Java Programing

Introduction to Java

What is Java?

- Java technology is both a programming language and a **platform!**

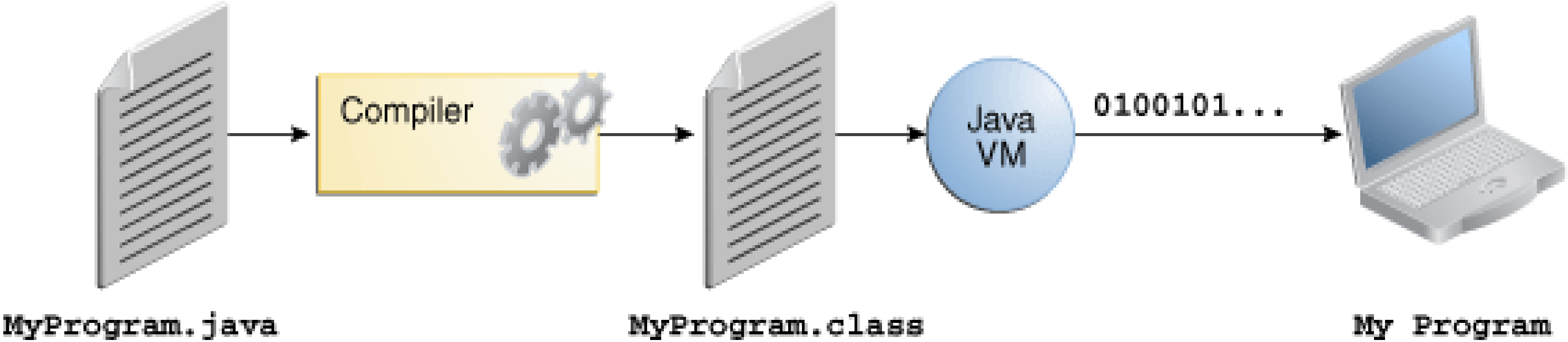
- The Java programming language is a high-level language

- Some if its strong points:
  - Simple
  - Object oriented
  - Multithreaded
  - Architecture neutral
  - Portable

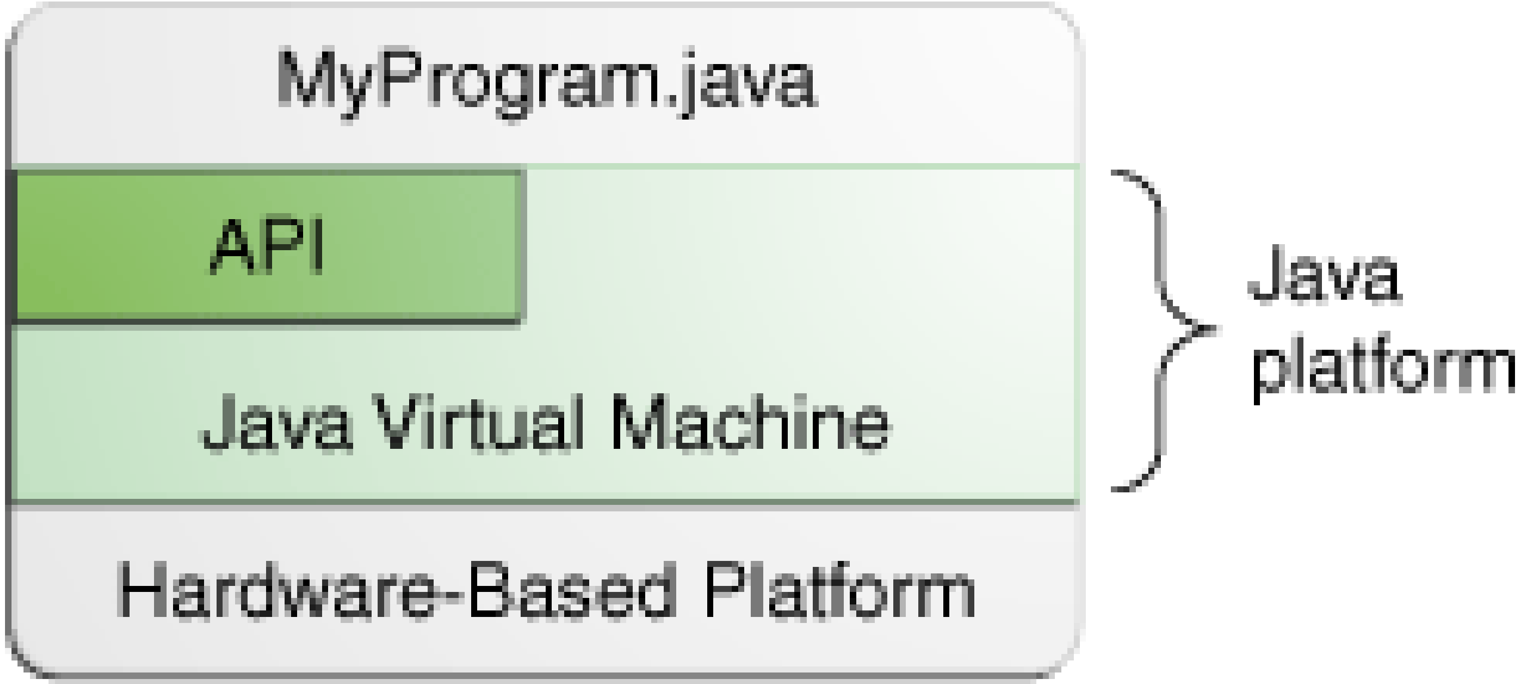
What can we do with Java platform ?

