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Tender Heart High School, Sector-33 B, Chandigarh

CLASS: IX SUBJECT: COMPUTER APPLICATION

TOPIC: values and Data Types

SUBJECT TEACHER: Prabhdeep kaur

Good Morning

This lesson is of class IX for the subject of Computer Application Topic values and Data Types. In our previous lesson we finished with Introduction and Concepts of Object Oriented Programming.

Program : Program is a set of instructions that can be executed by a computer to perform a specific task.

Token: Tokens are smallest elements of a program or we can say each statement of computer program is formed by using different words called 'Token' Each token is formed by using valid characters of computer language in which program is written and which are meaningful to the compiler. The different types of tokens used in Java are:

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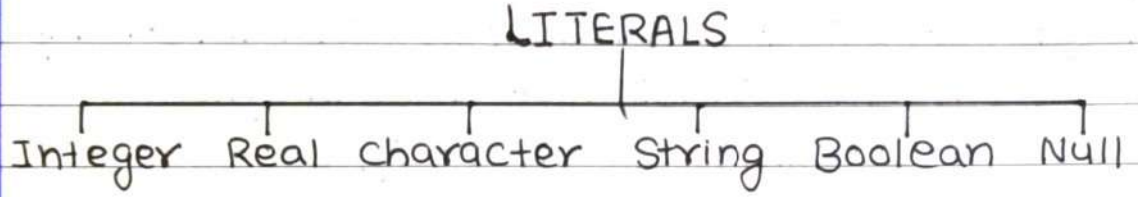
* **Literals**: Literals are fixed values of boolean, numeric, character, or string data form that remain unchanged during entire execution of the program. The various types of literals used in Java are



Integer Literals: An integer literal is a numeric value or we can say the whole numbers positive or negative without any fractional or exponential part. There are 4 types of integer literals in Java

* binary (base 2) eg: Int binary number 10010
* decimal (base 10) eg: Int decnumber 34
* Octal (base 8) eg: Int Octalnumber 027
* hexadecimal (base 16) eg: int hexadecimal 02F

Real Literals: A Real literals are also called floating point literals. These are numeric literal that has either fractional form or an exponential form. The placement of decimal point may not be same in real numbers.

eg: Float = 3.42

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Character Literals: Charater literals are unicode character that is either single letter, digit or any special symbol enclosed within single quote. It does not take part in arithmetical calculations

eg: Char letter = 'a';

String literals: A string literal is a sequence of characters enclosed inside double-quotes.

eg: String str = "Java Program"

Boolean literals: Boolean literals are used to initialize boolean data types. They can store two values: true and false. A boolean literal can either be true or false at a time.

eg: boolean flag = true;

Null literals: Null literal denotes the absence of a value. It is used to initialize an object or array

eg: String str = null;

Identifiers: In programming languages identifiers are used for identification purposes. Identifiers can be a class name, method name, variable name or label

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Example:

```
Public class Test
{
    Public static void main (string[])
    {
      int a = 20;
    }
}
```

In this code, we have 5 identifiers

* Test : Class name
* main : method name
* String : predefined class name
* int : data type
* a : variable name

Rules for defining identifiers

* The only allowed characters for identifiers are all alphanumeric character [A-Z, a-z, 0-9], $ (dollar sign) and '_' (underscore)
  eg: greek@ - is invalid identifier as it contain Special Character@
* Identifiers should not start with digits [0-9]
  eg: 123test - is invalid

* Java Identifiers are case-sensitive.
* There is no limit on the length.

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* Reserved words cannot be used as an identifier
eg: int while = 20 is invalid because while is reserved word. There are 53 reserved words in Java.

