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Object Oriented Programing (Java)

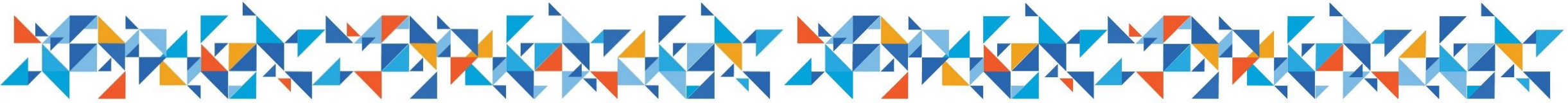
Introduction to Java Programming

Focus of the Course

- This is a **PROJECT** based course.
- Object-Oriented Software Development using Java
  - problem solving
  - program design, implementation, and testing
  - object-oriented concepts
    Classes and objects
    encapsulation
    inheritance
    polymorphism
  - graphical user interfaces (AWT, SWING)

Learning Outcome

- Should learn about the basics of Java Language
- Understand different Features of Java
- Should Know about Typical Java Development Environment



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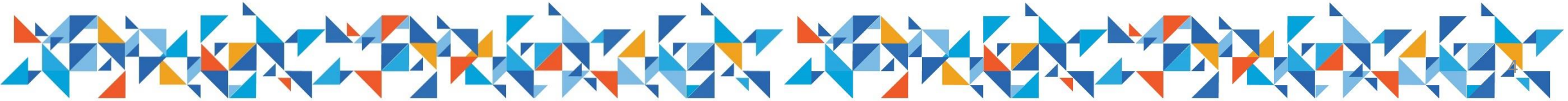
Before starting Java, Let's understand the general basic terminologies used in computer programming.



Computer Programming

- Computer programming is the act of writing computer programs.

- A computer program is a sequence of instructions written using a Computer Programming Language to perform a specified task by the computer.

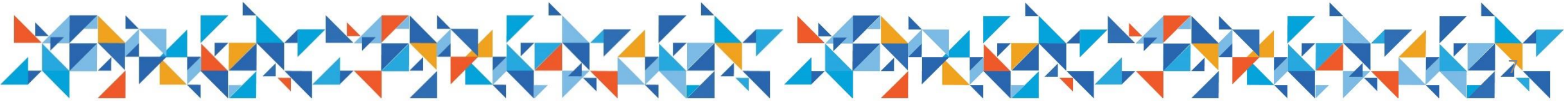
- A computer program is also called a **computer software**, which can range from two lines to millions of lines of instructions.

- Computer program instructions are also called program source code and **computer programming** is also called **program coding**.

- A computer without a computer program is just a dump box; it is programs that make computers active.

- As we have developed so many languages to communicate among ourselves, computer scientists have developed several computer-programming languages to provide instructions to the computer (i.e., to write computer programs).

- As we mentioned earlier, there are hundreds of programming languages, which can be used to write computer programs and following are a few of them −
- Java
- C
- C++
- Python
- PHP
- Perl
- Ruby



Uses of Computer Programs

- Today computer programs are being used in almost every field, household, agriculture, medical, entertainment, defense, communication, etc.

➢Listed below are a few applications of computer programs −

- MS Word, MS Excel, Adobe Photoshop, Internet Explorer, Chrome, etc., are examples of computer programs.

- Computer programs are being used to develop graphics and special effects in movie making.

- Computer programs are being used to perform Ultrasounds, X-Rays, and other medical examinations.

- Computer programs are being used in our mobile phones for SMS, Chat, and voice communication.

Computer Programmer

- Someone who can write computer programs or in other words, someone who can do computer programming is called a Computer Programmer.
- Based on computer programming language expertise, we can name computer programmers as follow –
- C Programmer
- C++ Programmer
- Java Programmer
- Python Programmer
- PHP Programmer
- Perl Programmer
- Ruby Programmer

- Most of the Human Interface Languages (Hindi, English, Spanish, French, etc.) are made of several elements like verbs, nouns, adjectives, adverbs, prepositions, and conjunctions, etc.
- Similar to Human Interface Languages, Computer Programming Languages are also made of several elements.

➢These basic elements include –

- **Programming Environment**
- **Basic Syntax**
- **Data Types**
- **Variables**
- **Keywords**
- **Basic Operators**
- **Decision Making**
- **Loops**
- **Numbers**
- **Characters**
- **Arrays**
- **Strings**
- **Functions**
- **File I/O**

Text Editor

- A text editor is a software that is used to write computer programs.

