Programming Fundamentals

Read, Expressions, Operators

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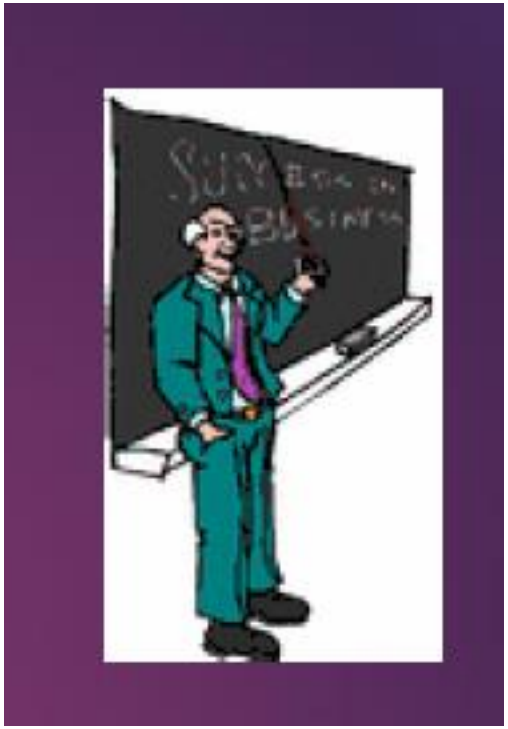
Lecture 04

Outline

- Read Java Console Input
- Arithmetic Expressions
- Boolean Expressions
  - Relational expressions
  - Logical Expressions
- Assignment Operators
- Increment and decrement operators



Read Java Console Input

- **Scanner Class in Java**
  - This is presumably the most favored technique to take input.
  - The Scanner class is to parse primitive composes and strings utilizing general expressions.
- **Pros –**
  - Helpful strategies for parsing natives (nextInt(), nextFloat(), …) from the tokenized input.

- The `Scanner` class is used to get user input, and it is found in the `java.util` package.
- To use the `Scanner` class, create an object of the class and use any of the available methods found in the `Scanner` class documentation.
- `nextLine()` method is used to read Strings.

For more information, see this link: https://data-flair.training/blogs/read-java-console-input/

Read Java Console Input (Example)

Method	Description
nextBoolean()	Reads a boolean value from the user
nextByte()	Reads a byte value from the user
nextDouble()	Reads a double value from the user
nextFloat()	Reads a float value from the user
nextInt()	Reads a int value from the user
nextLine()	Reads a String value from the user
nextLong()	Reads a long value from the user
nextShort()	Reads a short value from the user
next().charAt(0)	Reads a character value from the user

Read Java Console Input (Example)

```
import java.util.Scanner;
public class ReadSys
{
   public static void main(String args[])
   {
      Scanner in = new
Scanner(System.in);
      System.out.println("Enter String");
      String s = in.nextLine();
      System.out.println("You entered
string "+s);
      System.out.println("Enter Integer");
      int a = in.nextInt();
      System.out.println("You entered integer "+a);
      System.out.println("Enter Float");
      float b = in.nextFloat();
      System.out.println("You entered float "+b);
      System.out.println("Enter Character");
      char c = in.next().charAt(0);
      System.out.println("You entered character"+c);
   }
}
```

Dialog Boxes for Input /Output

- A dialog box is a small graphical window that displays a message to the user or requests input. Two of the dialog boxes are: –
  - **Message Dialog** - a dialog box that displays a message.
  - **Input Dialog** - a dialog box that prompts the user for input.

- The 'javax.swing.JOptionPane' class offers dialog box methods. The following statement must be before the program's class header:
  - import javax.swing.JOptionPane;

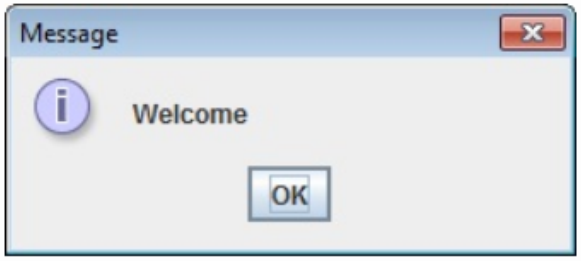
Message Dialog Box

- Syntax :
  - JOptionPane.showMessageDialog (null, <message>)

```
import javax.swing.JOptionPane;    // Needed for Dialog Box

/**
 *   This program demonstrates
 *   showMessageDialog.
 */
public class MessageDialogDemo
{
   public static void main(String[] args)
   {
      JOptionPane.showMessageDialog(null, "Welcome");
   }
}
```

Output :



```java
import javax.swing.JOptionPane;    // Needed for Dialog Box

/**
 *    This program demonstrates
 *    showInputDialog.
 */
public class InputDialogDemo
{
   public static void main(String[] args)
   {
      String name;

      // Get the user's name.
      name = JOptionPane.showInputDialog("What is your name? ");

      // Display message
      JOptionPane.showMessageDialog(null, "Hello " + name);
   }
}
```

Program Output

Arithmetic Operators

Arithmetic operators

Operator	example	Meaning
+	a + b	Addition –unary
-	a – b	Subtraction- unary
*	a * b	Multiplication
/	a / b	Division
%	a % b	Modulo division- remainder

Arithmetic Operators

- Operators: **+, -, * /**
- For **floating numbers**, the result as same as Math operations.
- Note on **integer** division: the result is an integer. **7/2 is 3**.
- **%** (remainder or modulo) is the special operator just for integer. It yields an integer as the result. **7%2 is 1**.
- Both / and % can only be used for positive integers.
- Precedence rule is similar to Math.

