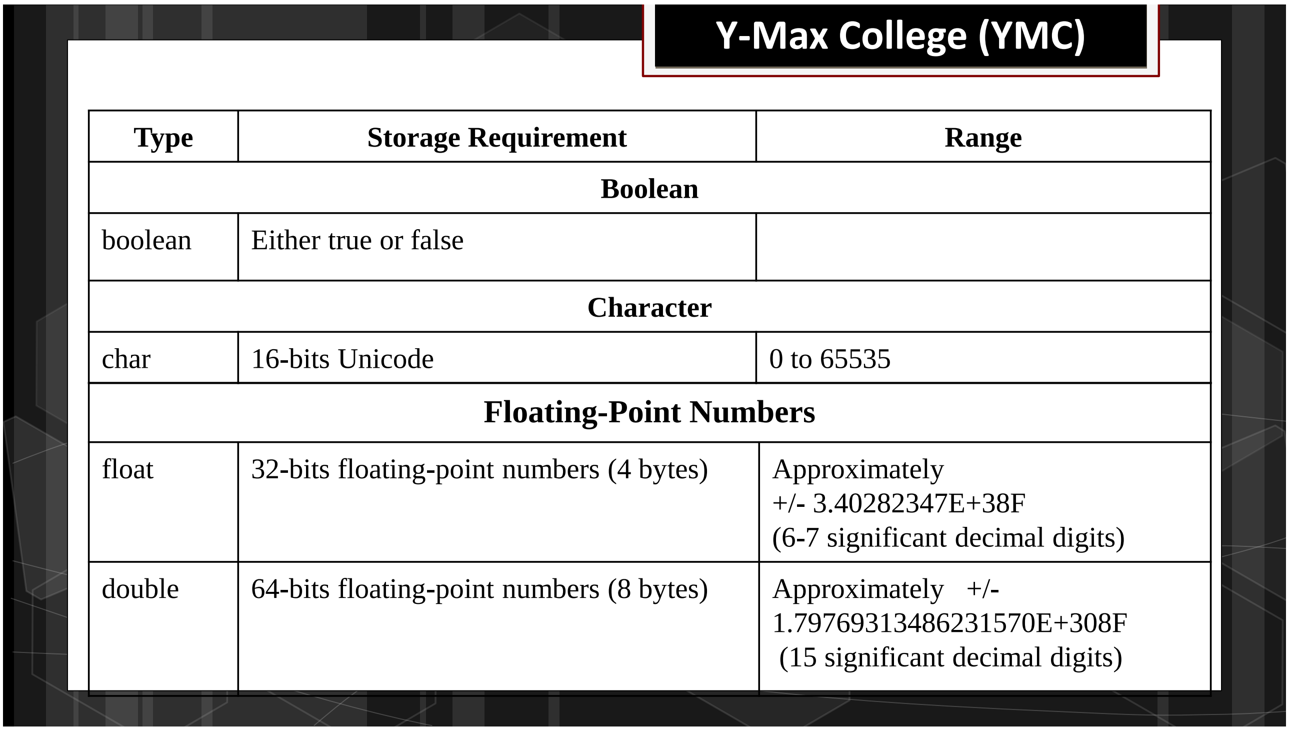
Primitive Data Types

- Numerical data types are called primitive data types.

Type	Storage Requirements	Range
Byte	8-bits signed two's-complement integer (1 bytes)	-128 to +127
Short	16-bits signed two's-complement integer (2 bytes)	-32768 to +32767
Int	32-bits signed two's-complement integer (4 bytes)	-2,147,483,648 to +2,147,483,647
Long	64-bits signed two's-complement integer (8 bytes)	-9,223,370,036,854,775,808L to +9,223,370,036,854,775,807L



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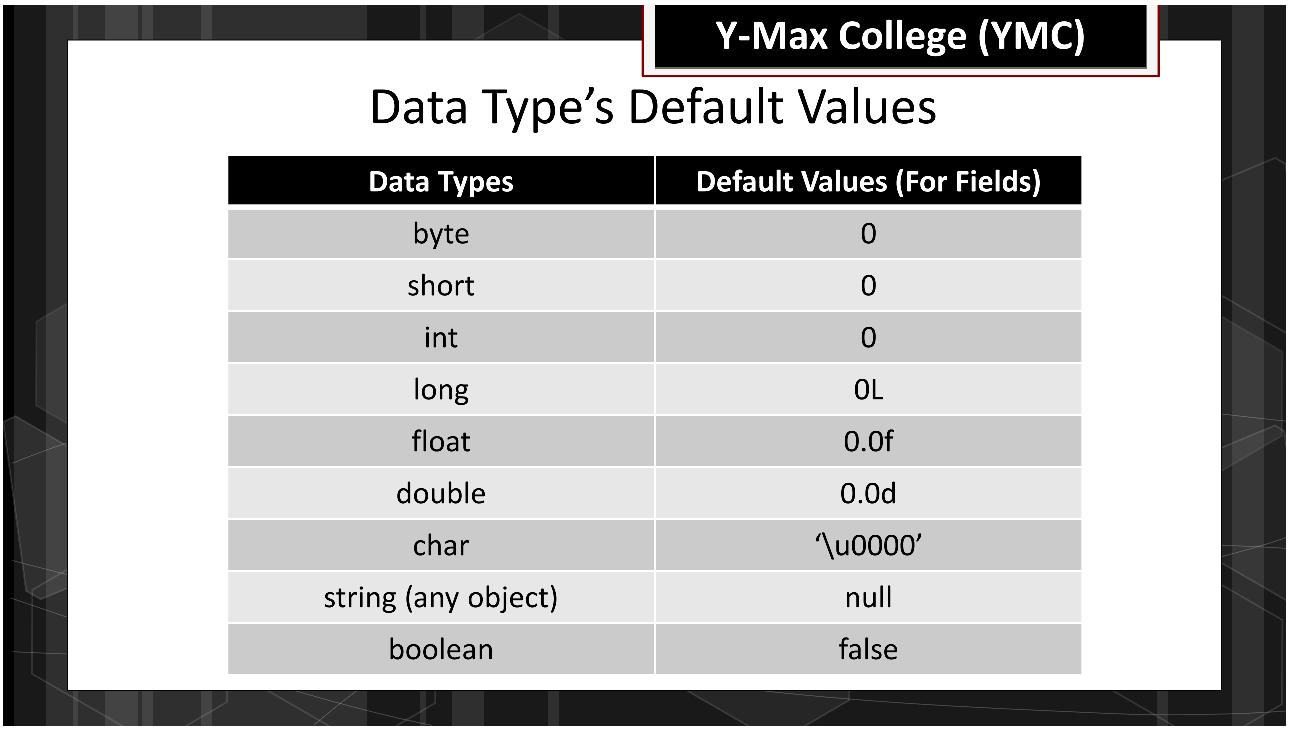
Type	Storage Requirement	Range
Boolean		
boolean	Either true or false	
Character		
char	16-bits Unicode	0 to 65535
Floating-Point Numbers		
float	32-bits floating-point numbers (4 bytes)	Approximately +/- 3.40282347E+38F (6-7 significant decimal digits)
double	64-bits floating-point numbers (8 bytes)	Approximately +/- 1.79769313486231570E+308F (15 significant decimal digits)



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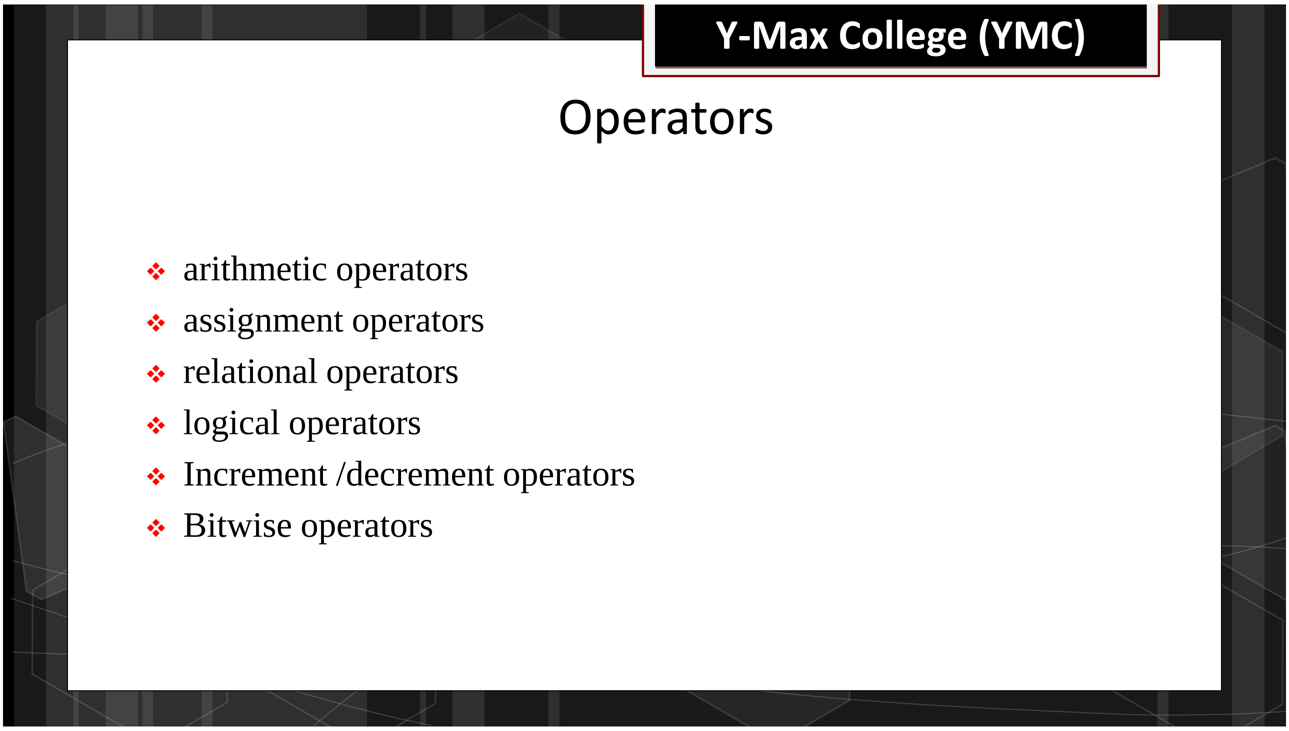
Data Type’s Default Values

Data Types	Default Values (For Fields)
byte	0
short	0
int	0
long	0L
float	0.0f
double	0.0d
char	‘\u0000’
string (any object)	null
boolean	false



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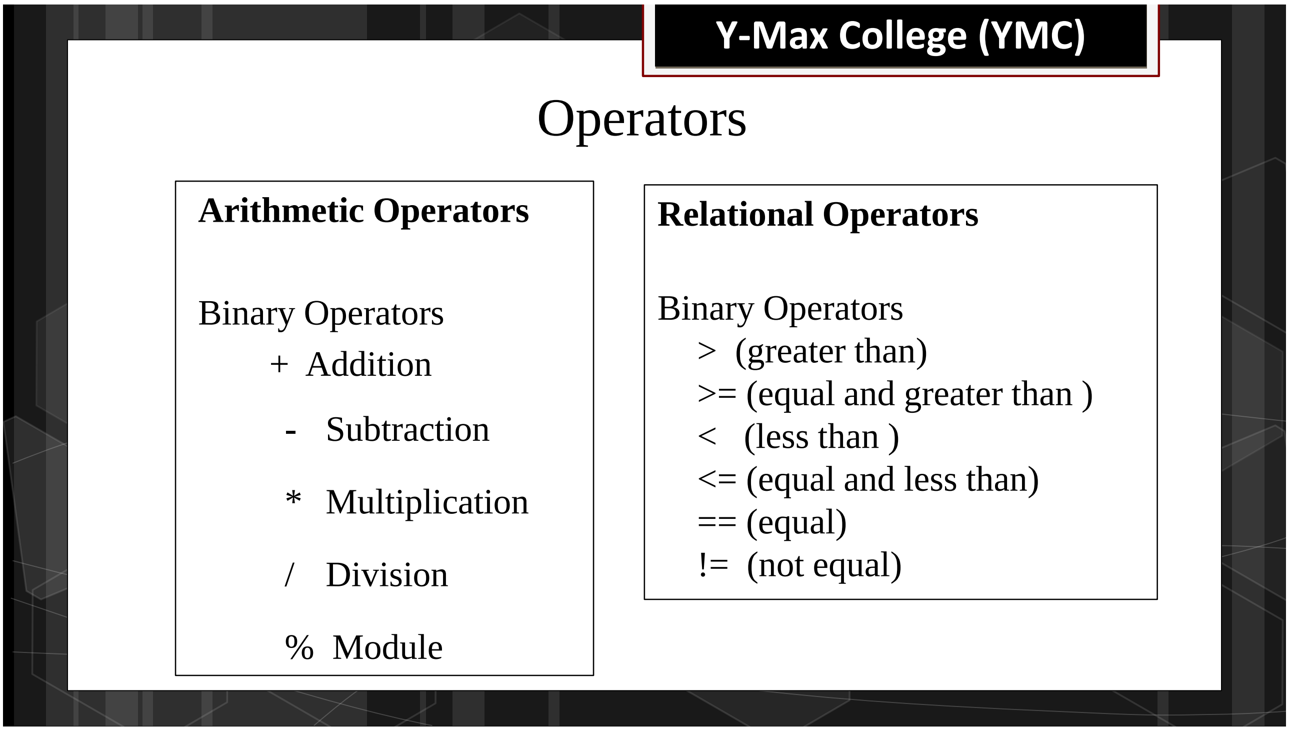
Operators

- arithmetic operators
- assignment operators
- relational operators
- logical operators
- Increment /decrement operators
- Bitwise operators



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Operators

Arithmetic Operators

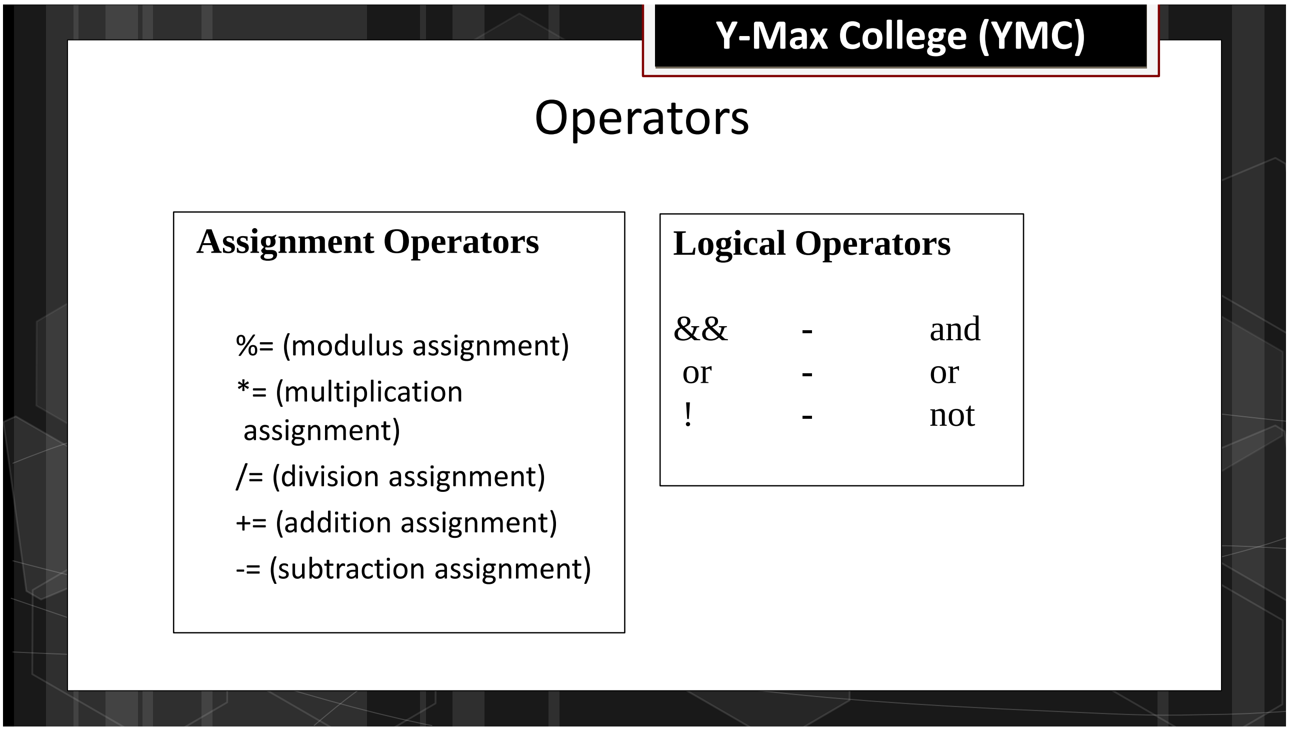
Binary Operators

+	Addition
-	Subtraction
*	Multiplication
/	Division
%	Module

Relational Operators

Binary Operators

>	(greater than)
>=	(equal and greater than)
<	(less than)
<=	(equal and less than)
==	(equal)
!=	(not equal)



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Operators

Assignment Operators

%= (modulus assignment)

*= (multiplication assignment)

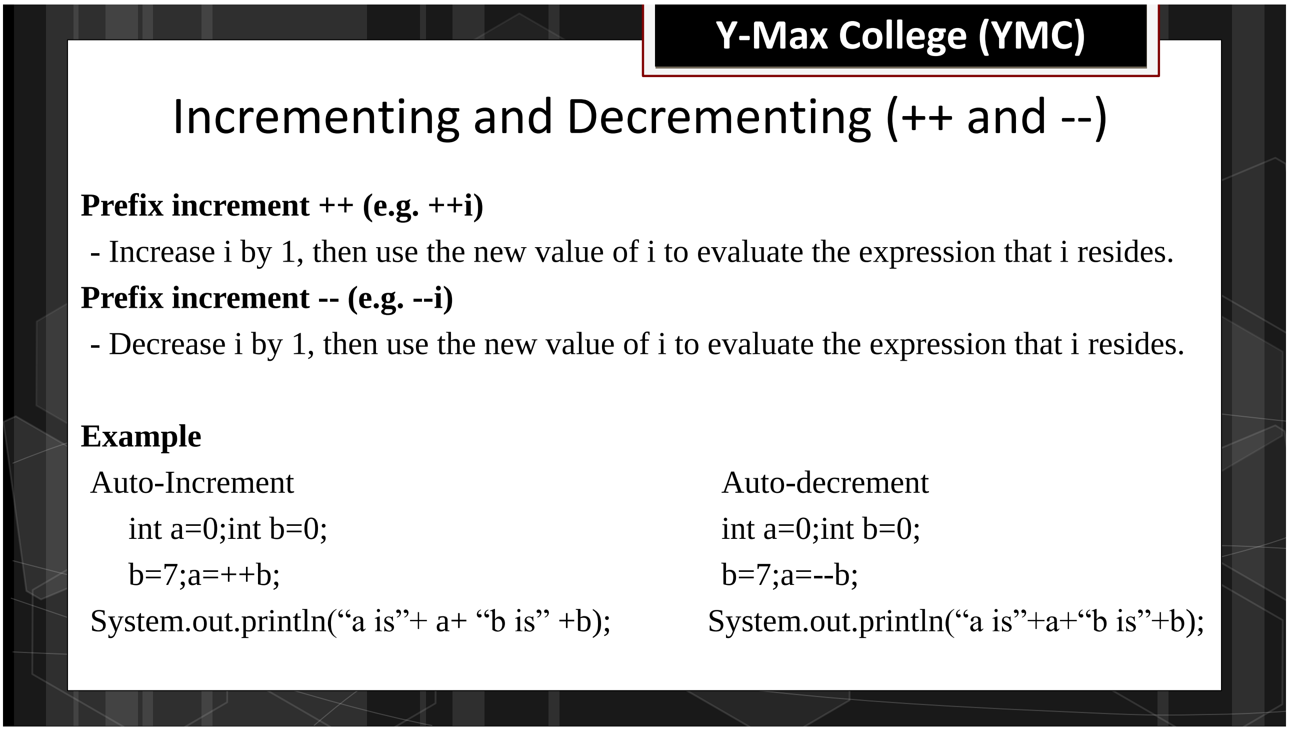
/= (division assignment)

+= (addition assignment)

-= (subtraction assignment)

Logical Operators

&&	-	and
or	-	or
!	-	not



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Incrementing and Decrementing (++ and --)

Prefix increment ++ (e.g. ++i)

- Increase i by 1, then use the new value of i to evaluate the expression that i resides.

Prefix increment -- (e.g. --i)

- Decrease i by 1, then use the new value of i to evaluate the expression that i resides.

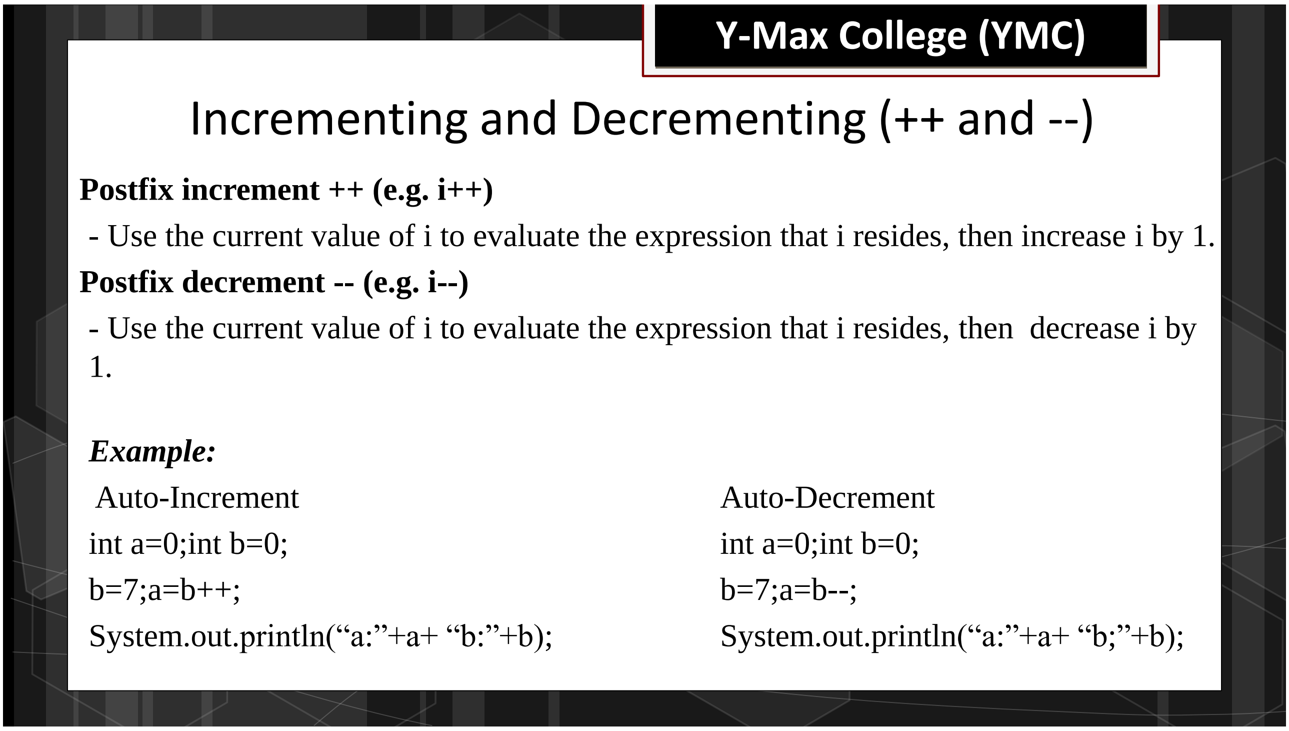
Example

Auto-Increment

```
    int a=0;int b=0;
    b=7;a=++b;
System.out.println("a is"+ a+ "b is" +b);
```

Auto-decrement

```
int a=0;int b=0;
b=7;a=--b;
System.out.println("a is"+a+"b is"+b);
```



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Incrementing and Decrementing (++ and --)

Postfix increment ++ (e.g. i++)

- Use the current value of i to evaluate the expression that i resides, then increase i by 1.

Postfix decrement -- (e.g. i--)

- Use the current value of i to evaluate the expression that i resides, then decrease i by 1.

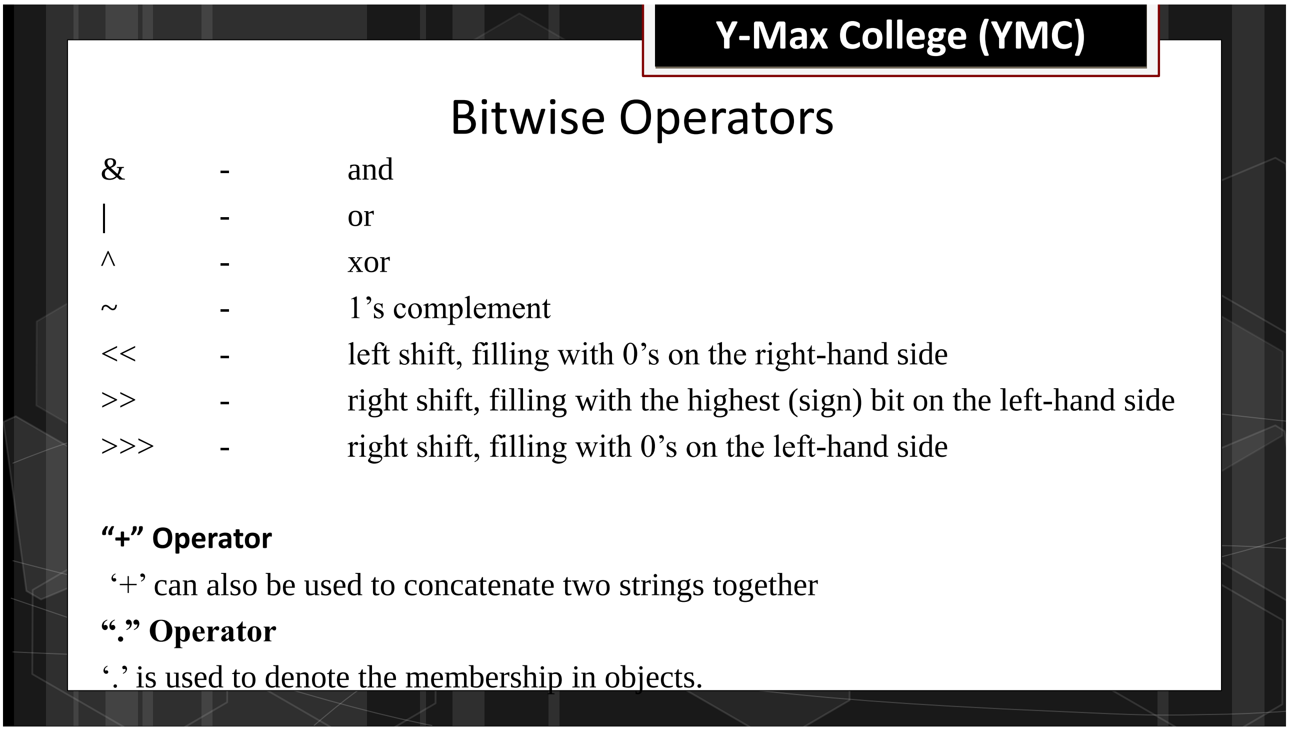
Example:

Auto-Increment

```
int a=0;int b=0;
b=7;a=b++;
System.out.println("a:"+a+ "b:"+b);
```

Auto-Decrement

```
int a=0;int b=0;
b=7;a=b--;
System.out.println("a:"+a+ "b;"+b);
```



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Bitwise Operators

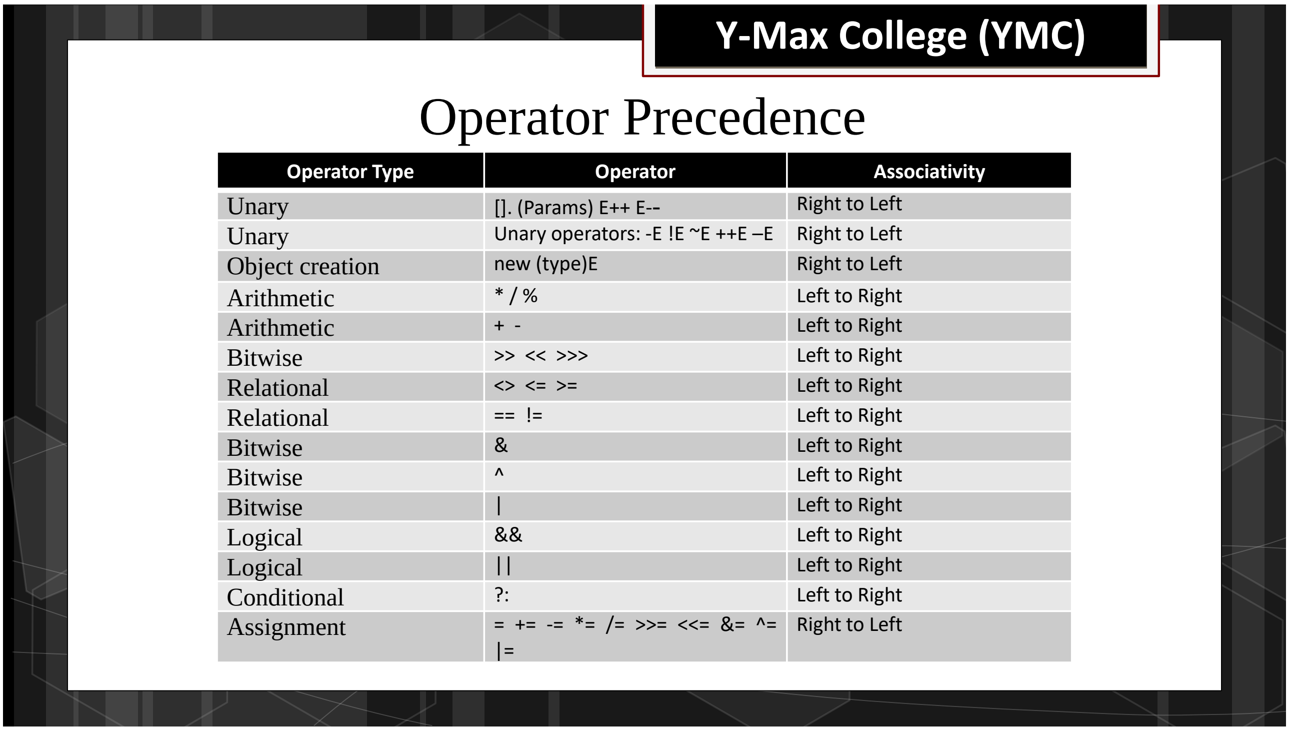
&	-	and
|	-	or
^	-	xor
~	-	1’s complement
<<	-	left shift, filling with 0’s on the right-hand side
>>	-	right shift, filling with the highest (sign) bit on the left-hand side
>>>	-	right shift, filling with 0’s on the left-hand side

“+” Operator

‘+’ can also be used to concatenate two strings together

“.” Operator

‘.’ is used to denote the membership in objects.