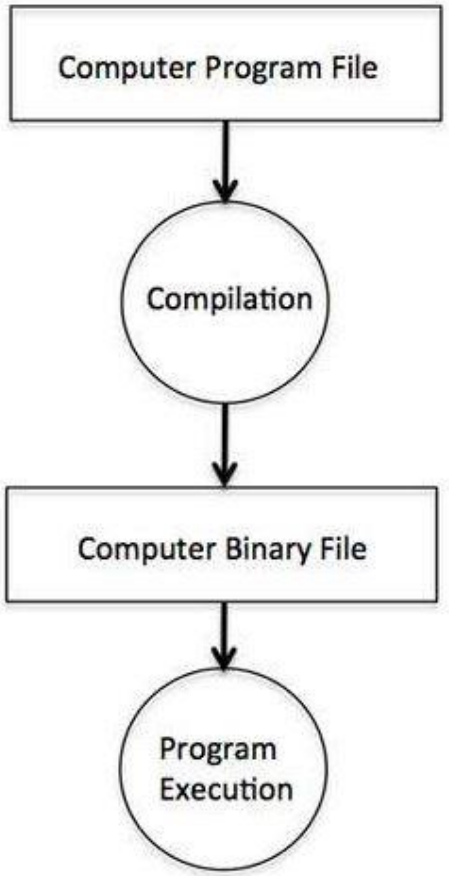
- Popular Java Editors are:
- NetBeans
- Eclipse
- IntelliJ IDEA
- BlueJ

Compiler

- The computer cannot understand your program directly given in the text format, so we need to convert this program in a binary format, which can be understood by the computer.
- The conversion from text program to binary file is done by another software called Compiler and this process of conversion from text formatted program to binary format file is called program compilation.

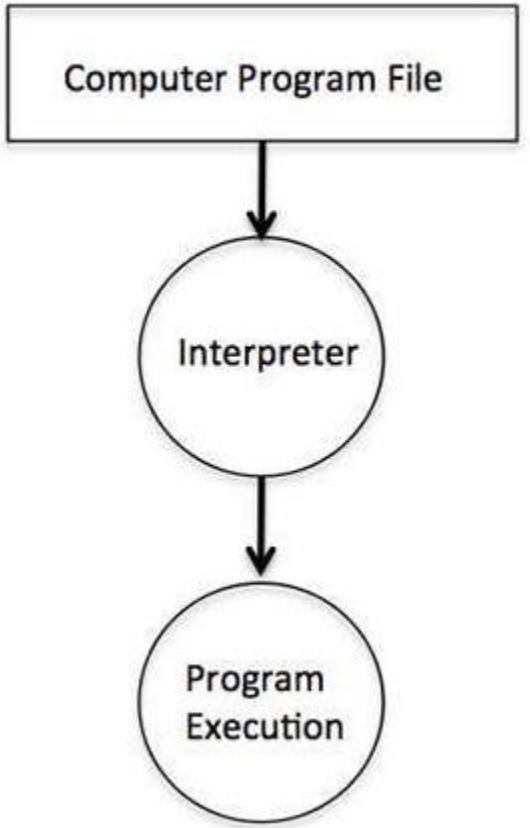
- Finally, you can execute binary file to perform the programmed task.
- So, if you are going to write your program in any such language, which needs compilation like C, C++, Java and Pascal, etc., then you will need to install their compilers before you start programming.

The following flow diagram gives an illustration of the process −



Interpreter

- There are other programming languages such as Python, PHP, and Perl, which do not need any compilation into binary format, rather an interpreter can be used to read such programs line by line and execute them directly without any further conversion.



