

# TM105 - Meeting 2

(المنهج الحديث - 2024)

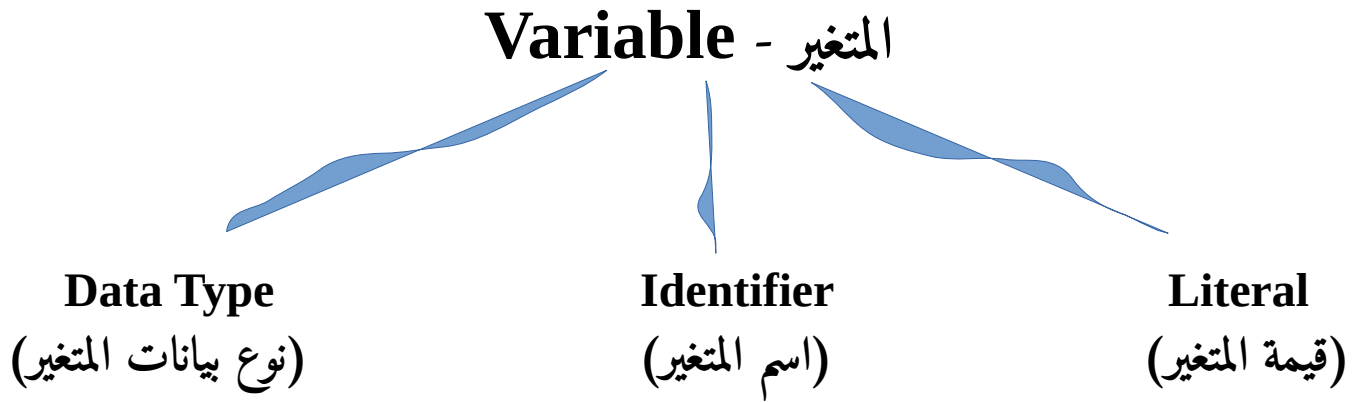


الجامعة العربية المفتوحة  
Arab Open University

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- Variables
- Identifiers
- Data Types
- Literals
- Variable Declaration
- Variable Initialization
- Plus Operate
- Expressions
- How To Evaluate Expressions
- Arithmetic Expressions
- Read From User
- printf()
- If Statement



**Variable:** **location** in the computer's **memory** where a **value** can be **stored**. المتغير عبارة عن مكان في الذاكرة يتم استخدامه بهدف تخزين البيانات.

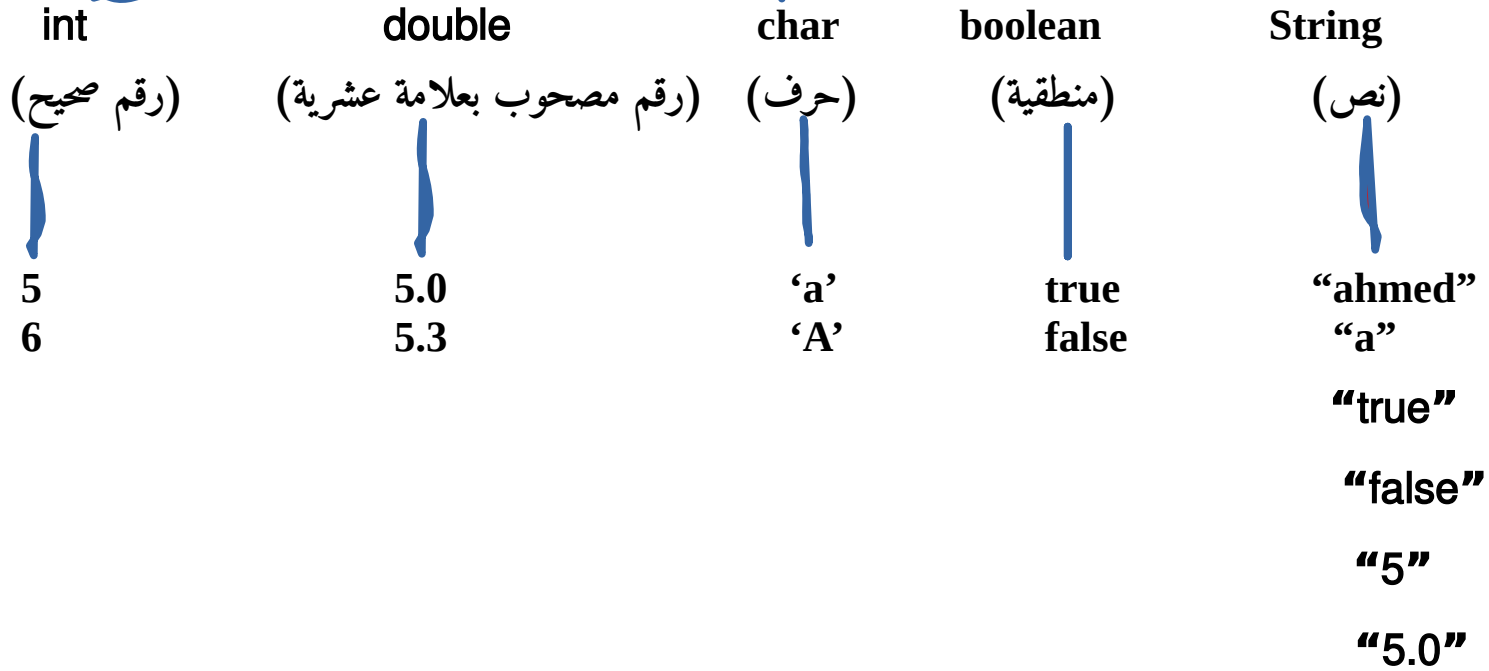
**Identifier:** An identifier is a **sequence of characters** that consist of **letters, digits**, underscores (**\_**), and dollar signs (**\$**).