Assignment: An assignment designates a value for a variable. After a variable is declared, you can assign a value to it by using an assignment statement. we can say storing a value in a variable. In Java, the equal sign = is used as the assignment operator.

eg: Int a = 20;

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Operators: Operators are the Symbols or Signs used to specify the operations to be performed in a Java expressions or statement Java divides the operators into the following groups:

Operators

Arithmetic operators | Assignment operators | comparison operators | Logical operators | Bitwise operators

Arithmetic Operators: are used to perform common mathematical operations.

operator	Name	Description	Example
+	Addition	Adds two values	X+Y
-	Subtraction	Subtracts one value from another	X-Y
*	Multiplication	Multiplies two values	X * Y
/	Division	Divides one value by another	X / Y
%	Modulus	Returns the division remainder	X % Y
++	increment	Increase the value of variable by 1	++X
--	Decrement	Decrease the value of a variable by 1	--X

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Assignment operators: are used to assign value to variable. eg: int x = 10; here assignment operator = use to assign the value 10 to a variable called x.

operators	Example	Same as
=	x=5	x=5
+=	x+=5	x=x+5
-=	x-=5	x=x-5
*=	x*=5	x=x*5
/=	x/=5	x=x/5
%=	x%=5	x=x%5
$=	x$=5	x=x$5
i=	xi=5	x=xi5
^=	x^=5	x=x^5
>>=	x>>=5	x=x>>5
<<=	x<<=5	x=x<<5

Comparison operators: are used to Compare two values

Operator	Name	Example
==	Equal to	x==y
!=	Not equal	x!=y
>	Greater than	x>y
<	Less than	x<y
>=	Greater than or equal to	x>=y
<=	Less than or equal to	x<=y

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Logical operators: are used to determine the logic between variables or values:

Operator	Name	Description	Example
&&	Logical and	Returns true if both statements are true	x<5 && x<10
||	Logical or	Returns true if one of the statements is true	x<5 || x<4
!	Logical not	Reverse the result, returns false if the result is true	!(x<5 && x<10)

Punctuators: are the punctuation signs used as special characters. Some of the punctuators are comma(,), semicolumns(:), dot(.) etc.

Separators: They are the special characters in Java, which are used to separate the variables or the characters. comma(,), Brackets(), curly brackets{}, Square brackets[] etc.

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Keywords: are the reserved words which are preserved by the system and carry special meaning for the System compiler. They have already been defined in the language and we cannot use them as name s for variables or identifiers eg. class, public, for, Systemetc.

Answer the following questions:

Q1. What is a token? Name different types of tokens.

Q2. Define the following with example:

a. variable
b. boolean datatype
c. keywords

Q3. Define different types of Literals?

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Answerkey

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Multiple Choice Questions

Literal	Keyword	Char variable	' '	String variable	65 - 90
12/3	object	double	boolean m=true		

Fill in the blanks

alphabets	Unicode	ASCII	token	literals
Assignment	Tokens	identifier	4	pure

Write short answers

1 Data types are used to identify the type of data a memory location can hold and the associated operations of handling it.

2 A variable represents a memory location through a symbolic name which holds a known or unknown value of a particular data type. This name of the variable is used in the program to refer to the stored value.
Example: **int mathScore = 95;**

3 The keyword final before a variable declaration makes it a constant. Its value can't be changed in the program.
Example: **final int DAYS_IN_A_WEEK = 7;**

4 Two kinds of data types are:

1. Primitive Datatypes.
2. Non-Primitive Datatypes.

5 A token is the smallest element of a program that is meaningful to the compiler. The different types of tokens in Java are:

1. Identifiers
2. Literals
3. Operators
4. Separators
5. Keywords

6

1. Name of the variable should be a sequence of alphabets, digits, underscore and dollar sign characters only.
2. It should not start with a digit.
3. It should not be a keyword or a boolean or null literal.

7 The process of converting one predefined type into another is called type casting.

8

(a) double pi = 3.142;

(b) double x = 1.732;

9 Distinguish between:

(a) **Integer and floating constant**

Integer Constant

Integer Constants represent whole number values like 2, -16, 18246, 24041973, etc.

Integer Constants are assigned to variables of data type — byte, short, int, long, char

Floating Constant

Floating Constants represent fractional numbers like 3.14159, -14.08, 42.0, 675.238, etc.