Introduction and basics for Java language

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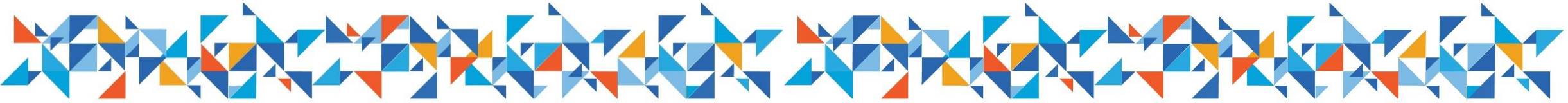
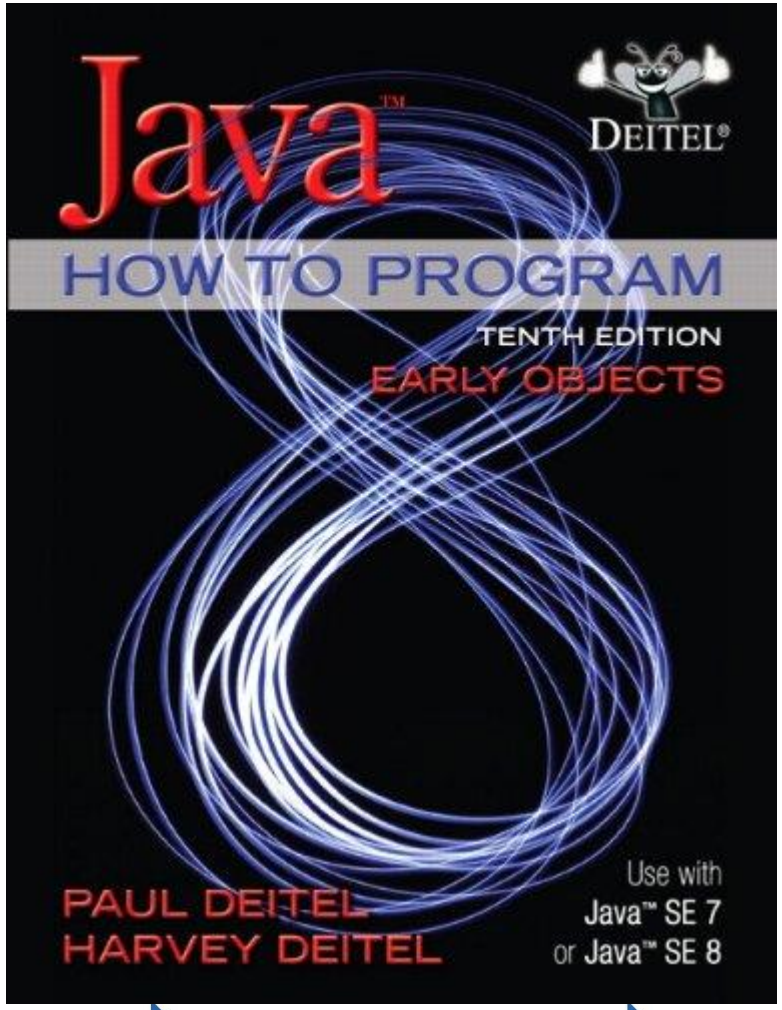


Text Book

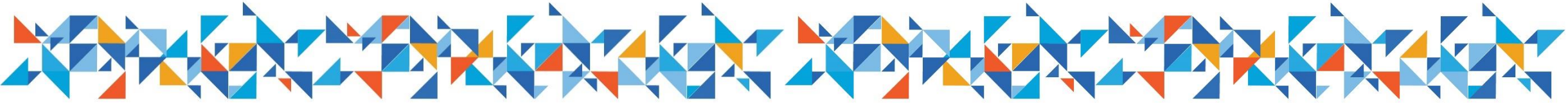


Title: Java How to Program, Early Objects
Author(s): Paul Deitel, Harvey Deitel
Publisher: Pearson Education
Year: 2015
ISBN: 0133807800,9780133807806

Object Oriented Programming using Java by Simon Kendal

What is Java Language

- Java is a general-purpose, high-level, Object Oriented and widely used computer programming language.
- According to Oracle, 97% of enterprise desktops, 89% of PC desktops, more than three billion devices run Java, and there are over 9 million Java developers.



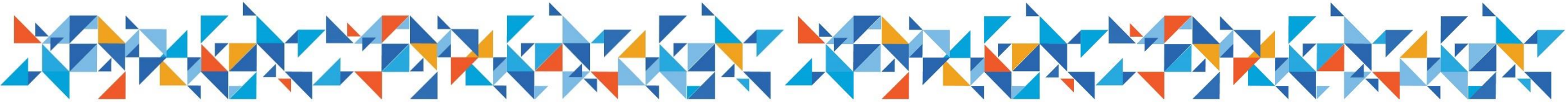
Java History

- Sun Microsystems in 1991 funded an internal corporate research project led by James Gosling, which resulted in creating Java Language
- To write programs that will run on a great variety of computer systems and computer-controlled devices.
- This is sometimes called “write once, run anywhere.”

