جامعة التنمية البشرية
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COMPUTER PROGRAMMING CONCEPTS

CS&IT 1101
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LECTURE 3 :INTRODUCTION TO JAVA PROGRAMMING LANGUAGE

OUTLINES

- What is java?
- Introduction to java language
- Why java
- Where it is used
- Basic of Java
- Data types in java
- Comments in java
- Variable in java
- Identifier in java
- Arithmetic operator
- expression

WHAT IS JAVA?

- Java is a programming language and a platform.
- Java is a high level, robust, secured and object- oriented programming language.
- **Platform:** Any hardware or software environment in which a program runs, is known as a platform. Since Java has its own runtime environment (JRE) and API, it is called platform.

INTRODUCTION TO JAVA PROGRAMMING LANGUAGE

- James Gosling from Sun Microsystems in 1995
- The goal was to provide platform- independent alternative to C++.
- architecturally neutral, means run on any platform or device (operating system).
- Java runs on a Java Virtual Machine (JVM).

WHY JAVA?

Java has been tested, refined, extended, and proven by a dedicated community of Java developers.

- Simple Grammar: Java has a very simple grammar familiar to anyone with experience in C and C++.
- Portability: Java does run on all the platforms.
- Speed: The latest JIT compilers for Suns JVM approach the speed of C/C++ code, and in some memory allocation intensive circumstances, exceed it.
- Garbage Collection: The programmer doesn't have to worry about memory (most of the time).
- Huge library and developer community support available on Internet.

WHERE IT IS USED?

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
- Enterprise Applications such as banking applications.
- Mobile
- Embedded System
- Smart Card
- Robotics
- Games
- etc.

WHY SUN CHOOSE "JAVA" NAME?

Why they choose java name for java language?

- The team gathered to choose a new name. The suggested words were "dynamic", "revolutionary", "Silk", "jolt", "DNA" etc. They wanted something that reflected the essence of the technology: revolutionary, dynamic, lively, cool, unique, and easy to spell and fun to say.
- According to James Gosling "Java was one of the top choices along with Silk". Since java was so unique, most of the team members preferred java.

BASIC OF JAVA (1/3)

- Java is a platform independent, more powerful, secure, high performance, multithreaded programming language. Here we discuss some points related to java.

Define byte

- Byte code is the set of optimized instructions generated during compilation phase and it is more powerful than ordinary pointer code.

Define JRE

- The Java Runtime Environment (JRE) is part of the Java Development Kit (JDK). It contains set of libraries and tools for developing java application. The Java Runtime Environment provides the minimum requirements for executing a Java application.

BASIC OF JAVA (2/3)

Define JVM

- JVM is set of programs developed by sun Micro System and supplied as a part of jdk for reading line by line of byte code and it converts into native understanding form of operating system. Java language is one of the compiled and interpreted programming language.

The JVM performs following operation:

- Loads code
- Verifies code
- Executes code

Provides runtime environment

JVM provides definitions for the: Memory area, Class file format, Register set, Garbage-collected heap, Fatal error reporting etc.

BASIC OF JAVA (3/3)