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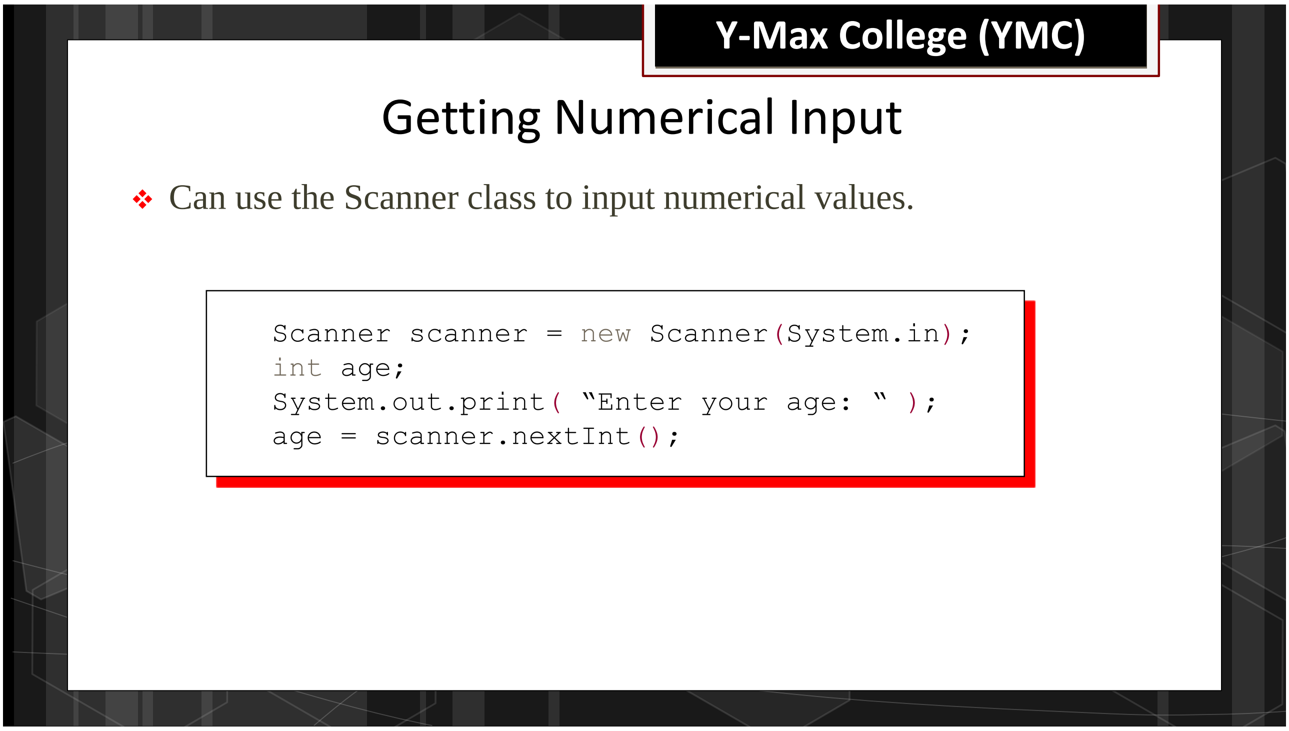
Operator Precedence

Operator Type	Operator	Associativity
Unary	[]. (Params) E++ E--	Right to Left
Unary	Unary operators: -E !E ~E ++E –E	Right to Left
Object creation	new (type)E	Right to Left
Arithmetic	* / %	Left to Right
Arithmetic	+ -	Left to Right
Bitwise	>> << >>>	Left to Right
Relational	<> <= >=	Left to Right
Relational	== !=	Left to Right
Bitwise	&	Left to Right
Bitwise	^	Left to Right
Bitwise	|	Left to Right
Logical	&&	Left to Right
Logical	||	Left to Right
Conditional	?:	Left to Right
Assignment	= += -= *= /= >>= <<= &= ^= |=	Right to Left



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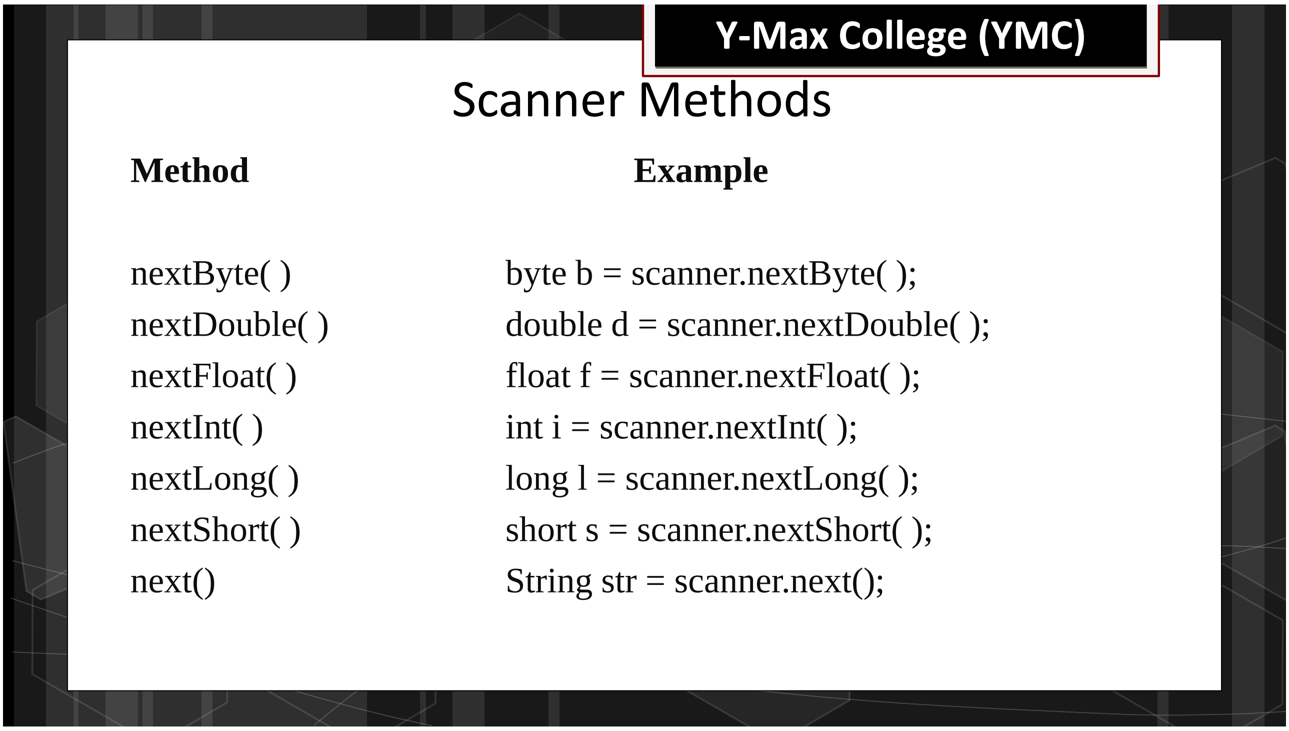
Getting Numerical Input

- Can use the Scanner class to input numerical values.

```
Scanner scanner = new Scanner(System.in);
int age;
System.out.print( “Enter your age: ‟ );
age = scanner.nextInt();
```



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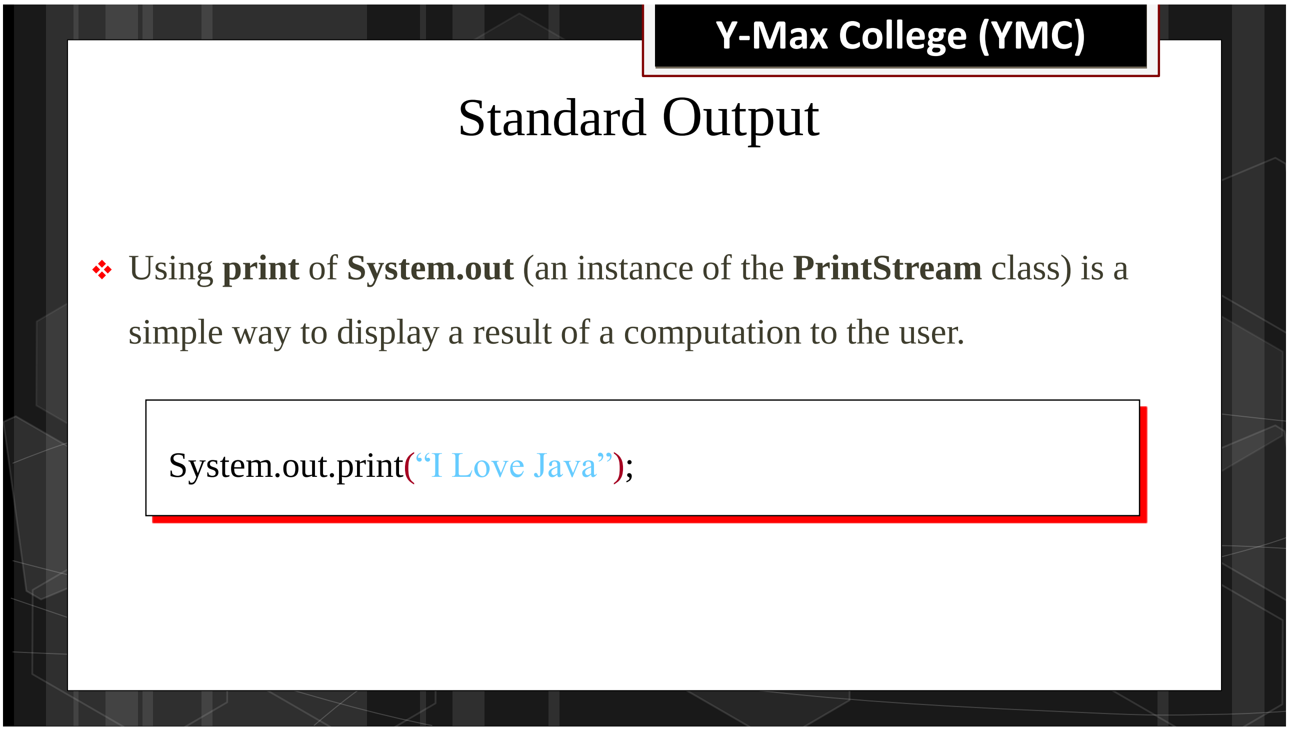
Scanner Methods

Method	**Example**
nextByte( )	byte b = scanner.nextByte( );
nextDouble( )	double d = scanner.nextDouble( );
nextFloat( )	float f = scanner.nextFloat( );
nextInt( )	int i = scanner.nextInt( );
nextLong( )	long l = scanner.nextLong( );
nextShort( )	short s = scanner.nextShort( );
next()	String str = scanner.next();



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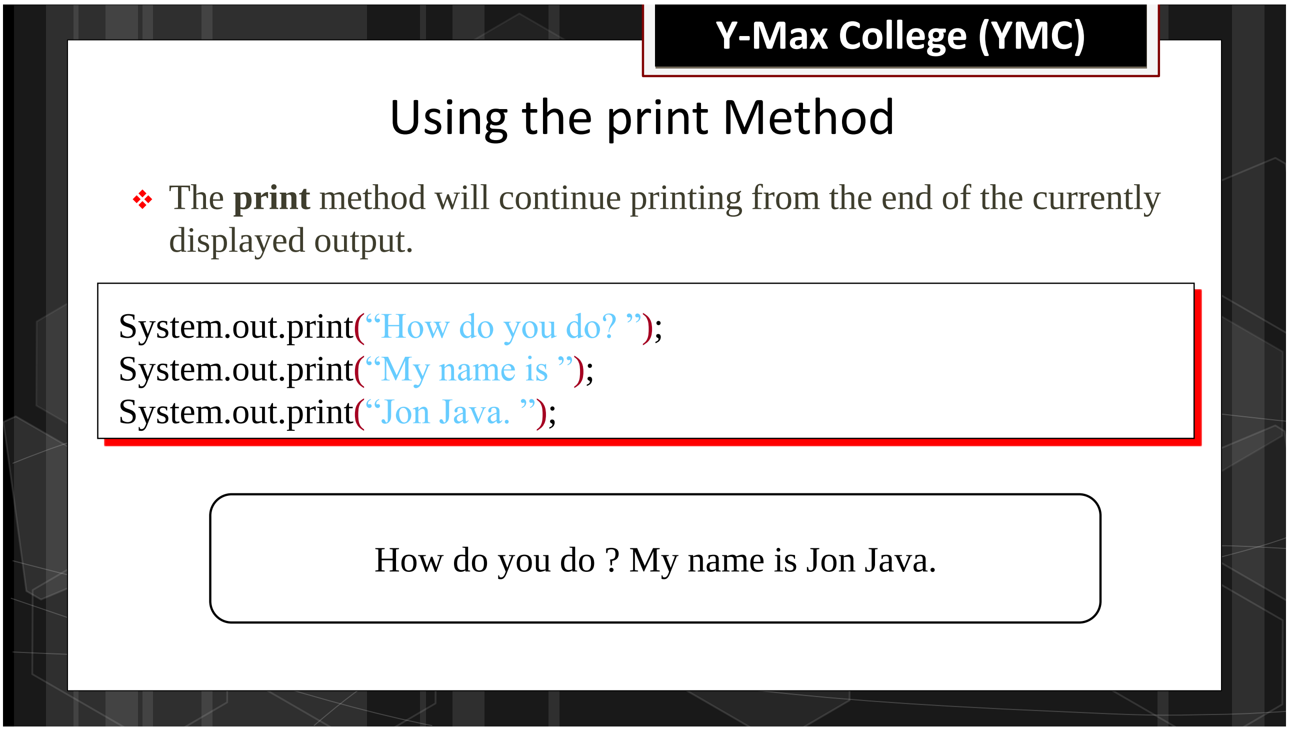
Standard Output

- ❖ Using **print** of **System.out** (an instance of the **PrintStream** class) is a simple way to display a result of a computation to the user.

```
System.out.print(“I Love Java”);
```



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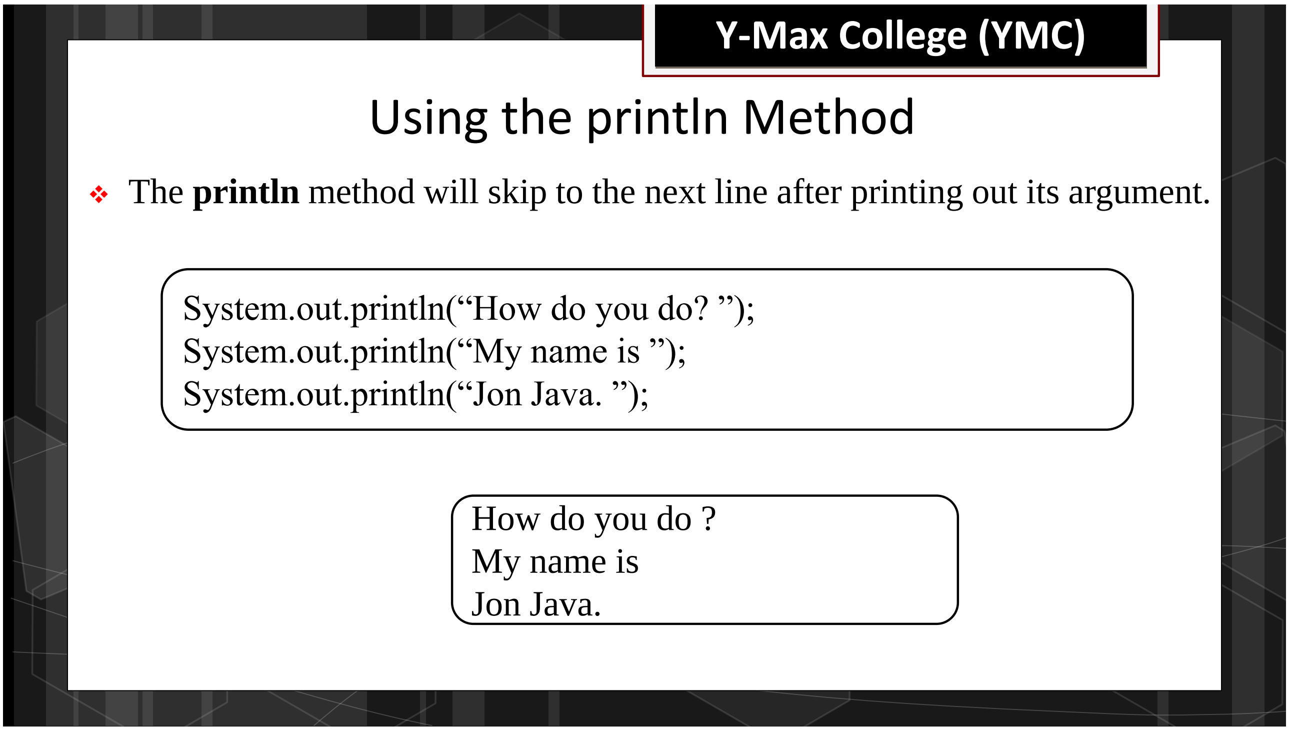
Using the print Method

- ❖ The **print** method will continue printing from the end of the currently displayed output.

```
System.out.print(“How do you do? ”);
System.out.print(“My name is ”);
System.out.print(“Jon Java. ”);
```

```
How do you do ? My name is Jon Java.
```



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Using the println Method

- The **println** method will skip to the next line after printing out its argument.

```
System.out.println(“How do you do? ”);
System.out.println(“My name is ”);
System.out.println(“Jon Java. ”);
```

```
How do you do ?
My name is
Jon Java.
```

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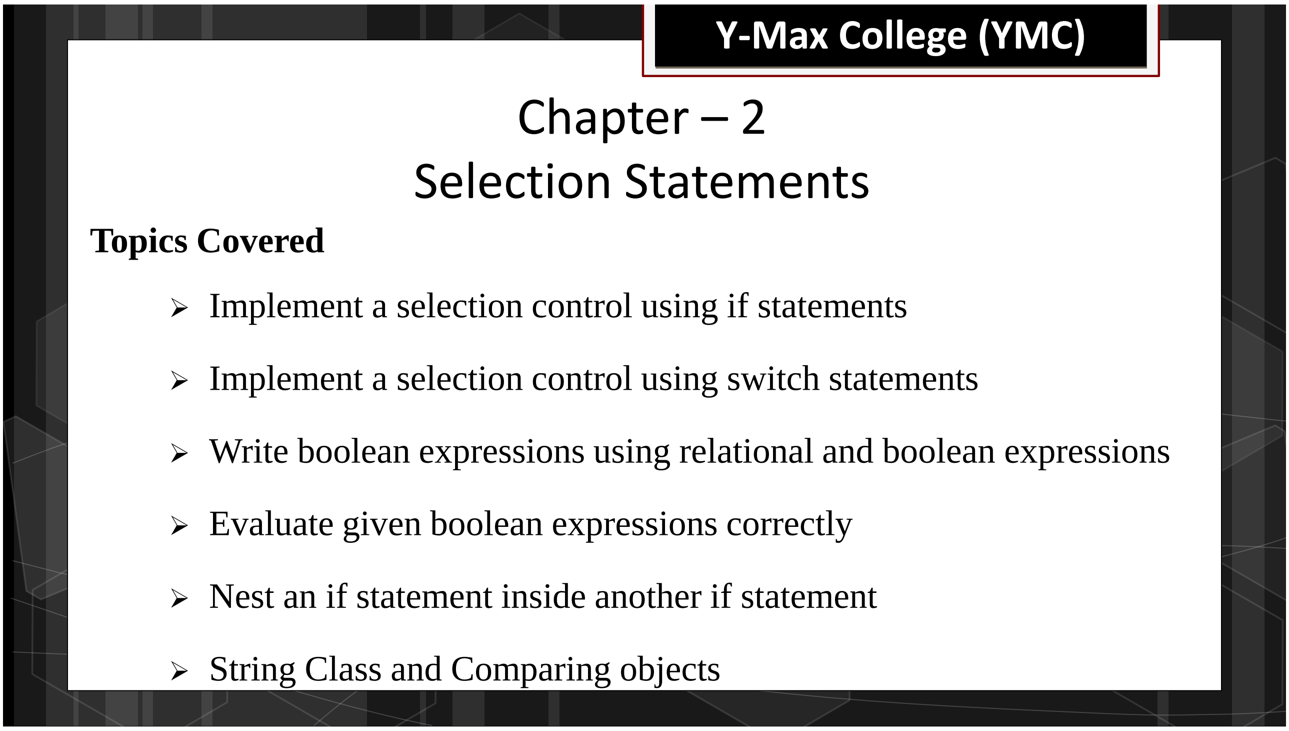
Any Questions….?



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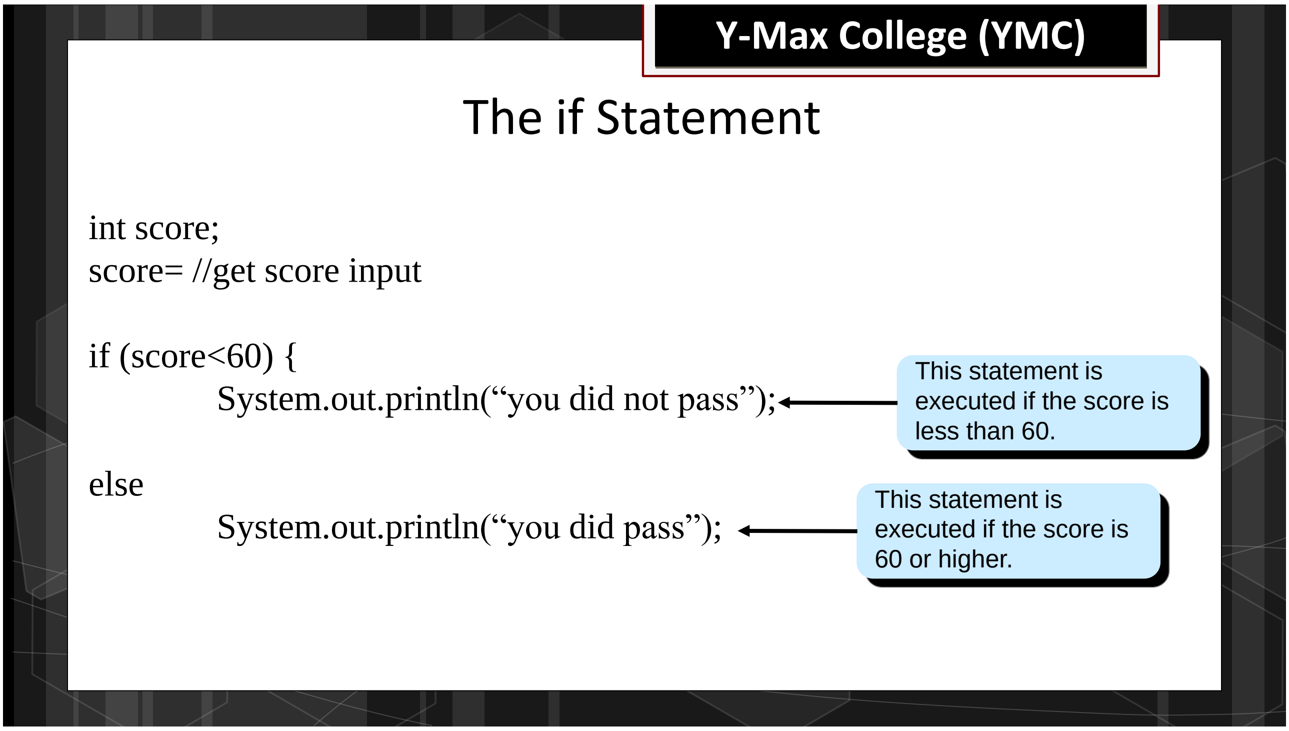
Chapter – 2
Selection Statements

Topics Covered

- Implement a selection control using if statements
- Implement a selection control using switch statements
- Write boolean expressions using relational and boolean expressions
- Evaluate given boolean expressions correctly
- Nest an if statement inside another if statement
- String Class and Comparing objects



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The if Statement

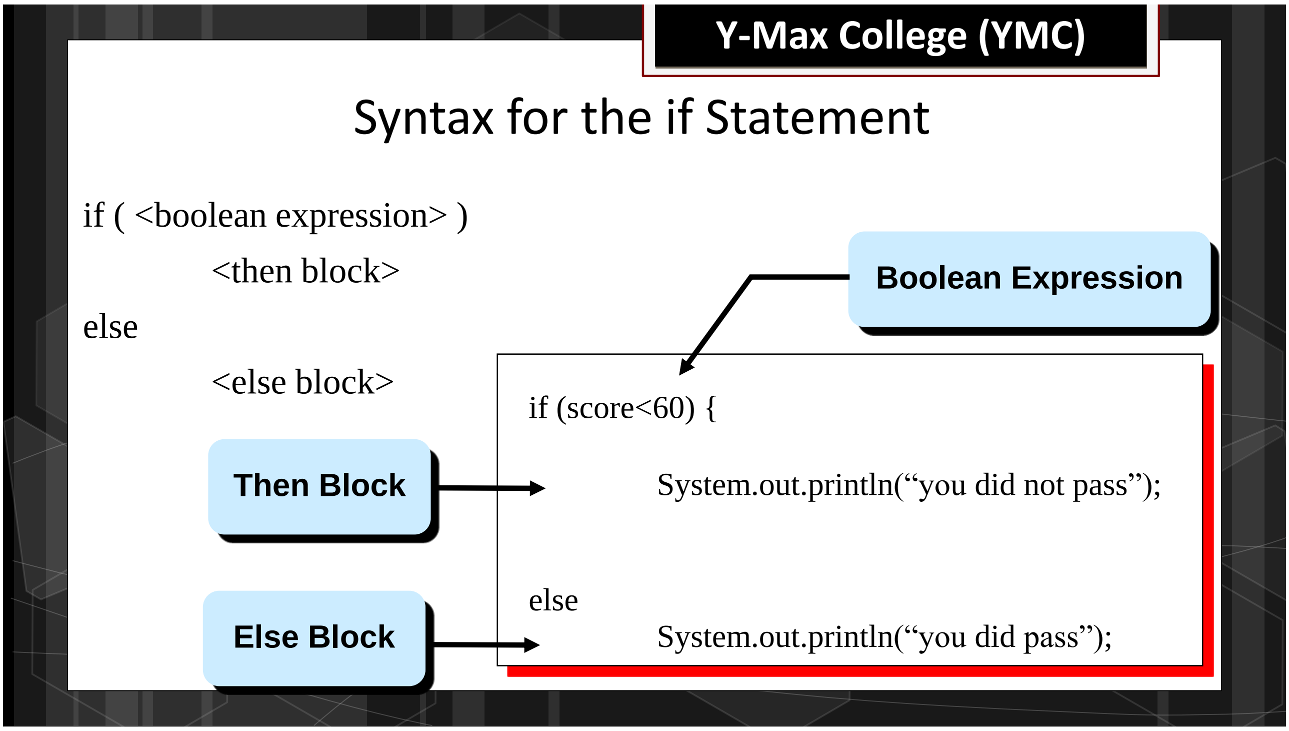
```
int score;
score= //get score input

if (score<60) {
        System.out.println(“you did not pass”);

else
        System.out.println(“you did pass”);
```

This statement is executed if the score is less than 60.