Version	Date
JDK Beta	1995
JDK1.0	January 23, 1996
JDK 1.1	February 19, 1997
J2SE 1.2	December 8, 1998
J2SE 1.3	May 8, 2000
J2SE 1.4	February 6, 2002
J2SE 5.0	September 30, 2004
Java SE 6	December 11, 2006
Java SE 7	July 28, 2011
Java SE 8	March 18, 2014 (LTS)
Java SE 9	September 21, 2017
Java SE 10	March 20, 2018
Java SE 11	September 25, 2018 (LTS)
Java SE 12	March 19, 2019
Java SE 13	September 17, 2019
Java SE 14	March 17, 2020 (LTS)

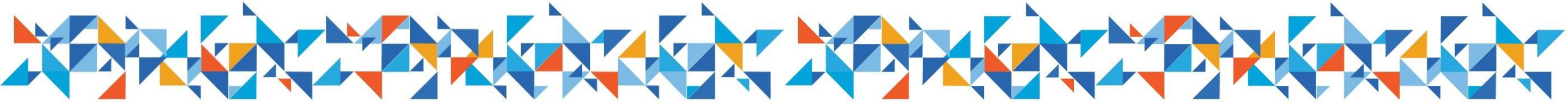
Java History

- Java was developed by James Gosling, Patrick Naughton, Mike Sheridan at Sun Microsystems Inc. in 1991. It took 18 months to develop the first working version.
- The initial name was **Oak** but it was renamed to **Java** in 1995 as OAK was a registered trademark of another Tech company.



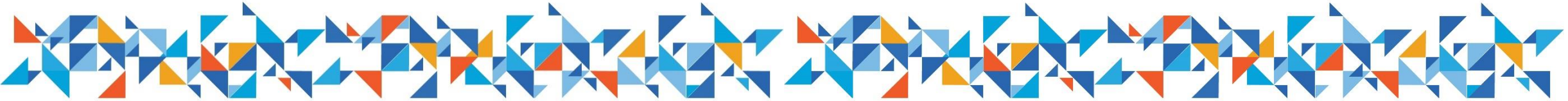
Java Editions

- 1. Java Standard Edition
- 2. Java Micro Edition
- 3. Java Enterprise Edition
- 4. JavaFX



Java Editions

- **1. JSE(Java Standard Edition)**
- Java Standard edition is a computing platform which is used for development and deployment of portable code that is used in desktop and server environments. Java Standard Edition is also known as Java 2 Platform, Standard Edition (J2SE).
- Java Standard Edition has a wide range of APIs such as Java Class Library etc. the best implementation of Java SE is Oracle Corporation’s Java Development Kit (JDK).
- **This edition can be used for developing standalone software/applications.**
- Stand-alone software is any software application that's not bundled with other software, nor does it require anything else to run. Essentially, it's software that can "stand on its own," without help from the internet or another computer process.
- **Windows, IOS, android, OS x and Linux**



Java Editions

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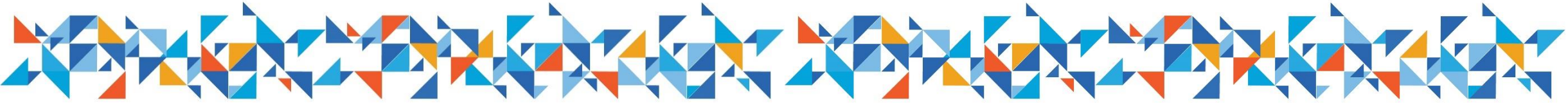
2. JEE(Java Enterprise Edition)

- Java Enterprise Edition is a set of specifications and extending Java SE 8 with features such as distributed computing and web services. The applications of Java Enterprise Edition run on reference runtimes. This reference runtime handle transactions, security, scalability, concurrency and the management of components to be deployed. Java Enterprise Edition is also known as Java 2 Platform Enterprise Edition (J2EE), and currently, it has been rebranded as Jakarta EE.
- **This edition can be used for developing web based software/applications.**
- **Example:** e-commerce, accounting, banking information systems.



Java Editions

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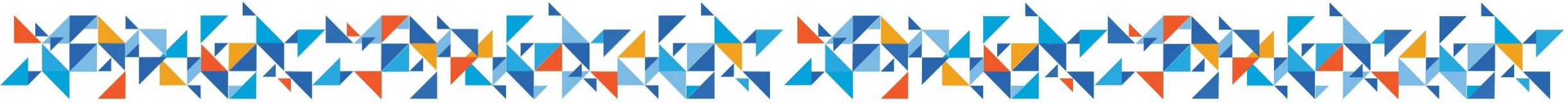
3. JME(Java Micro Edition)