- Create web applications
- Create web services
- Create desktop applications
- Create mobile applications
- Create software for Smart TVs, STBs
- Many other applications

How is a Java application created?



Why call Java a platform?



- Note: Here the term ‘API’ can be rephrased to ‘libraries’

Installing the tools

What tools do we need to learn Java?

- To get started with core Java programing, we will need:
  - Java Development Kit (JDK)
  - Integrated Development Environment (IDE)

Note:

There are several ‘flavours’ of JDK available today, but we would stick to the good old **Oracle’s** JDK!

Again, we have many options when it comes to picking up and IDE, like Eclipse, NetBeans and more modern ones like IDEA. We will use **IDEA**.

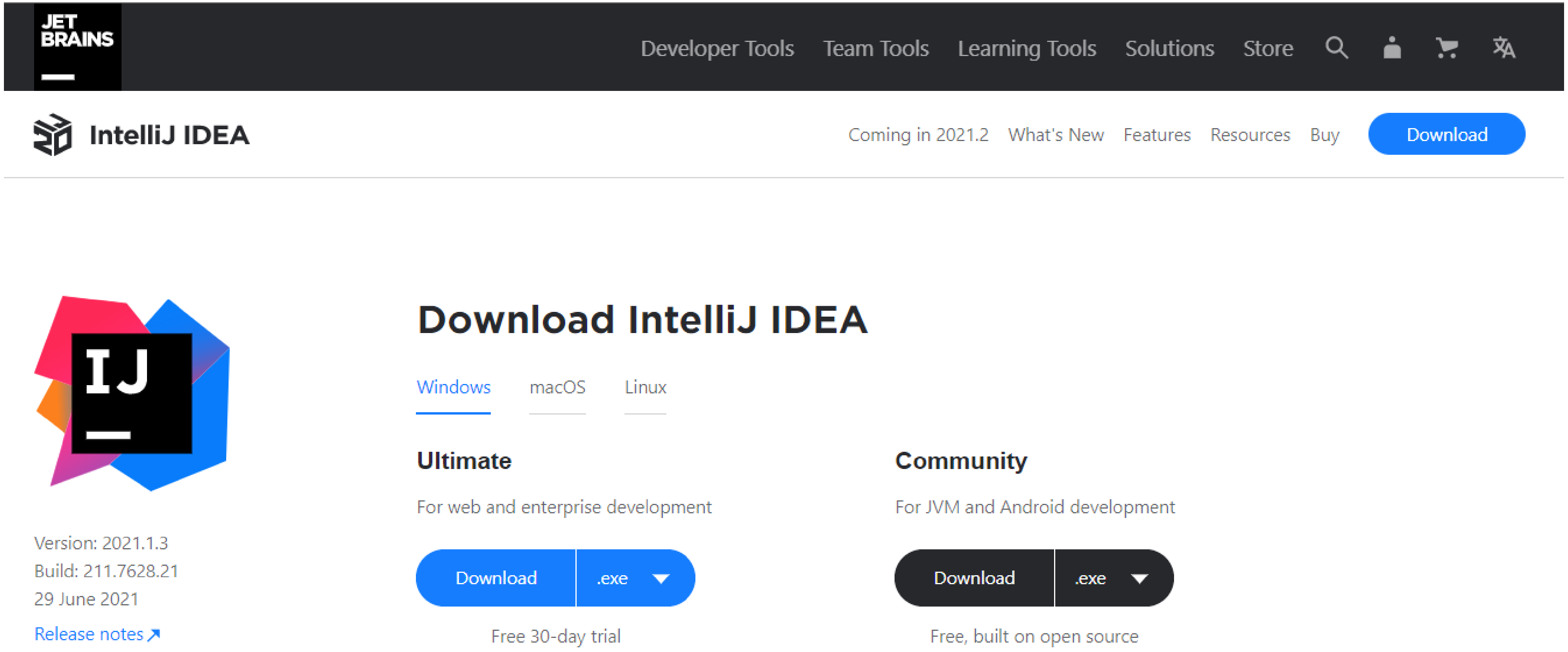
What is JDK exactly?

- JDK (Java Development Kit)
  - Java Compiler
  - JRE (Java Runtime Environment)
    - JVM (Java Virtual Machine)
    - Other Libraries required by JRE

Installing IntelliJ IDEA

Download and install community edition

https://www.jetbrains.com/idea/download/#section=windows



Download IntelliJ IDEA

Windows macOS Linux

Version: 2021.1.3
Build: 211.7628.21
29 June 2021
Release notes ↗

Ultimate

For web and enterprise development

Download .exe

Free 30-day trial

Community

For JVM and Android development

Download .exe

Free, built on open source

Getting started with Java tools

A quick overview of IntelliJ IDEA