Arithmetic Expressions

- Arithmetic operations can be used to express the mathematic expression in Java

$$b^2 - 4ac$$

$$b*b-4*a*c$$

$$x(y+z)$$

$$x*(y+z)$$

$$\frac{1}{x^2+x+3}$$

$$1/(x*x+x+3)$$

$$\frac{a+b}{c-d}$$

$$(a+b)/(c+d)$$

Increment and Decrement Operators

- Denoted as ++ or --
- Mean increase or decrease by 1
- Pre increment/decrement: ++a, --a
  - Increase/decrease by 1 before use.
- Post increment/decrement: a++, a--
  - Increase/decrease by 1 after use.
- Pre and Post increment/decrement yield different results when combining with another operation.

Pre and Post (Increment and Decrement)

```
int   count ;
count  =  0;
while (count < 5)
{   System.out.println( count++) ;
}
System.out.println("Done");
```

count	Expression	Output
0	true	0
1	true	0 1
2	true	0 1 2
3	true	0 1 2 3
4	true	0 1 2 3 4
5	false	0 1 2 3 4 Done

```
int   count ;
count  =  0;
while (count < 5)
{
    System.out.println (++count );
}
System.out.println("Done");
```

count	Expression	Output
0	true	1
1	true	1 2
2	true	1 2 3
3	true	1 2 3 4
4	true	1 2 3 4 5
5	false	1 2 3 4 5 Done

`boolean` Data Type

- Type **`boolean`** is a built-in type consisting of just 2 values, the constants true and false

- We can declare variables of type **boolean**

```
boolean isJavaFun = true;
boolean isFishTasty = false;
System.out.println(isJavaFun); // Outputs true
System.out.println(isFishTasty); // Outputs false
```

Boolean Expression

- **Expression that yields boolean result**
- **Include:**

  6 Relational Operators

  < <= > >= == !=

  3 Logical Operators

  ! && ||

Relational Operators

Operator	Meaning
<	Is less than
<=	Is less than or equal to
>	Is greater than
>=	Is greater than or equal to
==	Equal to
!=	Not equal to

Relational Operators

are used in boolean expressions of form:

ExpressionA	*Operator*	*ExpressionB*
temperature	**>**	**humidity**
B * B - 4.0 * A * C	**>**	**0.0**
abs (number)	**==**	**35**
initial	**!=**	**'Q'**

- **Notes:**
  - == (equivalency) is **NOT** = (assignment)
  - characters are compared alphabetically. However, lowercase letters are higher ASCII value.
  - An integer variable can be assigned the result of a logical expression
  - You cannot string inequalities together:

    Bad Code: **4<x<6** Good Code: **(x > 4) &&(x < 6)**

Relational Operators

```
int  x, y ;
x = 4;
y = 6;
```

EXPRESSION	VALUE
x < y	true
x + 2 < y	false
x != y	true
x + 3 >= y	true
y == x	false
y == x+2	true
y = x + 3	7
y = x < 3	0
y = x > 3	1

Logical Operators

are used in boolean expressions of form:

ExpressionA Operator ExpressionB

A || B (true if either A or B or both are true. It is false otherwise)

A && B (true if both A and B are true. It is false otherwise)

Logical Operators

Logical Operators

Operator	Meaning
&&	Logical AND
||	Logical OR
!	Logical NOT

Logical expression or a compound relational expression-

An expression that combines two or more relational expressions

Ex: if (a==b && b==c)

Logical Operators

```
int     age ;
bool   isSenior,  hasFever ;
float   temperature ;
age = 20;
temperature = 102.0 ;
isSenior = (age >= 55) ;                    // isSenior is  false
hasFever =  (temperature > 98.6) ;          // hasFever is  true
```

EXPRESSION	VALUE
isSenior && hasFever	false
isSenior || hasFever	true
!isSenior	true
!hasFever	false

Boolean Expression (examples)

taxRate is over 25% and *income* is less than $20000

temperature is less than or equal to 75 or *humidity* is less than 70%

age is between 21 and 60

age is 21 or 22

Boolean Expression (examples)

(taxRate > .25) && (income < 20000)

(temperature <= 75) || (humidity < .70)

(age >= 21) && (age <= 60)

(age == 21) || (age == 22)

Assignment operators

Shorthand Assignment operators

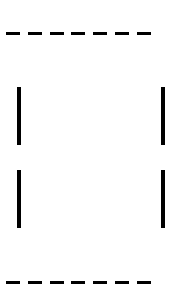
Simple assignment operator	Shorthand operator
a = a+1	a + =1
a = a-1	a - =1
a = a* (m+n)	a * = m+n
a = a / (m+n)	a / = m+n
a = a %b	a %=b

Example: Group Activity 1

- Write a program in Java to read three degrees of a student and calculate the average and then print it.

Example: Group Activity 2

- Write a program in Java to print the following figure.



Example: Group Activity 3

- Write a program in Java to ask a cashier to read a barcode and price of two items and then the output should be like the following message:

  - The bar code of the first item is:#0008999ff, it's price is: 3500 Iraqi Dinner

Lecture Summary

- In this lecture, we discussed:
  - Input: Scanner
  - Arithmetic operations
  - Boolean expressions
  - Many Examples

thank you!