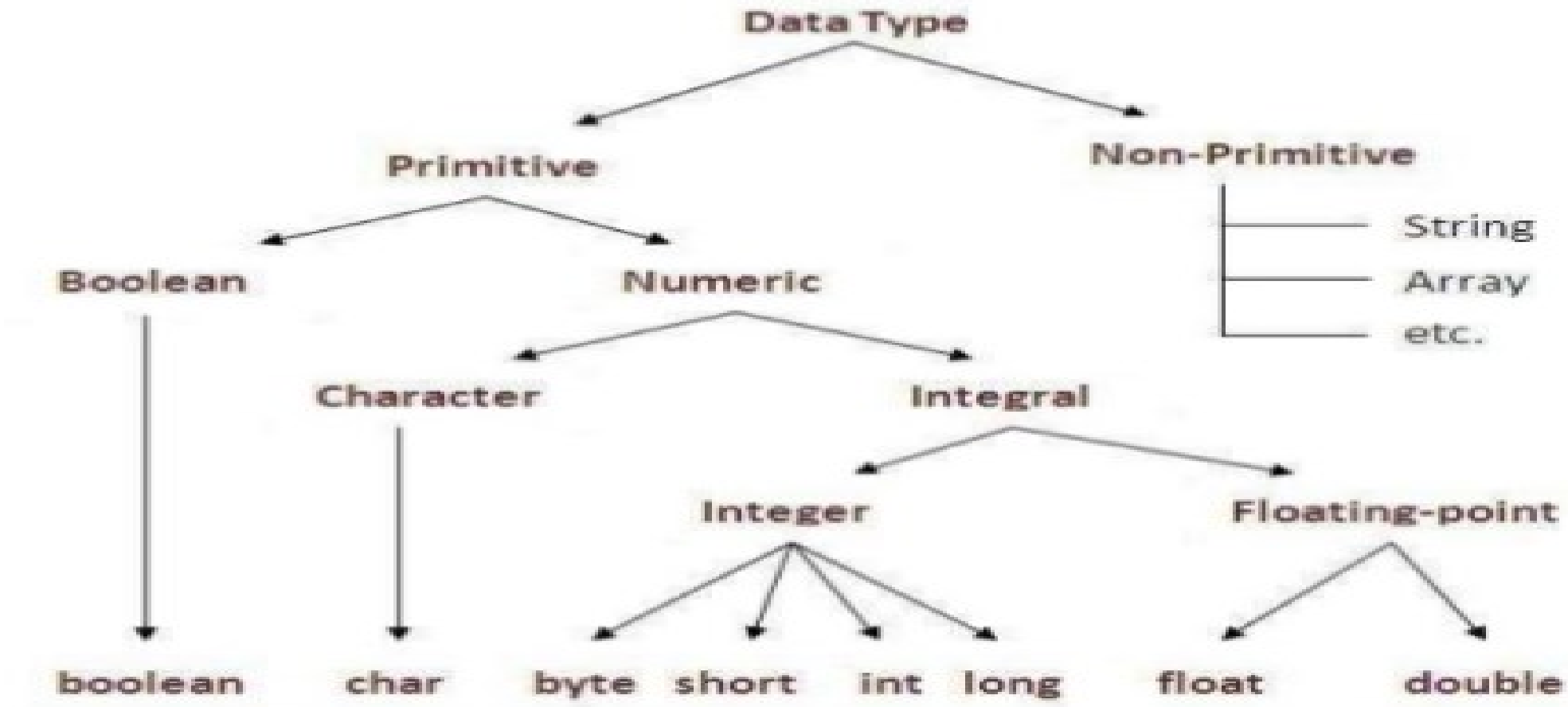
Garbage Collector

- Garbage Collector is the system Java program which runs in the background along with regular Java program to collect un-Referenced (unused) memory space for improving the performance of our applications.

DATA TYPES IN JAVA (1/2)

- The variables are the way to store data in the programming languages. In Java, you have to specify a data type of variables that tells what kind of data to be stored in it.
- Depending on the data types the operating system allocates memory and decides what type of data to be stored e.g. a number, a character etc.
- There are two kinds of Java data types:
  1. Primitive data types
  2. Object data types also known as the Reference data types

DATA TYPES IN JAVA (2/2)



PRIMITIVE DATA TYPES (1/2)

There are eight primitive datatypes supported by Java.

Primitive datatypes are predefined by the language and named by a keyword. Let us now look into the eight primitive data types in detail.

Byte: 8 bit, and number.

Short: is number type and takes two bytes.

int: is a numeric data type and takes four bytes.

Long: is numeric and takes eight bytes.

float: is a single precision and takes four bytes.

double: is a double precision and takes eight bytes.

char: can store any character and takes two bytes.