• **Help** menu:	About (Version)
• Main Settings :	File -> Settings
• **Project** panel:	Hide/Move
• Project root:	Open in -> Explorer
• Project structure:	Different folders and files
• Code editor:	Main.Java
• **Run** menu:	To run the project (Other options)
• **Run** panel:	To see output (can move around)

A handy tool - JShell

- JShell is an REPL tool (Read – Evaluate – Print-Loop)
- Useful for beginners to get a quick hold of language syntax
- Does not need a class or method to run
- Interactive way to evaluate functions
- Can be used by senior programmers as well
- Can be used on a terminal without IDE as well

Accessing JShell from IDEA

- Go to **Terminal** panel (if not shown, use Alt+F12 to open)
- Type JShell and press enter
- We can type any expression or function
- use /exit to quit

Java language basics

What is an expression?

- An *expression* is a construct made up of variables/literals, operators, and method invocations that evaluates to a single value

- 5 * 2
- 5 * 2 + 2
- (5 * 2) + 2 // more clear with parenthesis
- 5 * (2 + 2) // BODMAS applicable in Java as well

What is a variable?

- A variable is a name give to a memory location
- The programmer can keep varying (assigning) it’s value
- Declaration and assignment can be done separately
  - int x
  - x = 5
- Or together
  - int x = 5
- Value can be changed any time
  - x = 10

What are the rules to name a variable?

