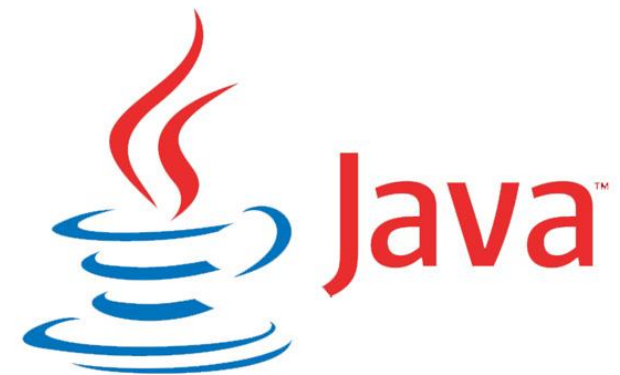


# Pengantar Pemrograman dengan Bahasa Java

IF2123 Aljabar Geometri

Oleh: Rinaldi Munir



Sekolah Teknik Elektro dan Informatika  
ITB











# Sejarah Bahasa Java



James Gosling

- Bahasa java dibuat oleh James Gosling saat masih bergabung di *Sun Microsystems* dan dirilis tahun 1995.
- Bahasa Java dapat dijalankan pada berbagai komputer dan *platform* sistem operasi.
- Slogan Java: *Write once, run anywhere!* (Tulis sekali, jalankan di manapun)
- Java adalah bahasa pemrograman bersifat umum (*general purpose*)
- Sintaks Bahasa Java diadopsi dari Bahasa C dan C++ tetapi lebih sederhana
- Nama “java” diambil dari jenis kopi yang diminum oleh James Gosling saat itu.

- Java termasuk Bahasa pemrograman yang populer untuk mengembangkan aplikasi, termasuk aplikasi berbasis web.

Language Rank	Types	Spectrum Ranking
1. Python	  	100.0
2. C++	  	99.7
3. Java	  	97.5
4. C	  	96.7
5. C#	  	89.4
6. PHP		84.9
7. R		82.9
8. JavaScript	 	82.6
9. Go	 	76.4
10. Assembly		74.1

**Gambar 1. Sepuluh (10) bahasa pemrograman top 2018:**

# IEEE Ranked the Top Programming Languages of 2019.

2019

Rank	Language	Type	Score
1	Python	  	100.0
2	Java	  	96.3
3	C	  	94.4
4	C++	  	87.5
5	R		81.5
6	JavaScript		79.4
7	C#	   	74.5
8	Matlab		70.6
9	Swift	 	69.1
10	Go	 	68.0

Sumber:

<https://learnworthy.net/ieee-ranked-the-top-programming-languages-of-2019/>

2020

# IEEE Ranked the Top Programming Languages of 2020

Rank	Language	Type	Score
1	Python ▾	  	100.0
2	Java ▾	  	95.3
3	C ▾	  	94.6
4	C++ ▾	  	87.0
5	JavaScript ▾		79.5
6	R ▾		78.6
7	Arduino ▾		73.2
8	Go ▾	 	73.1
9	Swift ▾	 	70.5
10	Matlab ▾		68.4

2021

## IEEE Ranked the Top Programming Languages of 2021

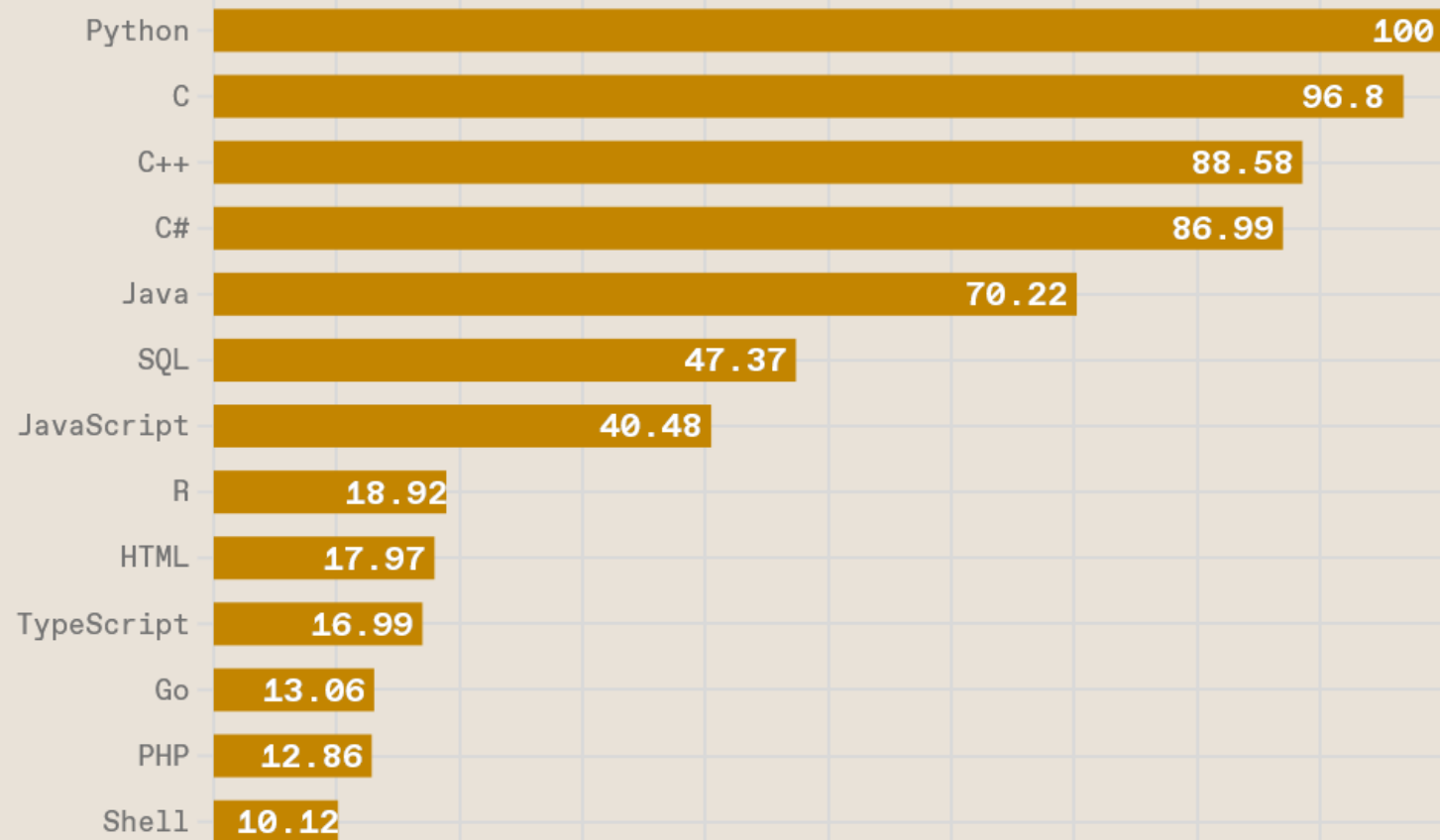
Rank	Language	Type	Score
1	Python	  	100.0
2	Java	  	95.4
3	C	  	94.7
4	C++	  	92.4
5	JavaScript		88.1
6	C#	   	82.4
7	R		81.7
8	Go	 	77.7
9	HTML		75.4
10	Swift	 	70.4

Source: <https://spectrum.ieee.org/top-programming-languages-2021>

# Top Programming Languages 2022












Click a button to see a differently weighted ranking

**Spectrum** Jobs Trending



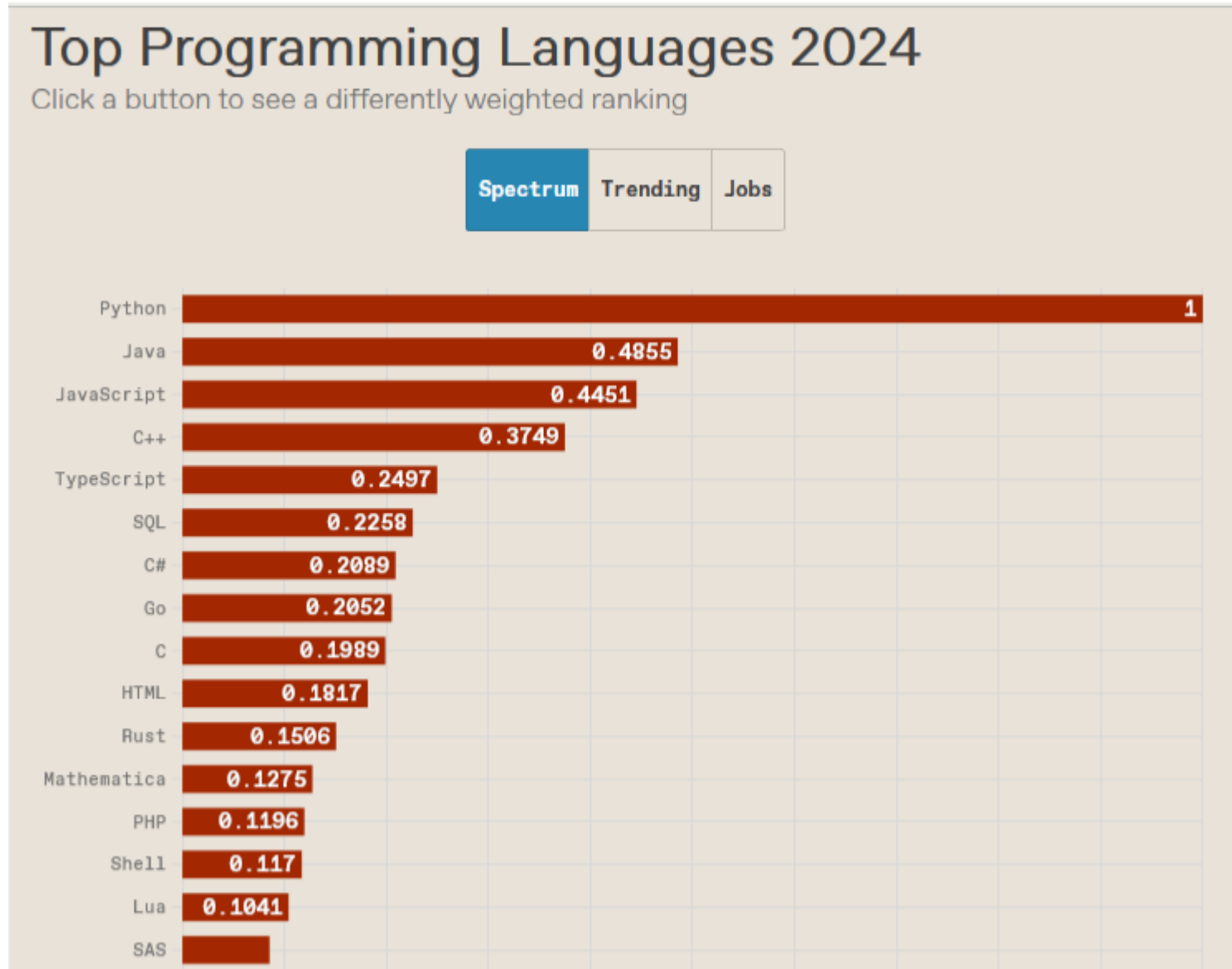
<https://spectrum.ieee.org/top-programming-languages-2022>

## IEEE Ranked the Top Programming Languages of 2023.

Language Rank	Types	Spectrum Ranking
1. Python	 	100.0
2. C	  	99.7
3. Java	  	99.5
4. C++	  	97.1
5. C#	  	87.7
6. R		87.7
7. JavaScript	 	85.6
8. PHP		81.2
9. Go	 	75.1
10. Swift	 	73.7