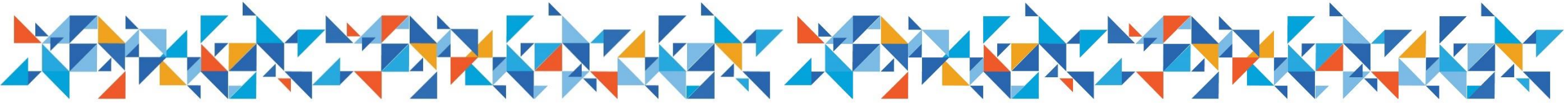
- Java Micro Edition is a computing platform which is used for the development and deployment of portable codes for the embedded and mobile devices. Java Micro Edition is also known as Java 2 Platform Micro Edition (J2ME). The Java Micro Edition was designed by Sun Microsystems and then later on Oracle corporation acquired it in 2010.
- This edition can be used for developing applications for mobile devices, wireless devices, embedded controllers, remote controllers where memory is limited.
- **Example:** micro-controllers, sensors, gateways, mobile phones, printers etc.

Java



Java Editions

- **4. JavaFX**
- JavaFX is used for creating desktop applications and also rich internet applications(RIAs) which can be run on a wide variety of devices. JavaFX has almost replaced Swing as the standard GUI library for Java Standard Edition. JavaFX support for desktop computers and web browsers.

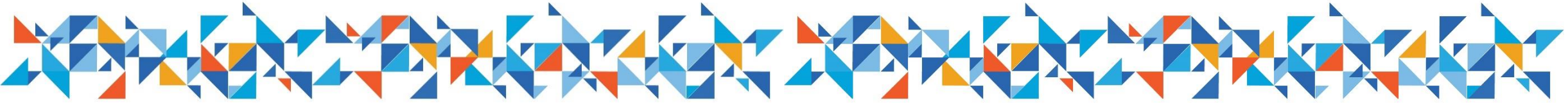


Features of Java

Java

Applications of Java

- According to Sun, 3 billion devices run Java. There are many devices where Java is currently used. Some of them are as follows:
- Desktop Applications such as acrobat reader, media player, antivirus, etc.
- Web Applications such as irctc.co.in, javatpoint.com, etc.
- Enterprise Applications such as banking applications.
- Mobile
- Embedded System
- Smart Card
- Robotics
- Games, etc.