هو الاسم الذي يتم اختياره للمتغيرات - عبارة عن مجموعة من الحروف والأرقام - أيضاً مسموح بعلامتي **underscore** وال **dollar**

## شروط تسمية المتغيرات - Identifiers naming rules

Valid تسمية مقبولة	Invalid تسمية غير مقبولة	قواعد تسمية المتغيرات
number1 ✓	1number ✗	1. اسم المتغير لا يبدأ برقم
fullname ✓	full name ✗	2. اسم المتغير لا يحتوي على مسافات
full_name full\$name	full#name ✗	3. العلامات الخاصة المسموح بها هي - و \$
True False Void Int Double Class Public Static Void ✓	true false int double public class ✗ static void	4. غير مسموح باستخدام الكلمات المحجوزة كأسماء للمتغيرات
_number1 \$number1 ✓		5. مسموح بأن يبدأ اسم المتغير بعلامة _ او \$
\$ \$_\$_ \$أو \$_ ---		6. أمثلة على أسماء متغيرات <b>مقبولة</b> ولكنها غير شائعة ولا ينصح باستخدامها عند تسمية المتغيرات.

# Data Types



**Literal:** is a constant value that **appears directly** in the **program**.

عبارة عن القيم الثابتة التي يتم اسنادها للمتغيرات

### Example:

5	→ Integral Literal (قيمة رقمية صحيحة)
5.0	→ Floating-Point Literal (قيمة رقمية عشرية)
'a'	→ Character Literal (قيمة حرفية)
"Ahmed"	→ String Literal (قيمة نصية)
true and false	→ Boolean Literal (قيمة منطقية)

---

**Variable Declaration:** It **specifies** a **name** and a **type** of a variable that is used in this program.

هي عملية من خلالها يتم الاعلان عن المتغير ويتم ذلك عن طريق تحديد نوع واسم للمتغير

**Example:** `int number1;` مثال

---

**Variable Initialization:** When a **value (Literal)** assigned to a variable for the **first time**.

هي عبارة عن أسناد قيمة ابتدائية للمتغير

**Examlpe:** `number1 = 10;` مثال



# Test yourself

## The literal is a -----

- A) location in the computer's memory where a value can be stored.
- B) sequence of characters that consist of letters, digits, underscores (\_), and dollar signs (\$).
- C) is a constant value that appears directly in the program.

## The variable is a -----

- A) location in the computer's memory where a value can be stored.
- B) sequence of characters that consist of letters, digits, underscores (\_), and dollar signs (\$).
- C) is a constant value that appears directly in the program.

## The Identifier is a -----

- A) location in the computer's memory where a value can be stored.
- B) sequence of characters that consist of letters, digits, underscores (\_), and dollar signs (\$).
- C) is a constant value that appears directly in the program.

## The statement **double a;** is an example for:

- A) Variable Initialization
- B) Variable declaration

## The literal "true" is an example for:

- A) boolean literal
- B) string literal

## ----- **x = "1";** The data type of the x variable should be:

- A) char
- B) string
- C) int
- C) double

## The **Void** is a valid name for a variable

- A) True
- B) False

# Example

كتابة برنامج لإيجاد حاصل جمع رقمين

Write a program to find the **sum** of two **numbers**.

**Variable names(Identifiers):**

**sum**

**number1**  
**number2**

```
File Edit View Navigate Code Refactor Build Run Tools VCS Window Help
untitled src Test main
Test.java
1 public class Test {
2
3     public static void main(String[] args) {
4
5         //Declaration:
6         int number1, number2, sum;
7
8         //Initialization:
9         number1 = 10;
10        number2 = 20;
11
12        //Find sum:
13        sum = number1 + number2;
14
15        //Print sum:
16        System.out.println(sum);
17
18    }
19 }
```

*// Declaration*  
*int number1;*  
*int number2;*  
*int sum;*  
*// initialization*  
*number1 = 10;*  
*number2 = 20;*  
*// Find Sum*  
*sum = n1 + n2;*  
*// Print Sum*  
*sop(sum);*

Version Control Run TODO Problems Terminal Services Build  
// Build completed successfully in 1 sec, 843 ms (9 minutes ago) 12:20 LF UTF-8 4spaces



# The (+) operator

The (+) binary operator Operates on two operands: Operand1 + Operand2

هو معامل يقوم بعملية معينة على معاملين فقط (Tow operands)

The (+) binary operator



**Addition Operator** (معامل جمع حسابي)

(if operand1 and operand2 are numbers)



**Concatenation Operator** (معامل دمج نصي)

(if any one of the two operands is a string)

## Example:

### (Addition Operator)

```
System.out.println(2 + 3);  
System.out.println(2.5 + 3);
```

### ( Concatenation Operator)

```
System.out.println("Welcome " + "To Java");  
System.out.println("Sum = " + 117);  
System.out.println(117 + " Is the sum.");  
System.out.println("3" + "5");  
System.out.println("sum = " + 3 + 5);  
System.out.println("sum = " + (3 + 5));  
System.out.println(3 + 5 + " = Sum");
```

The screenshot displays the IntelliJ IDEA IDE interface. The main editor window shows a Java file named `Test3.java` with the following code:

```
public static void main(String[] args) {  
    System.out.println( 3 + 4 ); // addition operator  
    System.out.println("Sum = " + 117); // concatenate operator  
    System.out.println("Sum = " + 3 + 4 ); // concatenate operator  
    System.out.println("Sum = " + ( 3 + 4 )); // 1-concatenate : 2- addition  
    System.out.println( 3 + 4 + " = sum"); //1- addition : 2- concatenate
```

The code is executed, and the output is shown in the Run window at the bottom. The output consists of five lines:

```
/usr/lib/jvm/zulu-17-amd64/bin/java -javaagent:/snap/intellij-idea-community/456/lib/idea_rt.jar=3571  
7  
Sum = 117  
Sum = 34  
Sum = 7  
7 = sum
```

The status bar at the bottom indicates that the build was completed successfully in 2 seconds and 8 milliseconds.