# IEEE Ranked the Top Programming Languages of 2024

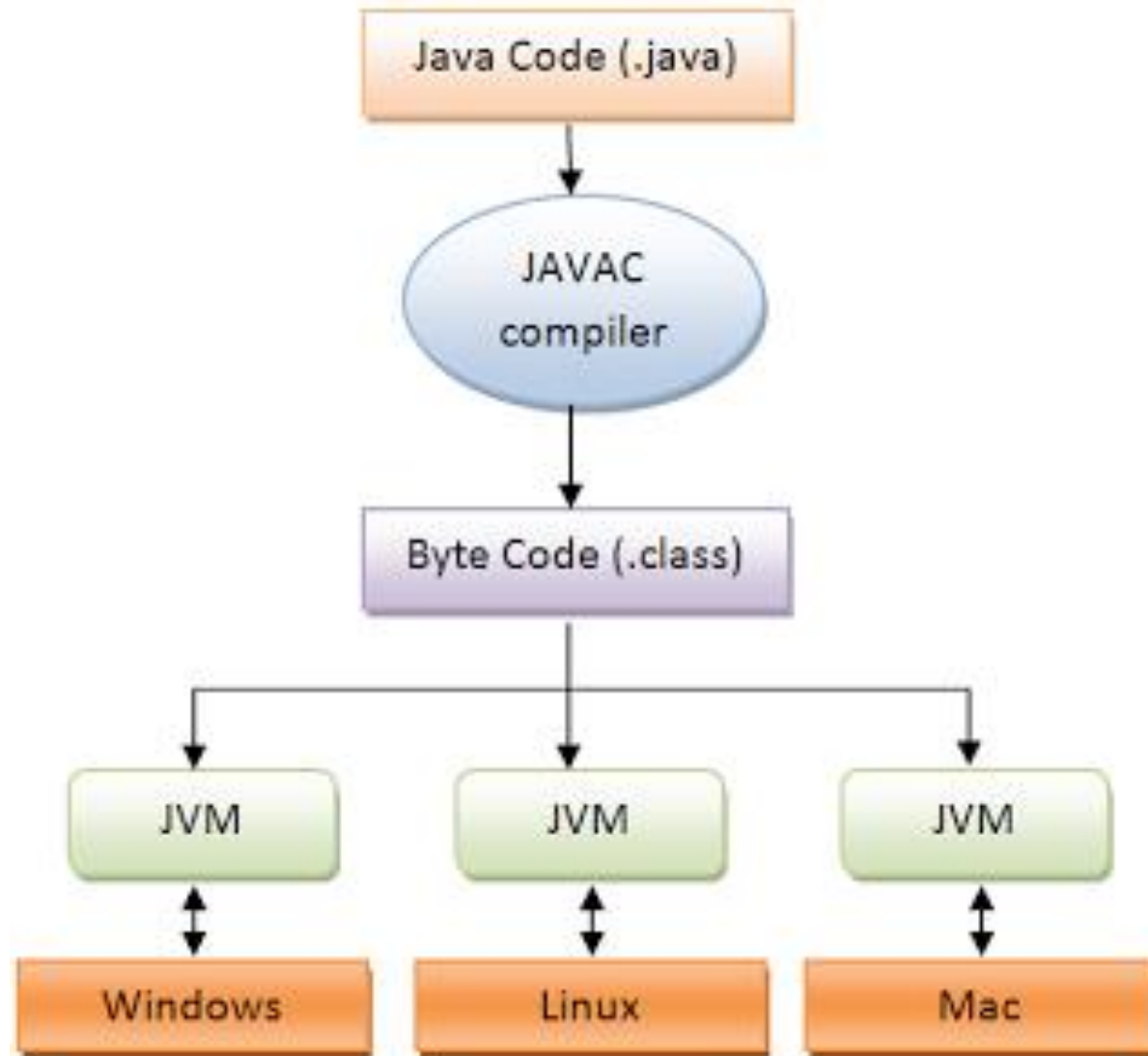


<https://spectrum.ieee.org/top-programming-languages-2024>

# Teknologi Java = Bahasa pemrograman + platform

## Java Sebagai Bahasa Pemrograman

- Bahasa java memiliki karakteristik: *sederhana, berorientasi objek, interpreted, terdistribusi, tangguh, portable, memiliki kinerja tinggi, aman, dinamis*. (Baca di: <http://java.sun.com/docs/white/langenv/>)
- *Compiler* java mengubah kode program menjadi bahasa *intermediate* yang disebut *java bytecode*. Kemudian *interpreter* Java bernama JVM (*Java Virtual Machine*) melakukan interpretasi *bytecode* setiap kali *bytecode* tersebut dijalankan.



Gambar 2. Proses kompilasi dan interpretasi program Java  
(Sumber gambar: <http://belajarjava-19.blogspot.co.id>)

## Java Sebagai Sebuah *Platform*

- *Platform* adalah lingkungan perangkat keras dan perangkat lunak untuk menjalankan program.
- Java adalah *platform* perangkat lunak untuk menjalankan program java.
- *Platform* java terdiri dari dua komponen:
  1. *Java Virtual Machine* (JVM)
  2. *Java Application Programming Interface* (Java API)
- JVM pada dasarnya adalah aplikasi sederhana yang ditulis dalam bahasa C untuk mengeksekusi program yang ditulis dalam bahasa Java.

- Cara kerja JVM: Pada saat eksekusi, JVM membaca *bytecode*, lalu mengubahnya ke bahasa mesin yang sesuai dengan komputer yang menjalankannya.
- Proses kompilasi bahasa java menghasilkan *bytecode* yang selalu sama untuk setiap sistem operasi atau jenis mesinnya, tetapi JVM akan mengubah *bytecode* menjadi bahasa mesin tujuannya.
- Java API merupakan *library* yang disediakan java untuk mengembangkan program java. Java API berisi sekumpulan komponen perangkat lunak yang memudahkan pemrogram java mengembangkan aplikasi.

# Kakas Java

Untuk membuat program java, diperlukan beberapa kakas:

1. *Java Development Kit (JDK)*

Unduh paket JDK (*Java Development Kit*) java terbaru dari laman:

<https://www.oracle.com/id/java/technologies/downloads/>

2. Editor teks

Sembarang editor teks seperti *Notepad*, *Ultraedit*, *Wordpad*, *Vi*, atau *Joe*

# Java Downloads



Java downloads

Tools and resources

Java archive



Looking for other Java downloads?

OpenJDK Early Access Builds

JRE for Consumers

## Java 20 and Java 17 available now

JDK 20 is the latest release of Java SE Platform and JDK 17 LTS is the latest long-term support release for the Java SE platform.

Learn about Java SE Subscription

JDK 20

JDK 17

GraalVM for JDK 20

GraalVM for JDK 17

## JDK Development Kit 20.0.2 downloads

## Java 20 and Java 17 available now

JDK 20 is the latest release of Java SE Platform and JDK 17 LTS is the latest long-term support release for the Java SE platform.

[Learn about Java SE Subscription](#)

[JDK 20](#) [JDK 17](#) [GraalVM for JDK 20](#) [GraalVM for JDK 17](#)

### JDK Development Kit 20.0.2 downloads

JDK 20 binaries are free to use in production and free to redistribute, at no cost, under the [Oracle No-Fee Terms and Conditions](#).

JDK 20 will receive updates under these terms, until September 2023 when it will be superseded by JDK 21.

[Linux](#) [macOS](#) [Windows](#)

Product/file description	File size	Download
x64 Compressed Archive	180.99 MB	<a href="https://download.oracle.com/java/20/latest/jdk-20_windows-x64_bin.zip">https://download.oracle.com/java/20/latest/jdk-20_windows-x64_bin.zip</a> (sha256)
x64 Installer	160.12 MB	<a href="https://download.oracle.com/java/20/latest/jdk-20_windows-x64_bin.exe">https://download.oracle.com/java/20/latest/jdk-20_windows-x64_bin.exe</a> (sha256)
x64 MSI Installer	158.90 MB	<a href="https://download.oracle.com/java/20/latest/jdk-20_windows-x64_bin.msi">https://download.oracle.com/java/20/latest/jdk-20_windows-x64_bin.msi</a> (sha256)



- Untuk pengembangan aplikasi visual (*visual programming*), anda membutuhkan kakas pengembangan java yang mengintegrasikan:
  - JDK
  - Editor teks
  - Editor antarmuka pengguna (GUI = *Graphical User Interface*)
  - Manajemen aplikasi
  - *Debugger*
- Contoh kakas pengembangan java: *Netbeans* dan *Eclipse*

# Netbeans

The screenshot displays the NetBeans IDE interface for a project named 'ECMAScript6Sales'. The interface includes a menu bar, a toolbar, a Projects view on the left, and three code editors in the main workspace.

**Projects View:** Shows the project structure with folders for 'Site Root', 'js', 'src', 'Unit Tests', 'Important Files', and 'npm Libraries'. Files include 'authenticator.js', 'buyer.js', 'main.js', 'thing.js', 'bundle.js', and 'index.html'.

**Code Editors:**

- buyer.js:** Contains a JSDoc comment for a 'buyThing' function, imports for 'verifyName', 'sendThing', and 'sendApology', and the function implementation.
- main.js:** Imports 'buyThing' from './buyer' and calls it with 'John Smith'.
- authenticator.js:** Contains a JSDoc comment for a 'verifyName' function and its implementation.
- thing.js:** Contains JSDoc comments and implementations for 'sendThing' and 'sendApology' functions.

**Navigator:** Shows the current function 'buyThing(name): Boolean|undefined' and its dependencies: 'sendApology', 'sendThing', and 'verifyName'.

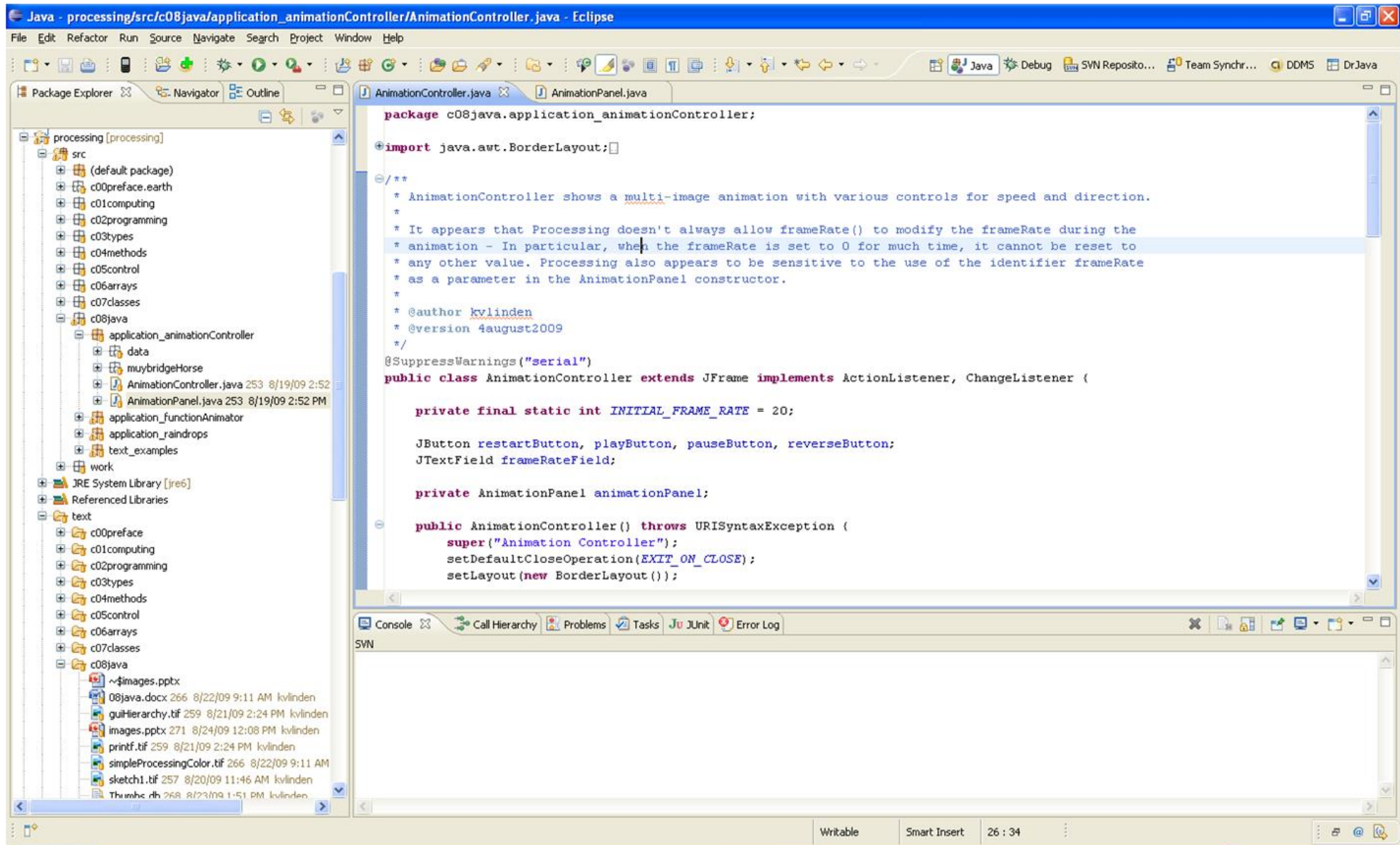
```
1  /**
2  * Buyer for obtaining Thing
3  * for an authenticated name.
4  * @param {type} name
5  * @returns {undefined}
6  */
7  import { verifyName } from './authenticator';
8  import { sendThing } from './thing';
9  import { sendApology } from './thing';
10
11  export function buyThing(name) {
12    console.log(name + " is trying to buy");
13    var verified = verifyName(name);
14    if(verified){
15      sendThing(name);
16    } else {
17      sendApology(name);
18    }
19    return verified;
20  }
```

```
1  import { buyThing } from './buyer';
2
3  name = 'John Smith';
4  console.log(name + " enters the system");
5  var result = buyThing(name);
6  console.log("sale success " + result);
```

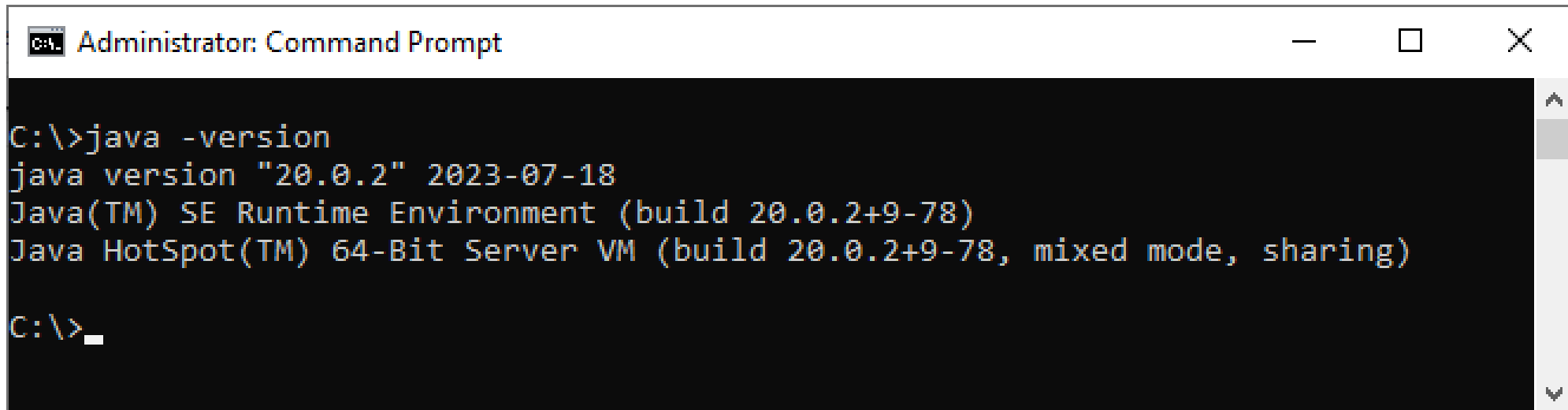
```
1  /**
2  * Verifier for name.
3  * @param {type} name
4  * @returns {undefined}
5  */
6  export function verifyName(name) {
7    var requiredNameLength = 1;
8    console.log("authenticating " + name);
9    return name.length > requiredNameLength;
10 }
```

```
1  /**
2  * Send thing if authentication succeeds.
3  * @param {type} name
4  * @returns {undefined}
5  */
6  export function sendThing(name){
7    console.log("send thing to " + name);
8  }
9
10 export function sendApology(name){
11   console.log("say sorry to " + name);
12 }
```