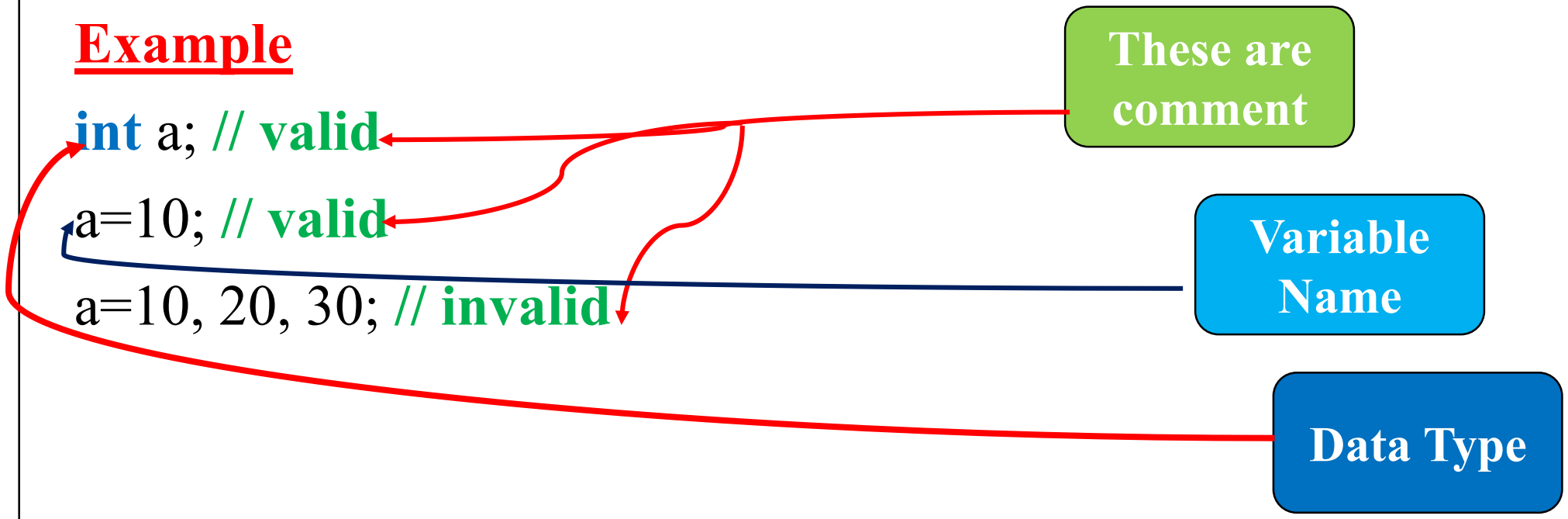
boolean: It takes one byte and can store either of two values : True or False.

PRIMITIVE DATA TYPES (2/2)

- Primitive data types are those whose variables allows us to store only one value but they never allows us to store multiple values of same type.
- This is a data type whose variable can hold maximum one value at a time.

Example

```
int a; // valid
a=10; // valid
a=10, 20, 30; // invalid
```



COMMENTS IN JAVA (1/2)

- Commenting in Java. **Comments** are an integral part of any program. They help the person reading the code (often you) better understand the intent and functionality of the program.

The Java language supports three types of comments:

1. Single line comment.
2. Multi Line Comment.
3. Documentation comment.

COMMENTS IN JAVA (2/2)

1. Single line comment.

// symbol is use to write single line comment in java.

Syntax:

// comments code

2. Multi Line Comment.

/* */ symbol is use to write multi line comment in java.

Syntax:

```
/* comment code line 1
comment code line 2 */
```

3. Documentation comment.

/** documentation */

This is a documentation comment and in general its called doc comment. The JDK javadoc tool uses doc comments when preparing automatically generated documentation. We can use only these two type