Types of Programming languages

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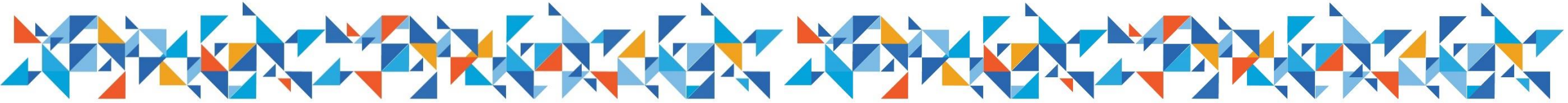
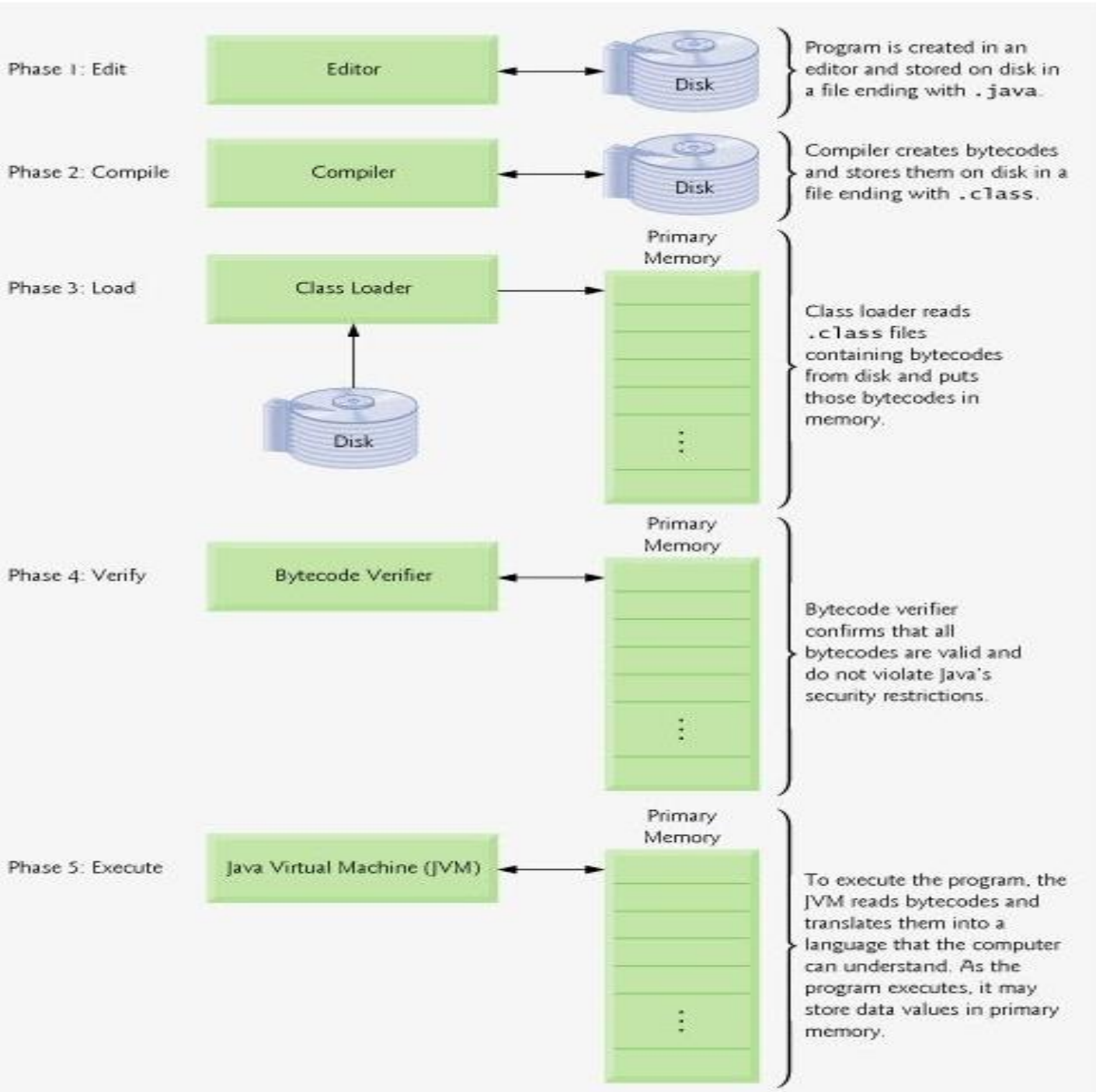
- Programmers write instructions in various programming languages, there are three general types of them:
  - Machine Language
  - Assembly Language
  - High-Level language Java (Bytecode)-> JVM -> Assembly -> Machine
- Java is a high-level programming Language



Typical Java Development Environment

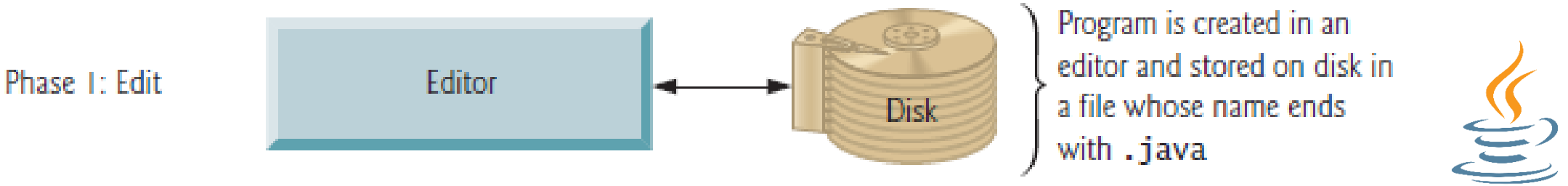
- Normally there are five phases to create and execute Java programs:

1. Edit,
2. Compile,
3. Load
4. Verify
5. Execute.



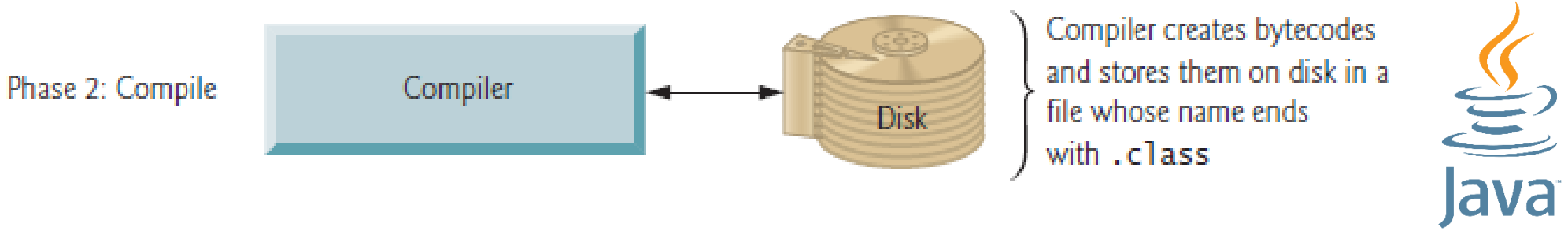
Phase 1

- **Editing** (Writing the Program)
- Consists of editing a file with an *editor program*, normally known simply as an *editor*
- Using the editor, you type a Java program, which is called source code
- You store the source code as: *filename.java*