# Eclipse

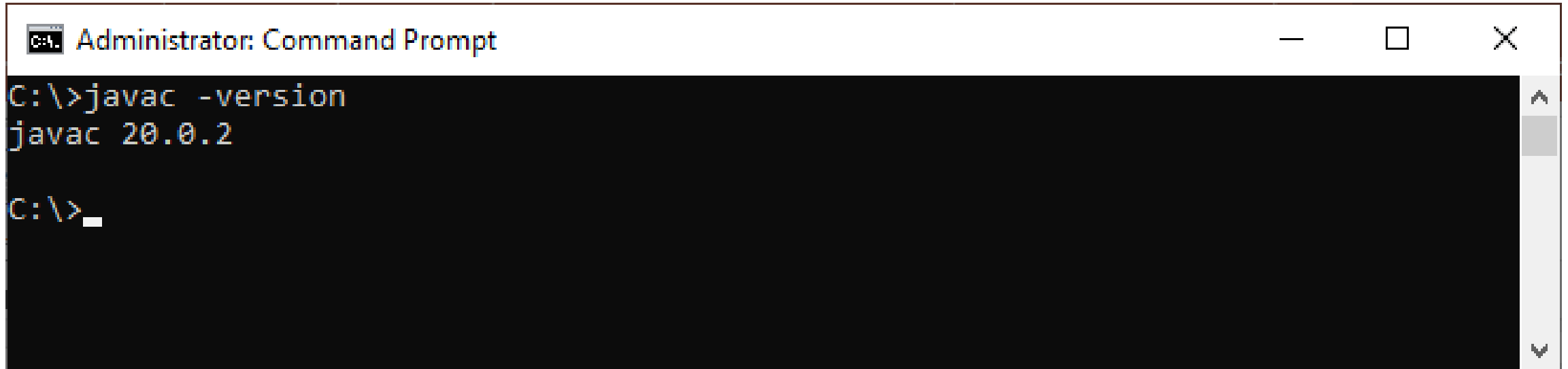


- Instalasilah JDK ke komputer anda dan ikuti semua instruksi untuk menginstalasinya.
- Aturlah nilai *environment variable* PATH melalui Control Panel > System > Advanced > Environment Variables
- Untuk mengetahui versi JRE (*java runtime environment*) yang terinstal:



```
Administrator: Command Prompt
C:\>java -version
java version "20.0.2" 2023-07-18
Java(TM) SE Runtime Environment (build 20.0.2+9-78)
Java HotSpot(TM) 64-Bit Server VM (build 20.0.2+9-78, mixed mode, sharing)
C:\>_
```

- Untuk mengetahui versi *compiler* java yang terinstal, ketikkan dari *prompt* `javac -version`:

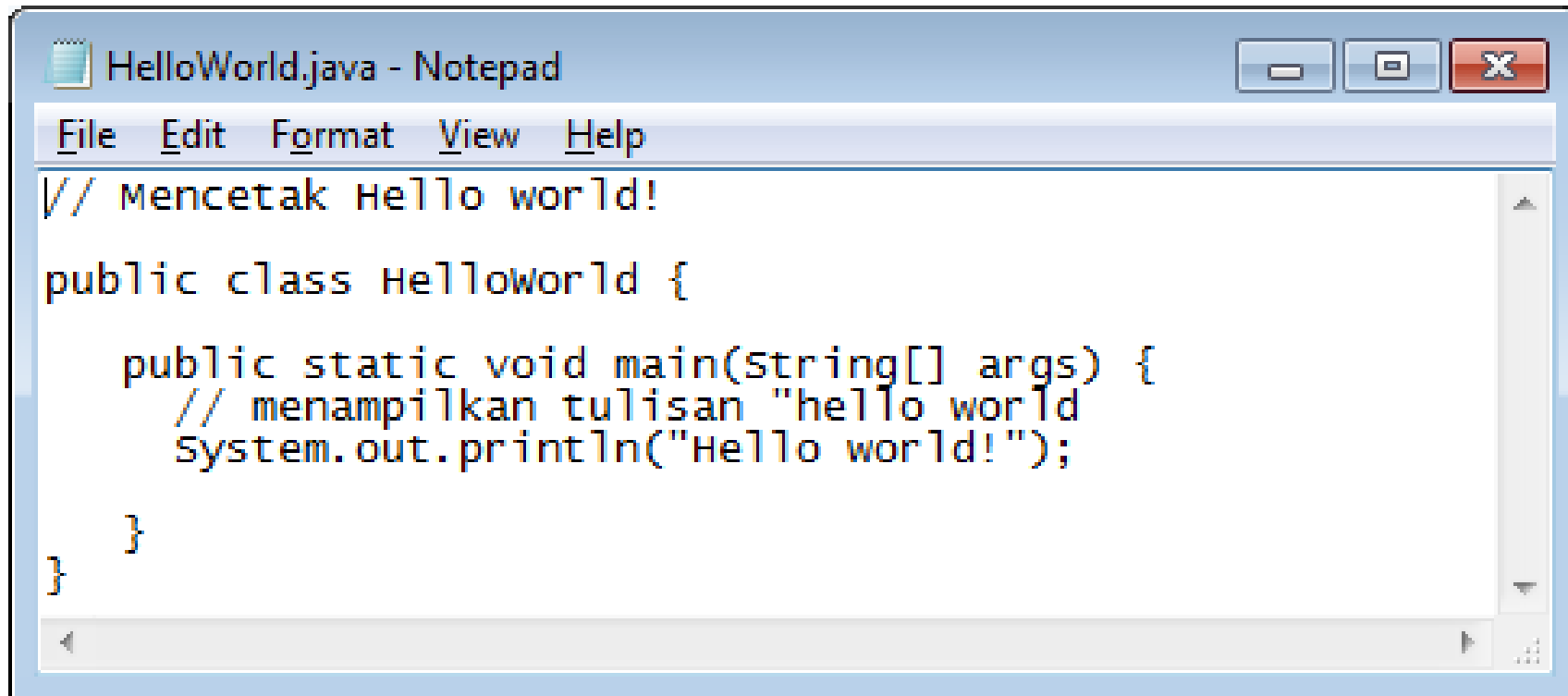
A screenshot of a Windows Command Prompt window titled "Administrator: Command Prompt". The window has a black background and white text. The command prompt shows the following text:

```
C:\>javac -version
javac 20.0.2
C:\>_
```

The cursor is positioned at the end of the second prompt line. The window title bar includes standard Windows window controls (minimize, maximize, close) on the right side.

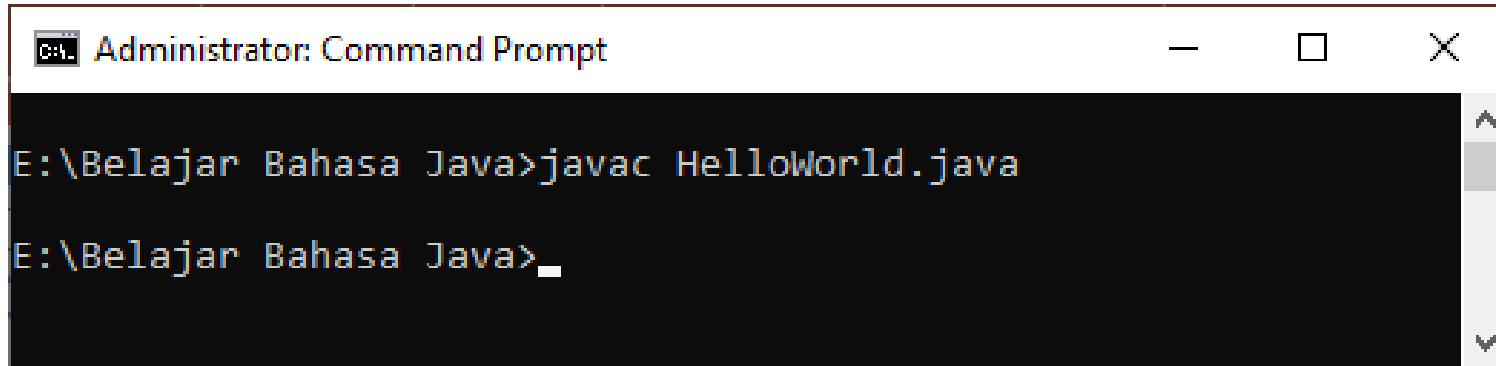
# Program java-ku yang pertama

- Ketik program *HelloWorld* di bawah ini dengan editor teks, simpan dengan nama file `HelloWorld.java` (harus sama persis dengan nama class)

A screenshot of a Notepad window titled "HelloWorld.java - Notepad". The window has a menu bar with "File", "Edit", "Format", "View", and "Help". The text area contains the following Java code:

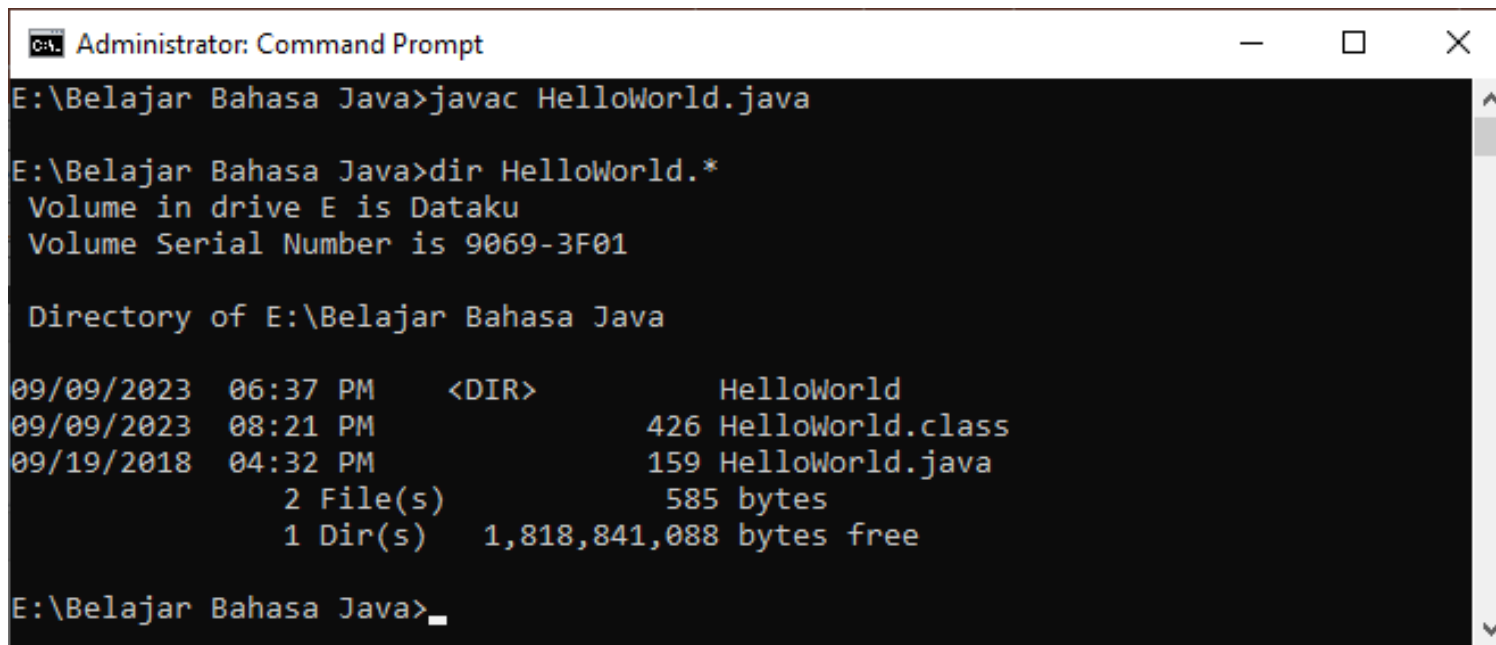
```
// Mencetak Hello world!  
  
public class HelloWorld {  
  
    public static void main(String[] args) {  
        // menampilkan tulisan "hello world"  
        System.out.println("Hello world!");  
    }  
}
```

- Kompilasi program *HelloWorld* dari *command prompt*:



```
Administrator: Command Prompt
E:\Belajar Bahasa Java>javac HelloWorld.java
E:\Belajar Bahasa Java>_
```