This statement is executed if the score is 60 or higher.



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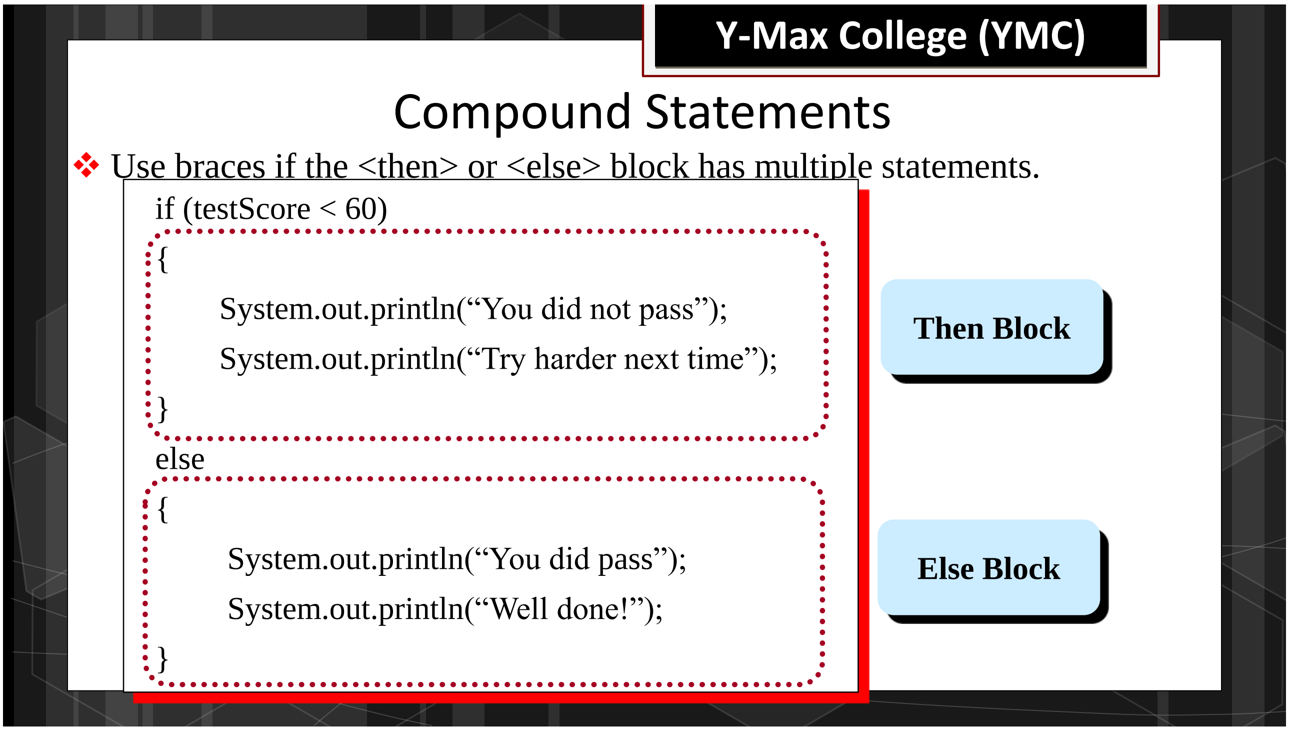
Syntax for the if Statement

```
if ( <boolean expression> )
        <then block>
else
        <else block>
```

```
if (score<60) {
        System.out.println("you did not pass");

else
        System.out.println("you did pass");
```

Boolean Expression
Then Block
Else Block



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Compound Statements

- Use braces if the <then> or <else> block has multiple statements.

```
if (testScore < 60)
{
        System.out.println("You did not pass");
        System.out.println("Try harder next time");
}
else
{
        System.out.println("You did pass");
        System.out.println("Well done!");
}
```

Then Block
Else Block

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Syntax for if Compound Statements

```
if ( <boolean expression> ) {
//statements
   …….
}
else {
//statements
   …….
}
```

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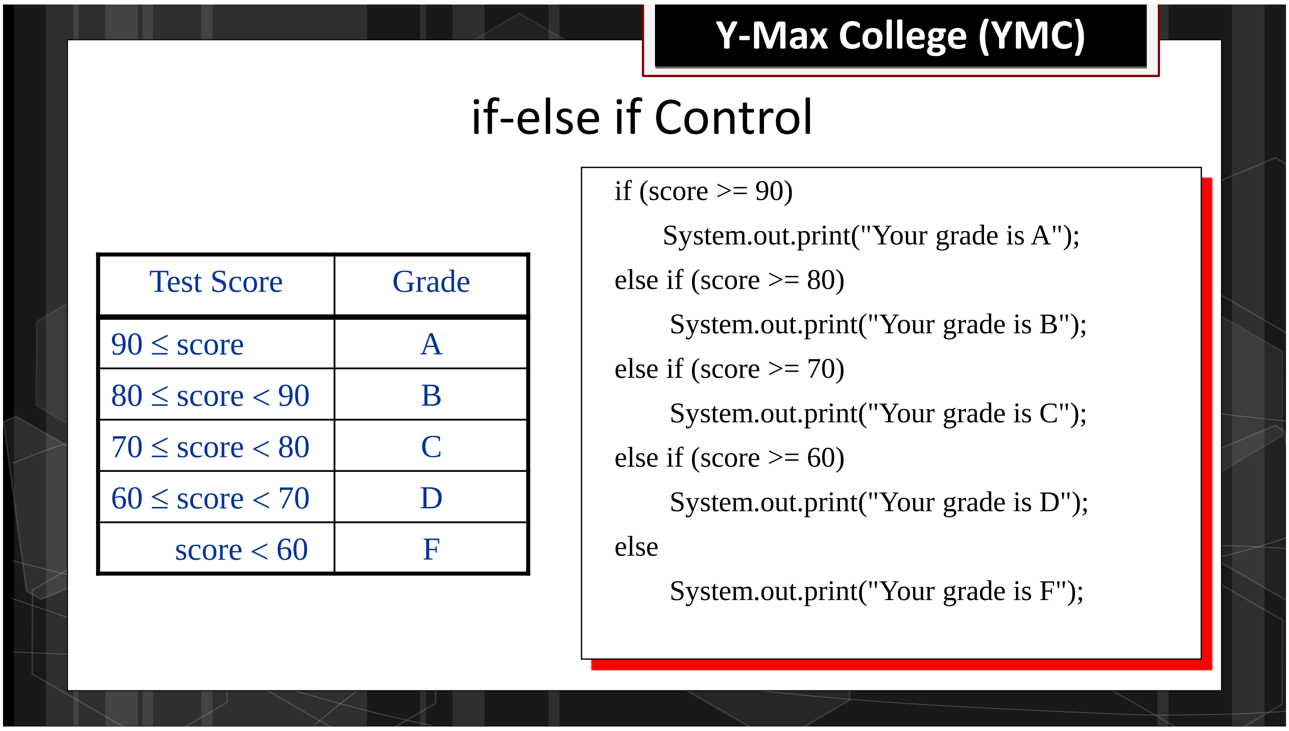
The nested-if Statement

- The then and else block of an if statement can contain any valid statements, including other if statements.
- An if statement containing another if statement is called a nested-if statement.

```
if (testScore >= 60) {
      if (studentAge < 10) {
            System.out.println("You did a great job");
      } else {
            System.out.println("You did pass"); //test score >= 60
      }                                          //and age >= 10
} else { //test score < 60
      System.out.println("You did not pass");
}
```



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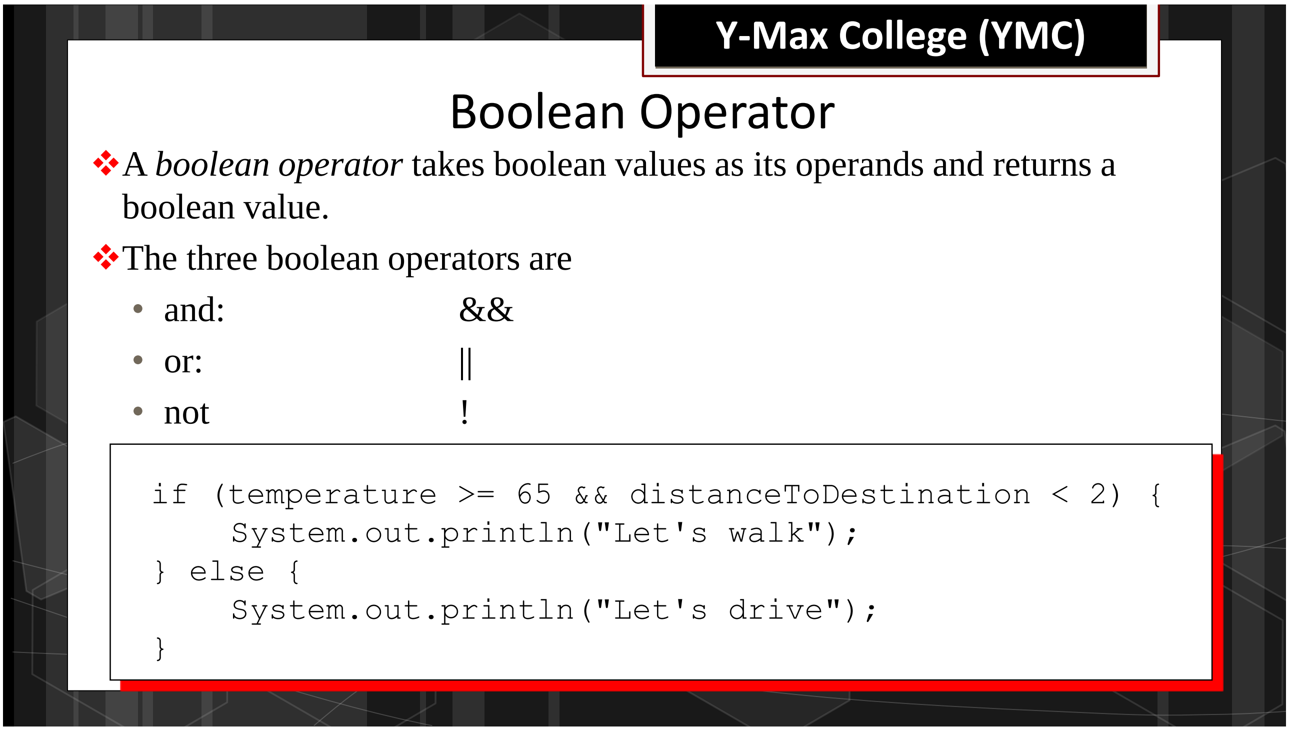
if-else if Control

Test Score	Grade
90 ≤ score	A
80 ≤ score < 90	B
70 ≤ score < 80	C
60 ≤ score < 70	D
score < 60	F

```
if (score >= 90)
    System.out.print("Your grade is A");
else if (score >= 80)
    System.out.print("Your grade is B");
else if (score >= 70)
    System.out.print("Your grade is C");
else if (score >= 60)
    System.out.print("Your grade is D");
else
    System.out.print("Your grade is F");
```



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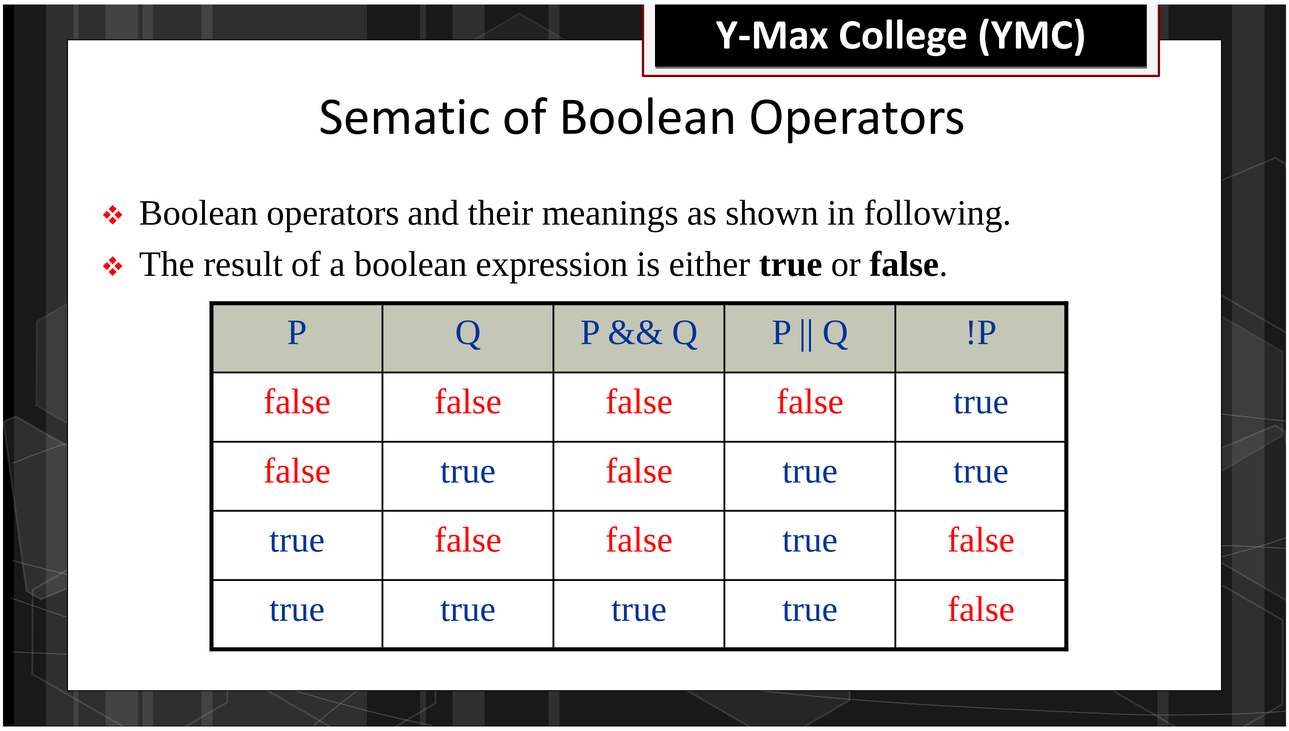
Boolean Operator

- A *boolean operator* takes boolean values as its operands and returns a boolean value.
- The three boolean operators are

and:	&&
or:	||
not	!

```
if (temperature >= 65 && distanceToDestination < 2) {
    System.out.println("Let's walk");
} else {
    System.out.println("Let's drive");
}
```



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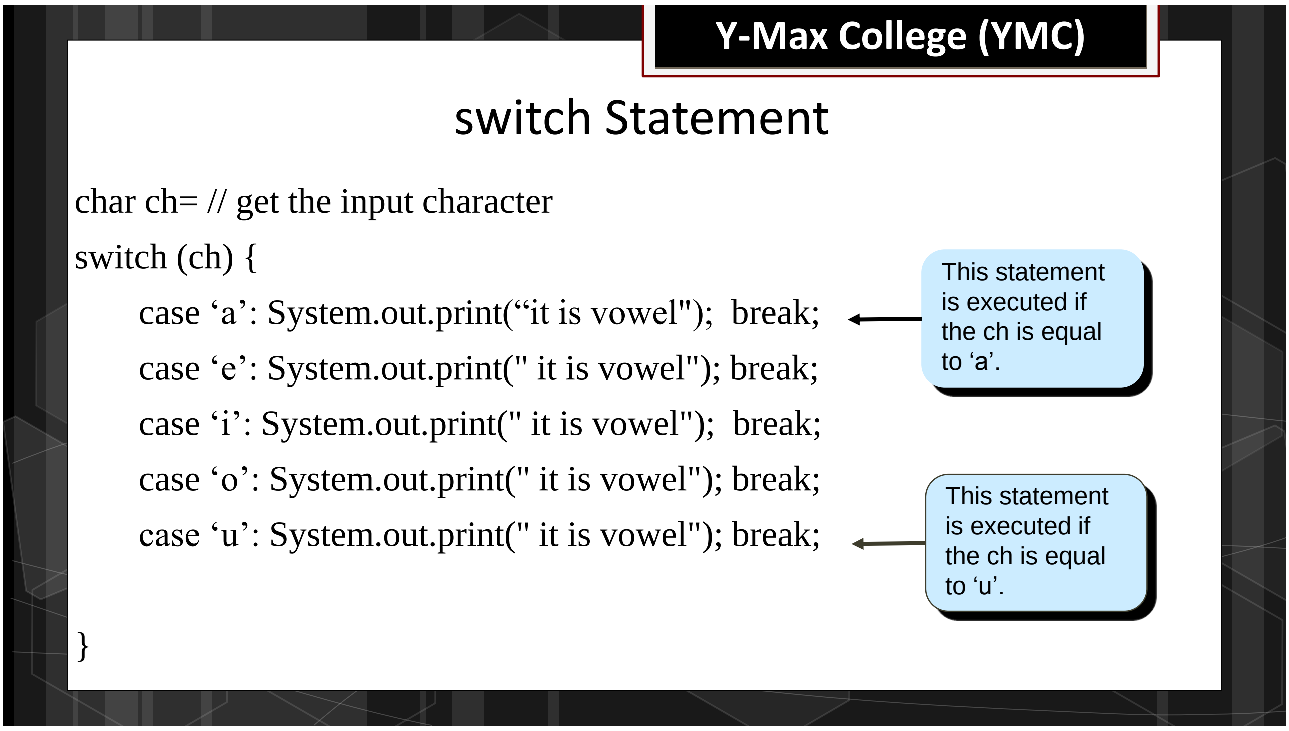
Sematic of Boolean Operators

- Boolean operators and their meanings as shown in following.
- The result of a boolean expression is either **true** or **false**.

P	Q	P && Q	P || Q	!P
false	false	false	false	true
false	true	false	true	true
true	false	false	true	false
true	true	true	true	false



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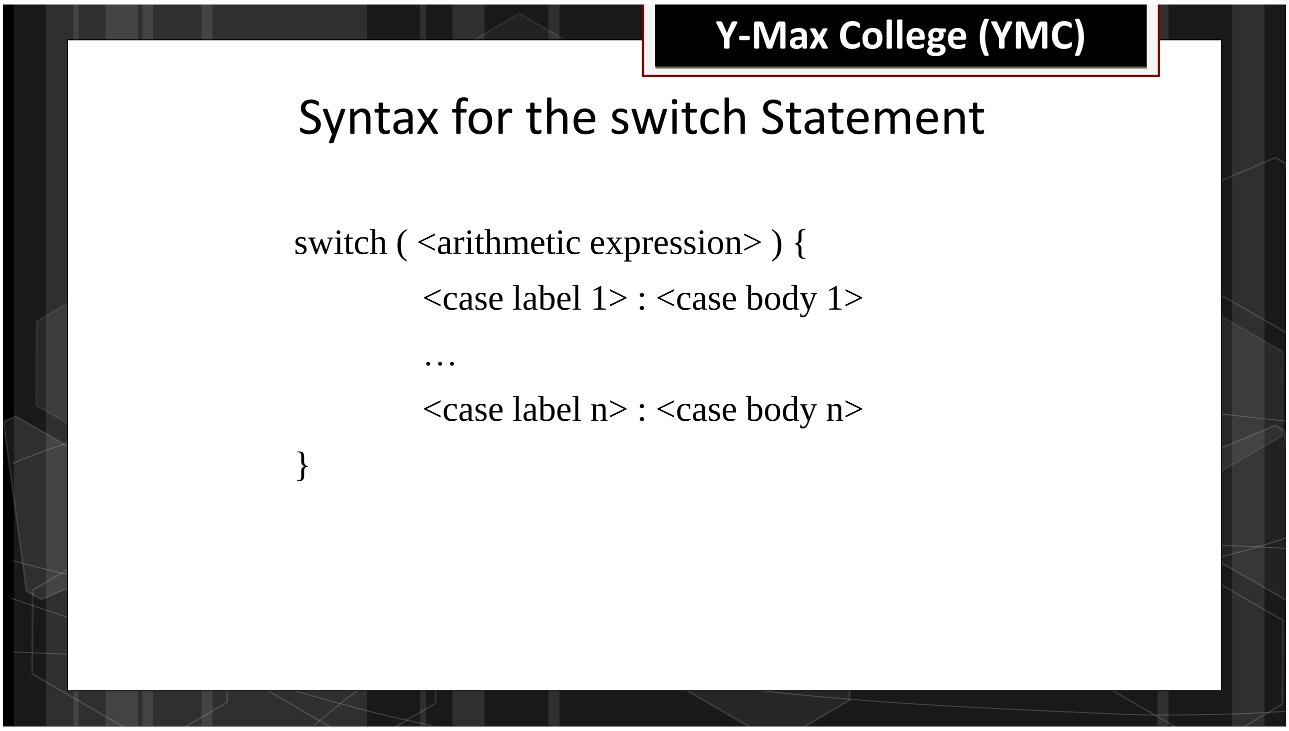
switch Statement

```
char ch= // get the input character
switch (ch) {
      case ‘a’: System.out.print(“it is vowel");  break;
      case ‘e’: System.out.print(" it is vowel"); break;
      case ‘i’: System.out.print(" it is vowel");  break;
      case ‘o’: System.out.print(" it is vowel"); break;
      case ‘u’: System.out.print(" it is vowel"); break;

}
```

This statement is executed if the ch is equal to ‘a’.

This statement is executed if the ch is equal to ‘u’.



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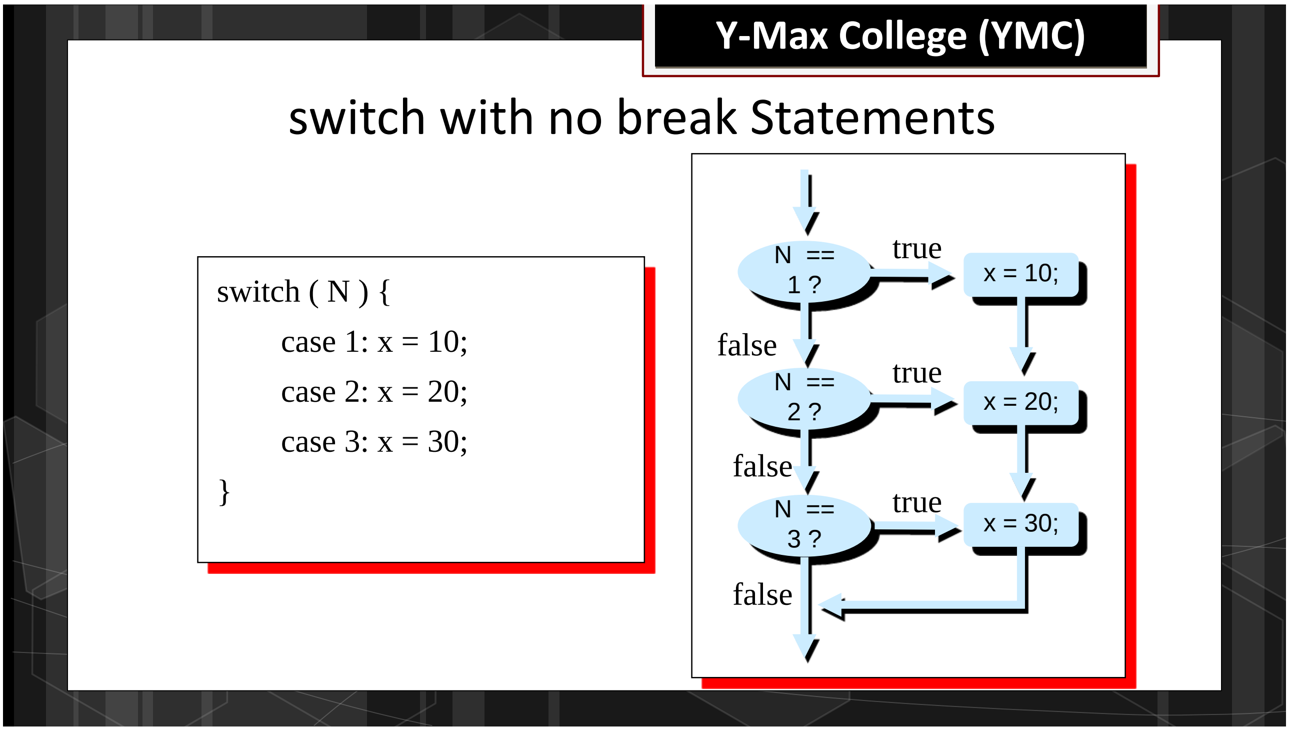
Syntax for the switch Statement

```
switch ( <arithmetic expression> ) {
        <case label 1> : <case body 1>
        …
        <case label n> : <case body n>
}
```



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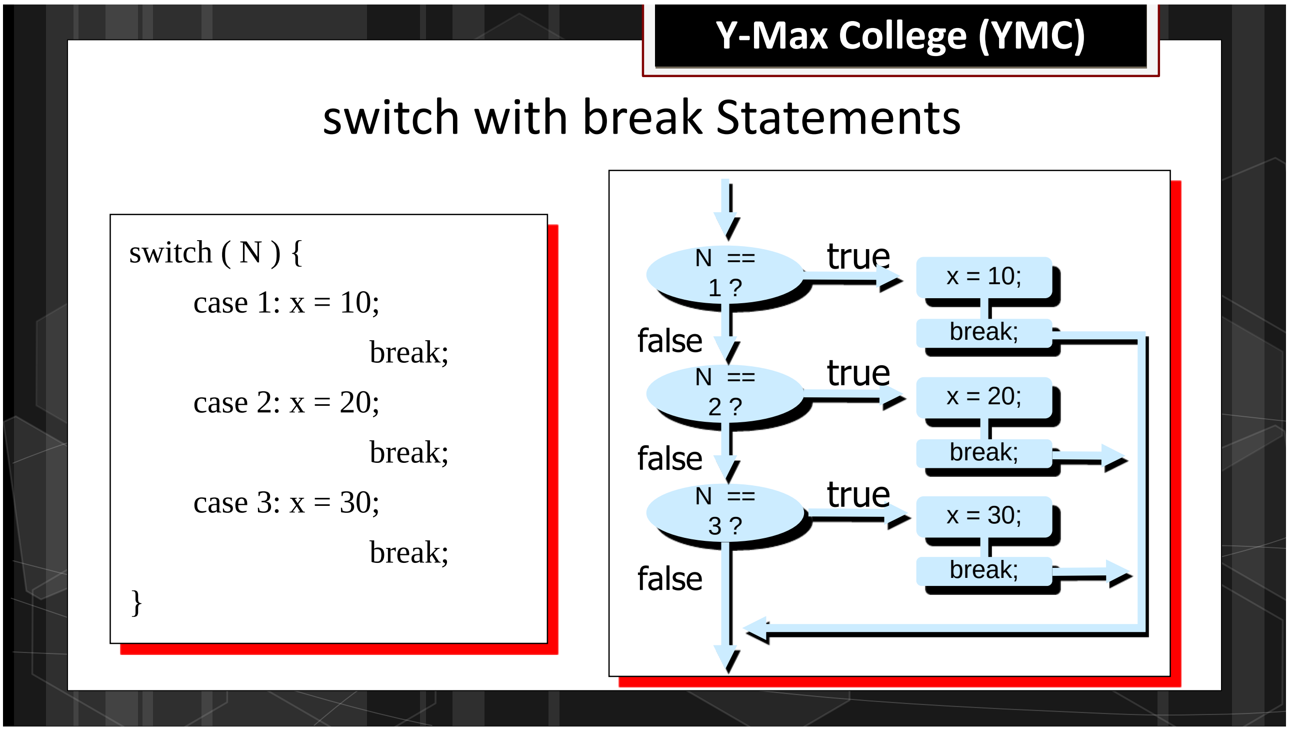
switch with no break Statements

```
switch ( N ) {
    case 1: x = 10;
    case 2: x = 20;
    case 3: x = 30;
}
```