Floating Constants are assigned to variables of data type — float, double

(b) **Token and Identifier**

Token

A token is the smallest element of a program that is meaningful to the compiler.

Tokens in Java are categorised into 5 types — Keywords, Identifiers, Literals, Punctuators, Operators.

Identifier

Identifiers are used to name things like classes, objects, variables, arrays, functions an so on.

Identifier is a type of token in Java.

(c) Character and String constant

Character Constant

Character Constants are written by enclosing a character within a pair of single quotes.

Character Constants are assigned to variables of type char.

String Constant

String Constants are written by enclosing a set of characters within a pair of double quotes.

String Constants are assigned to variables of type String.

(d) Character and Boolean literal

Character Literal

Character literals are written by enclosing a character within a pair of single quotes.

Character literals can be assigned to variables of any numeric data type — byte, short, int, long, float, double, char

Escape Sequences can be used to write character literals

Boolean Literal

A boolean literal can take only one of the two boolean values represented by the words true or false.

Boolean literals can only be assigned to variables declared as Boolean.

Only true and false values are allowed for boolean literals

10 (a) int (b) long (c) double (d) char

11 A boolean data type is used to store one of the two boolean values — true or false. The size of boolean data type is 8 bits or 1 byte.
Example:
boolean bTest = false;

12 Primitive data types are the basic or fundamental data types used to declare a variable. Examples of primitive data types in Java are byte, short, int, long, float, double, char, boolean.

13 Data types tells Java how much memory it should reserve for storing the value. Data types also help in preventing errors as the compiler can check and flag illegal operations at compile time itself.

14

(a) In implicit type conversion, the result of a mixed mode expression is obtained in the higher most data type of the variables without any intervention by the user.
Example:

```
int a = 10;
float b = 25.5f, c;
c = a + b;
```

(b) In explicit type conversion, the data gets converted to a type as specified by the programmer. For example:

```
int a = 10;
double b = 25.5;
float c = (float)(a + b);
```

15 In a mixed-mode expression, the process of promoting a data type into its higher most data type available in the expression without any intervention by the user is known as Coercion.
Example:

```
byte b = 42;
int i = 50000;
double result = b + i;
```

16 The process of converting one predefined type into another is called type conversion. In an implicit conversion, the result of a mixed mode expression is obtained in the higher most data type of the variables without any intervention by the user. For example:

```
int a = 10;
float b = 25.5f, c;
c = a + b;
```

In case of explicit type conversion, the data gets converted to a type as specified by the programmer. For example:

```
int a = 10;
double b = 25.5;
float c = (float)(a + b);
```

17 In static declaration, the initial value of the variable is provided as a literal at the time of declaration. For example:

```
int mathScore = 100;
double p = 1.4142135;
char ch = 'A';
```

In dynamic declaration, the initial value of the variable is the result of an expression or the return value of a method call. Dynamic declaration happens at runtime. For example:

```
int a = 4;
int b = Math.sqrt(a);

double x = 3.14159, y = 1.4142135;
double z = x + y;
```

18 A non-primitive data type is one that is derived from Primitive data types. A number of primitive data types are used together to represent a non-primitive data type. Examples of non-primitive data types in Java are Class and Array.

19 (i) Return data type is double.

(ii) Return data type is double.

20 int i; float f; double d; char c; byte b;

(a) i + c/b;

⇒ int + char / byte
⇒ int + char
⇒ int

(b) f/d + c*f;

⇒ float / double + char * float
⇒ double + float
⇒ double

(c) i + f - b*c;

⇒ int + float - byte * char
⇒ int + float - char
⇒ float - char
⇒ float

(d) (f/i)*c + b;
⇒ (float / int) * char + byte
⇒ float * char + byte
⇒ float + byte
⇒ float

(e) i + f- c + b/d;

⇒ int + float - char + byte / double
⇒ int + float - char + double
⇒ float - char + double
⇒ float + double
⇒ double

(f) i/c + f/b
⇒ int / char + float / byte
⇒ int + float
⇒ float