- Hasilnya sebuah file bernama `HelloWorld.class`



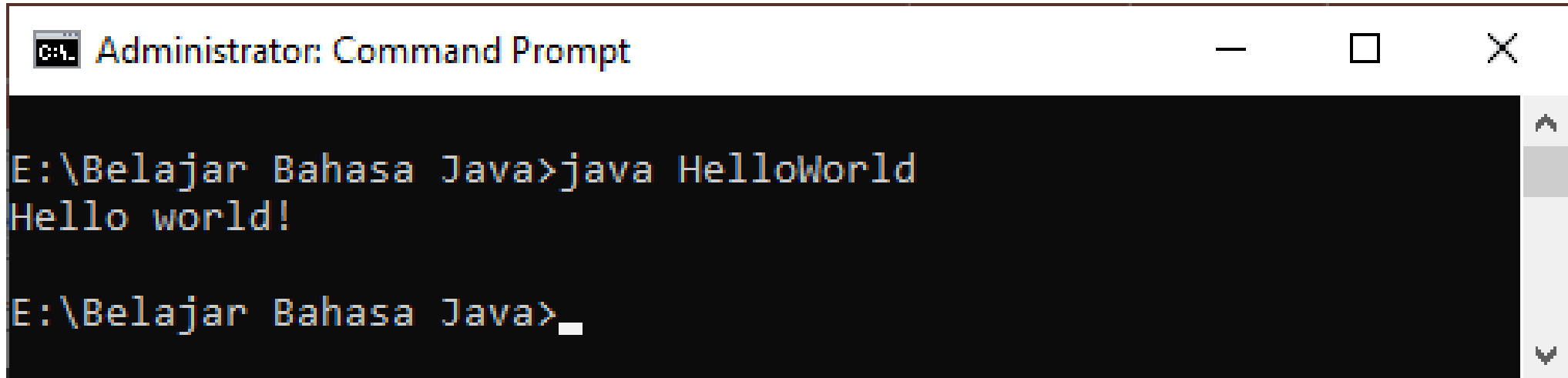
```
Administrator: Command Prompt
E:\Belajar Bahasa Java>javac HelloWorld.java
E:\Belajar Bahasa Java>dir HelloWorld.*
Volume in drive E is Dataku
Volume Serial Number is 9069-3F01

Directory of E:\Belajar Bahasa Java

09/09/2023  06:37 PM    <DIR>          HelloWorld
09/09/2023  08:21 PM                426 HelloWorld.class
09/19/2018  04:32 PM                159 HelloWorld.java
                2 File(s)          585 bytes
                1 Dir(s)  1,818,841,088 bytes free

E:\Belajar Bahasa Java>_
```

- Jalankan arsip `HelloWorld.class` melalui *command prompt*:

A screenshot of a Windows Command Prompt window titled "Administrator: Command Prompt". The window has standard Windows window controls (minimize, maximize, close) in the top right corner. The command prompt shows the following text:

```
E:\Belajar Bahasa Java>java HelloWorld
Hello world!
E:\Belajar Bahasa Java>_
```

The text is displayed in a monospaced font on a black background. A vertical scrollbar is visible on the right side of the command prompt area.

- Horeeee..., saya sudah bisa membuat program java!





Yang gue rasakan saat berhasil menulis program "Hello World" tanpa ada bug atau error



# Class dan Object

- Bahasa java adalah berorientasi objek. Struktur bahasa java terdiri dari kelas-kelas objek.
- **Kelas** (*class*) adalah *blue-print* dari objek, sedangkan **objek** adalah instansiasi dari kelas pada saat *runtime* (*running* program Java)
- Setiap kelas di dalam java memiliki *template*:

```
class NamaKelas {  
    // body kelas ditulis di sini  
}
```

- Satu kelas disimpan ke dalam satu file, nama file harus sama dengan nama kelas

- Di dalam kelas terdapat *atribut (data)* dan *method (function)*.
- Salah satu atau keduanya mungkin tidak terdapat di dalam kelas.
- Jadi, sebuah kelas membungkus data dan *method* dalam satu struktur. Konsep ini dinamakan *encapsulation*.

**Classname**  
(Identifier)

**Data Member**  
(Static attributes)

**Member Functions**  
(Dynamic Operations)

Student	Circle
name grade	radius color
getName() printGrade()	getRadius() getArea()

SoccerPlayer	Car
name number xLocation yLocation	plateNumber xLocation yLocation speed
run() jump() kickBall()	move() park() accelerate()

Examples of classes

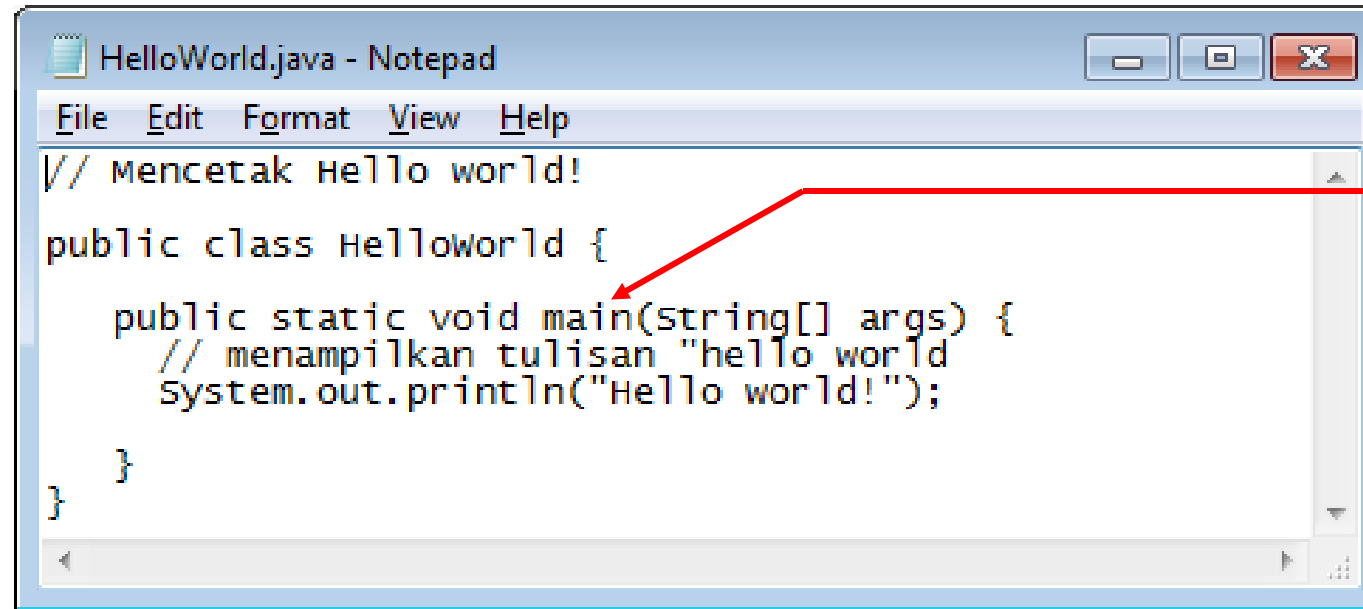
Button
- xsize - ysize - label_text - interested_listeners - xposition - yposition
+ draw() + press() + register_callback() + unregister_callback()

Author
-name:String -email:String -gender:char
+Author(name:String, email:String, gender:char) +getName():String +getEmail():String +setEmail(email:String):void +getGender():char +toString():String

'm' or 'f'

"name (gender) at email"

- Atribut di dalam kelas dinyatakan dengan variabel atau objek kelas lain.
- *Method* adalah operasi (prosedur, fungsi, atau konstruktor) yang dimiliki oleh sebuah kelas.
- Kelas `HelloWorld` tidak mempunyai atribut tetapi hanya mempunyai satu *method*, yaitu `main`:



```
File Edit Format View Help
// mencetak Hello world!
public class HelloWorld {
    public static void main(String[] args) {
        // menampilkan tulisan "hello world"
        System.out.println("Hello world!");
    }
}
```

Method/function

- Lebih lanjut mengenai kelas dan objek akan dipelajari di dalam kuliah *Pemrograman Berorientasi Objek* (di semester 4)

# Menggunakan *Package* di dalam Bahasa Java

- *Package* adalah pustaka (*library*) yang berisi sekumpulan *class*. *Package* dibuat untuk memudahkan manajemen kode program, khususnya pada program yang besar. Setiap *package* disimpan di dalam *folder* dengan nama yang sama.
- Ada dua macam *package* di dalam Java:
  1. *Built-in package*: *package* bawaan yang sudah disediakan oleh Java
  2. *User-defined package*: *package* yang dibuat sendiri oleh pemrogram
- Untuk menggunakan *package*, tambahkan perintah `import` di depan nama *package*
- Contoh mengimpor *built-in package* Java:

```
import java.util.Scanner;
```

`Scanner` adalah paket yang berisi *class* untuk proses input data teks

- Daftar lengkap package di dalam Java dapat dibaca dan dipelajari di dalam laman ini: <https://docs.oracle.com/javase/8/docs/api/java/util/package-summary.html>

← → ↻ <https://docs.oracle.com/javase/8/docs/api/java/util/package-summary.html> ☆ 📄 📥 📂

OVERVIEW **PACKAGE** CLASS USE TREE DEPRECATED INDEX HELP Java™ Platform Standard Ed. 8

PREV PACKAGE NEXT PACKAGE FRAMES NO FRAMES ALL CLASSES

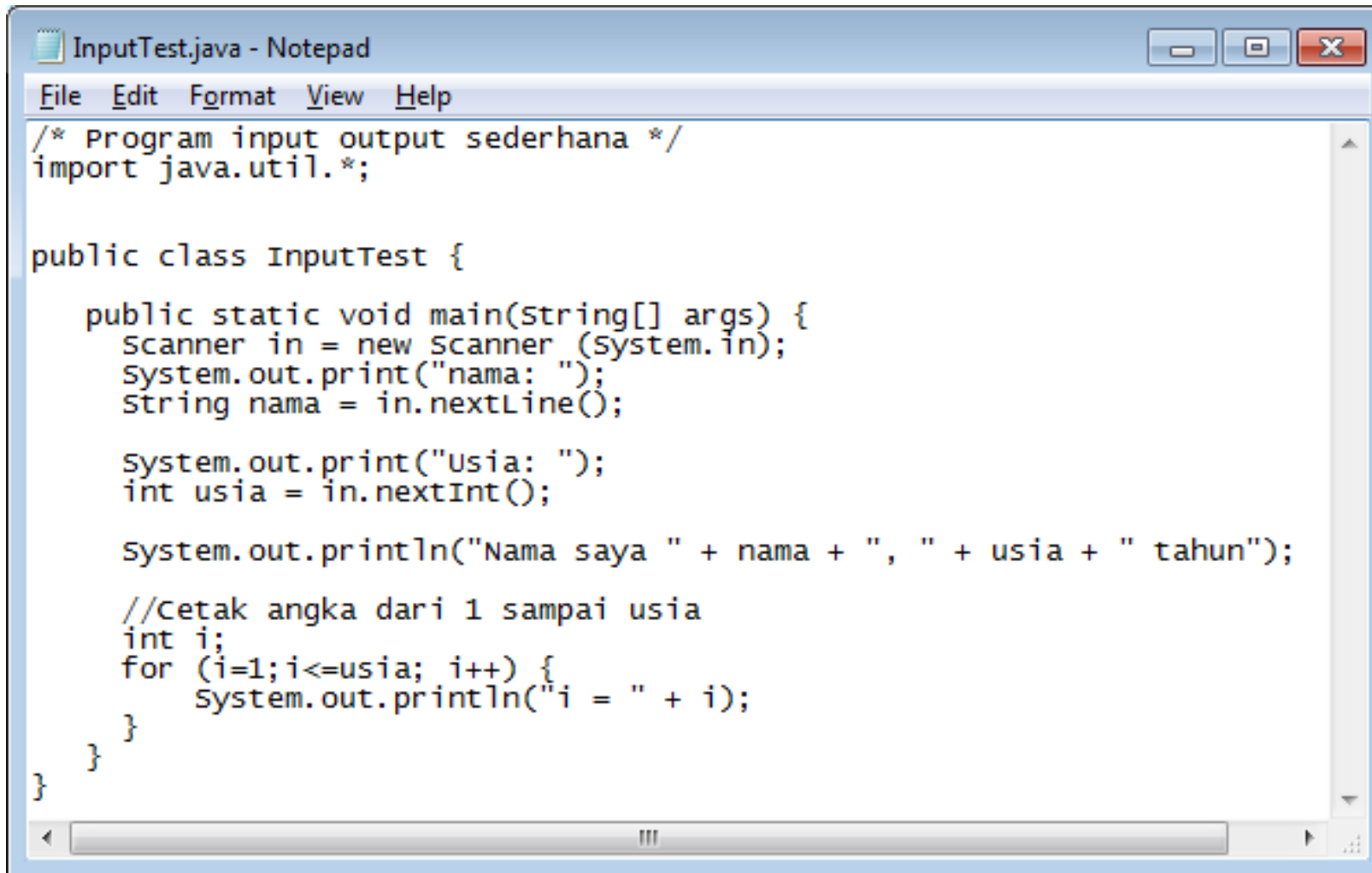
## Package java.util

Contains the collections framework, legacy collection classes, event model, date and time facilities, internationalization, and miscellaneous utility classes (a string tokenizer, a random-number generator, and a bit array).

See: [Description](#)

Interface Summary	
Interface	Description
<b>Collection</b> <E>	The root interface in the <i>collection hierarchy</i> .
<b>Comparator</b> <T>	A comparison function, which imposes a <i>total ordering</i> on some collection of objects.
<b>Deque</b> <E>	A linear collection that supports element insertion and removal at both ends.
<b>Enumeration</b> <E>	An object that implements the Enumeration interface generates a series of elements, one at a time.
<b>EventListener</b>	A tagging interface that all event listener interfaces must extend.
<b>Formattable</b>	The Formattable interface must be implemented by any class that needs to perform custom formatting using the 's' conversion specifier of <b>Formatter</b> .
<b>Iterator</b> <E>	An iterator over a collection.