N == 1 ?
true
x = 10;
false
N == 2 ?
true
x = 20;
false
N == 3 ?
true
x = 30;
false



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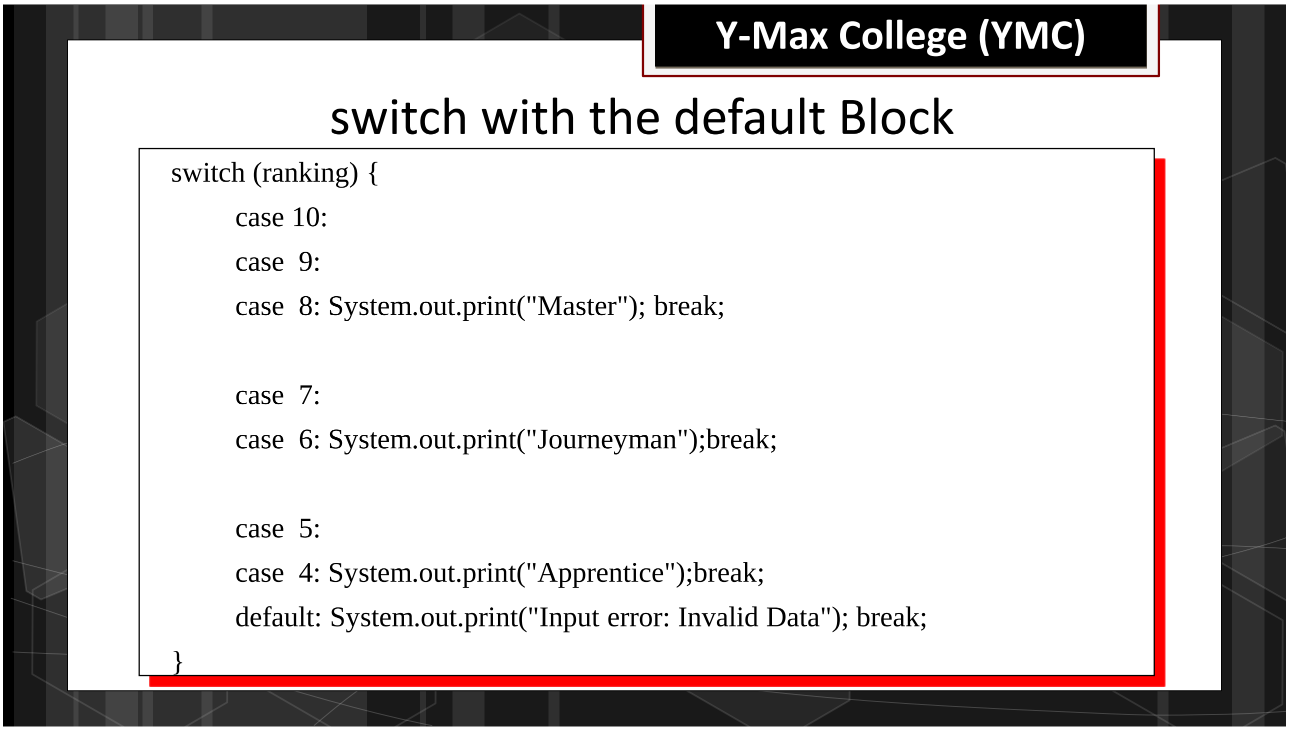
switch with break Statements

```
switch ( N ) {
        case 1: x = 10;
                        break;
        case 2: x = 20;
                        break;
        case 3: x = 30;
                        break;
}
```



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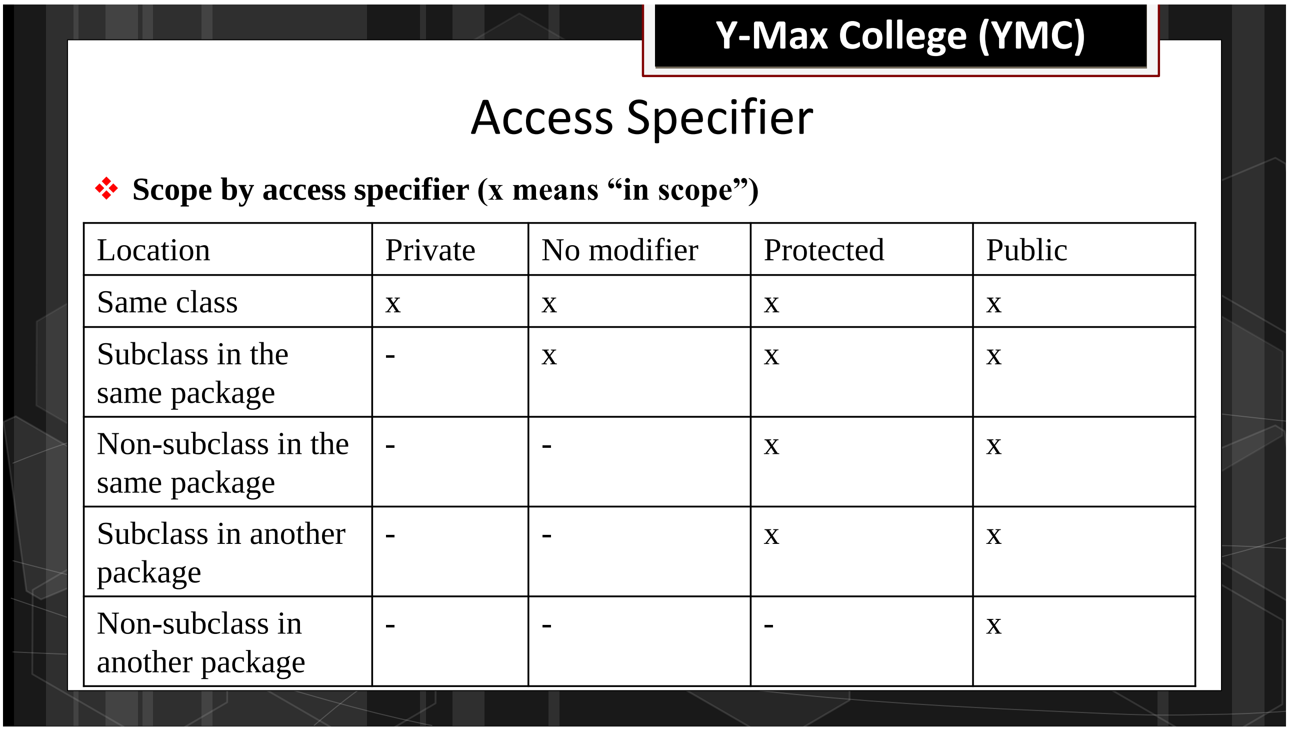
switch with the default Block

```
switch (ranking) {
        case 10:
        case  9:
        case  8: System.out.print("Master"); break;

        case  7:
        case  6: System.out.print("Journeyman");break;

        case  5:
        case  4: System.out.print("Apprentice");break;
        default: System.out.print("Input error: Invalid Data"); break;
}
```



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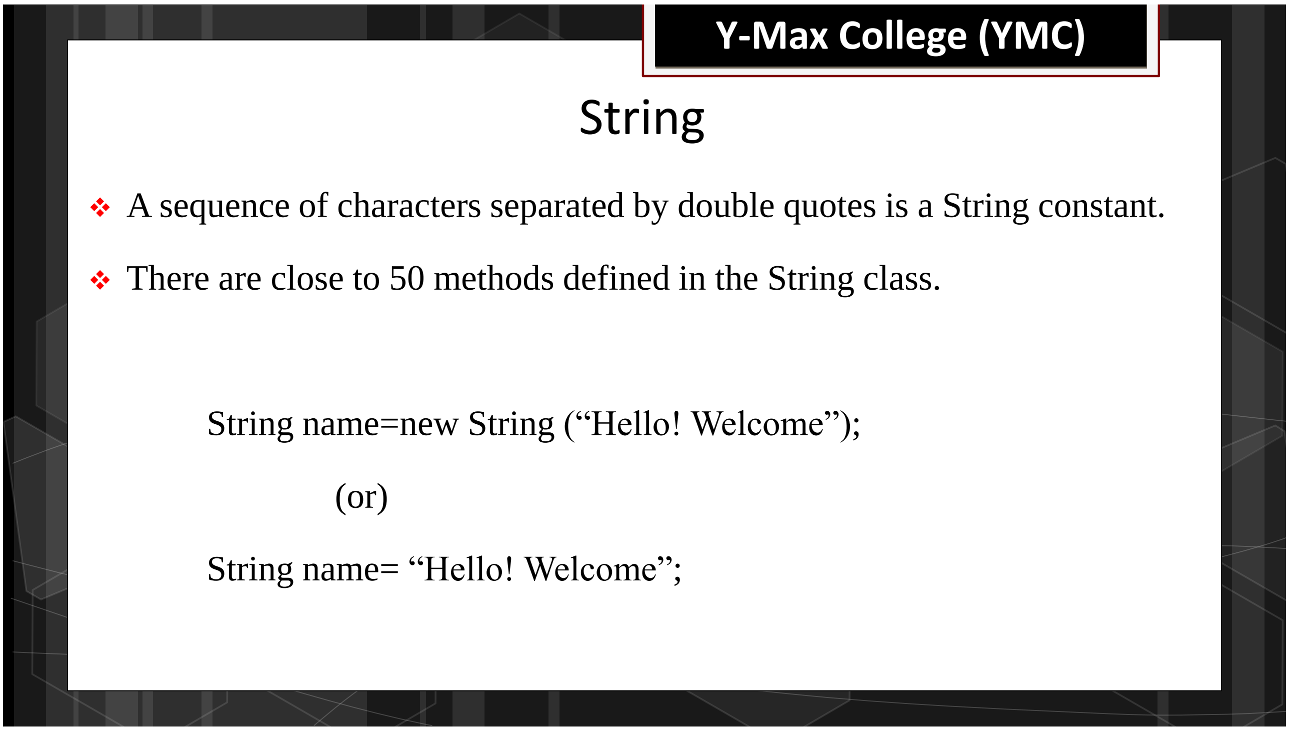
Access Specifier

❖ **Scope by access specifier (x means “in scope”)**

Location	Private	No modifier	Protected	Public
Same class	x	x	x	x
Subclass in the same package	-	x	x	x
Non-subclass in the same package	-	-	x	x
Subclass in another package	-	-	x	x
Non-subclass in another package	-	-	-	x



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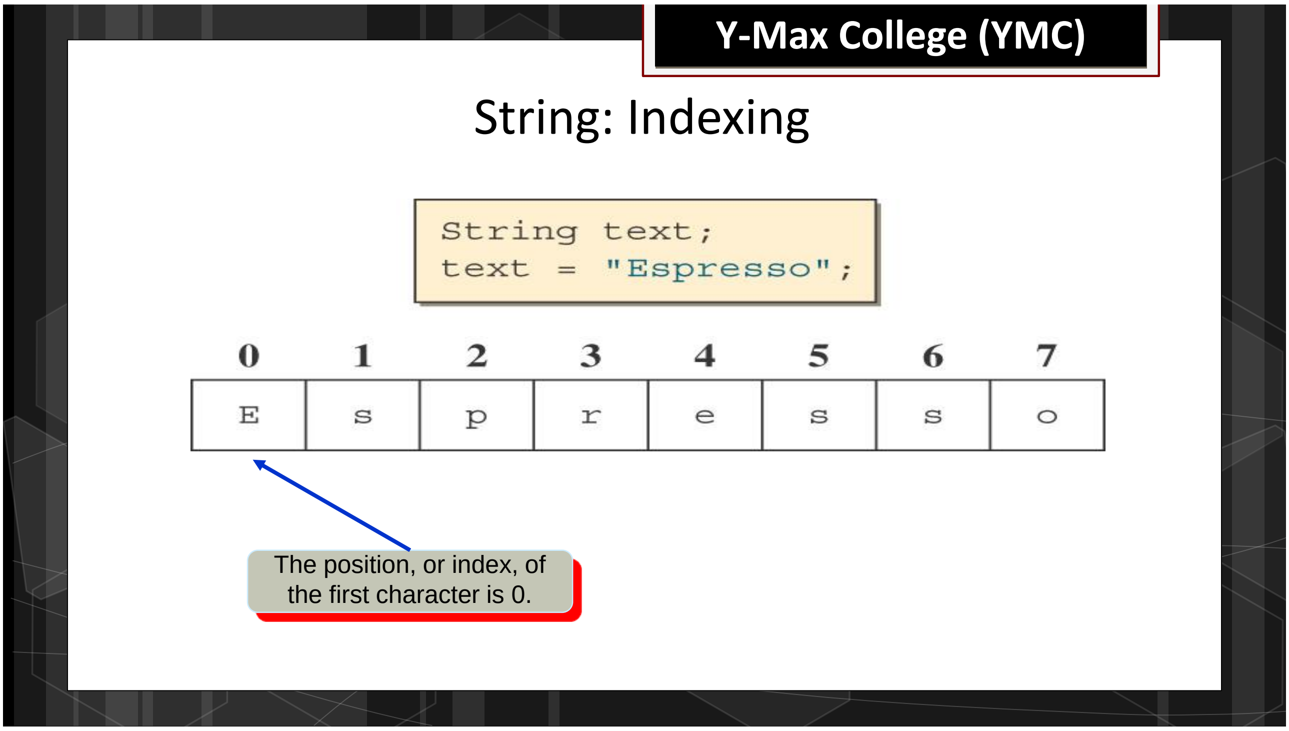
String

- A sequence of characters separated by double quotes is a String constant.
- There are close to 50 methods defined in the String class.

```
String name=new String (“Hello! Welcome”);
            (or)
String name= “Hello! Welcome”;
```



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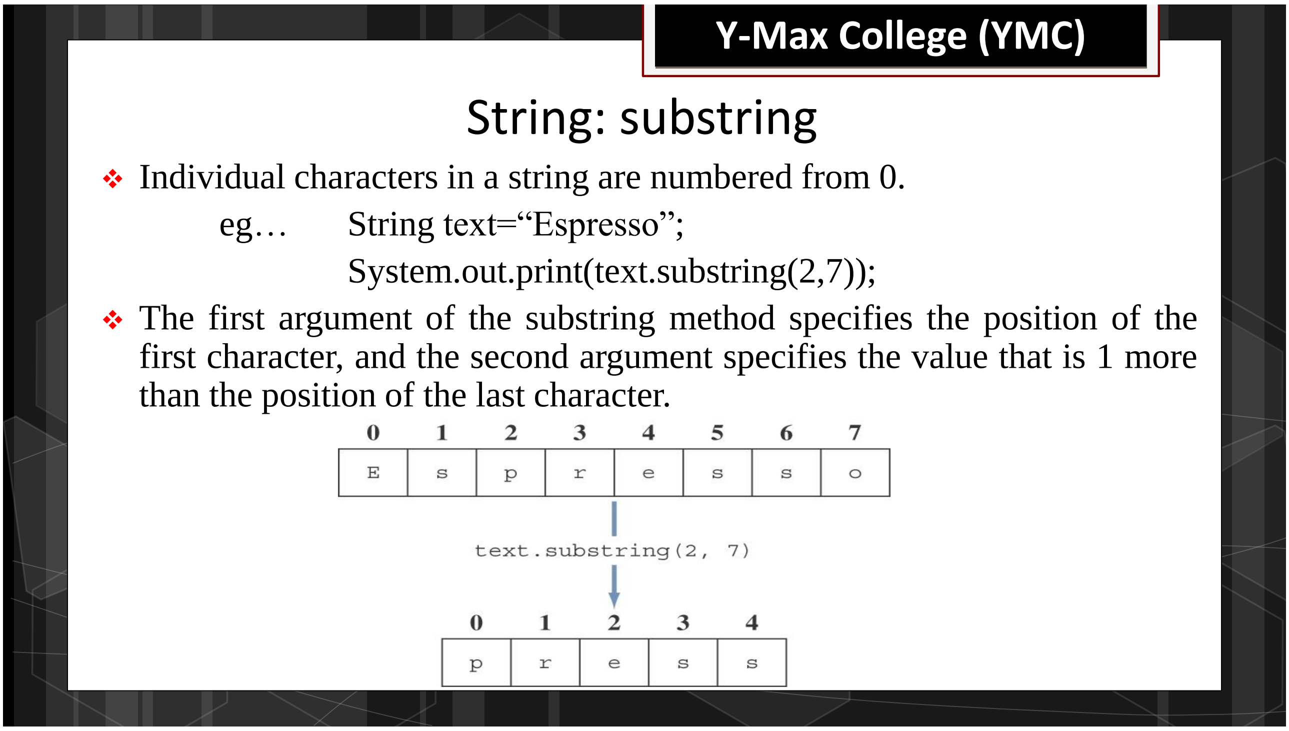
String: Indexing

```
String text;
text = "Espresso";
```

0	1	2	3	4	5	6	7
E	s	p	r	e	s	s	o

The position, or index, of the first character is 0.



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String: substring

- Individual characters in a string are numbered from 0.

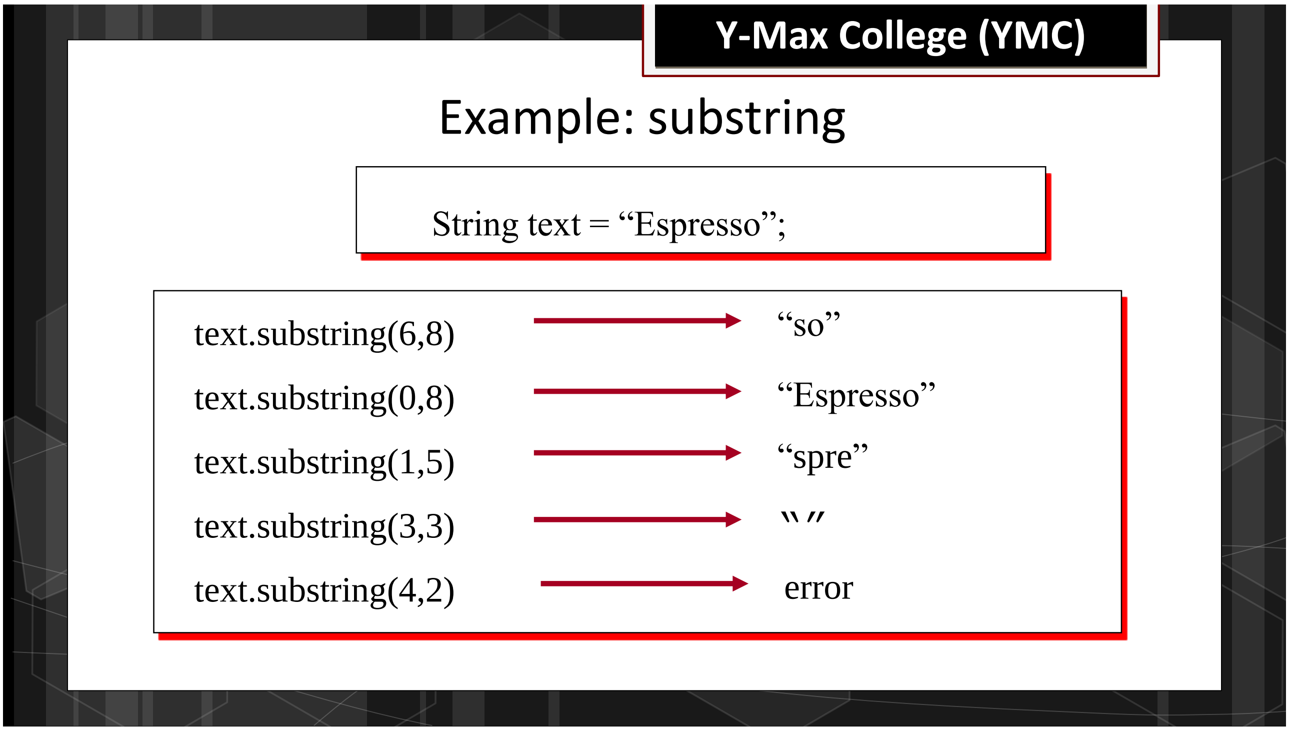
  eg… String text="Espresso";
  System.out.print(text.substring(2,7));

- The first argument of the substring method specifies the position of the first character, and the second argument specifies the value that is 1 more than the position of the last character.

0	1	2	3	4	5	6	7
E	s	p	r	e	s	s	o

```
text.substring(2, 7)
```

0	1	2	3	4
p	r	e	s	s



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Example: substring

```
String text = “Espresso”;
```

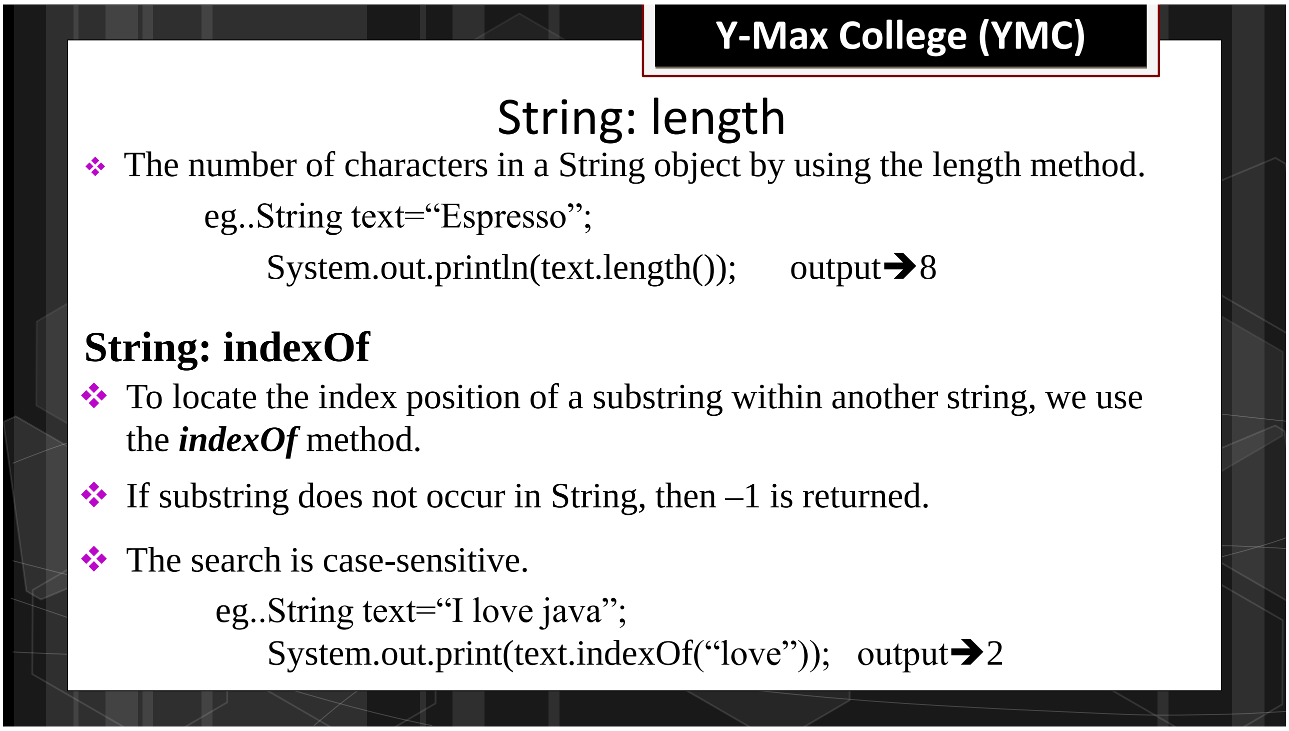
text.substring(6,8) → “so”

text.substring(0,8) → “Espresso”

text.substring(1,5) → “spre”

text.substring(3,3) → " "

text.substring(4,2) → error



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String: length

- The number of characters in a String object by using the length method.

  eg..String text=“Espresso”;

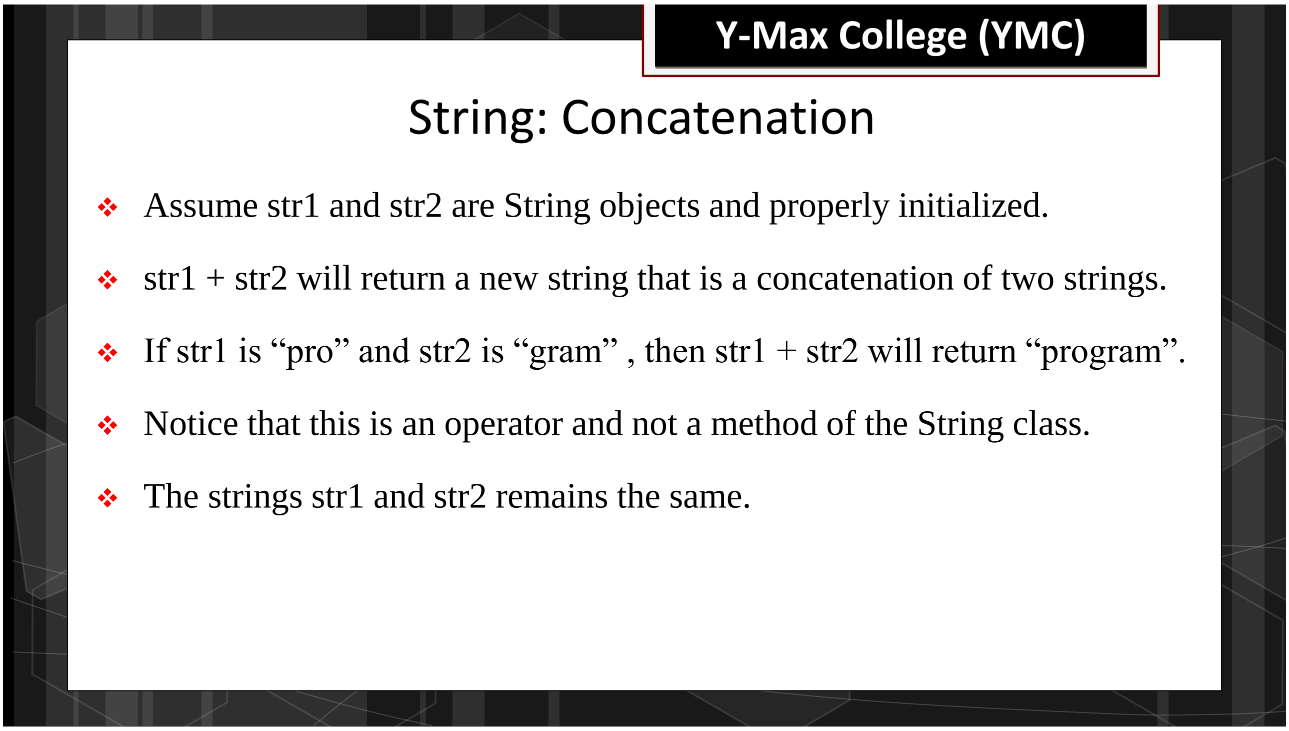
  System.out.println(text.length()); output➔8

String: indexOf

- To locate the index position of a substring within another string, we use the ***indexOf*** method.
- If substring does not occur in String, then –1 is returned.
- The search is case-sensitive.

  eg..String text=“I love java”;

  System.out.print(text.indexOf(“love”)); output➔2



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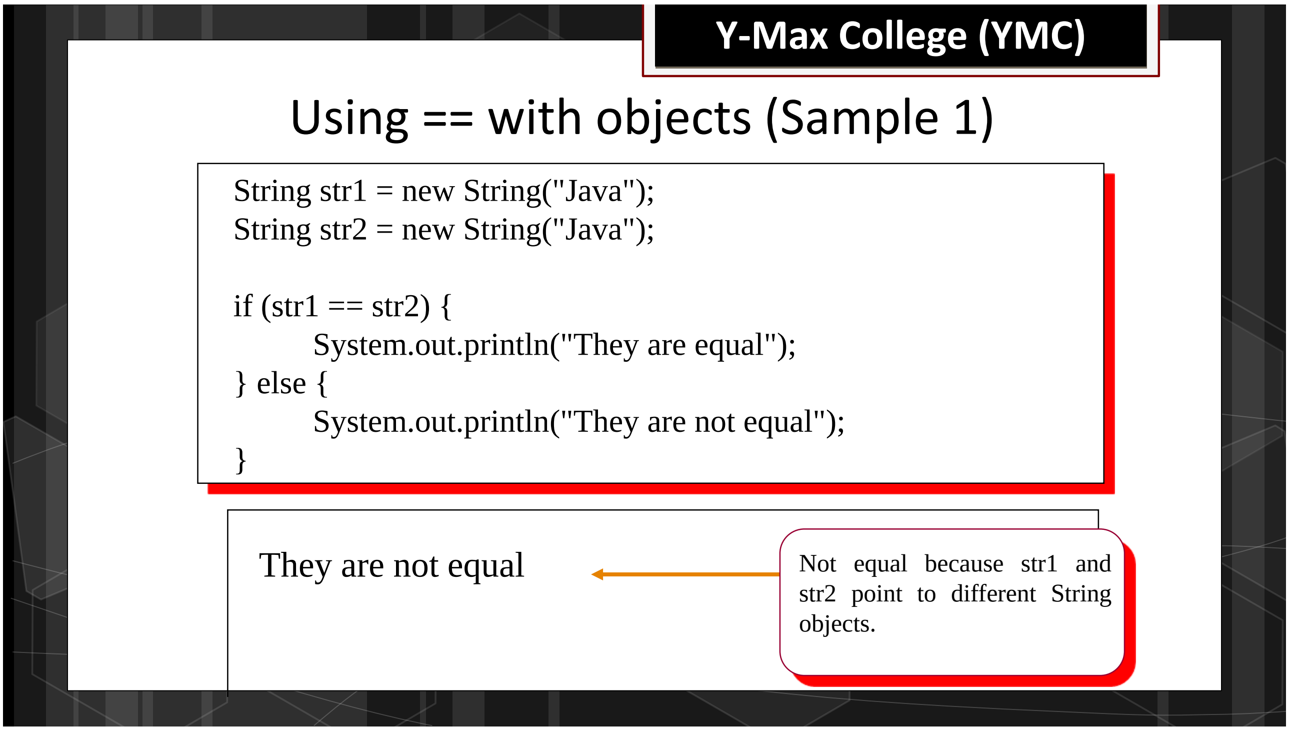
String: Concatenation

- Assume str1 and str2 are String objects and properly initialized.
- str1 + str2 will return a new string that is a concatenation of two strings.
- If str1 is “pro” and str2 is “gram” , then str1 + str2 will return “program”.
- Notice that this is an operator and not a method of the String class.
- The strings str1 and str2 remains the same.