# Expressions

التعبيرات الحسابية

int literal	5	int expression	2 + 3
double literal	5.0	double expression	2.0 + 3
boolean literal	true or false	boolean expression	2 > 1 or 1 > 2
String literal	"TM105"	sting expression	"TM" + "105"

```
int number1 = 5;
int number2 = (2 + 3);
double number3 = 5.0;
double number4 = (2.0 + 3);
boolean isTrue1 = true;
boolean isTrue2 = (2 > 1);
boolean isTrue3 = false;
boolean isTrue4 = (2 < 1);
String courseName1 = "TM105";
String courseName2 = ("TM" + "105");
```



## Test yourself

What the type of the following expressions?

- $3 + 4.5 + 7$
- $5 > 4$
- "a" + "b"

# How to evaluate expressions

## كيفية حساب قيمة الاكسبريشن

+ and -	$6 + 4 - 5 + 1 + 1 = 7$	يتم تنفيذ العملية الحسابية من اليسار الى اليمين
* / %	$5 * 6 / 2 = 15$	يتم تنفيذ العملية الحسابية من اليسار الى اليمين
() + / * -	$3 + 4 * 4 + 5 * (4 + 3) - 1 = ?$	يتم تنفيذ العملية الحسابية طبقاً لأولويات تنفيذ معينة كما يلي :

1. يتم التخلص من الأقواس
2. يتم التخلص من عملية الضرب أو القسمة أو باقي القسمة أيهم على اليسار
3. يتم التخلص من عمليات الجمع والطرح أيهما على اليسار

$$3 + 4 * 4 + 5 * (4 + 3) - 1$$

$$3 + 4 * 4 + 5 * 7 - 1$$

$$3 + 16 + 5 * 7 - 1$$

$$3 + 16 + 35 - 1$$

$$19 + 35 - 1$$

$$54 - 1$$

$$53$$



## Test yourself

**Evaluate the following expressions (Write steps):**

- $1 + 8 / 4 - 5 * 4 + 9 - 1$
- $1 + 8 / 4 - 5 * 4 + (9 - 1)$
- $12 + 2 * 8 / 4 - 2 + 5$

**If  $x = 2$ ,  $y = 3$ , and  $z = 6$ . Evaluate the following expression (Write steps):**

- $2 * x + (3 * y + z) + x * z$
- $y + z / x + (y + z)$

# Arithmetic Expression

Arithmetic Expression	Java Equivalent
$4x$	$4 * x$
$\frac{3+4x}{5}$	$(3 + 4 * x) / 5$
$\frac{5}{3+4x}$	$5 / (3 + 4 * x)$
$\frac{2x}{a+b}$	$2 * x / (a + b)$
$\frac{a+b}{2x}$	$(a + b) / (2 * x)$



## Test yourself

Convert the following arithmetic expression to the Equivalent java code:

1.  $9\left(\frac{4}{5x} + \frac{9+x}{3y}\right)$

2.  $\frac{2a+b}{7}$

3.  $\frac{a^2+b^2}{2c}$  → **Note:**  $a^2 = a * a$

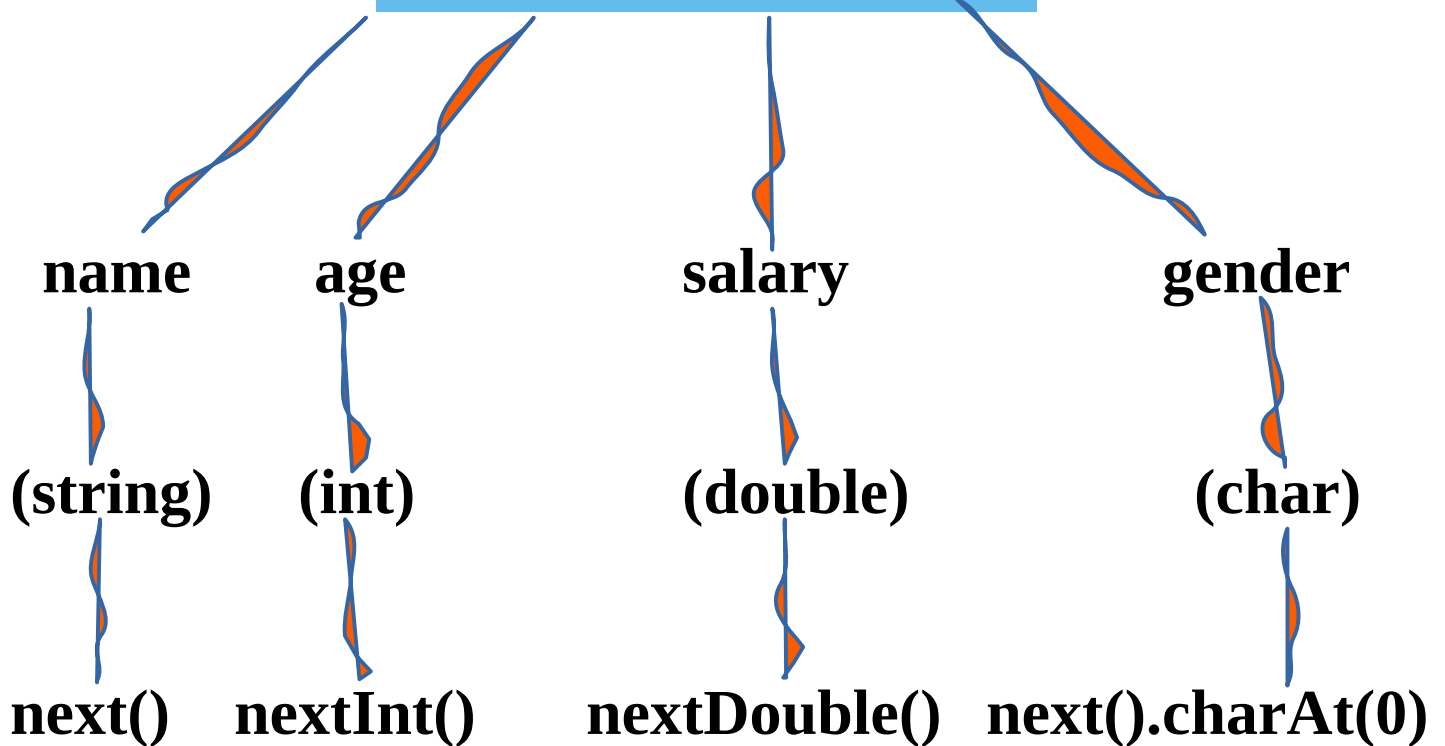
4.  $\frac{2x}{y^3}$  → **Note:**  $y^3 = y * y * y$

## تخصيص قيمة للمتغير من داخل البرنامج

```
String name = "ahmed";  
int age = 40;  
double salary = 5.6;  
char gender = 'm';
```

## تخصيص قيمة للمتغير عن طريق المستخدم

**Ask user to enter**



# Reading From User

```
Scanner s = new Scanner(System.in);
```

```
System.out.print("Enter your name: ");
```

```
String name = s.next(); // Reading a string from user
```

```
System.out.print("Enter your age: ");
```

```
int age = s.nextInt(); // Reading an integer from user
```

```
System.out.print("Enter your salary: ");
```

```
double salary = s.nextDouble(); // Reading a real number from user
```

```
System.out.print("Enter your gender: ");
```

```
char gender = s.next().charAt(0); // Reading a char from user
```



## Test yourself

```
----- input = new Scanner(-----);
```

```
System.out.print("Enter your -----: ");
```

```
int score = input.-----;
```

```
System.out.print("Enter your name: ");
```

```
----- name = input.-----;
```

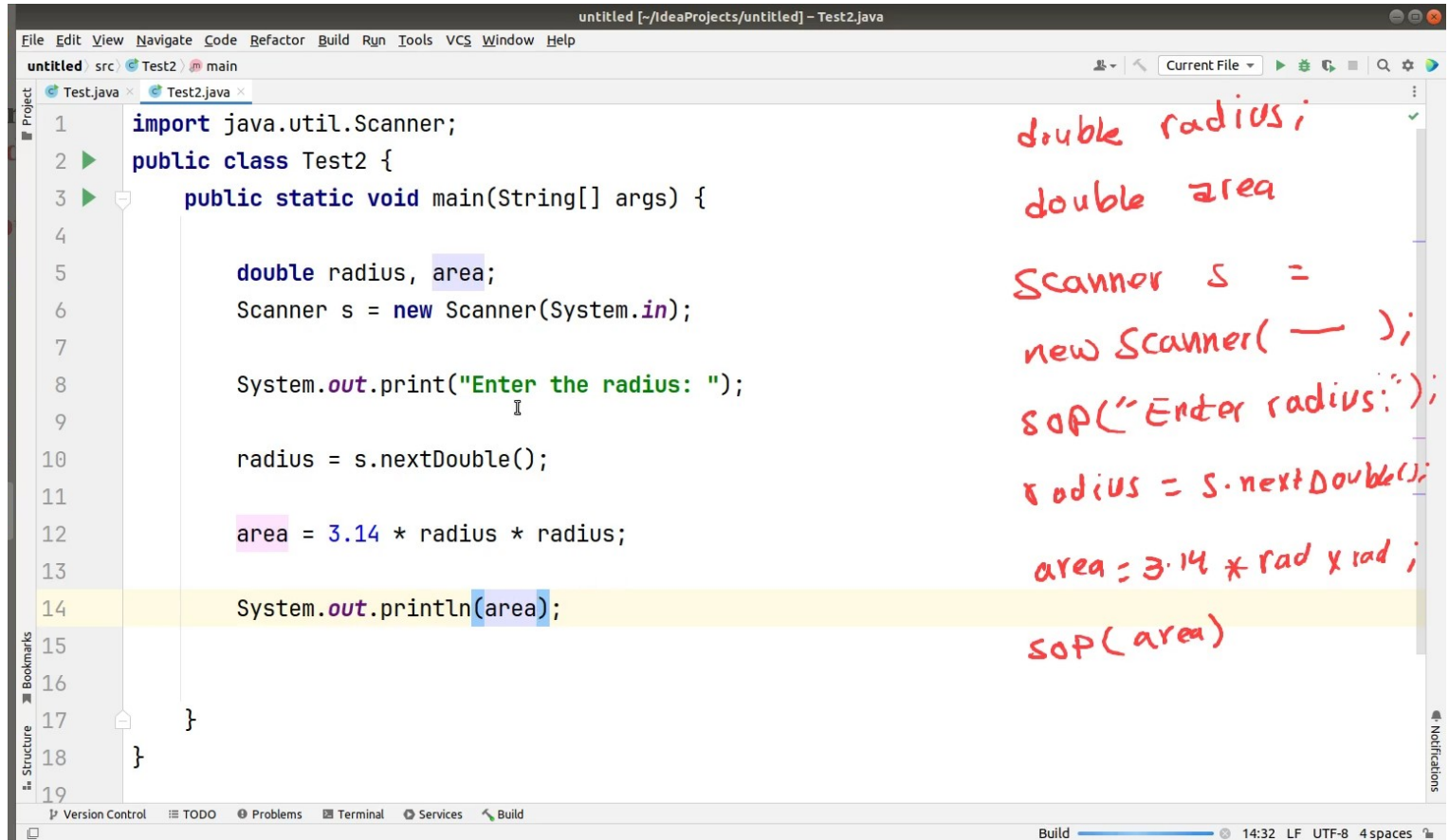
```
System.out.println("Your score = " + -----);
```