# Program Input/Output Sederhana

A screenshot of a Notepad window titled "InputTest.java - Notepad". The window contains the following Java code:

```
File Edit Format View Help
/* Program input output sederhana */
import java.util.*;

public class InputTest {

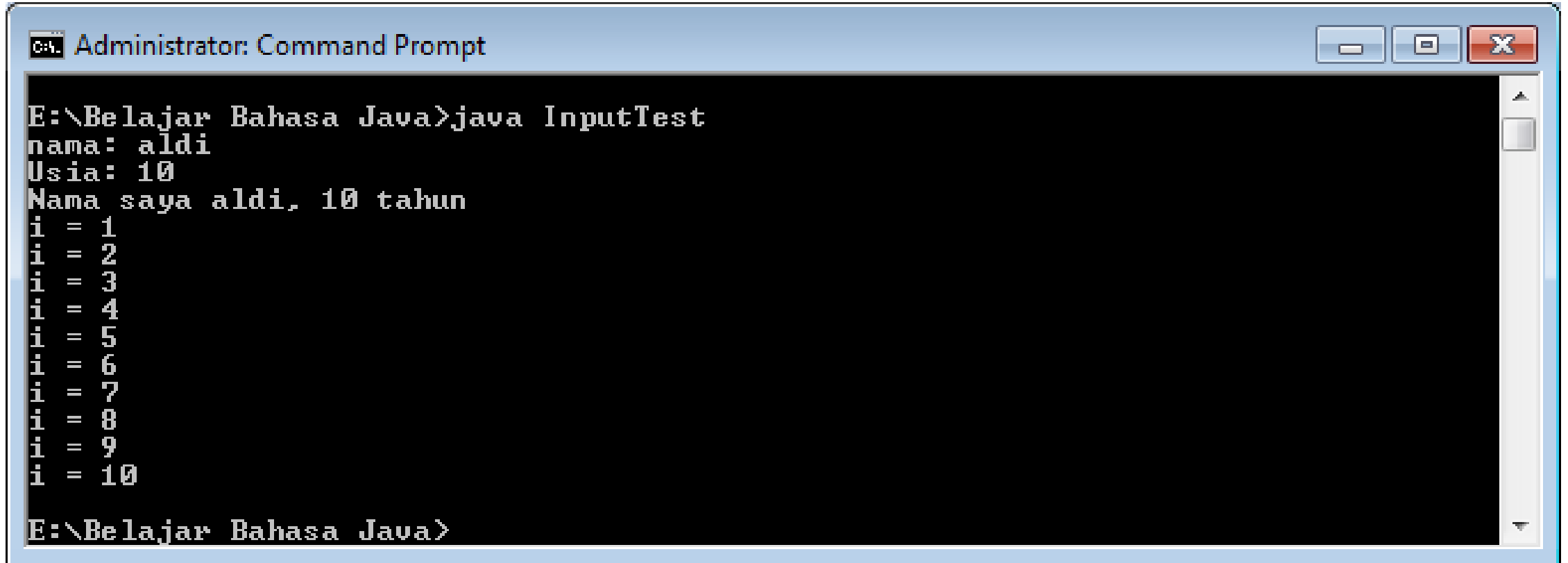
    public static void main(String[] args) {
        Scanner in = new Scanner (System.in);
        System.out.print("nama: ");
        String nama = in.nextLine();

        System.out.print("Usia: ");
        int usia = in.nextInt();

        System.out.println("Nama saya " + nama + ", " + usia + " tahun");

        //Cetak angka dari 1 sampai usia
        int i;
        for (i=1;i<=usia; i++) {
            System.out.println("i = " + i);
        }
    }
}
```

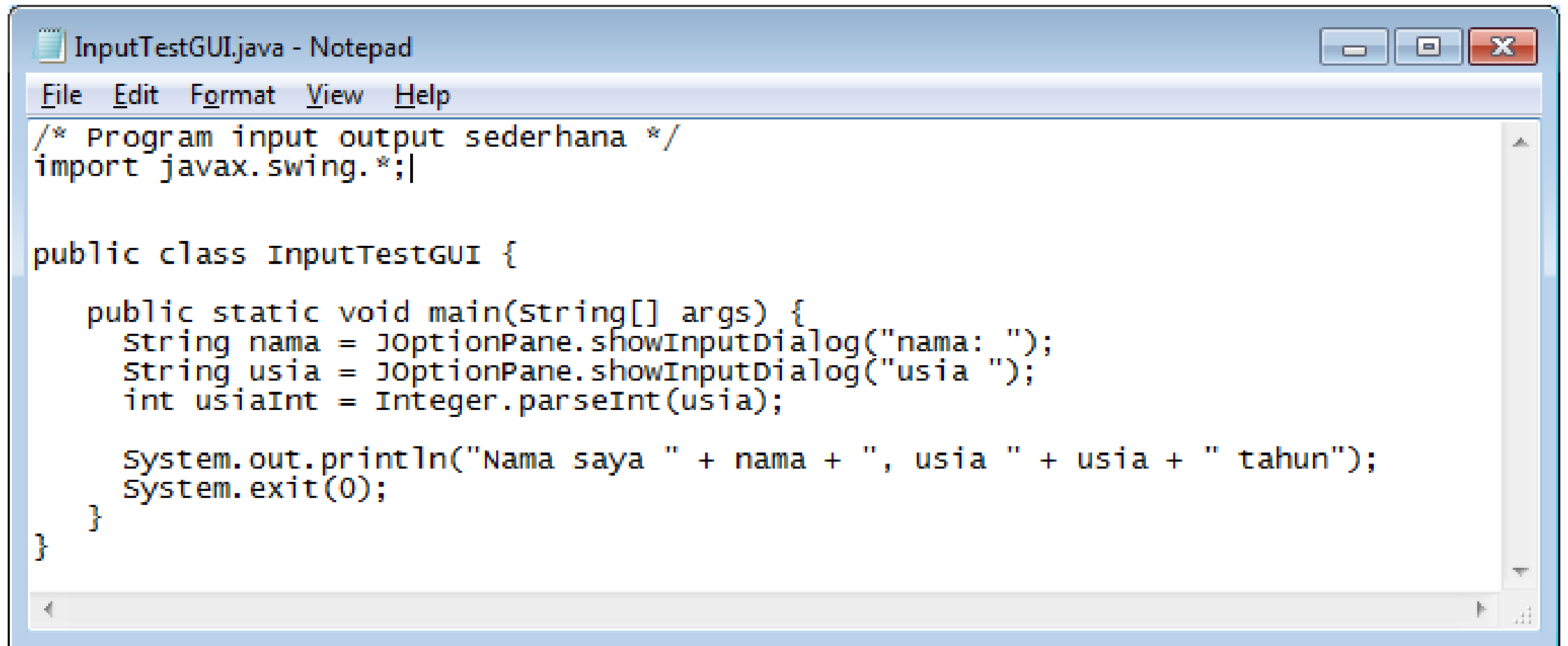
- Kompilasi `InputTest.java` dan jika sudah benar jalankan programnya:



```
Administrator: Command Prompt
E:\Belajar Bahasa Java>java InputTest
nama: aldi
Usia: 10
Nama saya aldi, 10 tahun
i = 1
i = 2
i = 3
i = 4
i = 5
i = 6
i = 7
i = 8
i = 9
i = 10
E:\Belajar Bahasa Java>
```



# Program Input dengan GUI



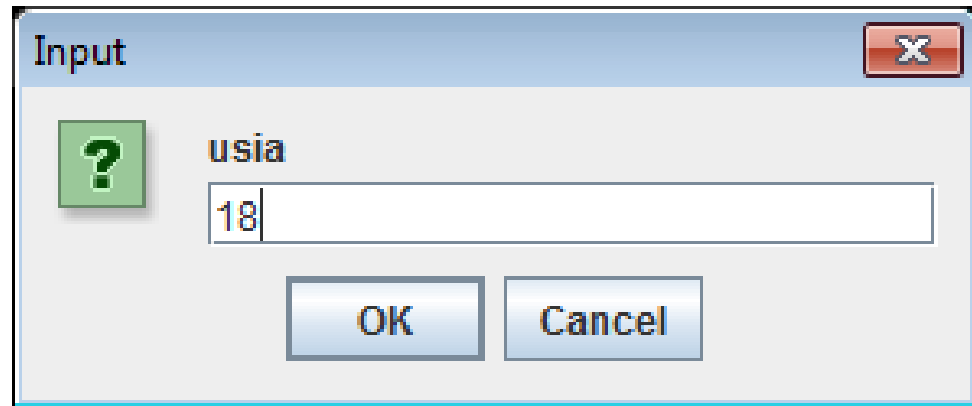
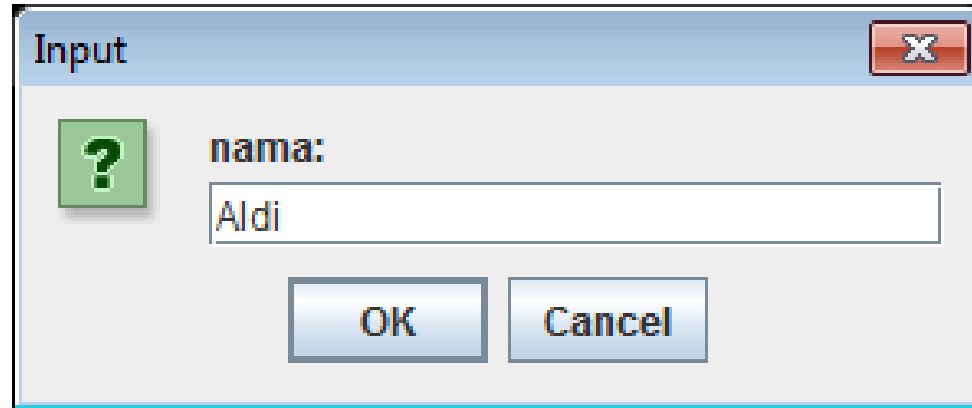
```
InputTestGUI.java - Notepad
File Edit Format View Help
/* Program input output sederhana */
import javax.swing.*;

public class InputTestGUI {

    public static void main(String[] args) {
        String nama = JOptionPane.showInputDialog("nama: ");
        String usia = JOptionPane.showInputDialog("usia ");
        int usiaInt = Integer.parseInt(usia);

        System.out.println("Nama saya " + nama + ", usia " + usia + " tahun");
        System.exit(0);
    }
}
```

- Kompilasi `InputTestGUI.java` dan jika sudah benar jalankan programnya:



# Program FindMonth

```
*FindMonth - Notepad
File Edit Format View Help
/* Program input output sederhana */
import javax.swing.*;

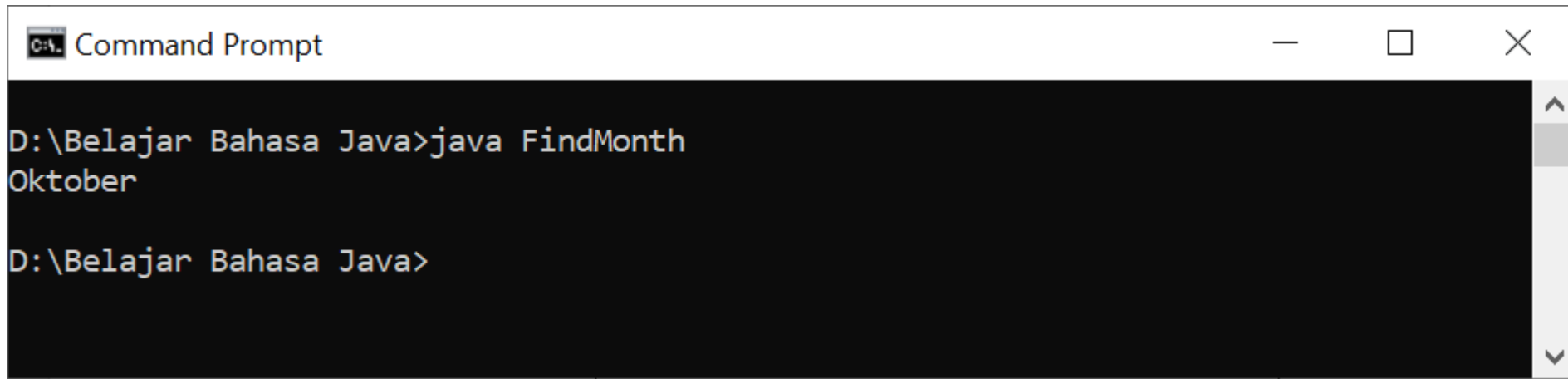
public class FindMonth {

    public static void main(String[] args) {

        String bulan = JOptionPane.showInputDialog("Bulan (1-12) ");
        int n = Integer.parseInt(bulan);
        switch (n) {
            case 1 : System.out.println("Januari"); break;
            case 2 : System.out.println("Februari"); break;
            case 3 : System.out.println("Maret"); break;
            case 4 : System.out.println("April"); break;
            case 5 : System.out.println("Mei"); break;
            case 6 : System.out.println("Juni"); break;
            case 7 : System.out.println("Juli"); break;
            case 8 : System.out.println("Agustus"); break;
            case 9 : System.out.println("September"); break;
            case 10 : System.out.println("Oktober"); break;
            case 11 : System.out.println("November"); break;
            case 12 : System.out.println("Desember"); break;
            default : System.out.println("Input tidak valid"); break;
        }

        System.exit(0);
    }
}

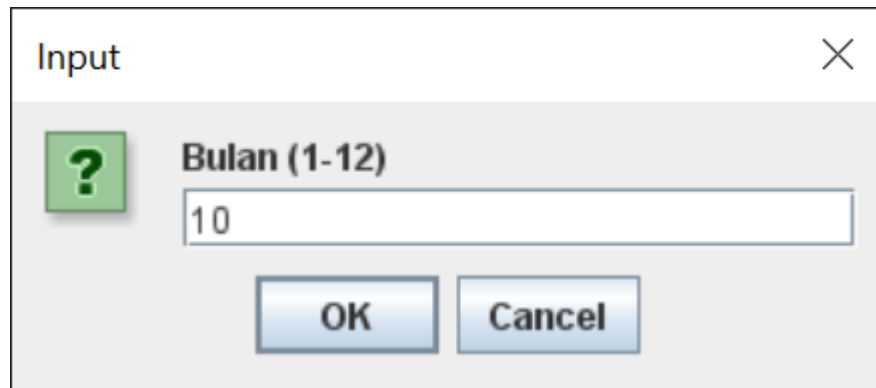
Ln 4, Col 1    100%    Windows (CRLF)    UTF-8
```