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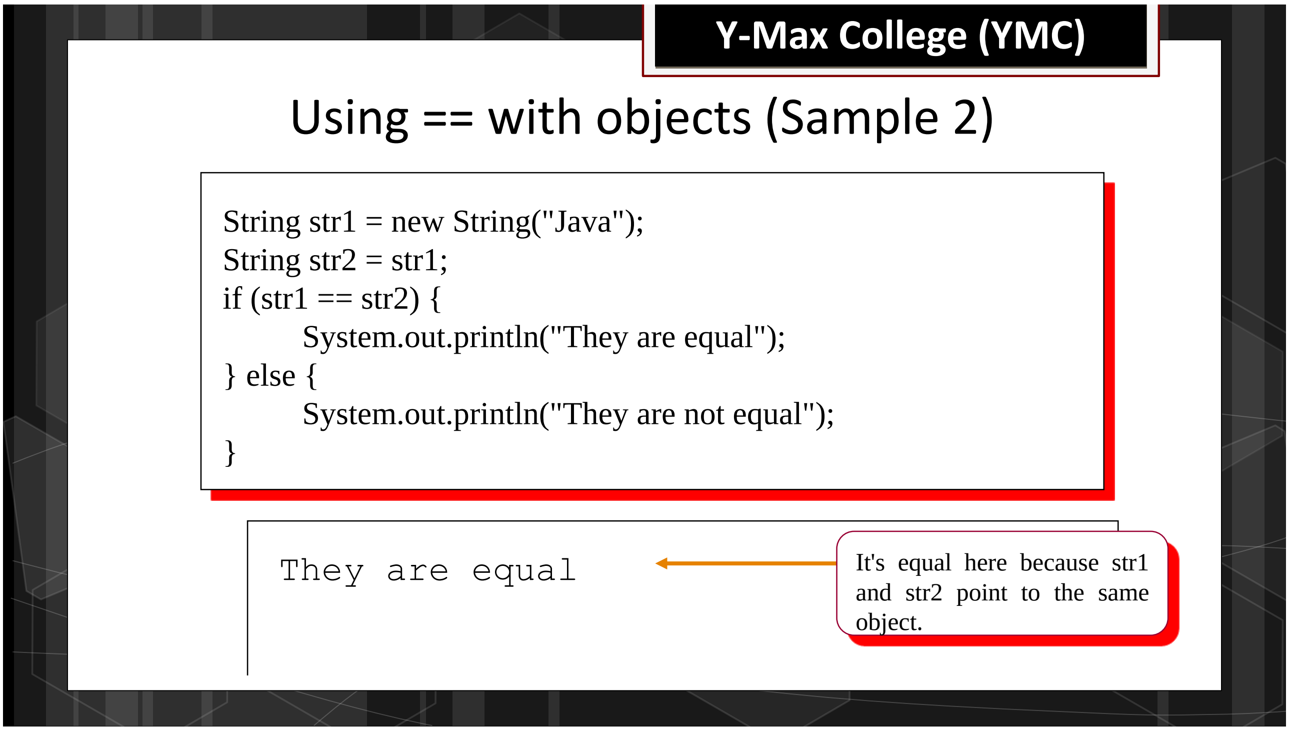
Using == with objects (Sample 1)

```
String str1 = new String("Java");
String str2 = new String("Java");

if (str1 == str2) {
        System.out.println("They are equal");
} else {
        System.out.println("They are not equal");
}
```

```
They are not equal
```

Not equal because str1 and str2 point to different String objects.



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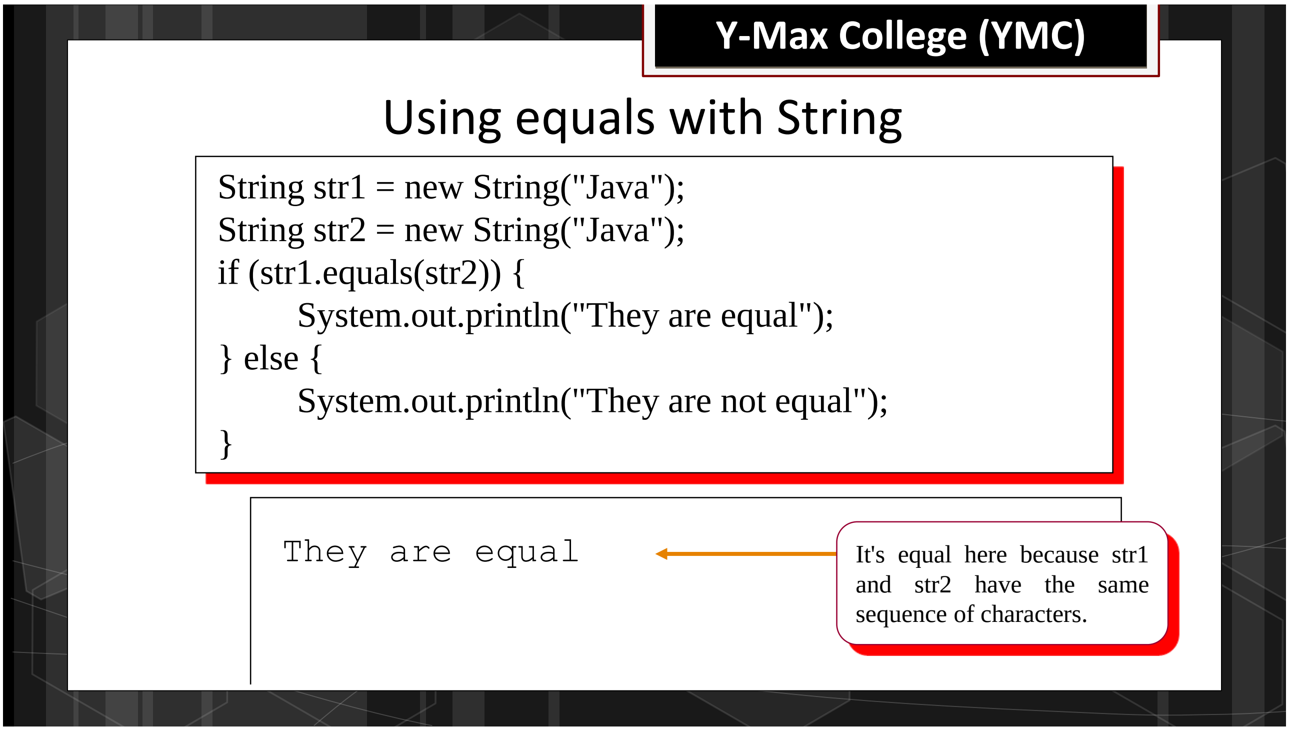
Using == with objects (Sample 2)

```
String str1 = new String("Java");
String str2 = str1;
if (str1 == str2) {
        System.out.println("They are equal");
} else {
        System.out.println("They are not equal");
}
```

```
They are equal
```

It's equal here because str1 and str2 point to the same object.



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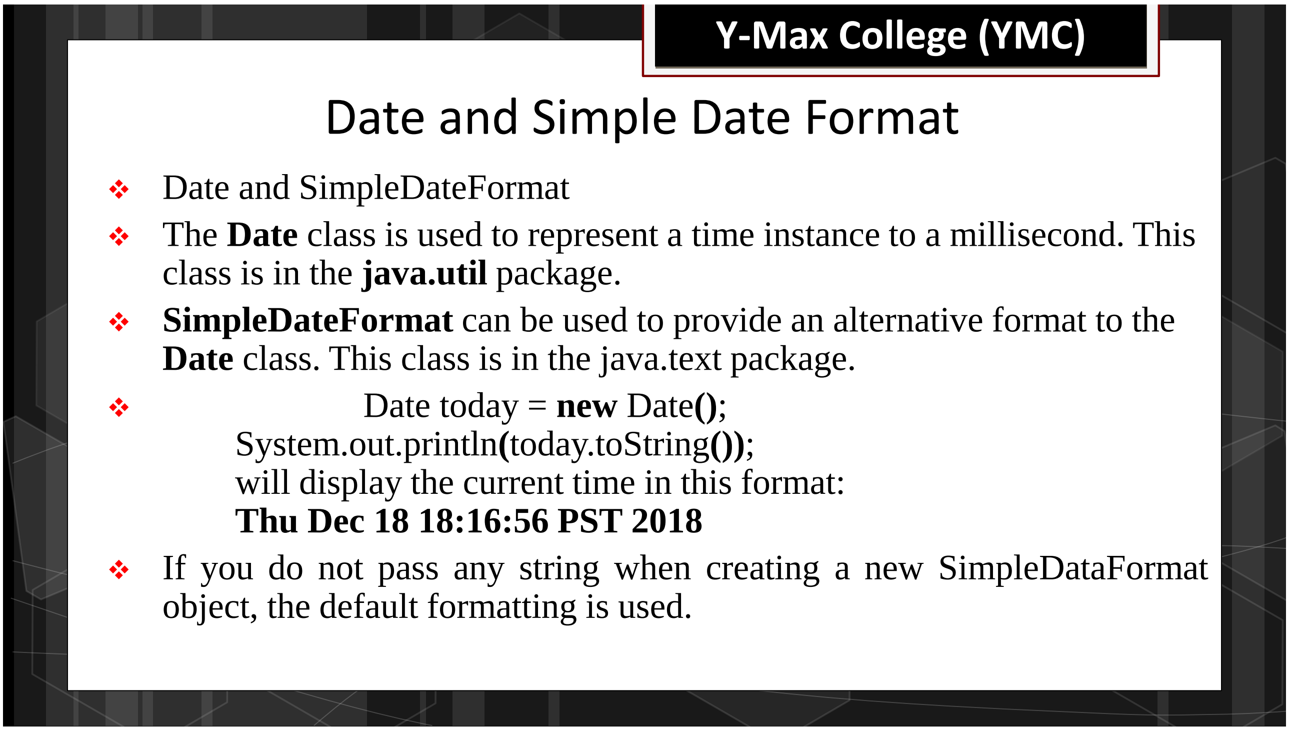
Using equals with String

```
String str1 = new String("Java");
String str2 = new String("Java");
if (str1.equals(str2)) {
        System.out.println("They are equal");
} else {
        System.out.println("They are not equal");
}
```

```
They are equal
```

It's equal here because str1 and str2 have the same sequence of characters.



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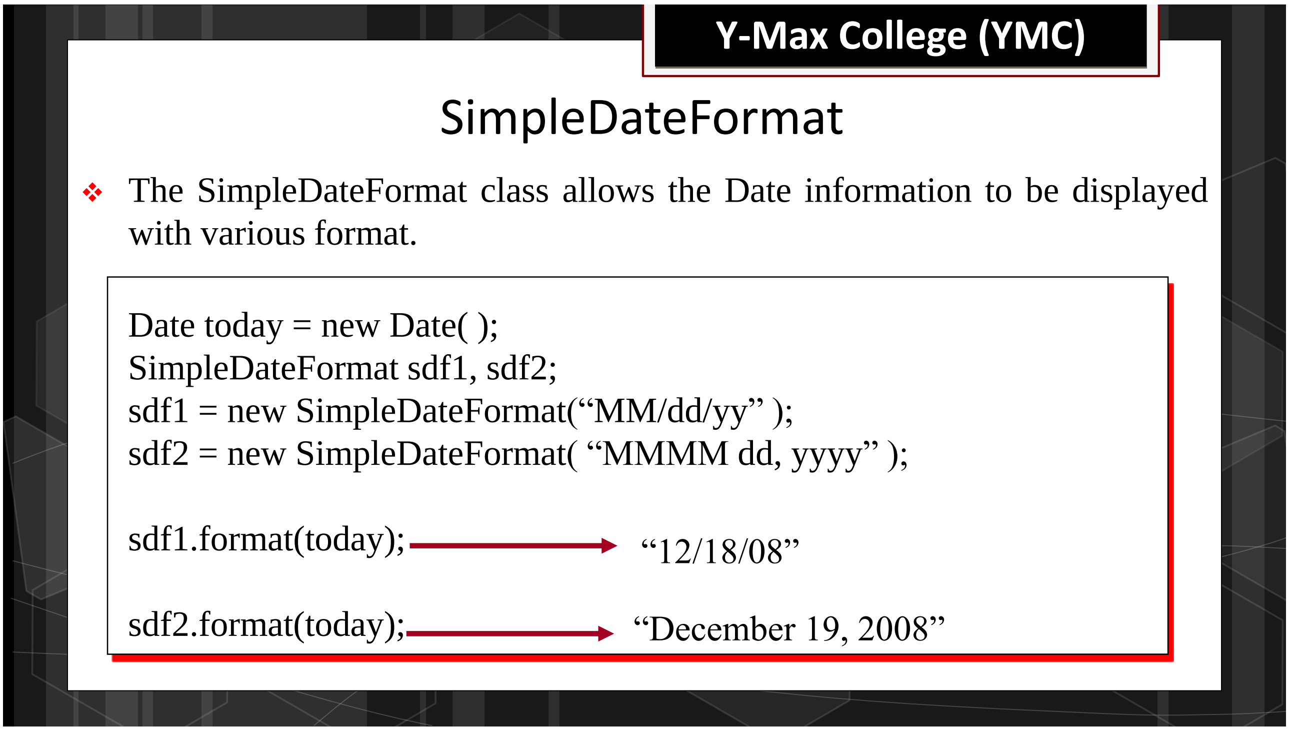
Date and Simple Date Format

- Date and SimpleDateFormat
- The **Date** class is used to represent a time instance to a millisecond. This class is in the **java.util** package.
- **SimpleDateFormat** can be used to provide an alternative format to the **Date** class. This class is in the java.text package.
- Date today = **new** Date**()**;
  System.out.println**(**today.toString**())**;
  will display the current time in this format:
  Thu Dec 18 18:16:56 PST 2018
- If you do not pass any string when creating a new SimpleDataFormat object, the default formatting is used.



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SimpleDateFormat

- The SimpleDateFormat class allows the Date information to be displayed with various format.

```
Date today = new Date( );
SimpleDateFormat sdf1, sdf2;
sdf1 = new SimpleDateFormat(“MM/dd/yy” );
sdf2 = new SimpleDateFormat( “MMMM dd, yyyy” );

sdf1.format(today); → “12/18/08”

sdf2.format(today); → “December 19, 2008”
```

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Any Questions….?

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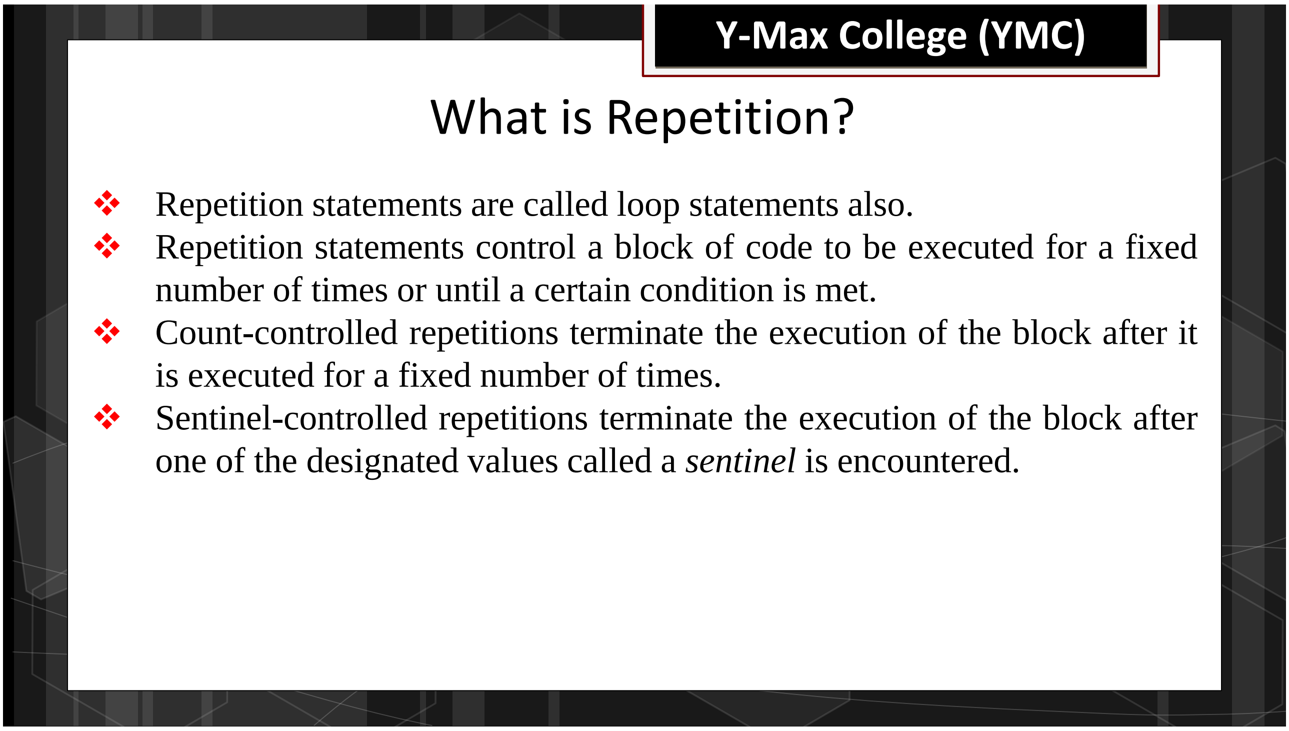
Chapter – 3
Repetition

Topics covered

- Implement repetition control in a program using **while** statements.
- Implement repetition control in a program using **do-while** statements.
- Implement repetition control in a program using **for** statements.
- Nest a loop repetition statement inside another repetition statement.
- Java Arrays
- Using function



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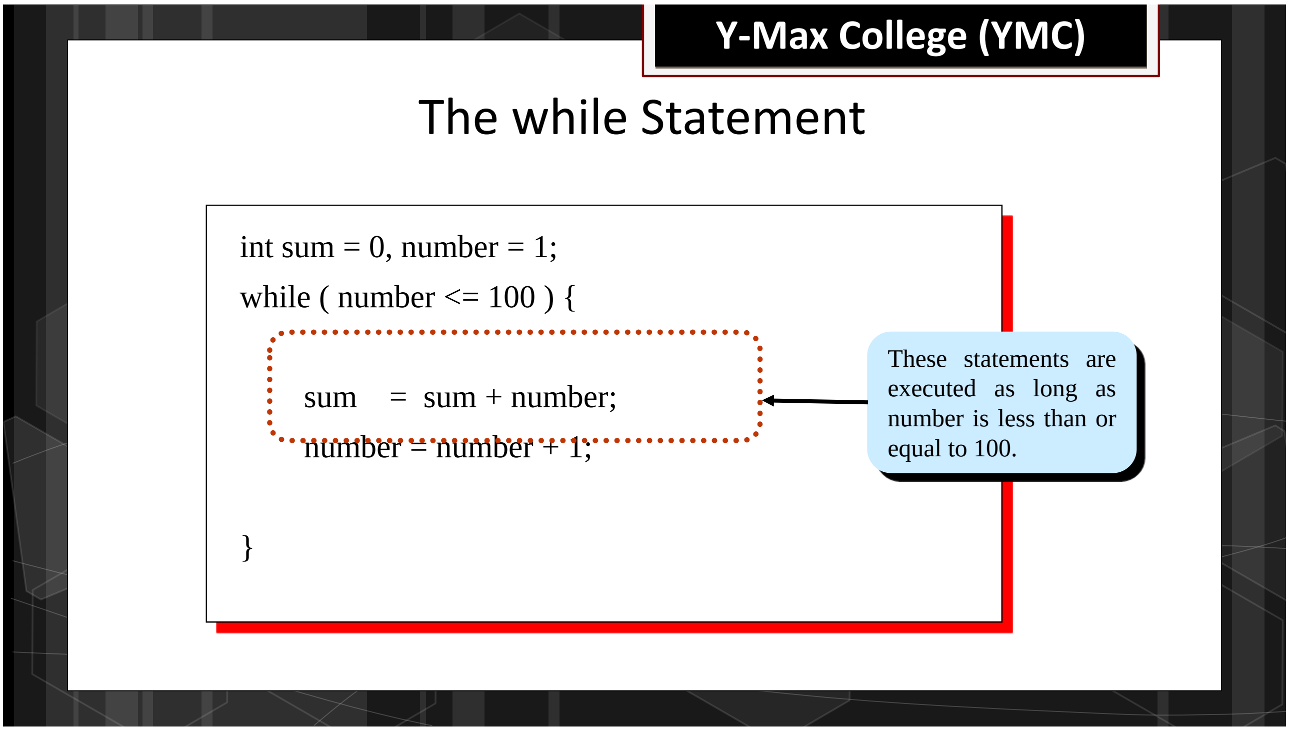
What is Repetition?

- Repetition statements are called loop statements also.
- Repetition statements control a block of code to be executed for a fixed number of times or until a certain condition is met.
- Count-controlled repetitions terminate the execution of the block after it is executed for a fixed number of times.
- Sentinel-controlled repetitions terminate the execution of the block after one of the designated values called a *sentinel* is encountered.



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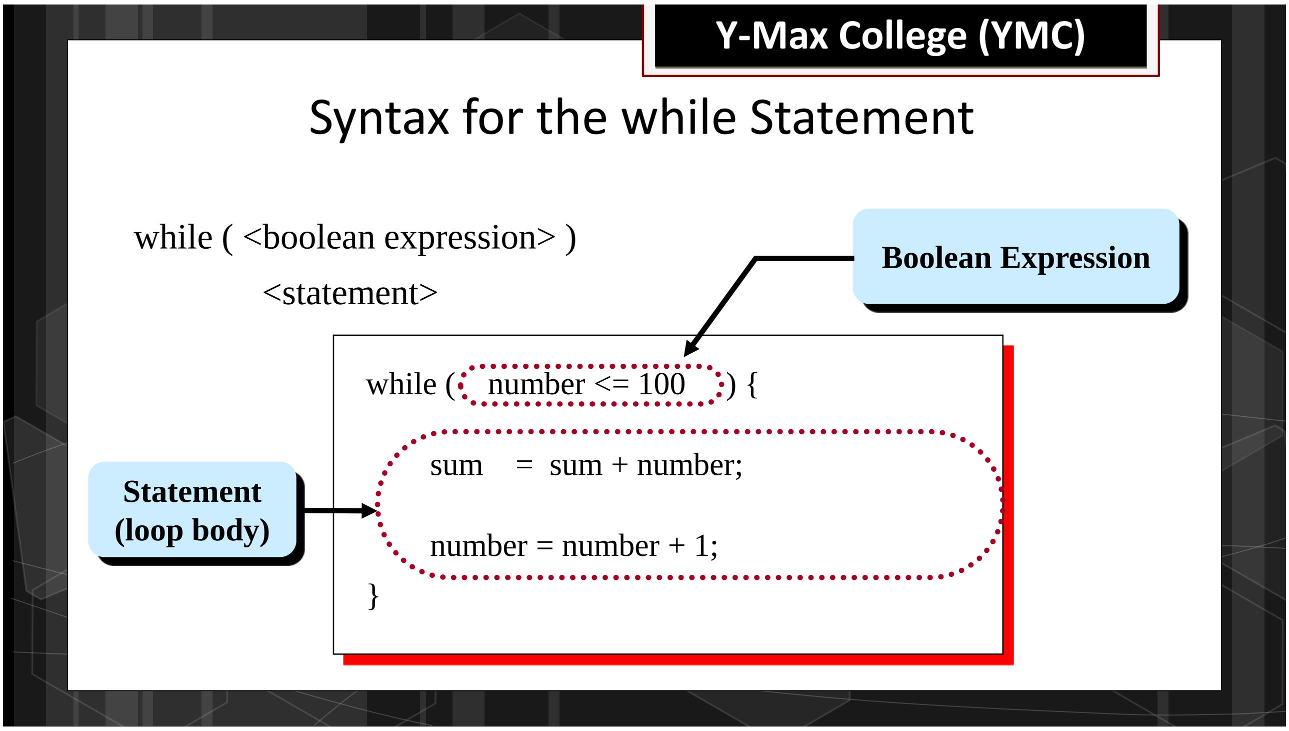
The while Statement

```
int sum = 0, number = 1;
while ( number <= 100 ) {

    sum    =  sum + number;
    number = number + 1;

}
```

These statements are executed as long as number is less than or equal to 100.