## Example:

Write Java program to read the radius of a circle and find its area. The radius should be a real number.

Note:  $\text{area} = 3.14 * \text{radius} * \text{radius}$



```
1 import java.util.Scanner;
2 public class Test2 {
3     public static void main(String[] args) {
4
5         double radius, area;
6         Scanner s = new Scanner(System.in);
7
8         System.out.print("Enter the radius: ");
9
10        radius = s.nextDouble();
11
12        area = 3.14 * radius * radius;
13
14        System.out.println(area);
15
16    }
17 }
18
19 }
```

Handwritten notes on the right side of the code editor:

- double radius;
- double area
- Scanner s =
- new Scanner( — );
- sop("Enter radius:");
- radius = s.nextDouble();
- area = 3.14 \* rad x rad ;
- sop(area)



## Test yourself

Write Java program to read the radius of a circle and find its Circumference. The radius should be a real number.

Note:  $\text{circumference} = 2 * 3.14 * \text{radius}$

# Printf()

Print()/println()	Output	Printf()	Output
<code>char c = 'a'; System.out.println(c);</code>	<b>a</b>	<code>char c = 'a'; System.out.printf("%c", c);</code>	<b>a</b>
<code>int i = 3; System.out.println(i);</code>	<b>3</b>	<code>int i = 3; System.out.printf("%d", i);</code>	<b>3</b>
<code>String name = "ali"; System.out.println(name);</code>	<b>ali</b>	<code>String name = "ali"; System.out.printf("%s", name);</code>	<b>ali</b>
<code>boolean b = true; System.out.println(b);</code>	<b>true</b>	<code>boolean b = true; System.out.printf("%b", b);</code>	<b>true</b>
<code>double d = 3.534521; System.out.println(d);</code>	<b>3.534521</b>	<code>double d = 3.534521; System.out.printf("%f", d);</code>	<b>3.534521</b>
		<code>double d = 3.532521; System.out.printf("%.2f", d);</code>	<b>3.53</b>
		<code>double d = 3.536521; System.out.printf("%.2f", d);</code>	<b>3.54</b>

## Note:

```
String name = "ali";  
System.out.printf("The name is %s", name);  
System.out.printf("%s is his name", name);  
int score = 20;  
System.out.printf("Your name is %s and your score is %d", name, score);
```

## Output:

The name is **ali**  
**ali** is his name  
Your name is **ali** and your score is **20**

## Example:

Write program to read the length and the width of the rectangle and prints the perimeter of that rectangle. The length and width of rectangle should be real numbers. Use printf() method to print the perimeter rounded to 2 decimal places.

Note:  $\text{perimeter} = 2 (\text{length} + \text{width})$ .

```
untitled [~/IdeaProjects/untitled] - Test5.java
File Edit View Navigate Code Refactor Build Run Tools VCS Window Help
untitled src Test5
Test.java Test2.java Test3.java Test4.java Test5.java
1 import java.util.Scanner;
2 public class Test5 {
3     public static void main(String[] args) {
4         double length, width, perimeter;
5         Scanner s = new Scanner(System.in);
6         System.out.println("Enter length: ");
7         length = s.nextDouble();
8         System.out.println("Enter width: ");
9         width = s.nextDouble();
10        perimeter = 2 * (length + width);
11        System.out.printf("The value of perimeter = %.2f", perimeter);
12    }

```

double L, W, P;  
Scanner S =  
new Scanner(—);  
sop("Enter Length:");  
L = S.nextDouble();  
sop("Enter width:");  
W = S.nextDouble();  
P = 2 \* (L + W);  
printf("%.2f", P);

Run: Test5  
Enter length:  
3.112312  
Enter width:  
4.5437321  
The value of perimeter = 15.31  
Process finished with exit code 0

Version Control Run TODO Problems Terminal Services Build  
// Build completed successfully in 2 sec, 83 ms (5 minutes ago) 16:1 LF UTF-8 4spaces



## Test yourself

Write java program that prompt the user to enter his name and his salary. The salary should be a real number. The program displays on the screen the following message using printf() method:

Your name is name and your salary is salary.