Command Prompt

```
D:\Belajar Bahasa Java>java FindMonth
Oktober

D:\Belajar Bahasa Java>
```



Input

 Bulan (1-12)

OK Cancel

# Kelas Mahasiswa

```
Mahasiswa - Notepad
File Edit Format View Help
import java.util.*;
class Mahasiswa {

    //Atribut:|
    String nama;
    String nim;
    int usia;

    // Method:

    Mahasiswa() { //Konstruktor:
    }

    void inputdatamhs() {
        Scanner in = new Scanner (System.in);
        System.out.println("Ketikkan data mahasiswa: ");
        System.out.print("Nama: "); String nama2 = in.nextLine();
        System.out.print("NIM: "); String nim2 = in.nextLine();
        System.out.print("Usia: "); int usia2 = in.nextInt();

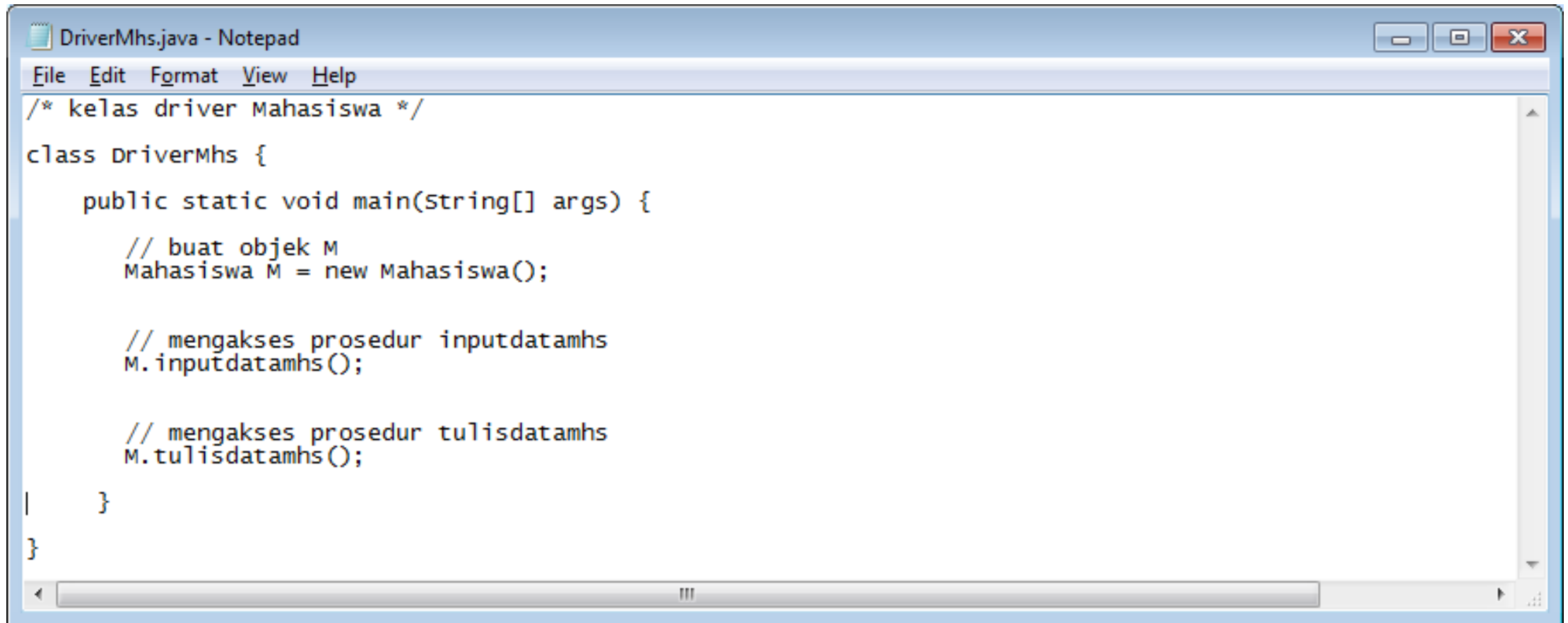
        this.nama = nama2;
        this.nim = nim2;
        this.usia = usia2;
    }

    void tulisdatamhs() {
        System.out.println();
        System.out.println("Data mahasiswa: ");
        System.out.println("Nama: " + this.nama);
        System.out.println("NIM: " + this.nim);
        System.out.println("Usia: " + this.usia);
    }
}

Ln 4, Col 14 100% Windows (CRLF) UTF-8
```

# Kelas DriverMhs

(yang menggunakan kelas Mahasiswa)

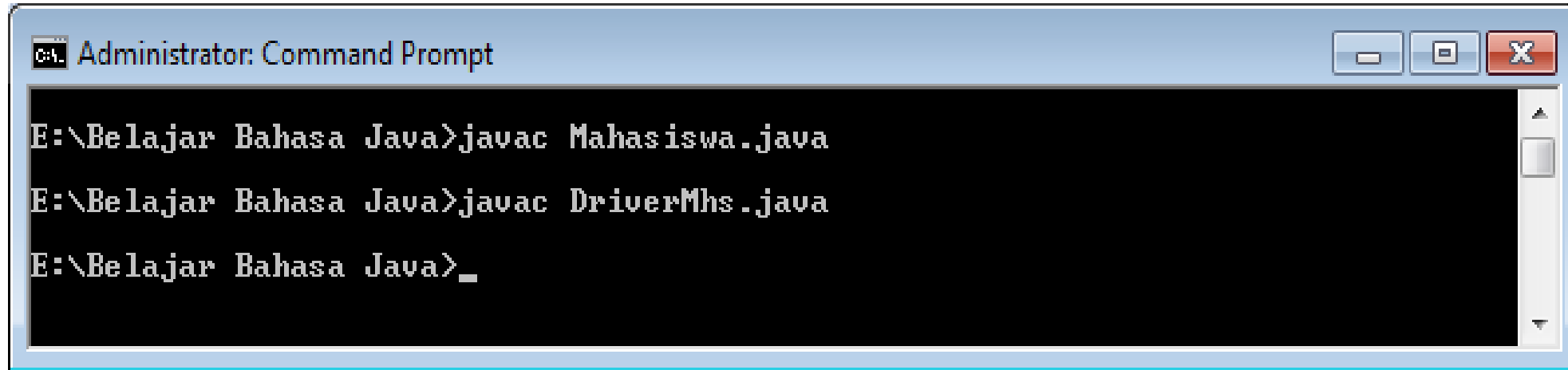


```
DriverMhs.java - Notepad
File Edit Format View Help
/* kelas driver mahasiswa */
class DriverMhs {
    public static void main(String[] args) {
        // buat objek M
        Mahasiswa M = new Mahasiswa();

        // mengakses prosedur inputdatamhs
        M.inputdatamhs();

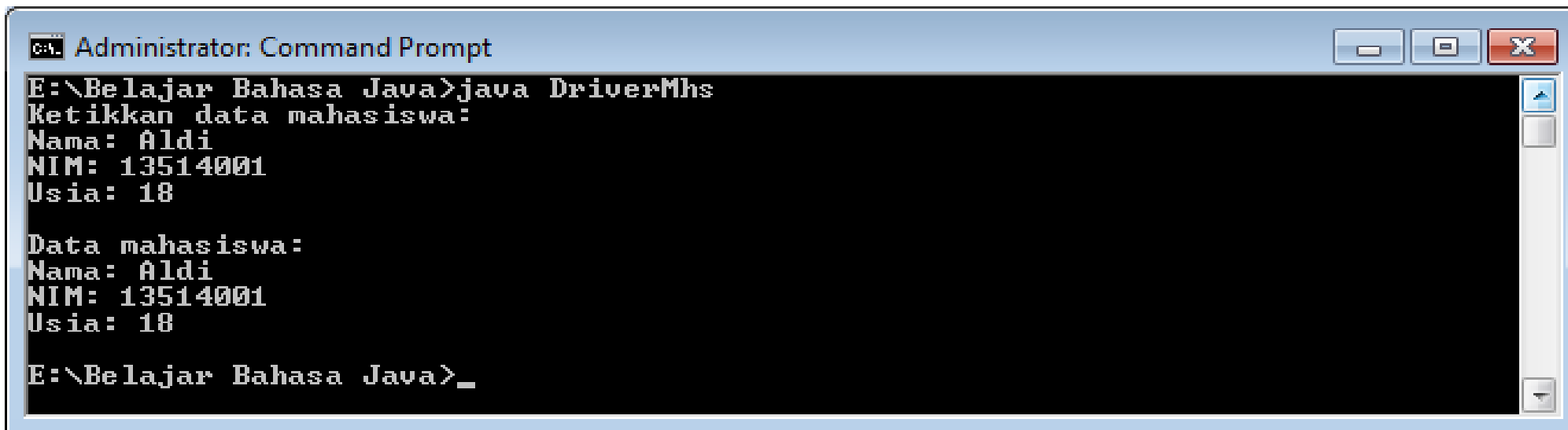
        // mengakses prosedur tulisdatamhs
        M.tulisdatamhs();
    }
}
```

- Kompilasi masing-masing Mahasiswa.java dan DriverMhs.java



```
Administrator: Command Prompt
E:\Belajar Bahasa Java>javac Mahasiswa.java
E:\Belajar Bahasa Java>javac DriverMhs.java
E:\Belajar Bahasa Java>_
```

- Jalankan kelas DriverMhs.class

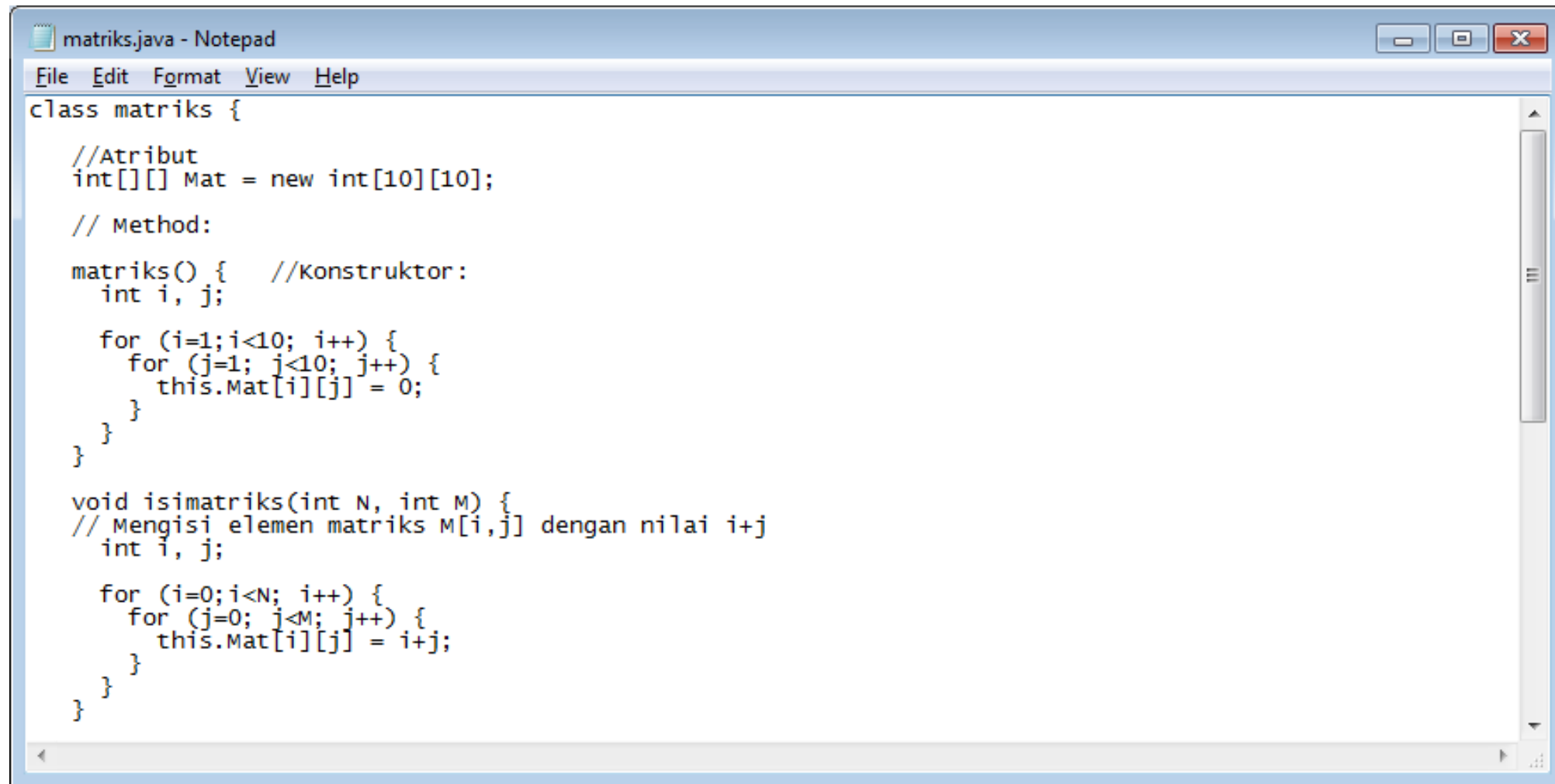


```
Administrator: Command Prompt
E:\Belajar Bahasa Java>java DriverMhs
Ketikkan data mahasiswa:
Nama: Aldi
NIM: 13514001
Usia: 18

Data mahasiswa:
Nama: Aldi
NIM: 13514001
Usia: 18

E:\Belajar Bahasa Java>_
```