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Syntax for the while Statement

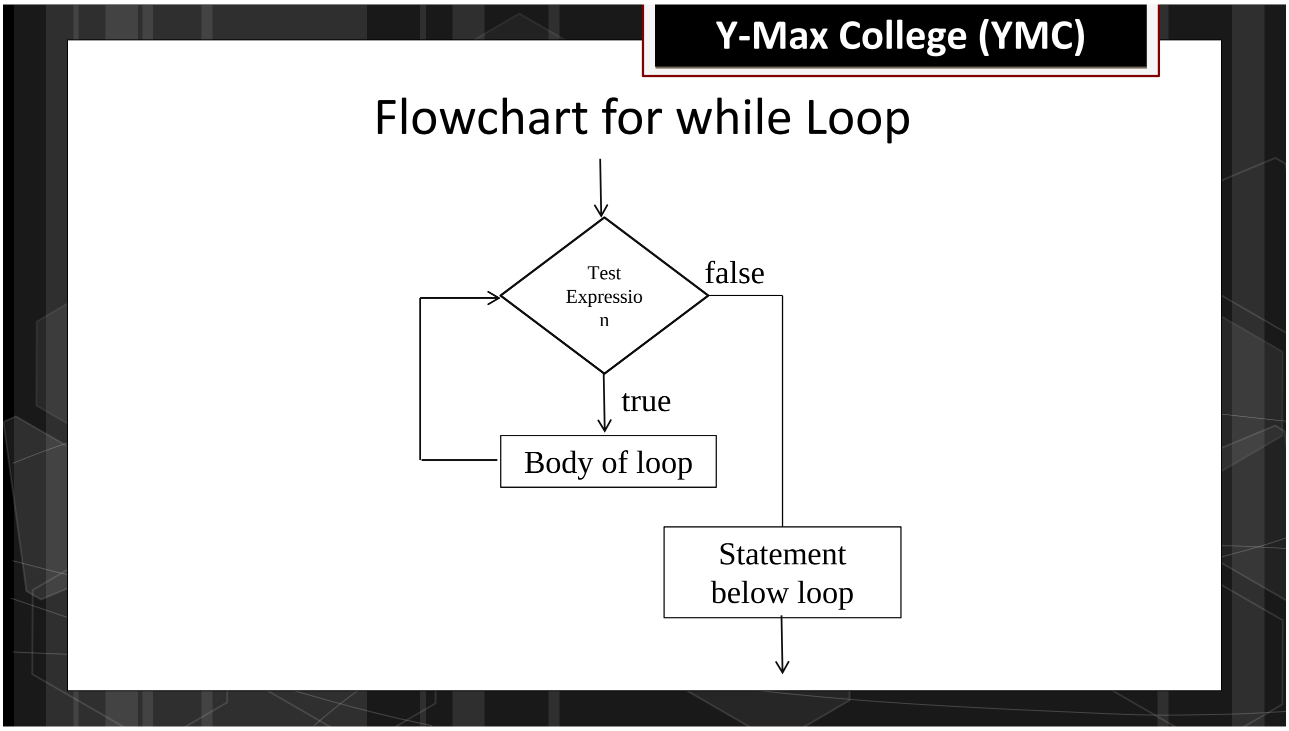
```
while ( <boolean expression> )
        <statement>
```

Boolean Expression

Statement (loop body)

```
while ( number <= 100 ) {
      sum    =  sum + number;

      number = number + 1;
}
```



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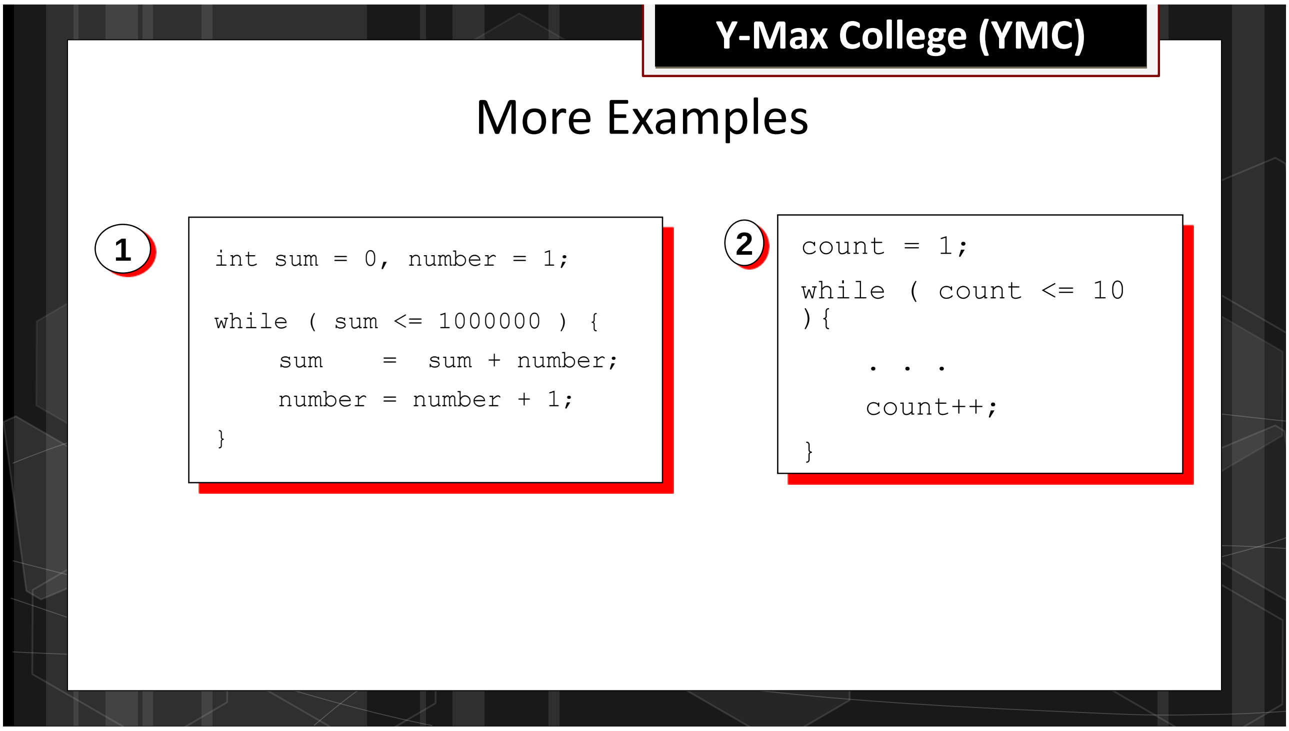
Flowchart for while Loop



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More Examples

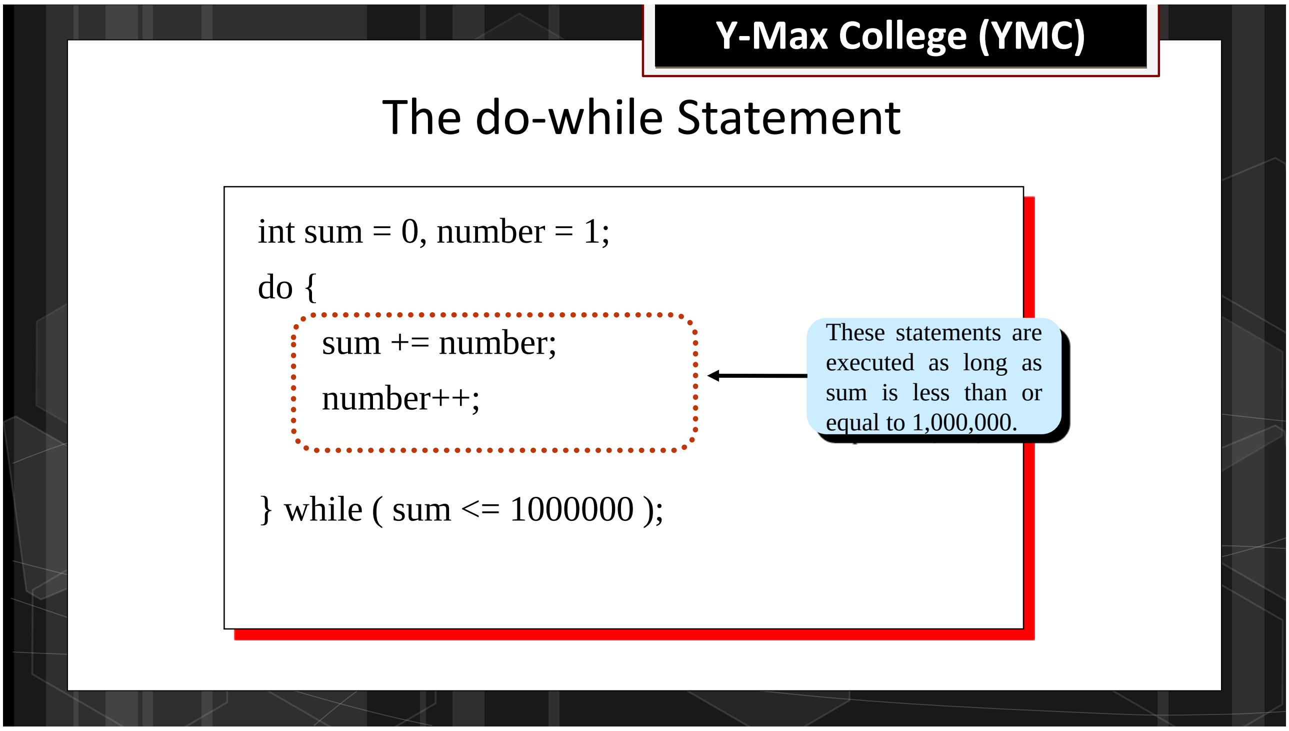
1

```
int sum = 0, number = 1;

while ( sum <= 1000000 ) {
      sum    =  sum + number;
      number = number + 1;
}
```

2

```
count = 1;
while ( count <= 10
){
     . . .
     count++;
}
```



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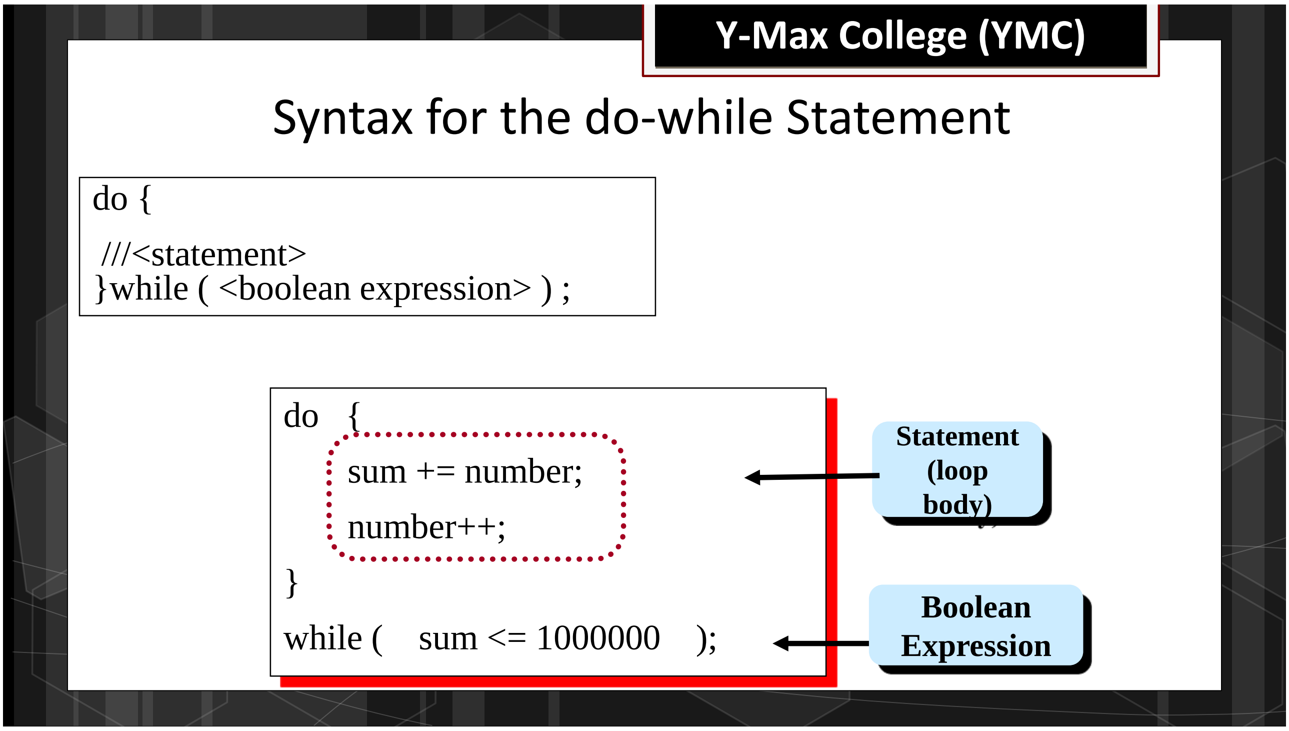
The do-while Statement

```
int sum = 0, number = 1;
do {
      sum += number;
      number++;

} while ( sum <= 1000000 );
```

These statements are executed as long as sum is less than or equal to 1,000,000.



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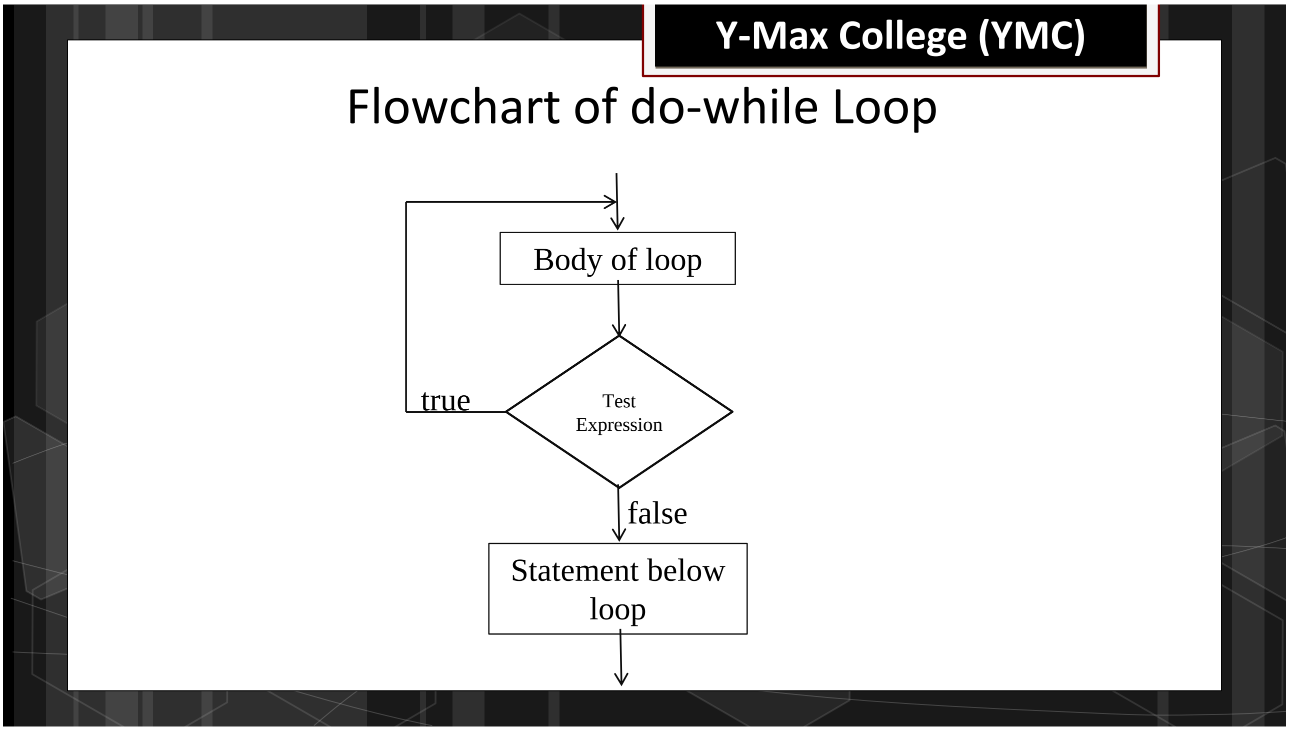
Syntax for the do-while Statement

```
do {
 ///<statement>
}while ( <boolean expression> ) ;
```

```
do   {
      sum += number;
      number++;
}
while (    sum <= 1000000    );
```

Statement (loop body)

Boolean Expression



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Flowchart of do-while Loop

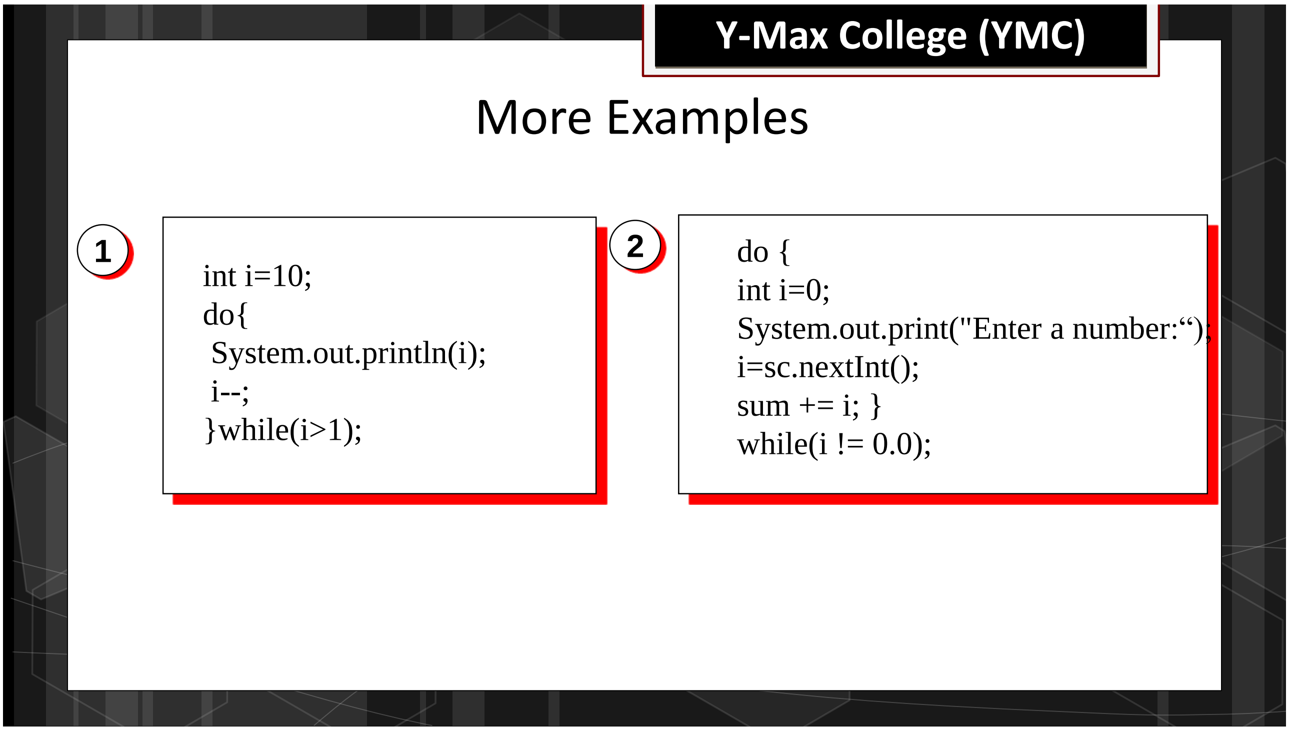
Body of loop

Test Expression

true

false

Statement below loop



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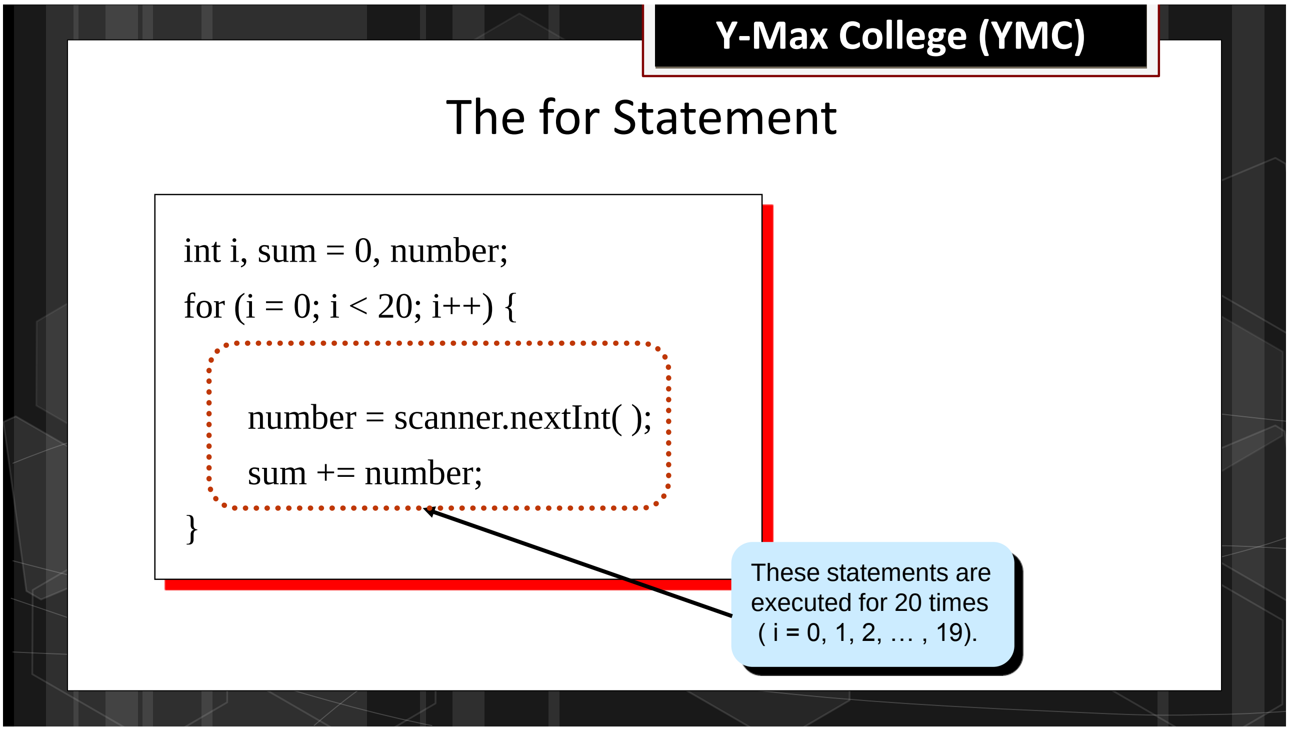
More Examples

1

```
int i=10;
do{
 System.out.println(i);
 i--;
}while(i>1);
```

2

```
do {
int i=0;
System.out.print("Enter a number:“);
i=sc.nextInt();
sum += i; }
while(i != 0.0);
```



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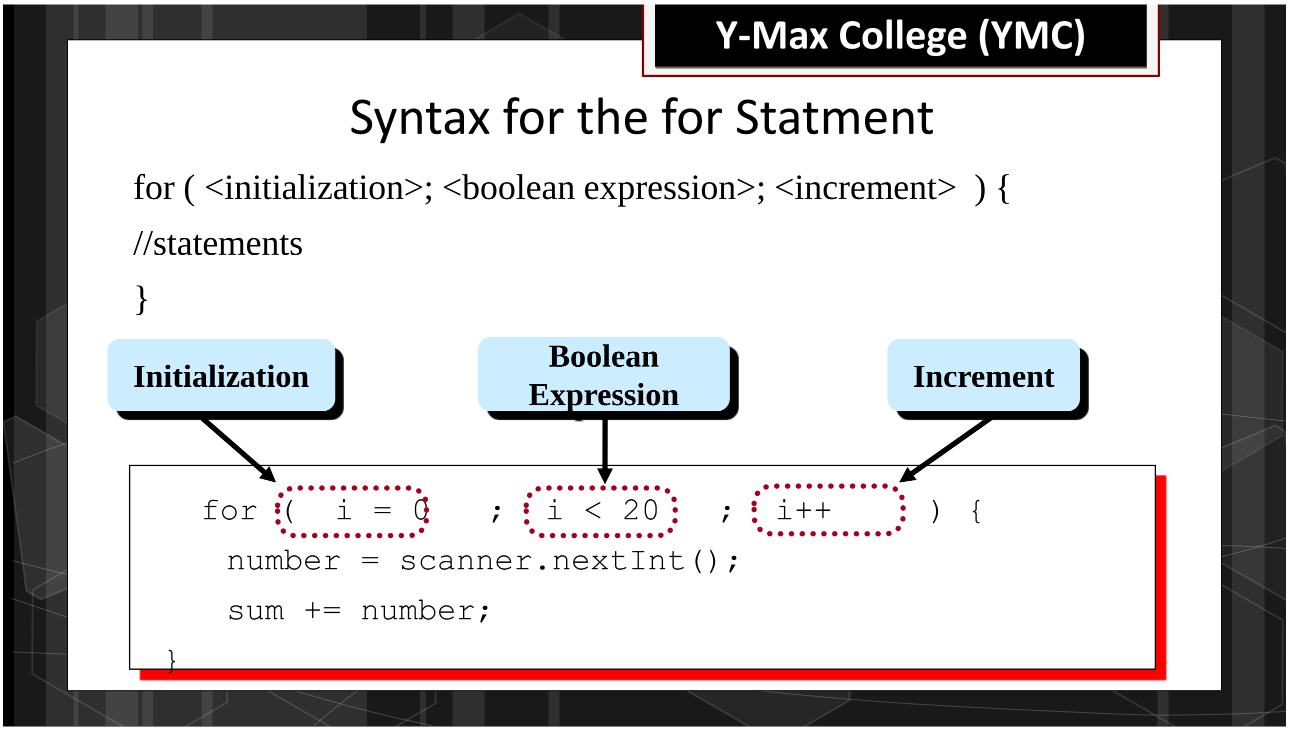
The for Statement

```
int i, sum = 0, number;
for (i = 0; i < 20; i++) {

    number = scanner.nextInt( );
    sum += number;
}
```

These statements are executed for 20 times (i = 0, 1, 2, … , 19).