**Note:** the salary should be rounded to 3 decimal places.

# If Statement



## One-Way

Ex:

```
int age = 15;  
if ( age > 18 ) {  
    sop("You can vote");  
}
```

## Two-Way

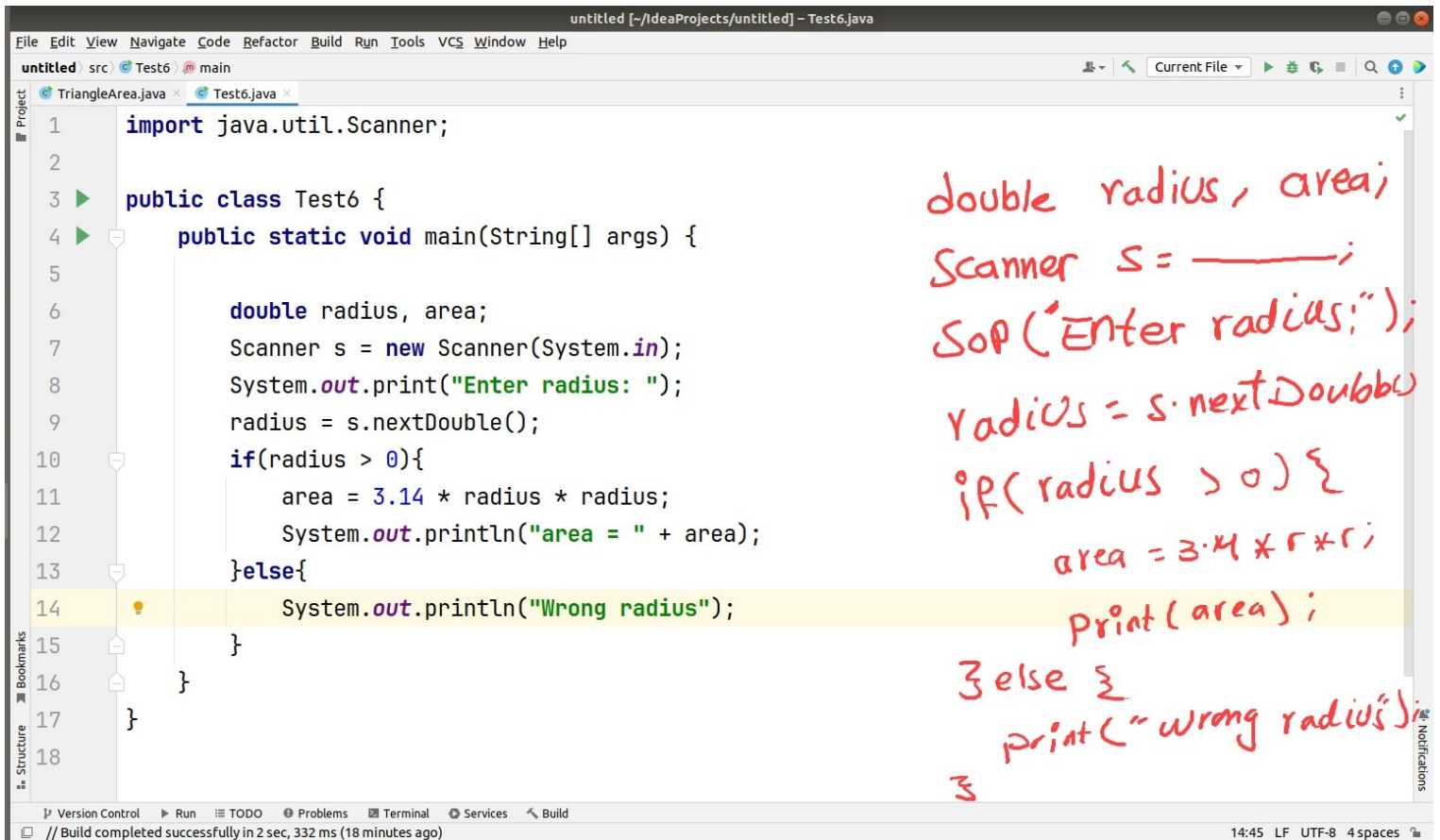
Ex:

```
int age = 20;  
if ( age > 18 ) {  
    sop("You can vote");  
else{  
    sop("Sorry. You can not vote")  
}
```

## Example:

Write Java program to read the radius of a circle. The radius should be a real number. The program calculates and prints the area of circle if the radius is positive, otherwise, the program displays an error message to user.

**Note:**  $\text{area} = 3.14 * \text{radius} * \text{radius}$



```
1 import java.util.Scanner;
2
3 public class Test6 {
4     public static void main(String[] args) {
5
6         double radius, area;
7         Scanner s = new Scanner(System.in);
8         System.out.print("Enter radius: ");
9         radius = s.nextDouble();
10        if(radius > 0){
11            area = 3.14 * radius * radius;
12            System.out.println("area = " + area);
13        }else{
14            System.out.println("Wrong radius");
15        }
16    }
17 }
18
```

double radius, area;  
Scanner s = \_\_\_\_\_;  
SOP("Enter radius:");  
radius = s.nextDouble();  
if(radius > 0) {  
 area = 3.14 \* r \* r;  
 print(area);  
} else {  
 print("wrong radius");  
}

Build completed successfully in 2 sec, 332 ms (18 minutes ago) 14:45 LF UTF-8 4 spaces



## Test yourself

**Write Java program to read the radius of a circle. The radius should be a real number. The program calculates and print the area if the radius is positive, otherwise, the program displays an error message to user.**

**Note: circumference =  $2 * 3.14 \times \text{radius}$**



2. Write a Java class called TriangleArea that reads from the user the base of a triangle and its height as real numbers. Then calculates and prints the area of the triangle (rounded to 3 decimal places).