# Kelas Matriks



```
matriks.java - Notepad
File Edit Format View Help
class matriks {
    //Atribut
    int[][] Mat = new int[10][10];

    // Method:

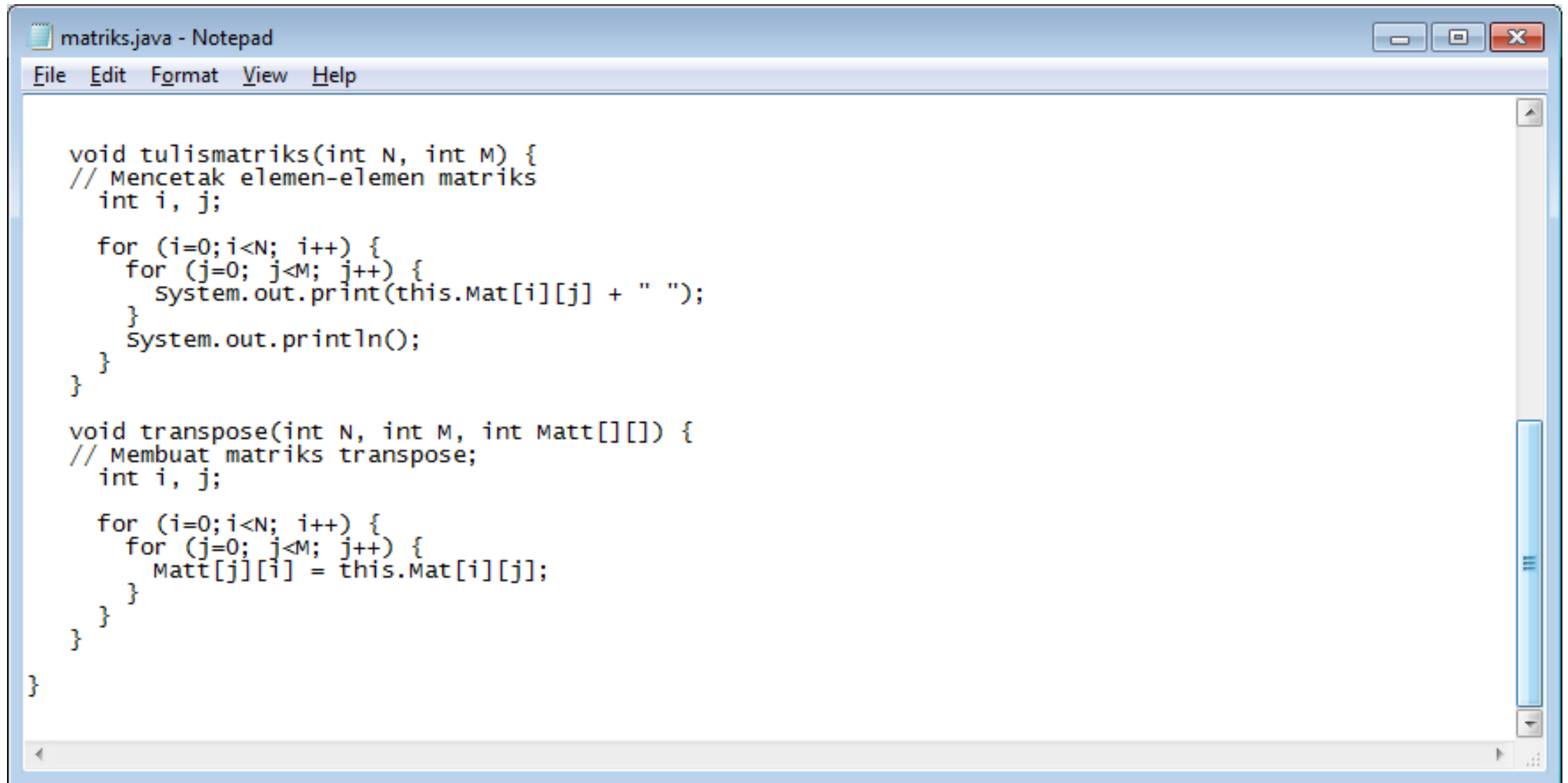
    matriks() { //Konstruktor:
        int i, j;

        for (i=1;i<10; i++) {
            for (j=1; j<10; j++) {
                this.Mat[i][j] = 0;
            }
        }
    }

    void isimatriks(int N, int M) {
        // Mengisi elemen matriks M[i,j] dengan nilai i+j
        int i, j;

        for (i=0;i<N; i++) {
            for (j=0; j<M; j++) {
                this.Mat[i][j] = i+j;
            }
        }
    }
}
```





```
void tulismatriks(int N, int M) {
// Mencetak elemen-elemen matriks
int i, j;

for (i=0; i<N; i++) {
for (j=0; j<M; j++) {
System.out.print(this.Mat[i][j] + " ");
}
System.out.println();
}
}

void transpose(int N, int M, int Matt[][]) {
// Membuat matriks transpose;
int i, j;

for (i=0; i<N; i++) {
for (j=0; j<M; j++) {
Matt[j][i] = this.Mat[i][j];
}
}
}
}
```

# Kelas DriverMatriks

(yang menggunakan kelas Mahasiswa)

```
DriverMatriks.java - Notepad
File Edit Format View Help
/* kelas driver Matriks */
class DriverMatriks {
    public static void main(String[] args) {
        // buat objek P1
        matriks M = new matriks();

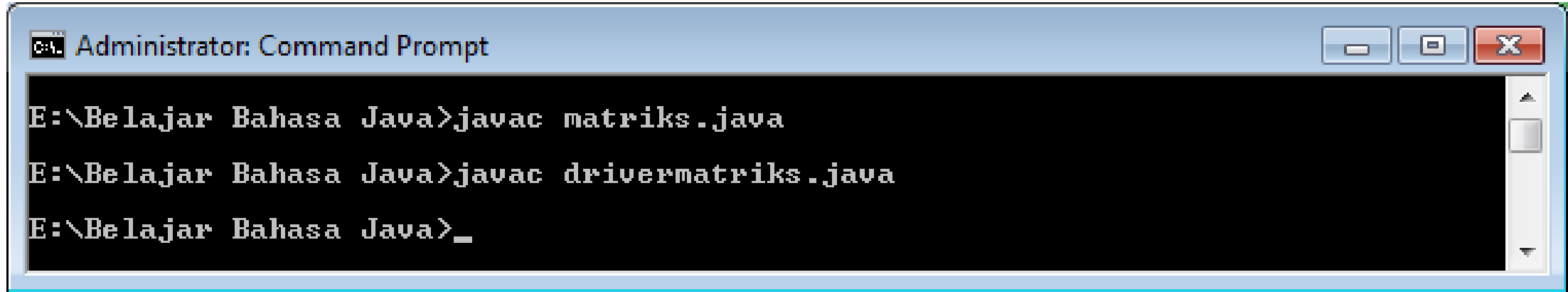
        // mengisi matriks
        M.isimatriks(3,4);

        // menulis matriks
        System.out.println("Isi matriks: ");
        M.tulismatriks(3, 4);

        // membuat matriks transpose
        int[][] M2;
        M2 = new int[4][3];
        M.transpose(3,4,M2);

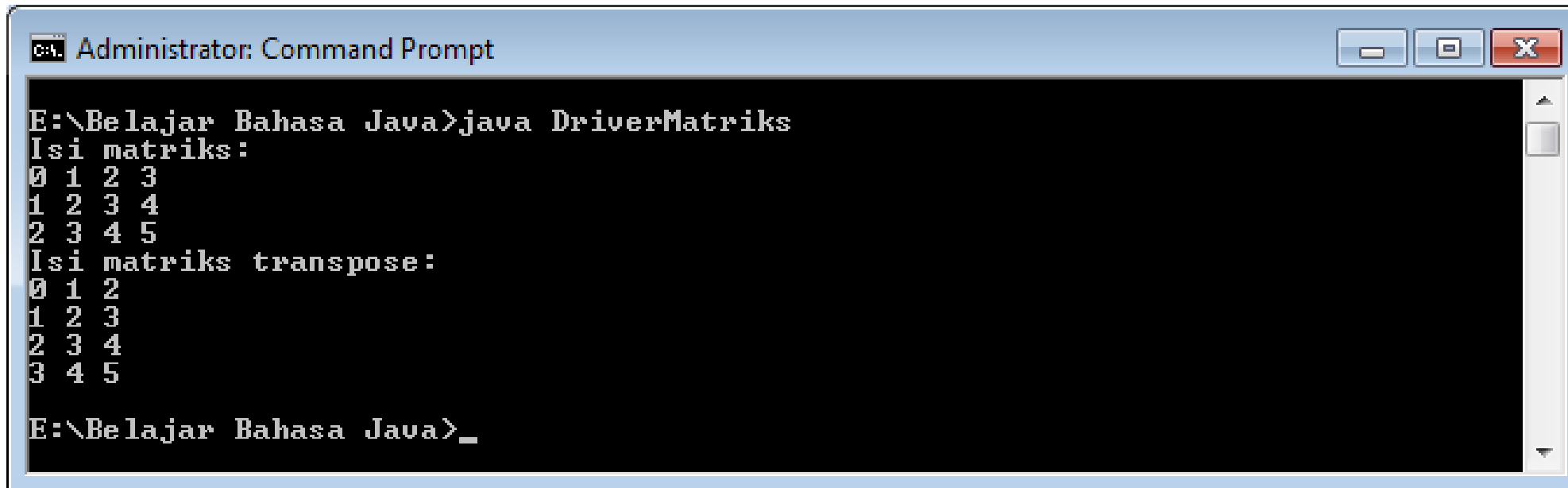
        // Tulis matriks transpose
        System.out.println("Isi matriks transpose: ");
        int i, j;
        for (i=0; i<4; i++) {
            for (j=0; j<3; j++) {
                System.out.print(M2[i][j] + " ");
            }
            System.out.println();
        }
    }
}
```

- Kompilasi masing-masing `matriks.java` dan `DriverMatriks.java`



```
Administrator: Command Prompt
E:\Belajar Bahasa Java>javac matriks.java
E:\Belajar Bahasa Java>javac drivermatriks.java
E:\Belajar Bahasa Java>_
```

- Jalankan kelas `DriverMatriks.class`



```
Administrator: Command Prompt
E:\Belajar Bahasa Java>java DriverMatriks
Isi matriks:
0 1 2 3
1 2 3 4
2 3 4 5
Isi matriks transpose:
0 1 2
1 2 3
2 3 4
3 4 5
E:\Belajar Bahasa Java>_
```

# Kelas Stack

```
Stack - Notepad
File Edit Format View Help
/* kelas Stack */

class Stack {

    //Atribut
    public int TOP;
    public int[] s = new int[11];

    //Konstruktor:
    Stack() {
        this.TOP = 0;

        System.out.println("Telah dibuat sebuah stack");
        this.tulis();

    }

    // Metode lain:

    void tulis() {
        System.out.println("TOP = " + this.TOP);
    }
}

Ln 1, Col 1    100%    Windows (CRLF)    UTF-8
```