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Syntax for the for Statment

for (<initialization>; <boolean expression>; <increment>) {

//statements

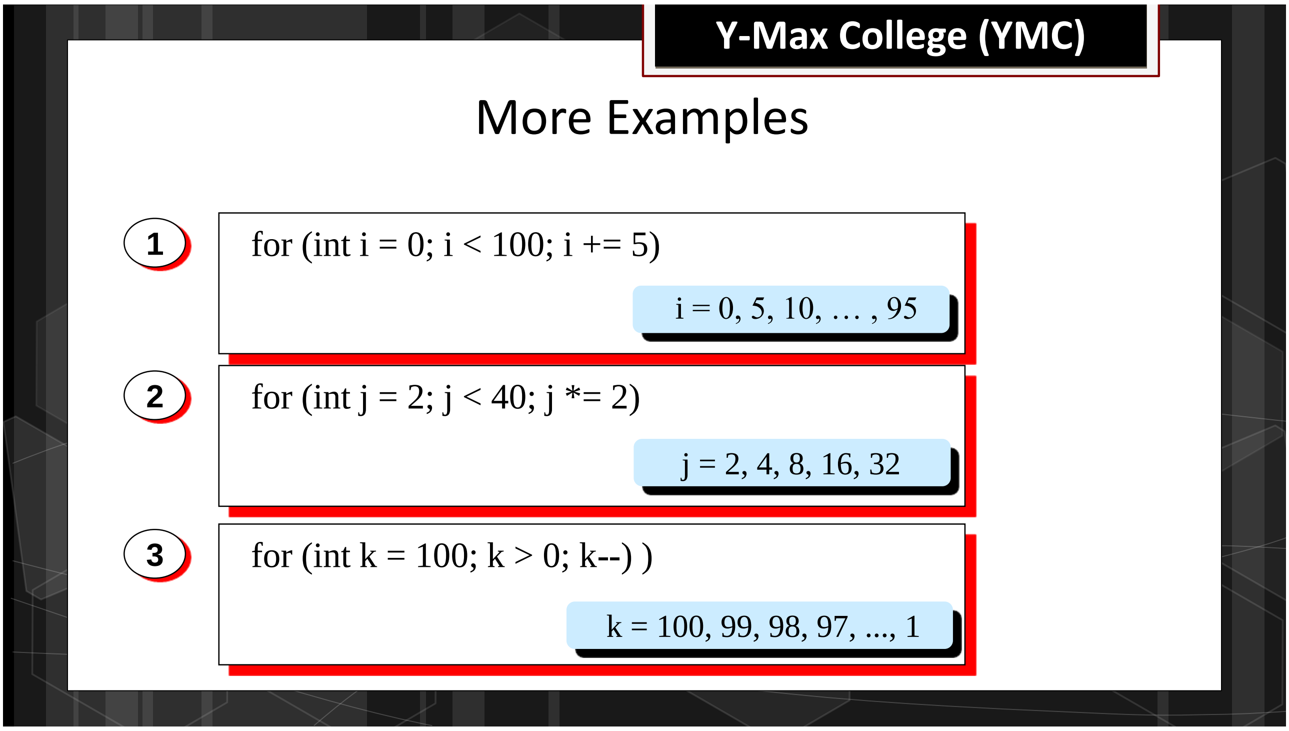
}

Initialization

Boolean Expression

Increment

```
    for ( i = 0   ; i < 20 ; i++   ) {
      number = scanner.nextInt();
      sum += number;
   }
```



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More Examples

1

for (int i = 0; i < 100; i += 5)

i = 0, 5, 10, … , 95

2

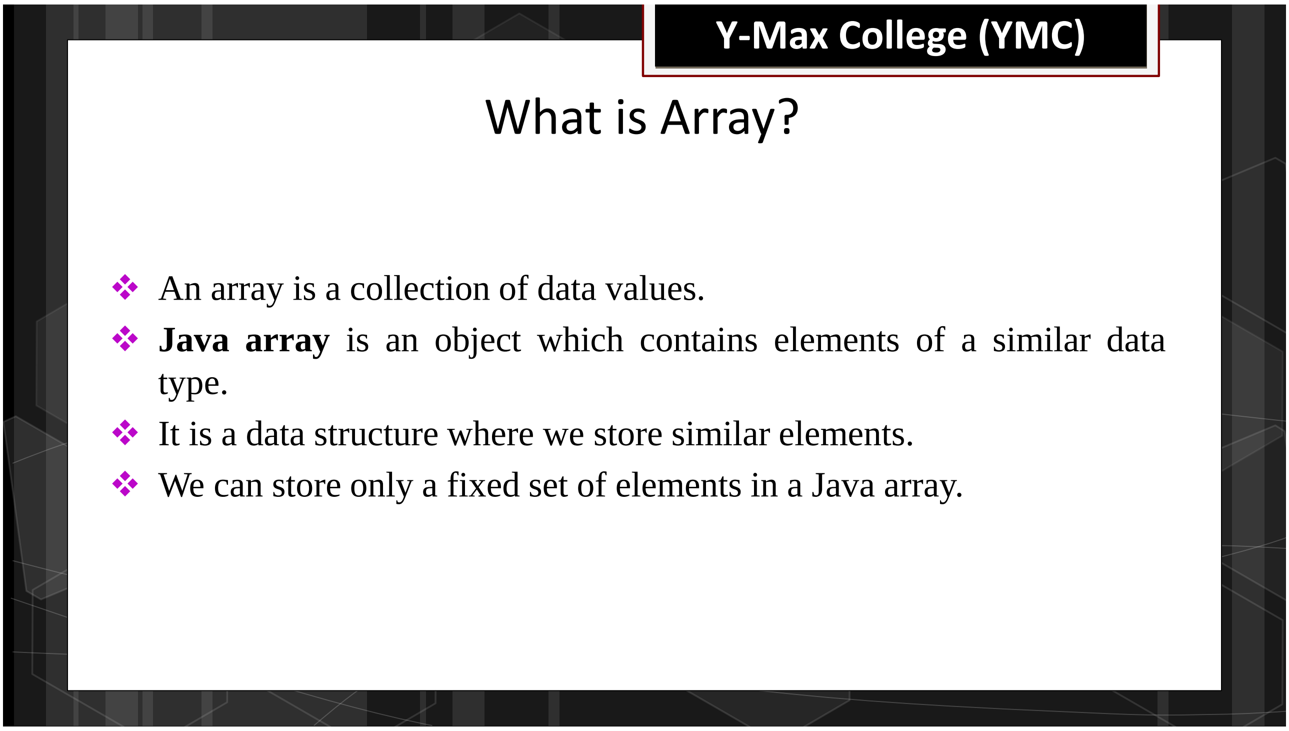
for (int j = 2; j < 40; j *= 2)

j = 2, 4, 8, 16, 32

3

for (int k = 100; k > 0; k--))

k = 100, 99, 98, 97, ..., 1



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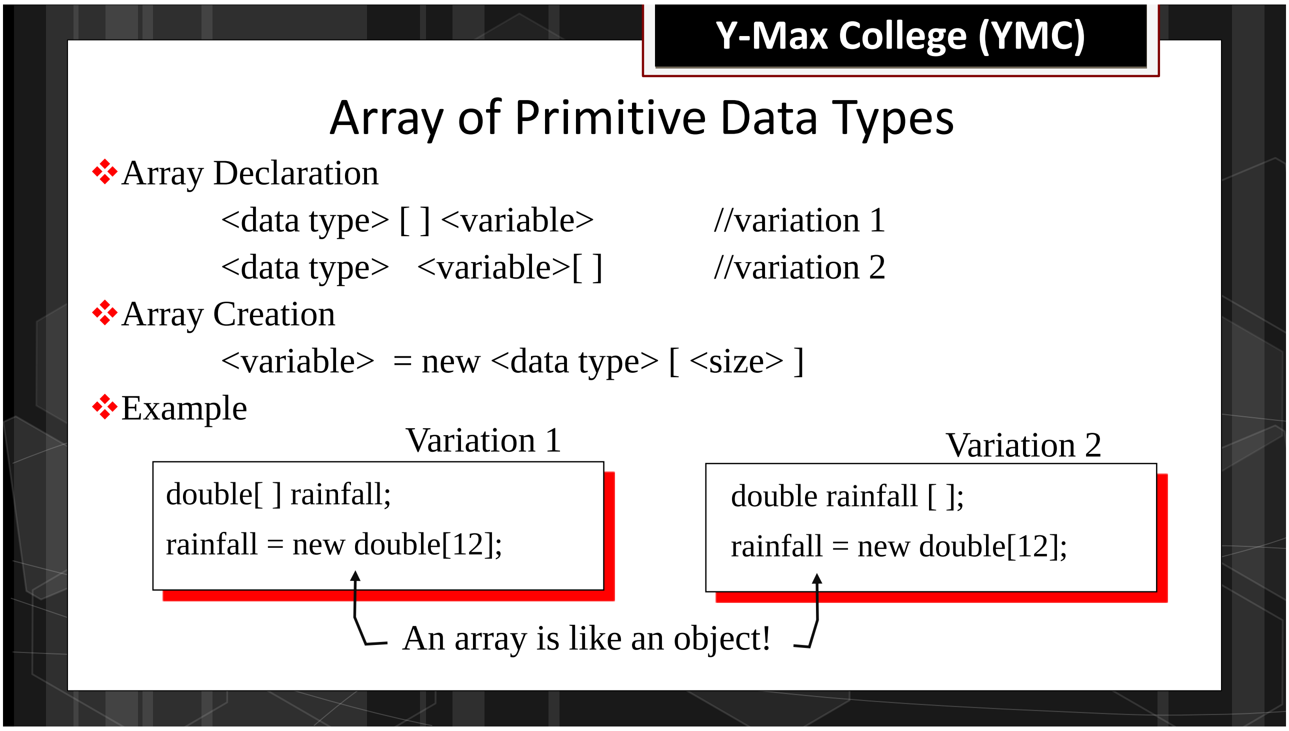
What is Array?

- An array is a collection of data values.
- **Java array** is an object which contains elements of a similar data type.
- It is a data structure where we store similar elements.
- We can store only a fixed set of elements in a Java array.



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Array of Primitive Data Types

- Array Declaration

```
<data type> [ ] <variable>          //variation 1
<data type>   <variable>[ ]         //variation 2
```

- Array Creation

```
<variable>  = new <data type> [ <size> ]
```

- Example

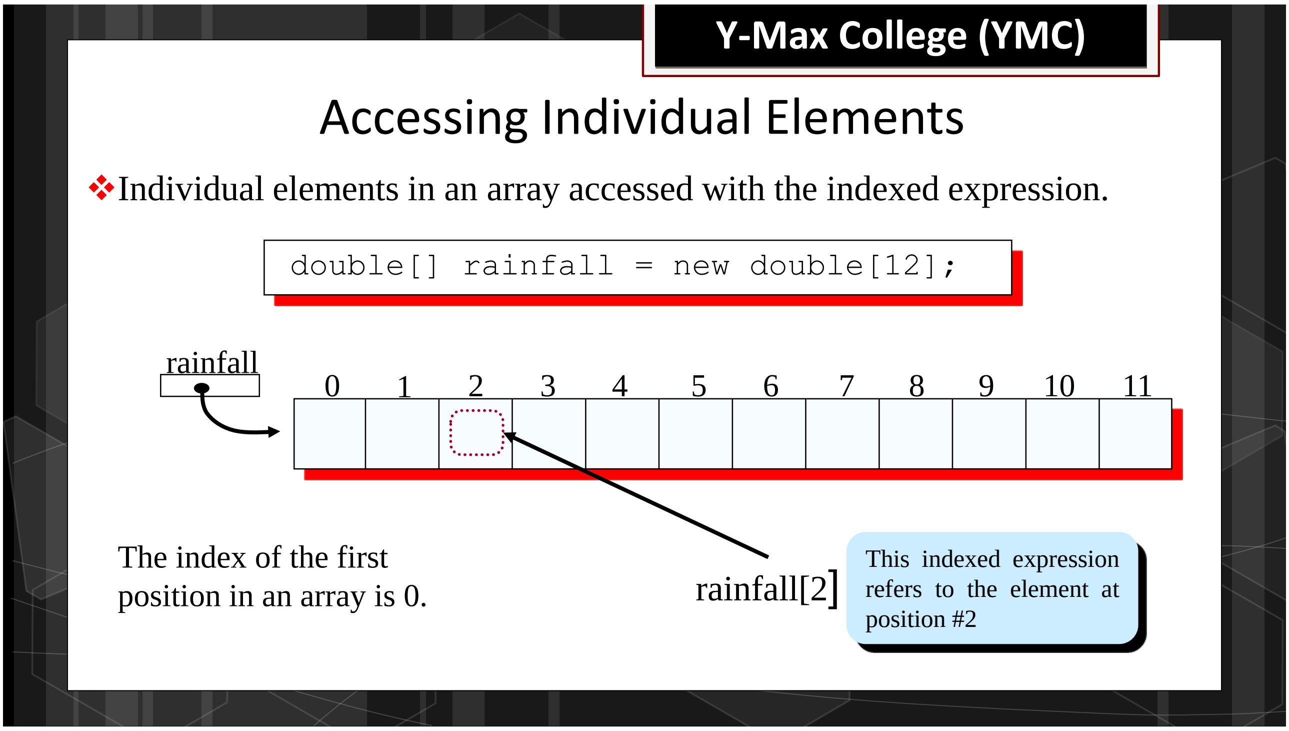
Variation 1

```
double[ ] rainfall;
rainfall = new double[12];
```

Variation 2

```
double rainfall [ ];
rainfall = new double[12];
```

An array is like an object!



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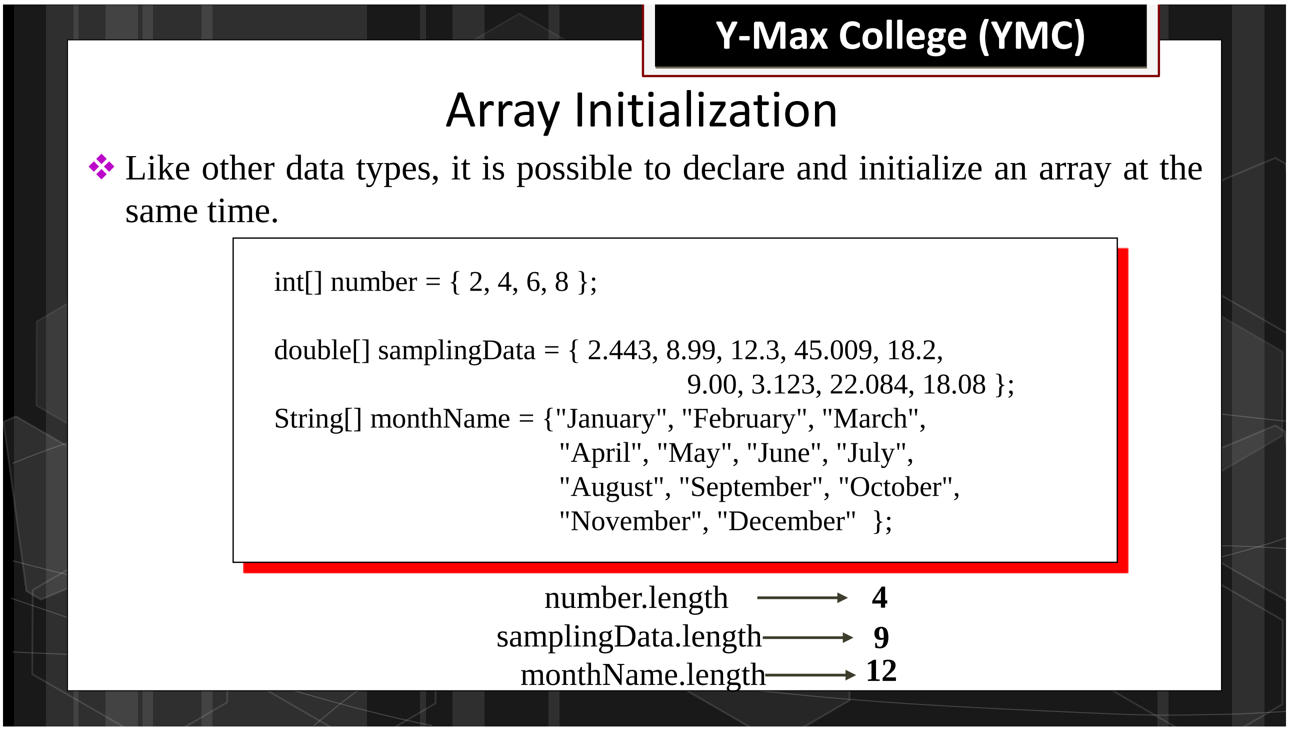
Accessing Individual Elements

❖Individual elements in an array accessed with the indexed expression.

```
double[] rainfall = new double[12];
```

The index of the first position in an array is 0.

This indexed expression refers to the element at position #2



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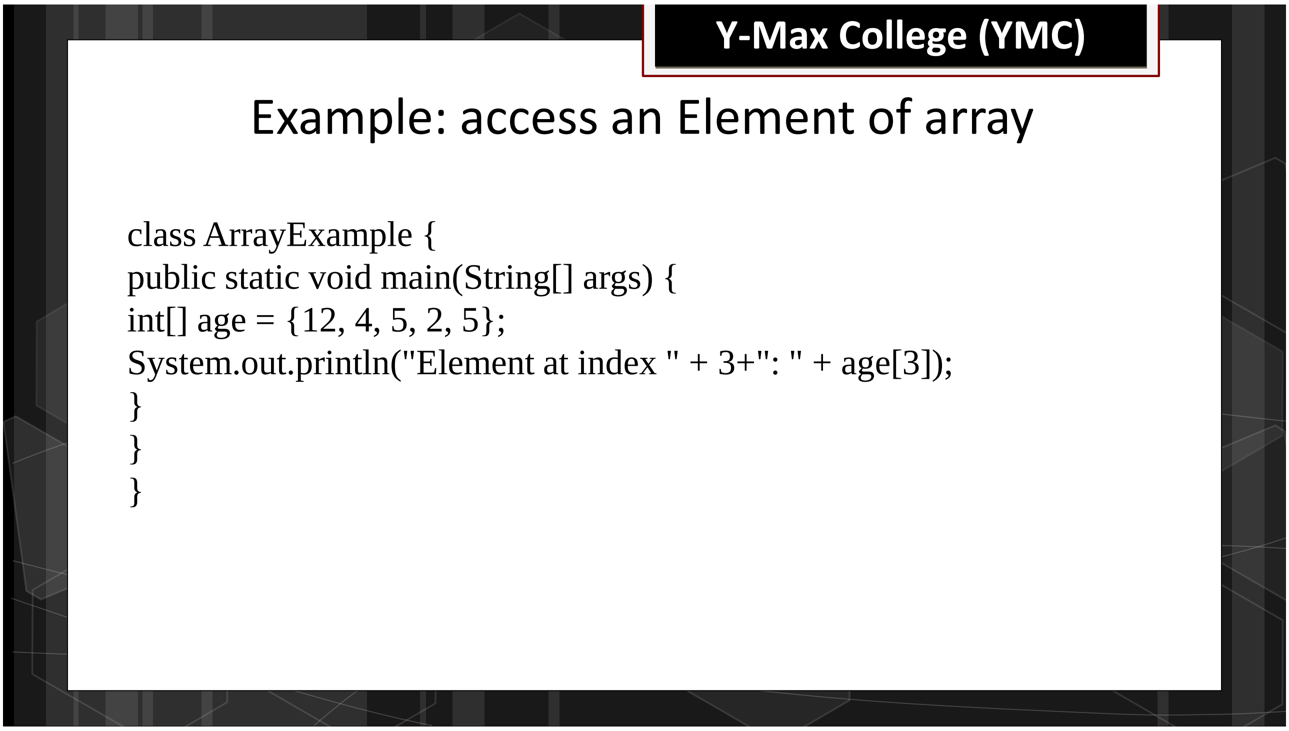
Array Initialization

❖ Like other data types, it is possible to declare and initialize an array at the same time.

```
int[] number = { 2, 4, 6, 8 };

double[] samplingData = { 2.443, 8.99, 12.3, 45.009, 18.2,
                                                  9.00, 3.123, 22.084, 18.08 };
String[] monthName = {"January", "February", "March",
                                   "April", "May", "June", "July",
                                   "August", "September", "October",
                                   "November", "December"  };
```

number.length → **4**
samplingData.length → **9**
monthName.length → **12**



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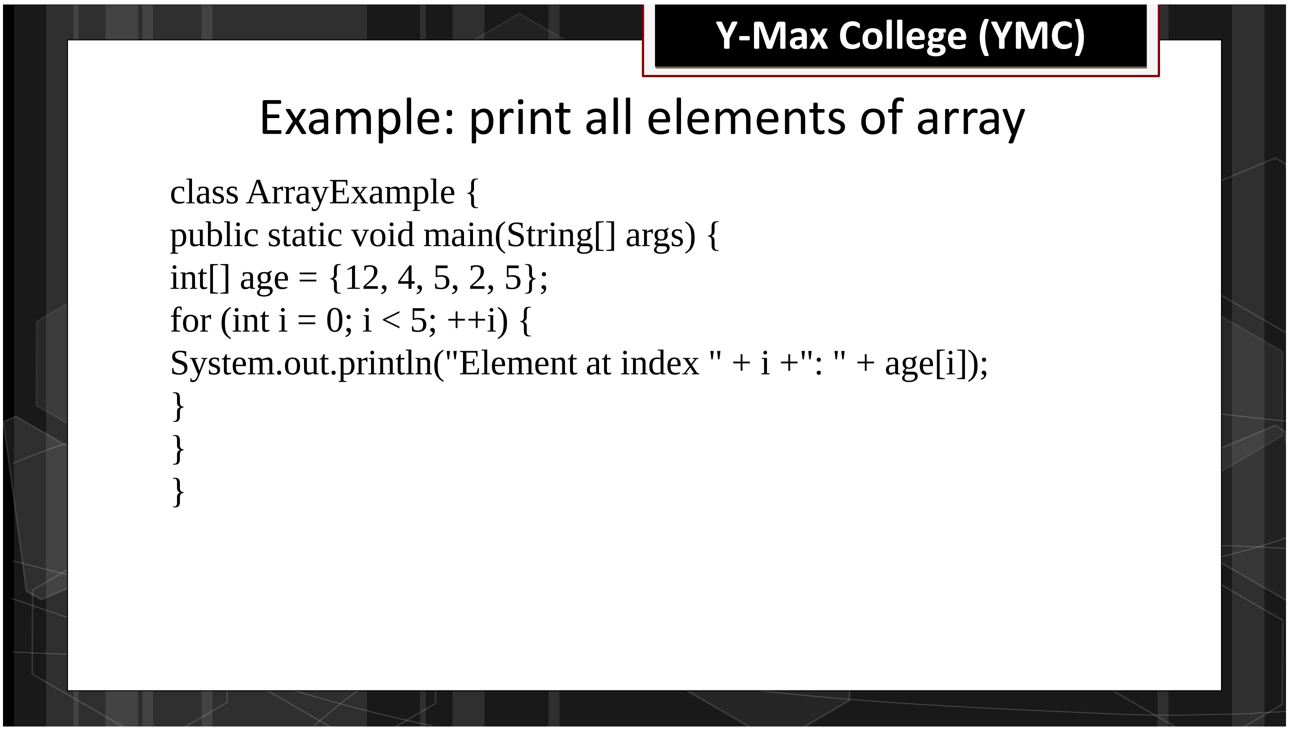
Example: access an Element of array

```
class ArrayExample {
public static void main(String[] args) {
int[] age = {12, 4, 5, 2, 5};
System.out.println("Element at index " + 3+": " + age[3]);
}
}
}
```



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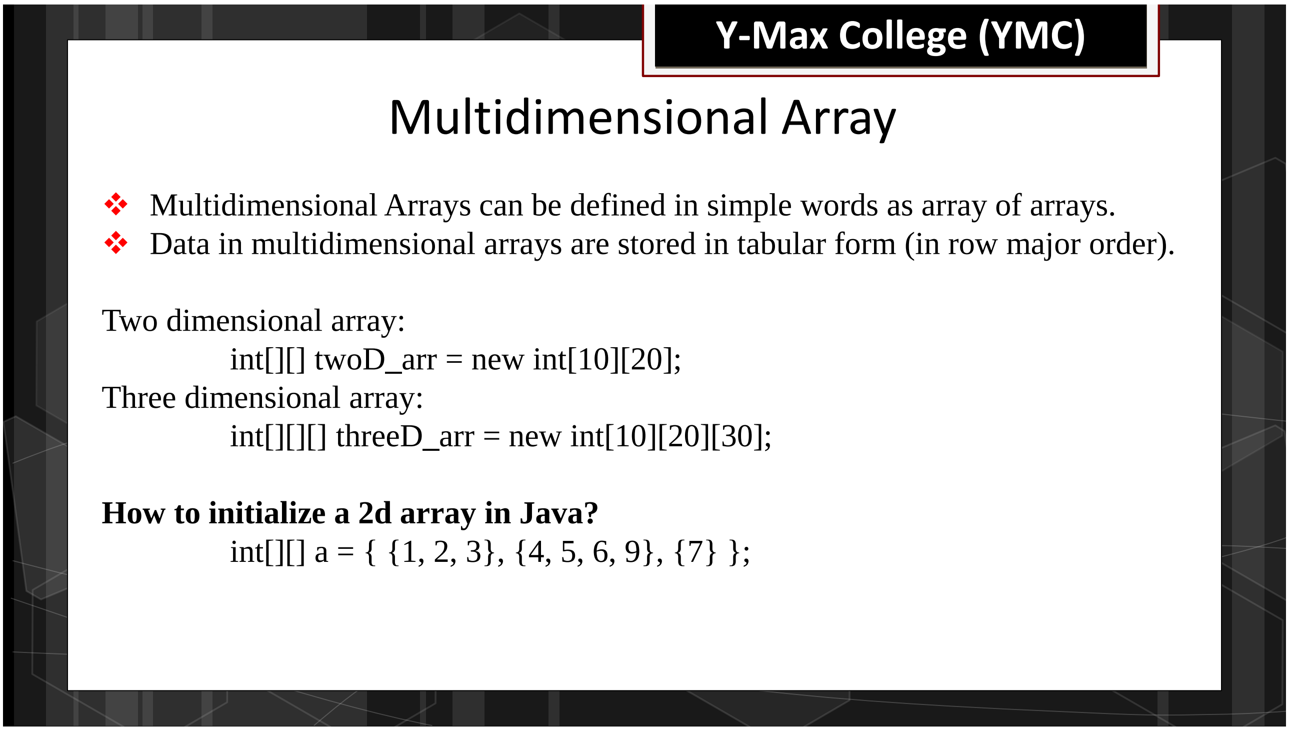
Example: print all elements of array

```
class ArrayExample {
public static void main(String[] args) {
int[] age = {12, 4, 5, 2, 5};
for (int i = 0; i < 5; ++i) {
System.out.println("Element at index " + i +": " + age[i]);
}
}
}
```



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Multidimensional Array

- Multidimensional Arrays can be defined in simple words as array of arrays.
- Data in multidimensional arrays are stored in tabular form (in row major order).