- Variable names are case-sensitive
- It cannot begin with number
- It cannot be a keyword
- It must not contain spaces
- It can use underscore or dollar symbol

Variable naming best practices

- It is recommended to begin with a letter and not _ or $
- Use full words instead of short forms
- Camel case is a common standard (amountDue)
- Pascal case also exists (AmountDue)
- So does snake case (amount_due)
- All uppercase is also not recommended for variables

What is a primitive datatype?

Primitive types are special data types built into the language; they are not objects created from a class

Primitive Data Types

1. byte
2. short
3. int
4. long
5. float
6. double
7. Boolean
8. char

Non primitive datatypes

1. String

2. Array

3. Others

Primitive datatypes sizes

Data Type	Size in bytes	Range
byte	1	-128 to 127
short	2	-32,768 to 32,767
int	4	-2,147,483,648 to 2,147,483,647
long	8	-9,223,372,036,854,775,808 to 9,223,372,036,854,775,807
float	4	precision of 7 decimal digits
double	8	precision of 15 decimal digits
boolean	Not defined	true or false
char	2	for single unicode character

Primitive datatypes defaults

DATA TYPE	DEFAULT VALUE (FOR FIELDS)
byte	0
short	0
int	0
long	0L
float	0.0f
double	0.0d
char	'\u0000'
String	null
boolean	false

A heads-up on default values

The compiler never assigns a default value to an uninitialized **local** variable, Accessing an uninitialized local variable will result in a compile-time error!

Problem

Print the area of a triangle, given that it’s base is 2 units and height is 1.5 units

- Solve it in JShell
- First use variables of double datatype
- Then redo the problem with variables of float datatype

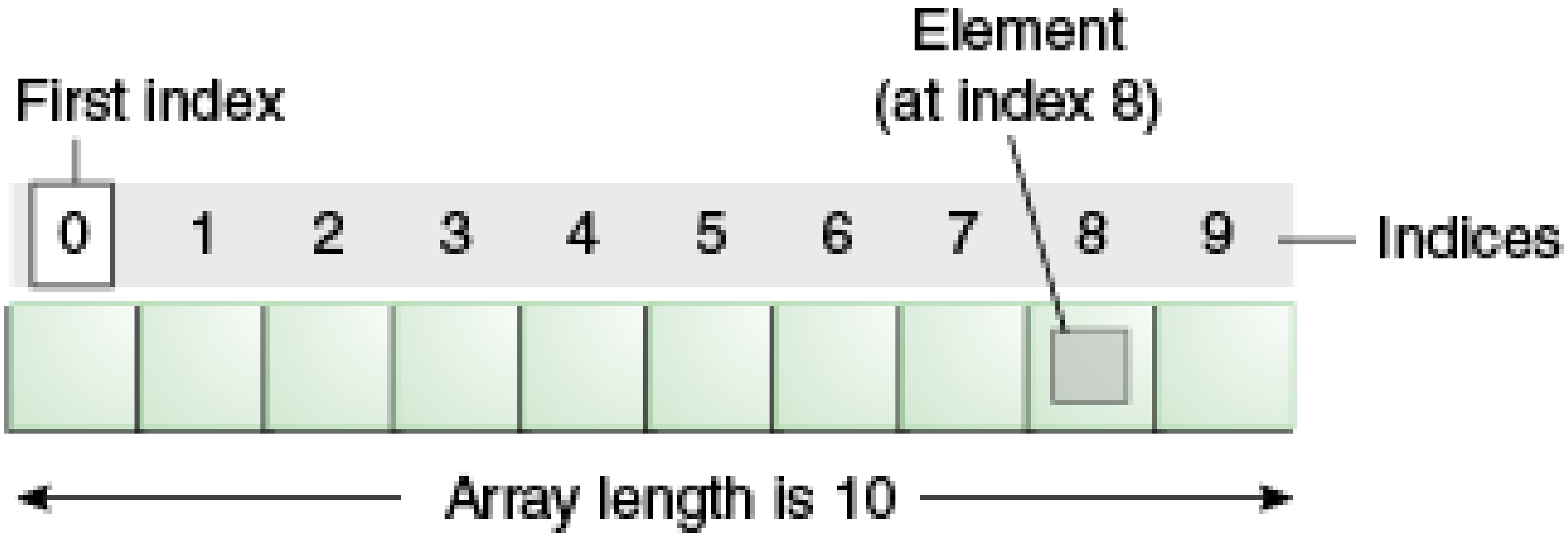
Note: You will be in for some surprises!