$$\text{area} = \frac{1}{2}(\text{base})(\text{height})$$

3. Modify the previous program so that after calculating the area a message is displayed to indicate if the triangle is small or big. A triangle is considered big if its area is 100 or more. Otherwise, it is small.

```
1 import java.util.Scanner;
2 public class TriangleArea {
3
4     public static void main(String[] args) {
5         double base, height, area;
6         Scanner s = new Scanner(System.in);
7         System.out.print("Enter height: ");
8         height = s.nextDouble();
9         System.out.print("Enter base: ");
10        base = s.nextDouble();
11        area = 1.0 / 2 * base * height;
12        System.out.printf("Aea = %.3f\n", area);
13
14        if(area >= 100){
15            System.out.println("Big area");
16        }else{
17            System.out.println("Small area");
18        }
19    }
20 }
```

Handwritten annotations in red:

- `double base, height, area;`
- `Scanner s = new Scanner(System.in);`
- `sop("Enter base");`
- `base = s.nextDouble();`
- `sop("Enter height:");`
- `height = s.nextDouble();`
- `area = 1.0 / 2 * base * height;`
- `printf("%.3f", area);`
- `if (area >= 100){`
- `print("big area");`
- `} else {`
- `print("small area");`
- `}`

IDE status bar: Build completed successfully in 13 sec, 525 ms (4 minutes ago) 17:43 LF UTF-8 4 spaces





## Test yourself

**Write a java program according to the following specifications:**

- **Read 2 real numbers from user x and y.**
- **If y is greater than 0 then calculate and print the value of z rounded to 2 decimal places, otherwise, display an error message to user.**

$$z = 9 \left( \frac{x}{4} + \frac{9+x}{y} \right)$$

## Common error

ONE-way

```
if ( grade >= 50 );  
    System.out.println("Pass");
```



Logic error

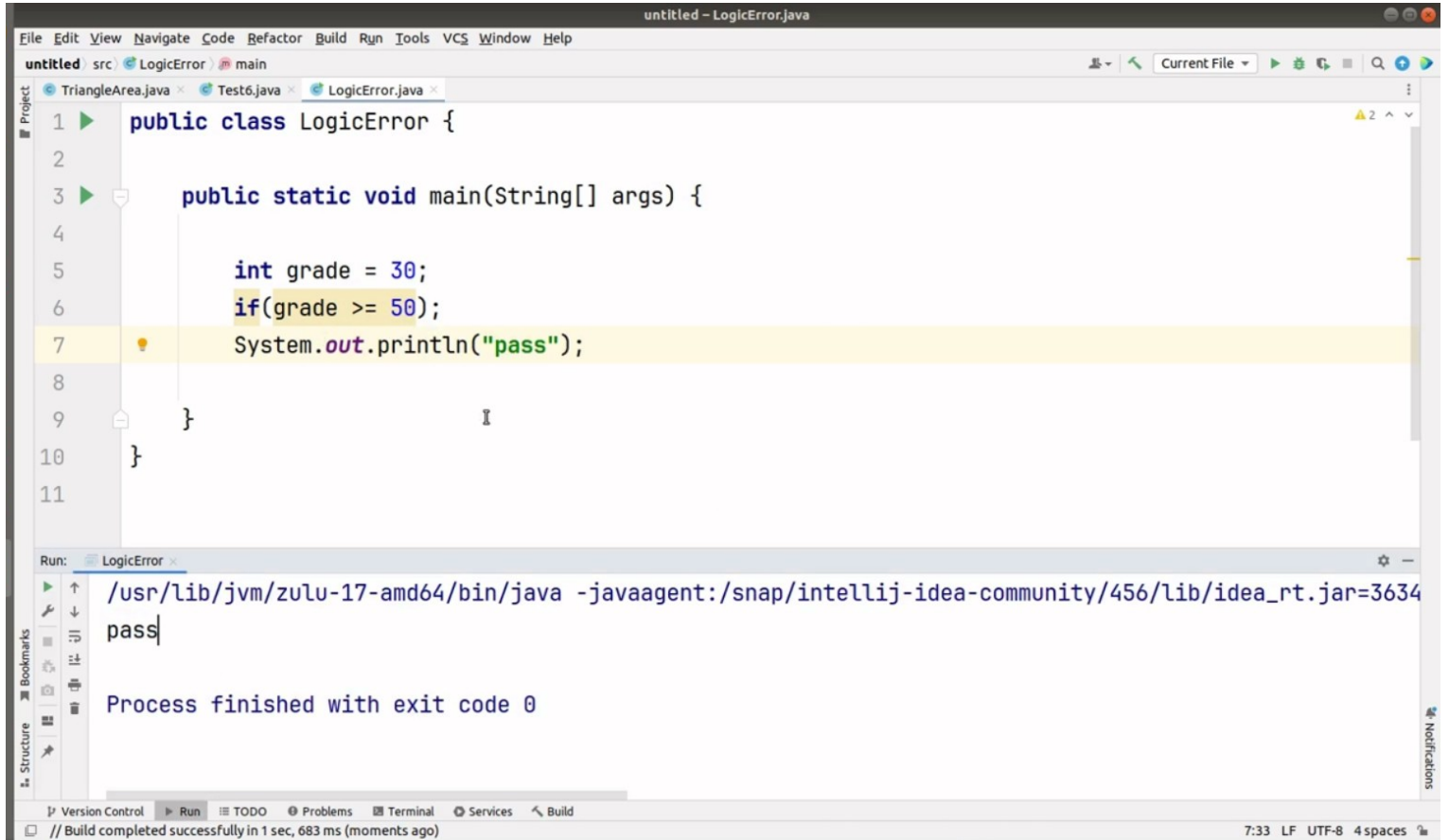
Two-way

```
if ( grade >= 50 );  
    System.out.println("Pass");  
else  
    System.out.println("Fail");
```