THE BYTE DATA TYPE OF JAVA

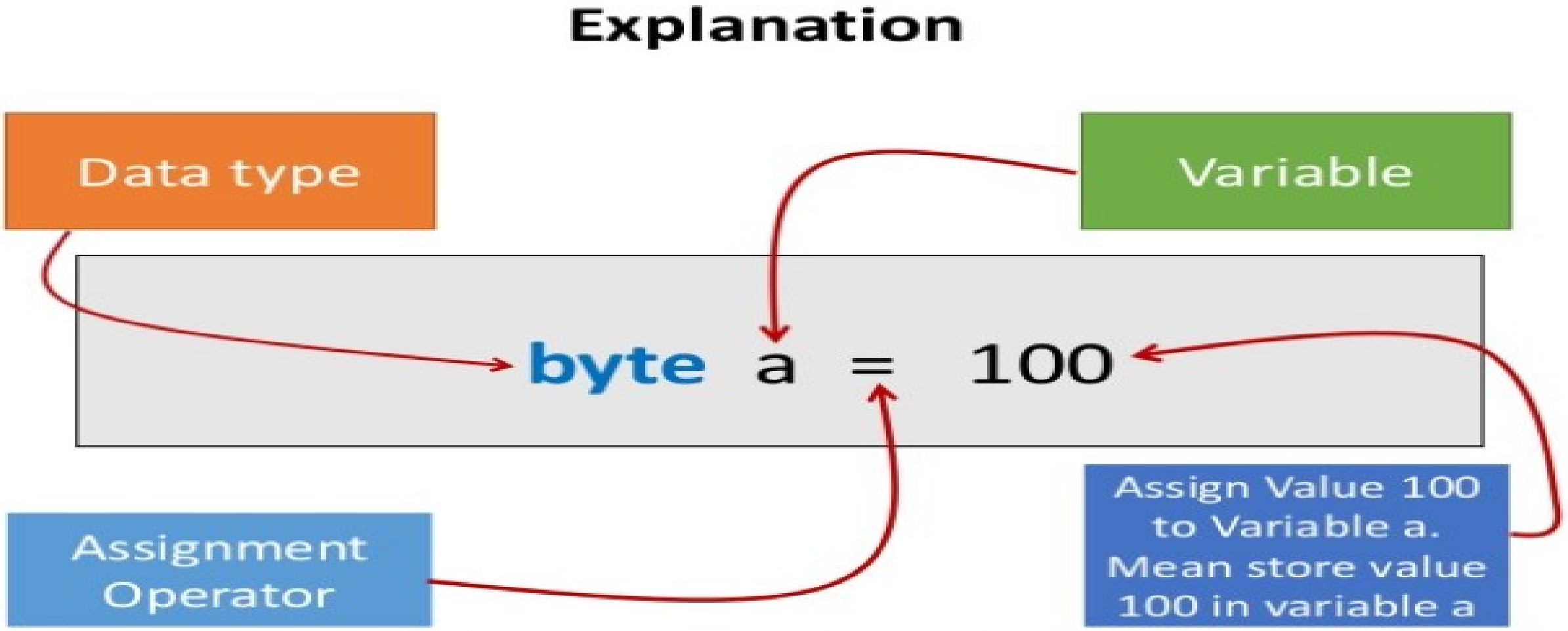
Java has eight types of primitive data types to store data in the Java programs. The byte is one of the primitive data types in Java.

- The byte takes eight bits or one byte of signed memory.
- Byte Is a numeric type.
- Byte data type is used to save space in large arrays, mainly in place of integers, since a byte is four times smaller than an integer.
- The Default value of the byte variable is 0.
- The Minimum value of the **byte** type can be -128.
- The Maximum value of the **byte** java type can be 127.

Example:

byte a = 100, **byte** b = -50

BYTE


Explanation
Data type
Variable
byte a = 100
Assignment Operator
Assign Value 100 to Variable a. Mean store value 100 in variable a

THE SHORT DATA TYPE IN JAVA

The Java short is one of the primitive data types in Java.

- Takes two bytes or 16 bits of memory.
- Is a numeric type.
- Short data type can also be used to save memory as byte data type. A short is 2 times smaller than an integer.
- The default value of the **short** variable is 0.
- The minimum value of the short type can be –32768.
- The maximum value of the short type can be 32767.

Example:

```
short s = 10000, short r = -20000
```

THE INTEGER DATA TYPE OF JAVA

- The **int** type takes 32 bits or four bytes of memory.
- It is a numeric type
- Integer is generally used as the default data type for integral values unless there is a concern about memory.
- The default value of the **int** variable is 0.
- The minimum value of the Java integer type can be – 2,147,483,648.
- The maximum value of int Java type can be 2,147,483,647.

Example:

int a = 100000, **int** b = -200000

THE LONG DATA TYPE IN JAVA

- This is a numeric data type like byte, int etc.
- Takes 64 bits or eight bytes memory.
- The Java long is a numeric data type.
- The default value of a **long** variable is 0L.
- The minimum value of the long, Java data type can be- 9,223,372,036,854,775,808.
- This type is used when a wider range than int is needed.
- Other numeric data types include the byte, short, int while the float and double with single and double precision, respectively.

Example:

long a = 100000L, long b = -200000L

THE FLOAT DATA TYPE OF JAVA

- Takes 32 bits or four bytes of memory.
- Float is mainly used to save memory in large arrays of floating point numbers.
- The float is a numeric type with single-precision.
- The default value of the float variable is 0.0f.