Learnings from the problem

- Integer divisions resulted in integer result
- Use *f* suffix for floating type literals
- Assigning larger type to a smaller one results in error
- A combination of variable, literals and operators resulted in one line of code which we called **statement**
- A statement forms a complete unit of execution

What is an array?

- An *array* is a container (object) that holds a fixed number of values of a **single type**



How to create an array?

- The length of an array is established when the array is created and its length is fixed after that
- int[] marks (Declaration)
- marks = new int[6] (Construction)
- int[] marks = new int[6] (usually both are combined)
- Same concept holds good for other datatypes as well

How to initialize and access array items

- int[] marks = {60,70,75,80,90}   (initialize)
- marks.length (prints 5)
- marks[0]   (access first element)
- marks[4]   (access last element)
- marks[5]   (error)

Good news!

Let's start using IntelliJ IDEA!

We may still utilize JShell when required!

A heads up on control flow statements

- The statements inside a program is executed from top to bottom, in the order that they appear
- **Control flow statements** can break up this flow of execution by using looping, decision making, and branching
- This allows the developer to **conditionally** execute a particular piece of code
- If-else, for loop, while loop, switch, and return, break, continue are the control flow statements available in Java

Problem

- Give below are the number of people in four families
- Display which family has even and which has odd number of people

Family No	No of people
1	2
2	3
3	4
4	1

Learnings from the problem

1. Nested Expressions

2. For loop basics

3. Operators ++, %, ==

4. If-else condition

5. First program using IntelliJ Idea

Problem

- Given the scores (out of 100) of a student in five of his subjects shown
  - Print all his scores
  - Find out in how many subjects he has scored 70 and above
  - Find out if he has scored full in any subject

Subject	**Marks**
Physics	75
Chemistry	70
Math	100
Biology	65
English	85

Learnings from the problem

- Used boolean variable
- Used ++ operator
- Learnt IDE feature of converting foreach to normal for loop
- If condition without else and without braces

What is a String exactly?

- A String is a non-primitive datatype in Java
- It is used to store text data
- Internally, it is an *object* (more on it later)
- A string literal has to be enclosed in double quotes
- String fruit = “Apple” (Declaration and initialization)
- Java has several inbuilt methods for strings

How to use special characters in strings?

- Since string literals must be enclosed in quotes, compiler would have difficulties in dealing with certain situations.
- We use **escape** character \ to deal with it
- System.out.println(" "Java" is a language") (error)
- System.out.println(" \\"Java\\" is a language") (no error)

Useful string operations

- Strings can be joined using **+** operator or **concat()**
- length() gives us the number of characters in the string
- toUpperCase() and toLowerCase()
- equals() and isEmpty()

Note: An empty string is also a blank string, but not vice versa.

Problem

Given the name of a country as “India” find if it contains the letter ‘d’ in it

Learnings from the problem

- Note down

Problem – Part A

- When a user inputs his email account, display a welcome message to him
  - Let use ‘**hard-coded**’ email id for now
  - Lets use simple **concatenation** for displaying the welcome message

Learnings from the problem

- Note down

Problem – Part B

- When a user enters his email account, display a welcome message to him
    - Let us show the **date** and time the user logged in
    - Lets use **format** the displaying message in better way

Learnings from the problem

- Note down