Compilation error

# Logic Error Example

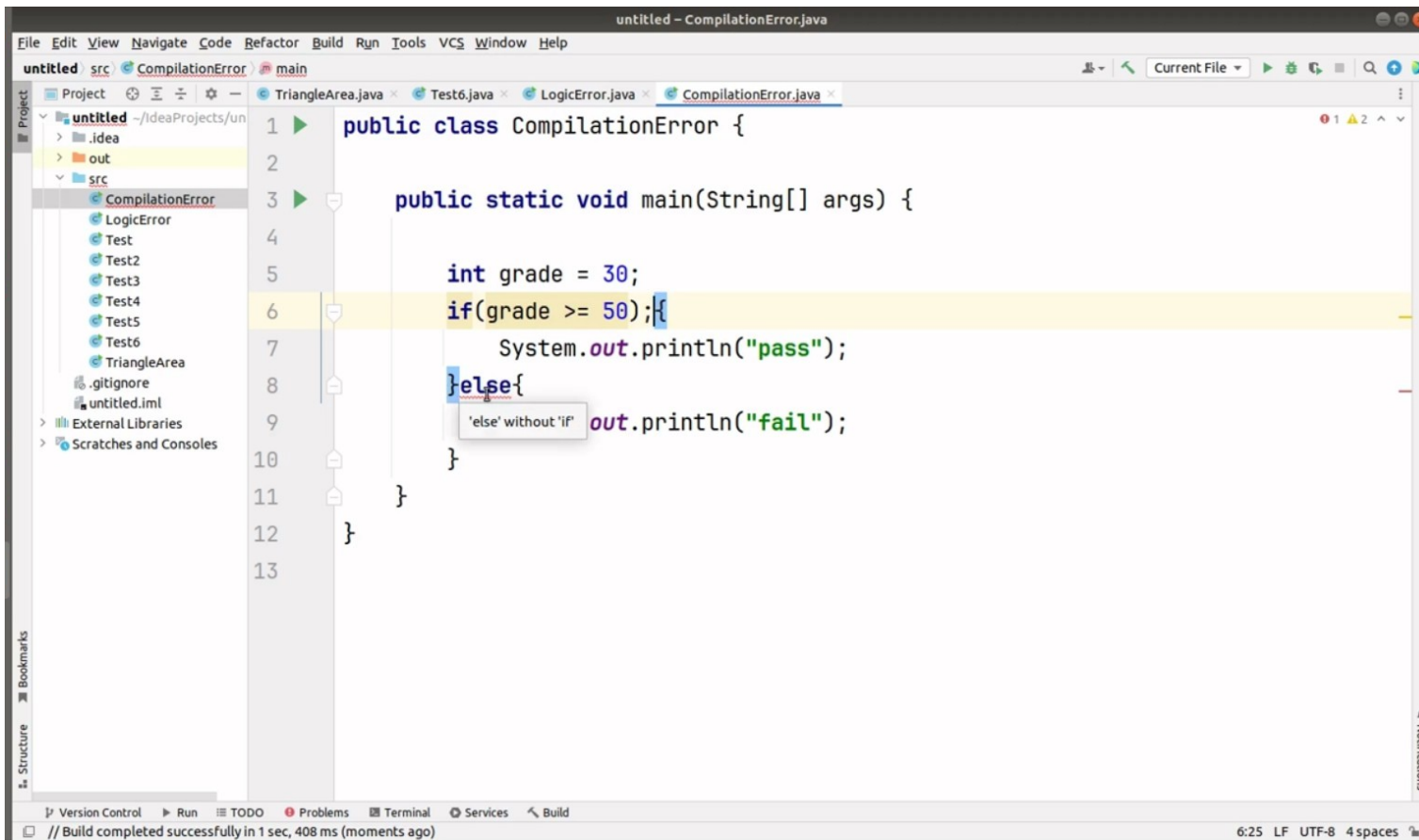


```
untitled - LogicError.java
File Edit View Navigate Code Refactor Build Run Tools VCS Window Help
untitled src LogicError main
TriangleArea.java Test6.java LogicError.java
1 public class LogicError {
2
3     public static void main(String[] args) {
4
5         int grade = 30;
6         if(grade >= 50);
7         System.out.println("pass");
8
9     }
10 }
11

Run: LogicError
/usr/lib/jvm/zulu-17-amd64/bin/java -javaagent:/snap/intellij-idea-community/456/lib/idea_rt.jar=3634
pass
Process finished with exit code 0

// Build completed successfully in 1 sec, 683 ms (moments ago)
7:33 LF UTF-8 4 spaces
```

# Compilation Error Example



# التعريفات المهمة

**Variable:** location in the computer's memory where a value can be stored.

**Identifier:** An identifier is a sequence of characters that consist of letters, digits, underscores (\_), and dollar signs (\$).

**Literal:** is a constant value that appears directly in the program.

**Variable Declaration:** It specifies a name and a type of a variable that is used in this program.

**Variable Initialization:** When a value (Literal) assigned to a variable for the first time.

رابط المينج كامل على اليوتيوب: <https://youtu.be/414hI1EJfSs>

عند وجود أي مشكلة في الوصول إلى المقطع على اليوتيوب يمكنكم التواصل معي على الواتساب

بالتوفيق

مهندس: رمضان ابراهيم