Example:

```
float f1 = 234.5f
```

THE DOUBLE DATA TYPE OF JAVA

- It is like the float data type but with a double precision.
- A double type variable takes 64 bits or eight bytes memory.
- This data type is generally used as the default data type for decimal values, generally the default choice.
- The double is a numeric type with double-precision.
- The Default value of the double variable is 0.0d.

Example:

```
double d1 = 123.4
```

THE CHAR DATA TYPE IN JAVA

- Takes 16 bits or two bytes memory.
- Is used to store any type of character value.
- The minimum value of char variable is 0.
- The maximum value is 65,535.
- Char data type is used to store any character
- The Default value of the char is ‘\u0000’

Example:

```
char letterA = 'A'
```

THE BOOLEAN DATA TYPE OF JAVA

- A Boolean variable may have two possible values:
- True or False.
- The default value of the Java Boolean variable is false.
- An example of using the Boolean variable is in the conditional statement like the if, switch etc.

Example:

boolean one = true

Primitive Data Types

Data Type	Default Value	Default size
boolean	false	1 bit
char	'\u0000'	2 byte
byte	0	1 byte
short	0	2 byte
int	0	4 byte
long	0L	8 byte
float	0.0f	4 byte
double	0.0d	8 byte

IDENTIFIERS IN JAVA

- All Java components require names.
- Name used for classes, methods, interfaces and variables are called **Identifier.**
- Identifier must follow some rules. Here are the rules:

1. All identifiers must start with either a letter(a to z or A to Z) or currency character($) or an underscore (_).
2. After the first character, an identifier can have any combination of characters. A Java **keyword** cannot be used as an identifier.
3. Identifiers in Java are case sensitive, foo and Foo are two different identifiers.
4. Spaces are not permitted inside identifiers

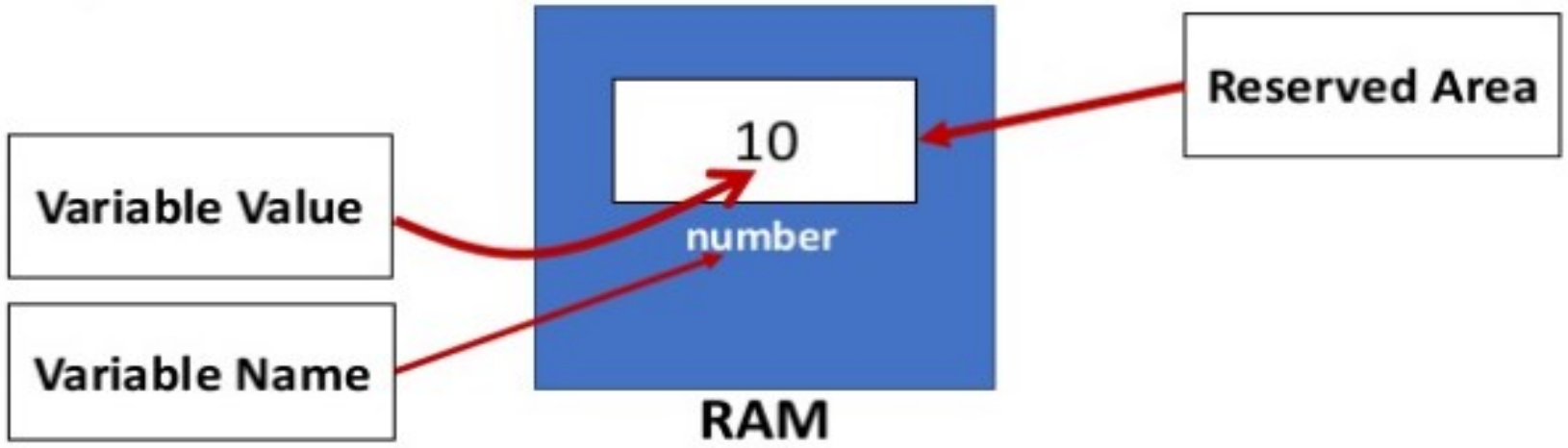
VARIABLE IN JAVA(1/2)

Variable is a name of memory location and **Data Type** specifies size and the type of value that can be stored in a variable (identifier).