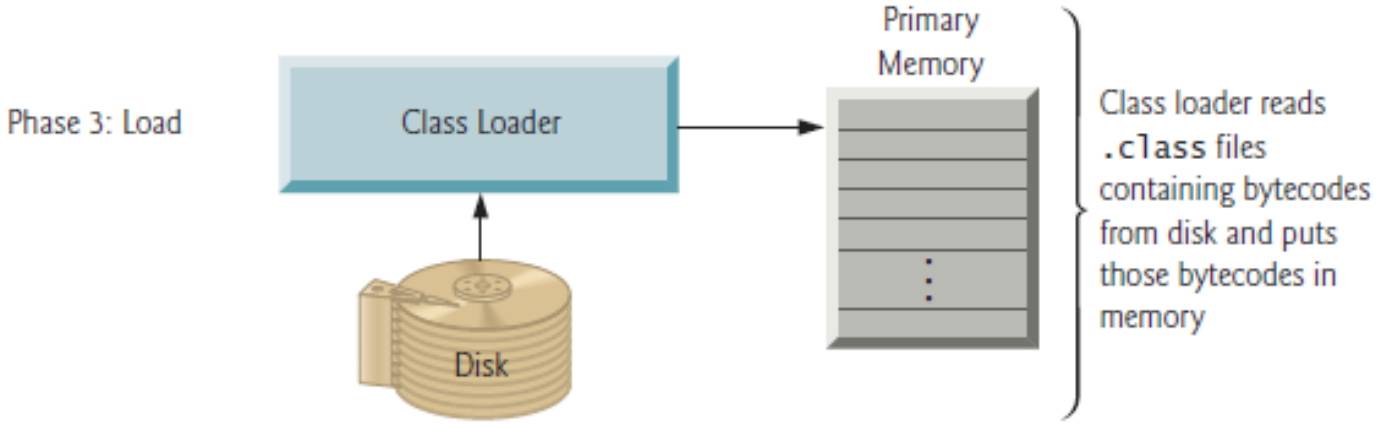
Phase 2

- ***Compiling a Java Program into Bytecodes***
- Compiler produces a **.class** file such s: ***filename.class*** that contains the compiled version
- The **Java Virtual Machine** (**JVM**)—a part of the JDK and the foundation of the Java platform—executes bytecodes.



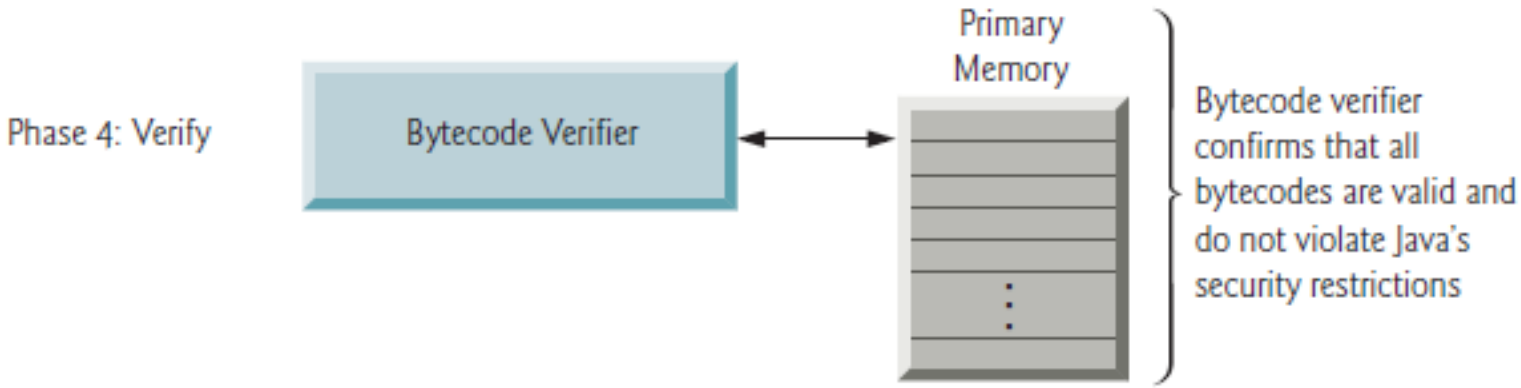
Phase 3

- ***Loading a Program into Memory***
- The JVM places the program in memory to execute it—this is known as **loading**