Two dimensional array:

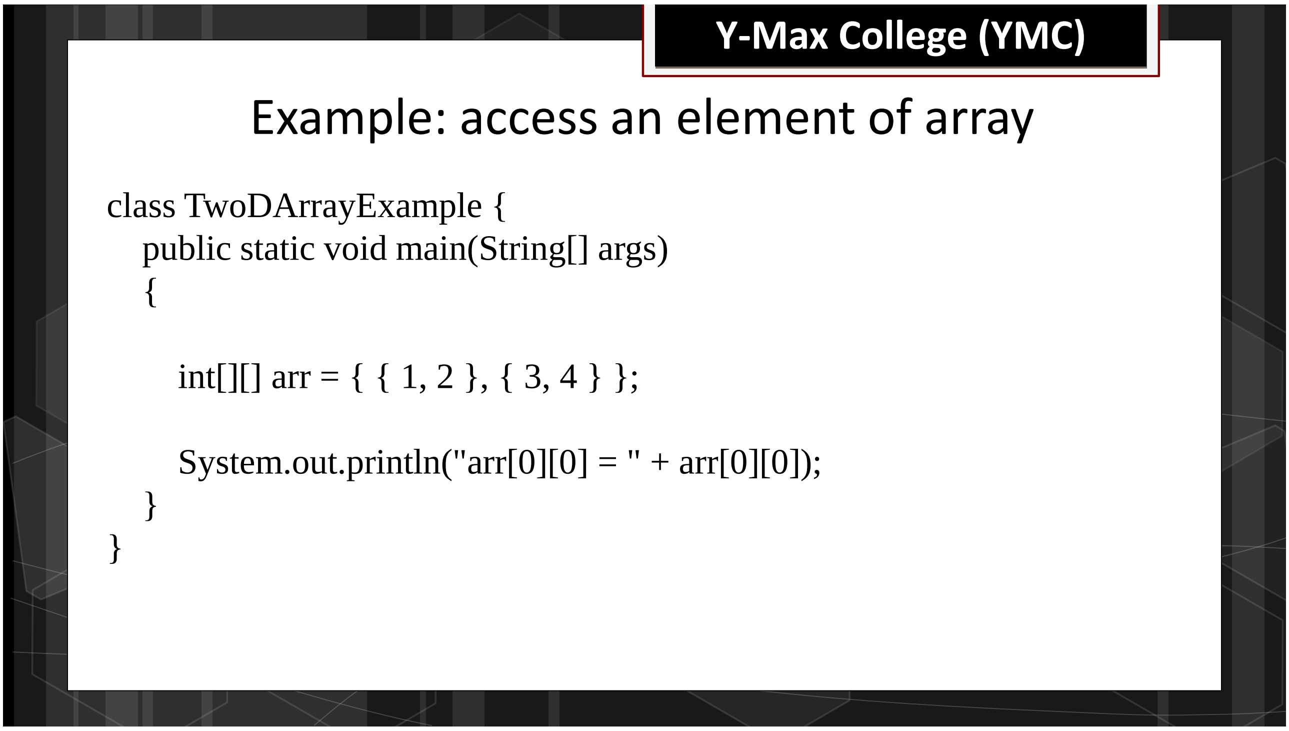
```
        int[][] twoD_arr = new int[10][20];
```

Three dimensional array:

```
        int[][][] threeD_arr = new int[10][20][30];
```

How to initialize a 2d array in Java?

```
        int[][] a = { {1, 2, 3}, {4, 5, 6, 9}, {7} };
```



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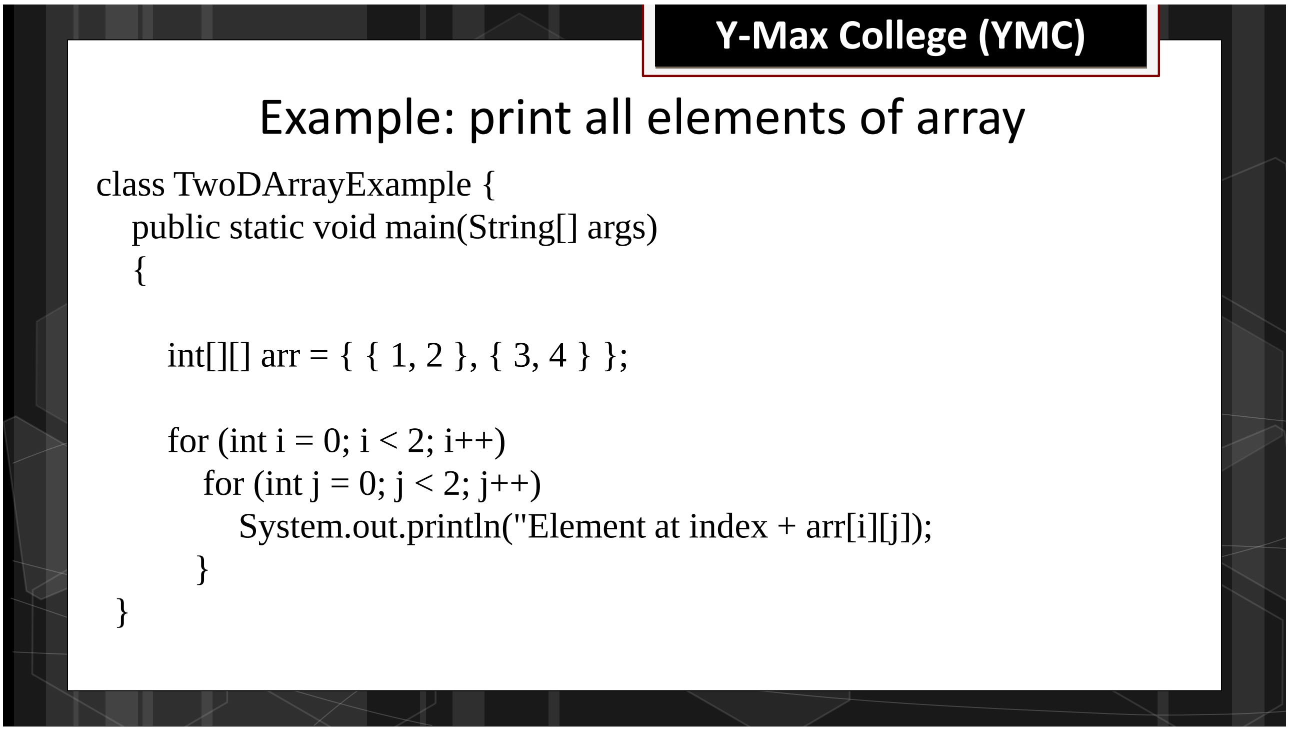
Example: access an element of array

```
class TwoDArrayExample {
   public static void main(String[] args)
   {

      int[][] arr = { { 1, 2 }, { 3, 4 } };

      System.out.println("arr[0][0] = " + arr[0][0]);
   }
}
```



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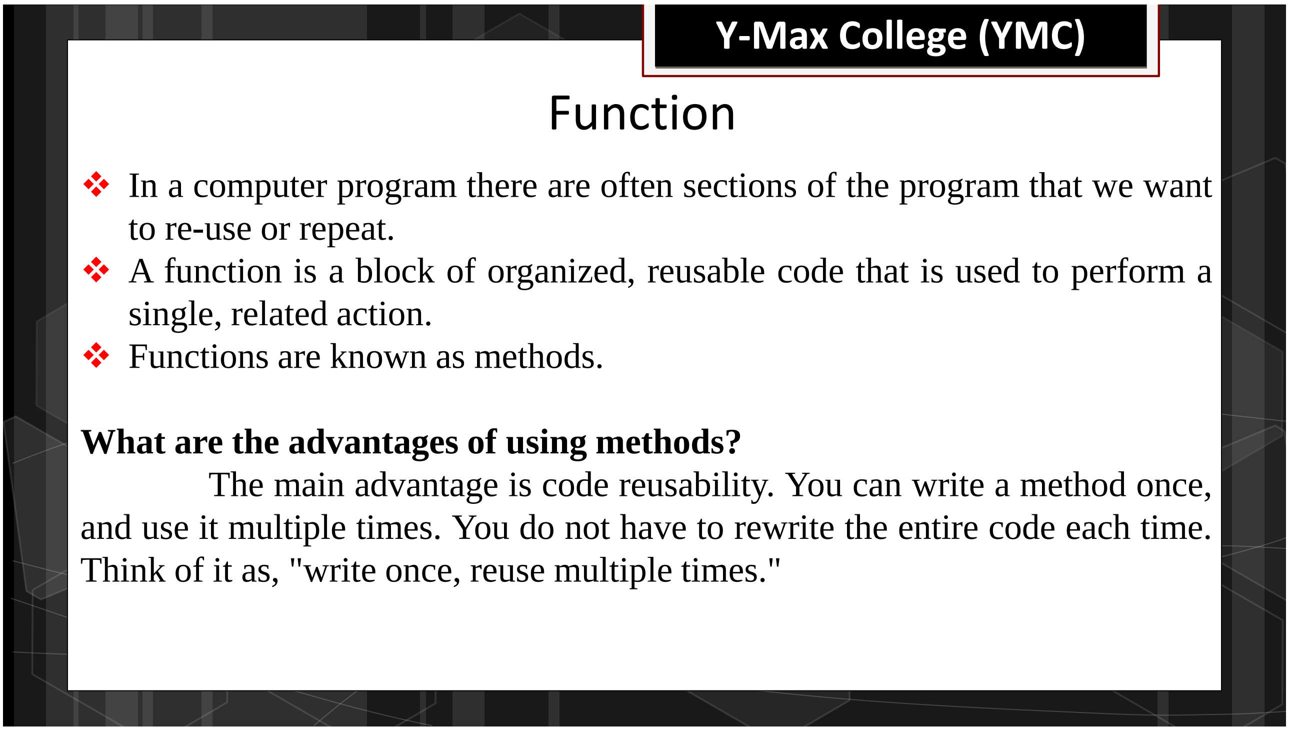
Example: print all elements of array

```
class TwoDArrayExample {
   public static void main(String[] args)
   {

      int[][] arr = { { 1, 2 }, { 3, 4 } };

      for (int i = 0; i < 2; i++)
         for (int j = 0; j < 2; j++)
            System.out.println("Element at index + arr[i][j]);
         }
 }
```



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Function

- In a computer program there are often sections of the program that we want to re-use or repeat.
- A function is a block of organized, reusable code that is used to perform a single, related action.
- Functions are known as methods.

What are the advantages of using methods?

The main advantage is code reusability. You can write a method once, and use it multiple times. You do not have to rewrite the entire code each time. Think of it as, "write once, reuse multiple times."

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Types of Java Methods

Depending on whether a method is defined by the user, or available in standard library, there are two types of methods:

- Standard Library Methods
- User-defined Methods

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Standard Library Methods

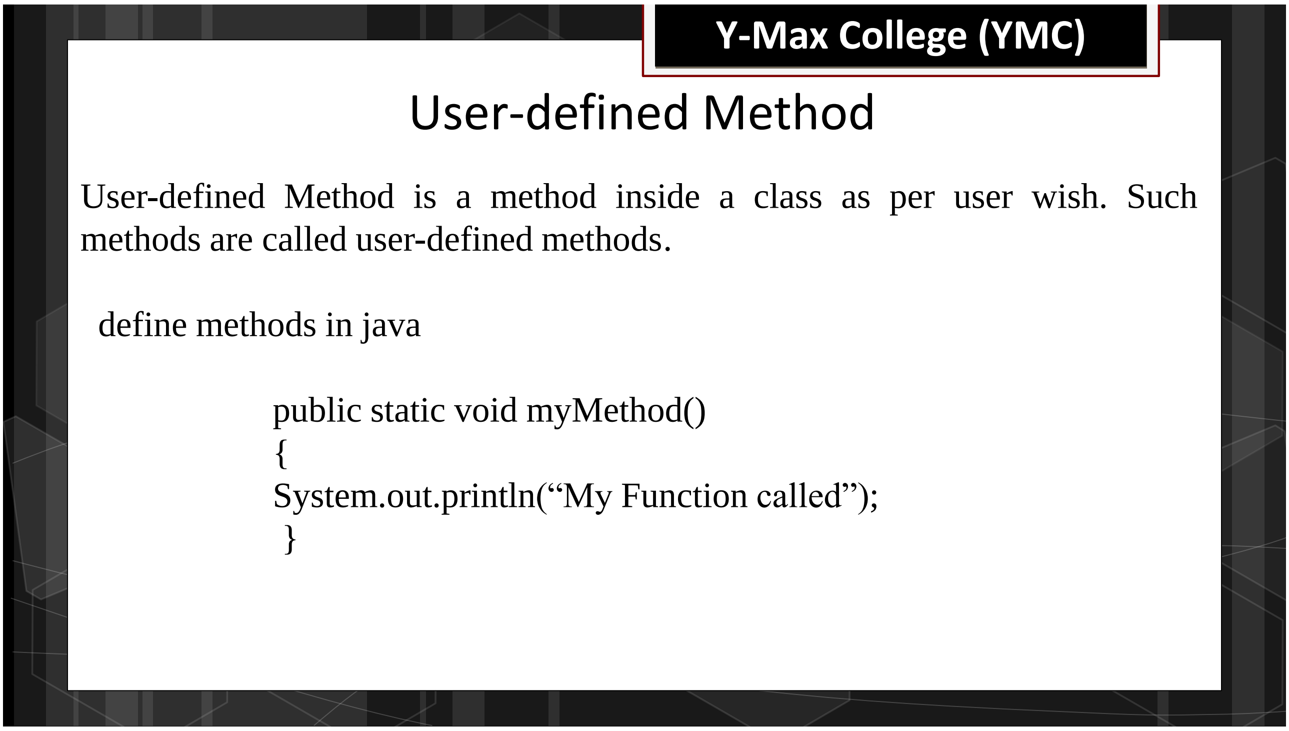
The standard library methods are built-in methods in Java that are readily available for use. These standard libraries come along with the Java Class Library (JCL) in a Java archive (*.jar) file with JVM and JRE.

eg..

- print() is a method of java.io.PrintSteam. The print("...") prints the string inside quotation marks.
- sqrt() is a method of Math class. It returns square root of a number.

eg..

```
        public class Numbers {
        public static void main(String[] args) {
        System.out.print("Square root of 4 is: " + Math.sqrt(4));
}        }
```



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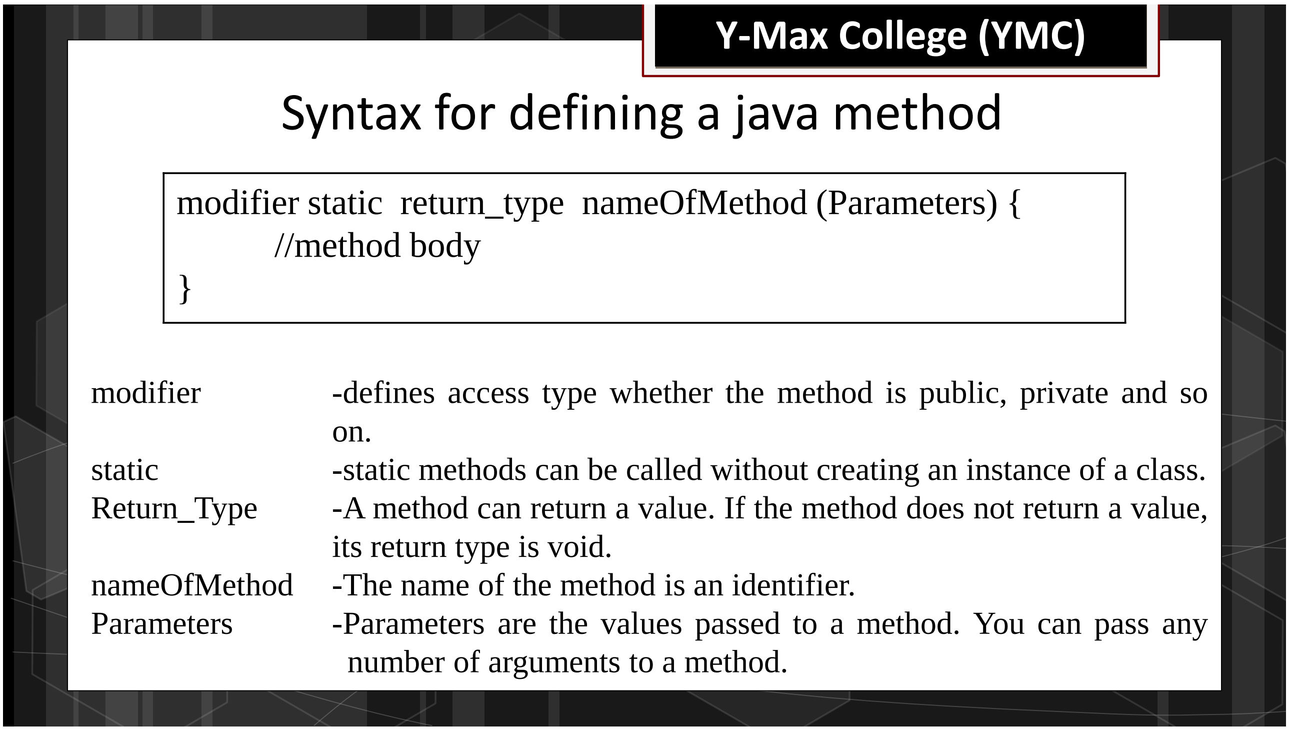
User-defined Method

User-defined Method is a method inside a class as per user wish. Such methods are called user-defined methods.

define methods in java

```
public static void myMethod()
{
System.out.println("My Function called");
 }
```



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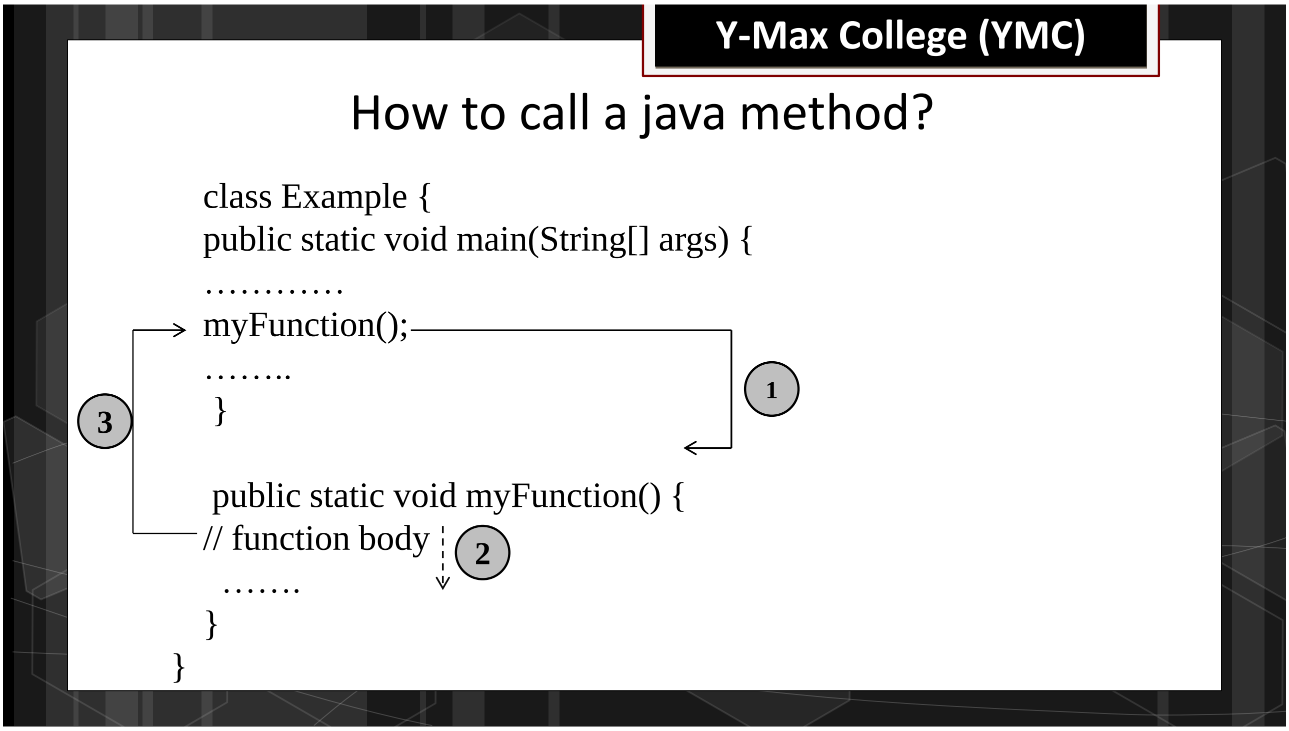
Syntax for defining a java method

```
modifier static  return_type  nameOfMethod (Parameters) {
          //method body
}
```

modifier	-defines access type whether the method is public, private and so on.
static	-static methods can be called without creating an instance of a class.
Return_Type	-A method can return a value. If the method does not return a value, its return type is void.
nameOfMethod	-The name of the method is an identifier.
Parameters	-Parameters are the values passed to a method. You can pass any number of arguments to a method.



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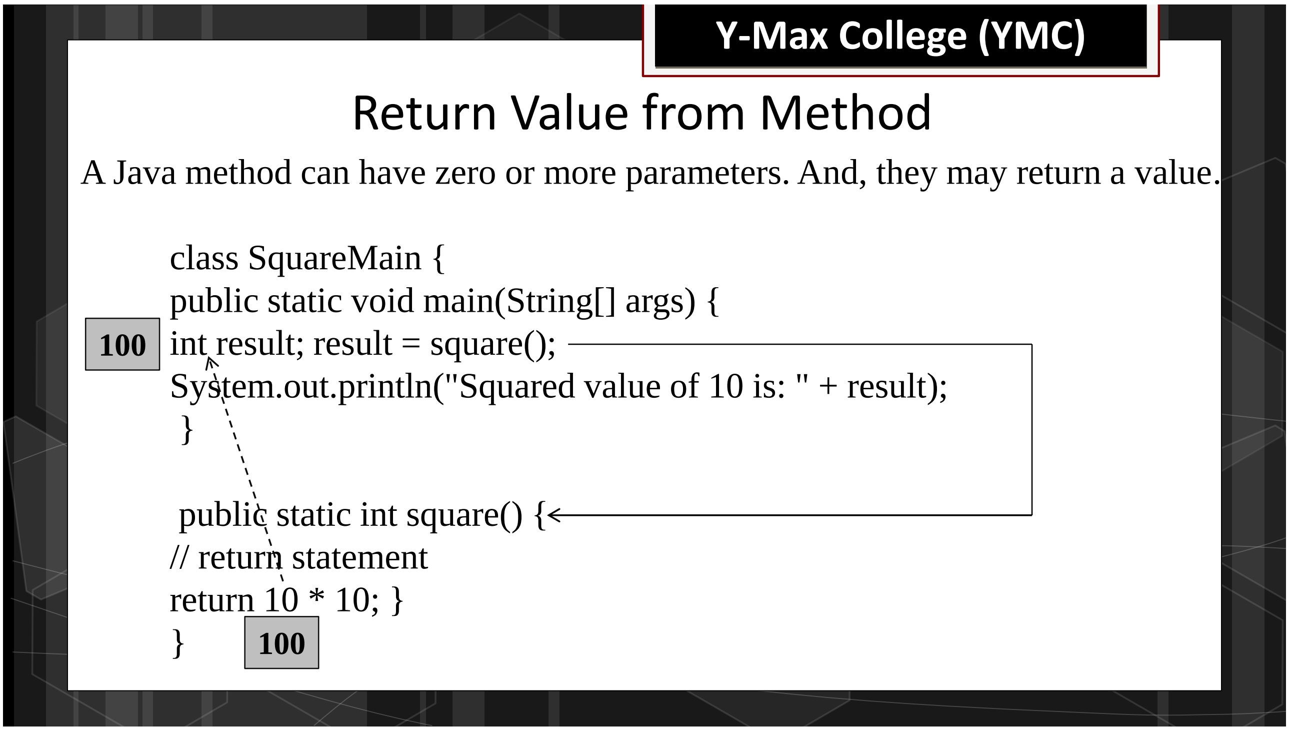
How to call a java method?

```
class Example {
public static void main(String[] args) {
…………
myFunction();
……..
 }

 public static void myFunction() {
// function body
  …….
}
}
```



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Return Value from Method

A Java method can have zero or more parameters. And, they may return a value.

```
class SquareMain {
public static void main(String[] args) {
int result; result = square();
System.out.println("Squared value of 10 is: " + result);
 }

 public static int square() {
// return statement
return 10 * 10; }
}
```

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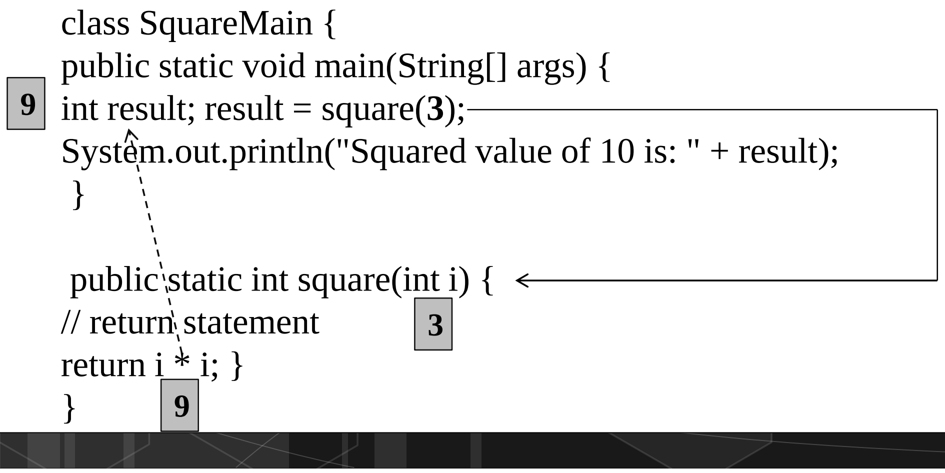
Method Accept Arguments and Returning Value

A Java method accepts parameters. And, they may return a value.



```
class SquareMain {
public static void main(String[] args) {
int result; result = square(3);
System.out.println("Squared value of 10 is: " + result);
 }

 public static int square(int i) {
// return statement
return i * i; }
}
```

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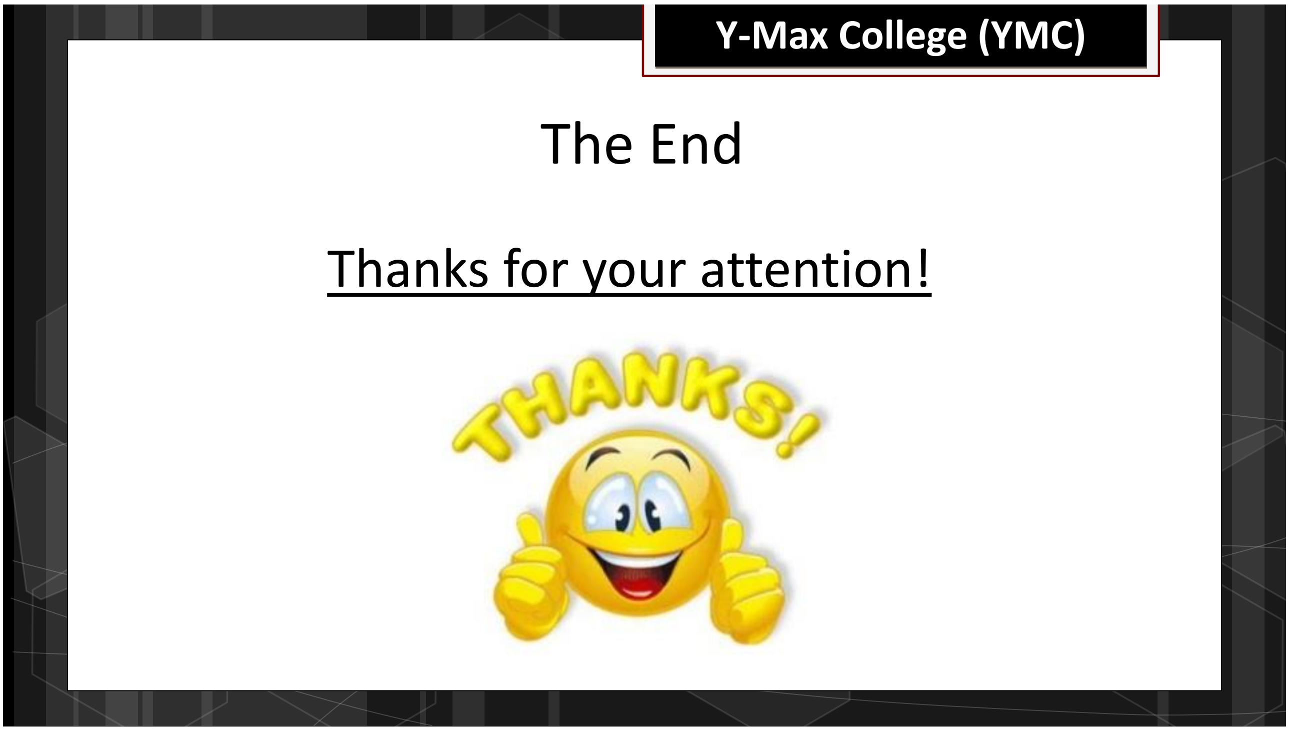
Any Questions….?



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The End

Thanks for your attention!

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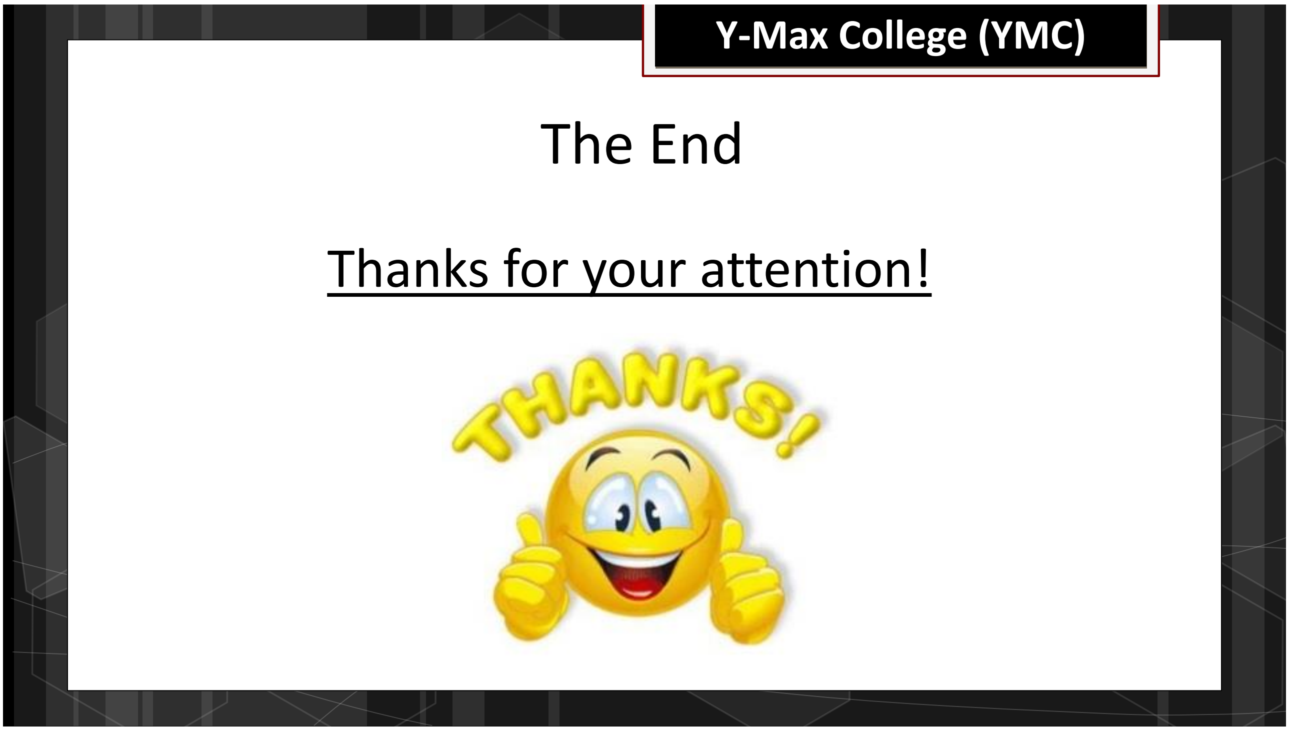
Any Questions….?



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The End

Thanks for your attention!