Variable in Java:

Variable: is name of reserved area allocated in memory.

variable names start with a lowercase letter



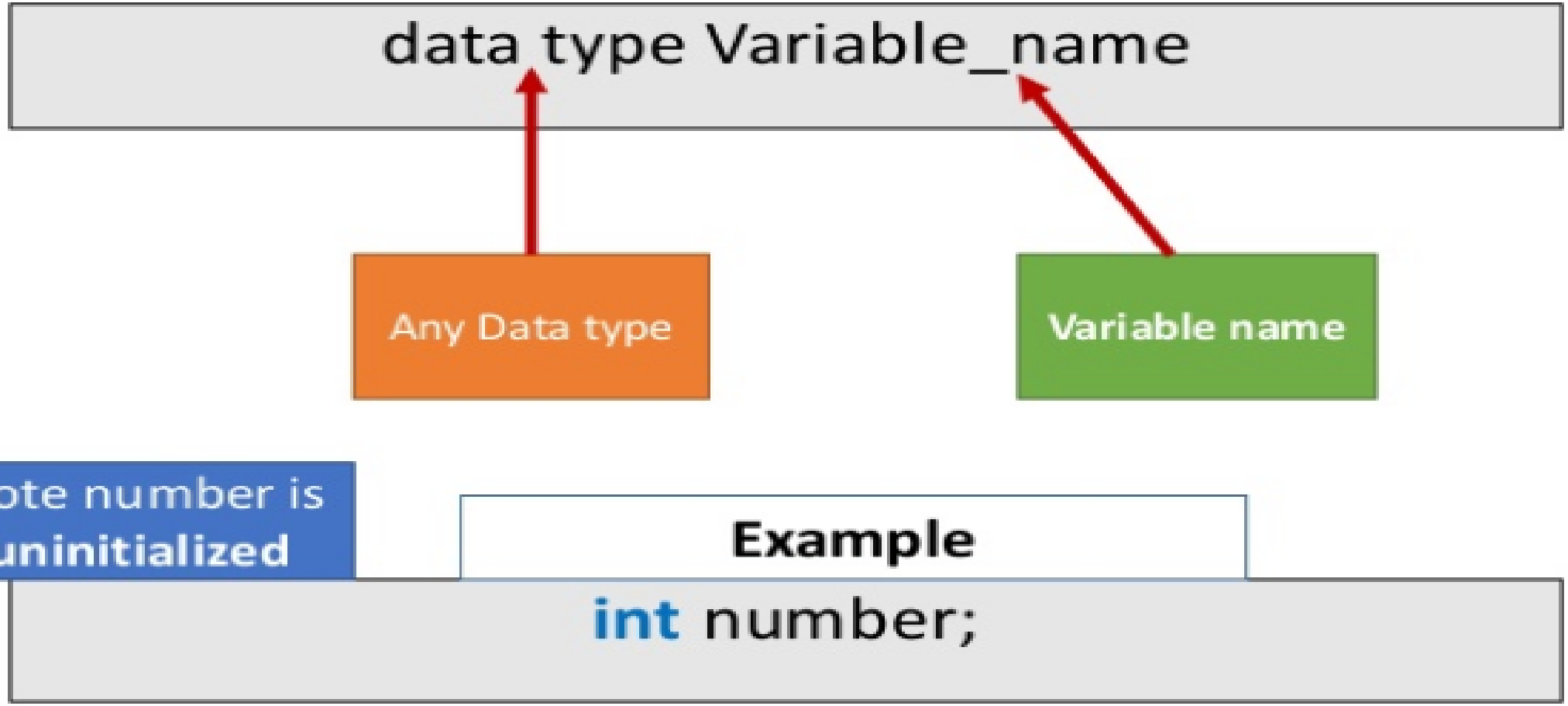
VARIABLE IN JAVA(2/2)

- A variable provides us with named storage that our programs can manipulate. Each variable in Java has a specific type, which determines the size and layout of the variable's memory; the range of values that can be stored within that memory; and the set of operations that can be applied to the variable.
- We must declare all variables before they can be used. Following is the basic form of a variable declaration:

data type variable = value ; variable = value ... ;

- Here data type is one of Java's datatypes and variable is the name of the variable. To declare more than one variable of the specified type, you can use a comma-separated list.