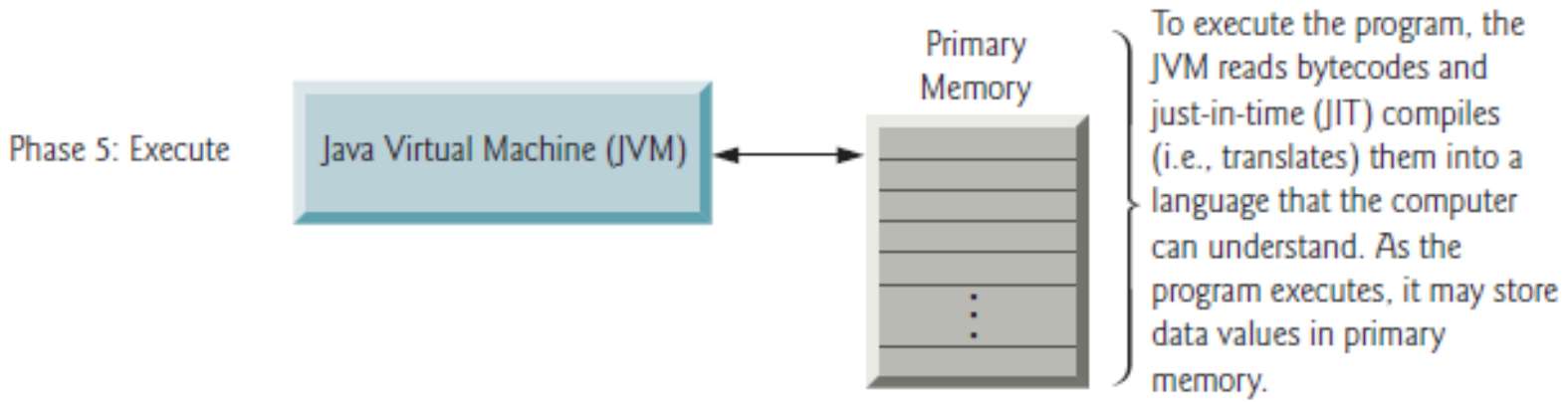
Phase 4

- **Bytecode Verification**
- The **bytecode verifier** examines their bytecodes to ensure that they're valid and do not violate Java's security restrictions



Phase 5

- **Execution:**
- The JVM **executes** the program's bytecodes, thus performing the actions specified by the program

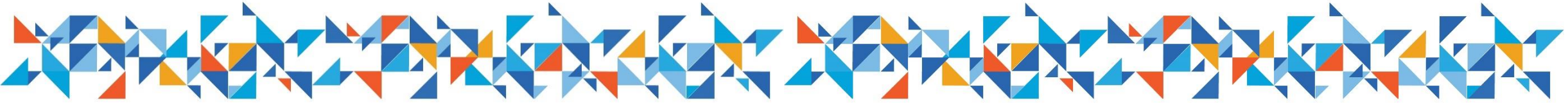


Integrated Development Environment

- **IDEs** provide tools that support the software development process, such as:
- Editors
- Debuggers for locating **logic errors** and more.
- There are many popular Java IDEs, including:

  - NetBeans (www.netbeans.org)
  - Eclipse (www.eclipse.org)
  - IntelliJ IDEA (www.jetbrains.com)

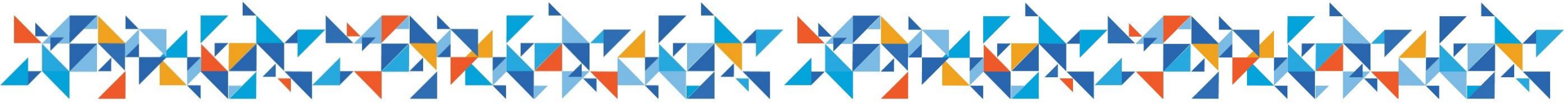
  - We will use Netbeans for this interactive course ☺



Hello world example

- The traditional Hello world program can be written in Java as:

```java
public class HelloWorldApp {
    public static void main(String[] args) {
        System.out.println("Hello World!"); // Prints the string to the console.
    }
}
```



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Thank You…!