VARIABLE DECLARATION IN JAVA



Variable Declaration and initializes in Java

```
data type Variable_name = value;
```

Example

```
int number=10;
```

UNINITIALIZED VARIABLES

```
int d;
    System.out.println(d);

  // ERROR - uninitialized variable
```

THE ASSIGNMENT OPERATOR

Assignment operator: =

- Not used as a statement about equality

- Used to change the value of a variable

```
int a = 13;
    a = 12;
```

ARITHMETIC OPERATORS

- Arithmetic operators are used in mathematical like addition, subtraction etc. The following table lists the arithmetic operators:

Operator	Description
+	Additive operator (also used for String concatenation)
-	Subtraction operator
*	Multiplication operator
/	Division operator
%	Modification or Remainder operator

ARITHMETIC OPERATORS

- Arithmetic Expression is constructed by using arithmetic operators and numbers.
- The numbers and alphabetical symbols in the expression are called **operand.**

UNARY & BINARY OPERATOR

1. -6

The operator **-** (subtraction) is used to specify that the number **6** is negative. And **-** has only one operand, which is 6. operators that have only one operand are called **unary operators.**

unary operators: An operator that has only one operand

2. 5 - 3

The symbol – is used to subtract 3 from 5. in this expression, - has two operands, 5 and 3. operator that have two operand are called **binary operator.**

binary operator: An operator that has two operand.

UNARY & BINARY OPERATOR

3. **+ 27**

the operator + is used to indicate that the number 27 is positive. Here, because + has only one operand, it acts as a unary operator.

- - and + can be unary or binary arithmetic operator.
- * , / and % are binary and must have two operands.

ORDER OF PRECEDENCE

- According to the order of precedence rules for arithmetic operator:

*** , / , %**

have a higher level of precedence than:

+ , -

- When arithmetic operators have the same level of precedence, operations are performed from **left to right**. To avoid confusion, you can use parentheses to group arithmetic expressions.

EXAMPLE

- Using the order of precedence rules,

  3 * 7 – 6 + 2 * 5 / 4 + 6

CHARACTER ARITHMETIC

- Since the **char** data type is also an integral data type, java allows you to preform arithmetic operations on **char** data.
- There is difference between the character **'8'** and the integer **8**.
- the integer value **8** is **8.**
- The integer value of **'8'** is **56**, which is the Unicode collating sequence of the character '8'.

1. 8 + 7 = 15
2. '8' * '7' = 56 * 55 = 3080.

EXPRESSION

- If all operands (that is, numbers) in an expression are integers, the expression is called **integral expression.**
- If all operands in an expression are floating-point numbers, the expression is called **floating-point** or **decimal expression.**

Example:

1. 3 + 3 * 5;
2. 12.8 * 17.5 - 34.50;

MIXED EXPRESSION (1/3)

- An expression that has operands of different data type is called a **mixed expression.**
- A mixed expression contains both integers and floating-point numbers.
- **Example:**

1. 2 + 3.5
2. 6 / 4 + 3.9
3. 5.4 * 2 – 13.6 +18 / 2

MIXED EXPRESSION(2/3)

- Two rules apply when evaluating a mixed expression:

1. When evaluating an operator in a mixed expression:
   a. Is the operator has the same type of operands (both integers or both float), the operator is evaluated according to the type of operand. Integer operand yield an integer result; floating-point numbers yield a floating-point number result.
   b. If the operator has both types of operand (one is an integer and the other is floating-point number), during calculation the integer is treated temporarily as a floating-point number with the decimal part of zero, and then the operator is evaluated. The result is a floating-point number.

MIXED EXPRESSION(3/3)

2. The entire expression is evaluated according to the precedence rules.
   - ✓ The multiplication, division, and modulus operators are evaluated before the addition and subtraction operator.
   - ✓Operators having the same level of precedence are evaluated from left to right.

REVIEW QUESTIONS

1. What is the type of the values 0 and "0"?
2. Which of the following are legal identifiers?

   Greeting1.

   g.

   void.

   101dalmatians.

   Hello, World.

   <greeting>.

3. Is 12 = 12 a valid expression in the Java language?

THANK YOU.....

DO YOU HAVE ANY QUESTIONS ?