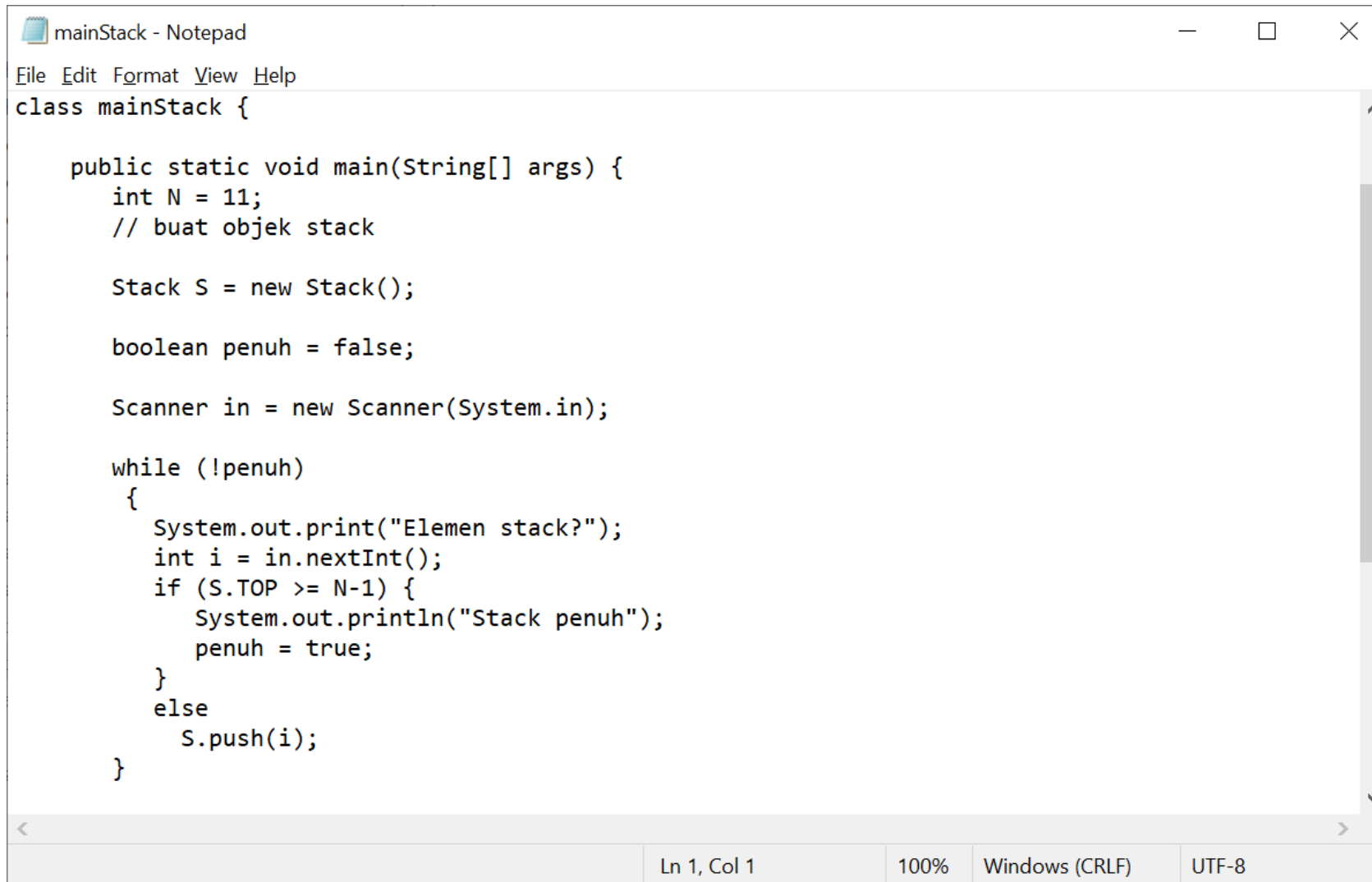
```
void tulis() {
    System.out.println("TOP = " + this.TOP);
}

void push(int x){
    this.TOP ++;
    //if (this.TOP > N-1)
    //    System.out.println("stack penuh");
    // else
    s[TOP] = x;
}

int pop(){
    if (this.TOP == 0) {
        System.out.println("stack kosong");
        return 0;
    }
    else {
        int x = s[TOP];
        this.TOP--;
        return x;
    }
}
}
```

# Kelas mainStack

(yang menggunakan kelas Stack)



```
mainStack - Notepad
File Edit Format View Help
class mainStack {

    public static void main(String[] args) {
        int N = 11;
        // buat objek stack

        Stack S = new Stack();

        boolean penuh = false;

        Scanner in = new Scanner(System.in);

        while (!penuh)
        {
            System.out.print("Elemen stack?");
            int i = in.nextInt();
            if (S.TOP >= N-1) {
                System.out.println("Stack penuh");
                penuh = true;
            }
            else
                S.push(i);
        }
    }
}
```

Ln 1, Col 1 | 100% | Windows (CRLF) | UTF-8

```
S.tulis();

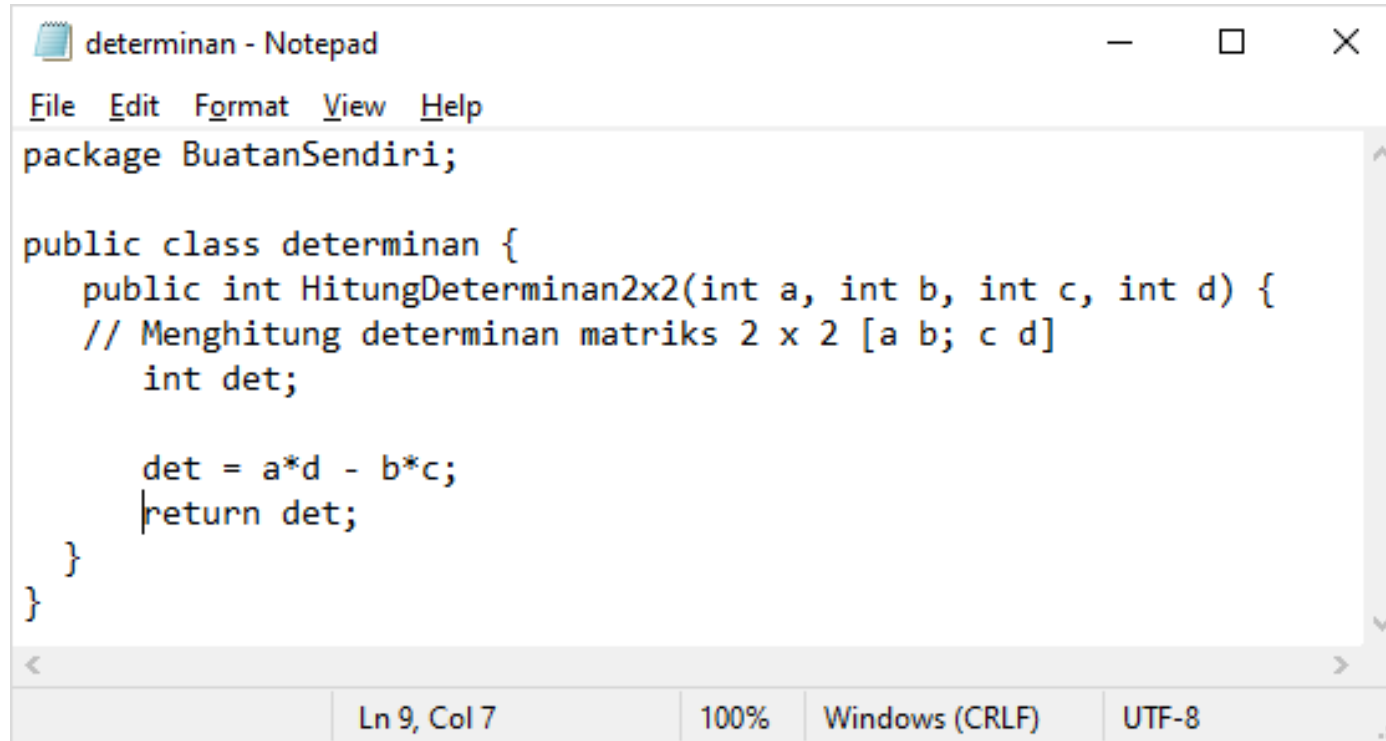
// mengakses elemens stack
int j = S.TOP;
while (j != 0)
{
    int x = S.pop();
    System.out.println("Nilai yang di-pop: " + x);
    j = S.TOP;
}

}
```

```
Command Prompt
D:\Belajar Bahasa Java>java mainStack
Telah dibuat sebuah stack
TOP = 0
Elemen stack?5
Elemen stack?7
Elemen stack?29
Elemen stack?12
Elemen stack?7
Elemen stack?18
Elemen stack?90
Elemen stack?23
Elemen stack?45
Elemen stack?44
Elemen stack?10
Stack penuh
TOP = 10
Nilai yang di-pop: 44
Nilai yang di-pop: 45
Nilai yang di-pop: 23
Nilai yang di-pop: 90
Nilai yang di-pop: 18
Nilai yang di-pop: 7
Nilai yang di-pop: 12
Nilai yang di-pop: 29
Nilai yang di-pop: 7
Nilai yang di-pop: 5
D:\Belajar Bahasa Java>
```



# Membuat *package* buatan sendiri



```
determinan - Notepad
File Edit Format View Help
package Buatansendiri;

public class determinan {
    public int HitungDeterminan2x2(int a, int b, int c, int d) {
        // Menghitung determinan matriks 2 x 2 [a b; c d]
        int det;

        det = a*d - b*c;
        return det;
    }
}
```

Ln 9, Col 7    100%    Windows (CRLF)    UTF-8

- Paket bernama `Buatansendiri`, berisi satu kelas bernama `determinan`
- Buat *sub-folder* bernama `Buatansendiri` di dalam folder proyek Java yang sedang kita kembangkan (folder Belajar Bahasa Java)
- Simpan *package* di atas ke dalam sub-folder `Buatansendiri` dengan nama `determinan.java`

Belajar Bahasa Java

Home Share View

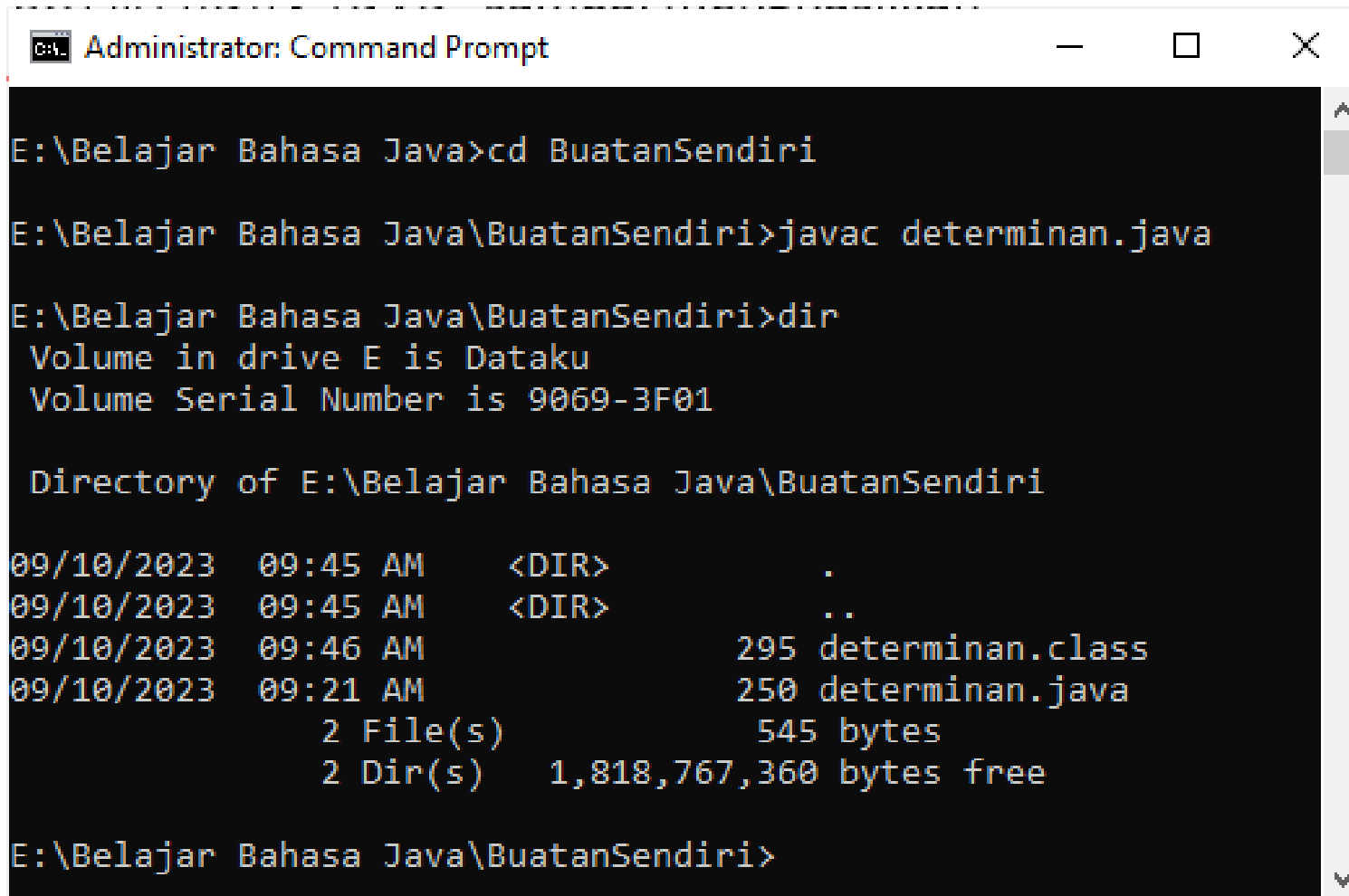
This PC > Dataku (E:) > Belajar Bahasa Java

Search Belajar Bah...

Name	Date modified	Type	Size
browseFile	9/9/2023 6:37 PM	File folder	
BuatanSendiri	9/10/2023 6:03 AM	File folder	
HelloWorld	9/9/2023 6:37 PM	File folder	
Lingkaran	9/9/2023 6:37 PM	File folder	
myApplet	9/9/2023 6:37 PM	File folder	
Test	9/9/2023 6:37 PM	File folder	
DriverMatriks.class	9/15/2021 2:57 PM	CLASS File	2 KB
DriverMatriks.java	9/5/2015 5:37 PM	JAVA File	1 KB
DriverMhs.class	9/19/2018 4:49 PM	CLASS File	1 KB
DriverMhs.java	9/5/2015 4:21 PM	JAVA File	1 KB
DriverTitik.class	1/26/2017 12:36 PM	CLASS File	1 KB
DriverTitik.java	1/26/2017 12:36 PM	JAVA File	1 KB
FindMonth.class	3/18/2011 1:56 PM	CLASS File	2 KB

35 items | 1 item selected

- Kompilasi program `determinan.java` sampai menghasilkan `determinan.class`



```
Administrator: Command Prompt
E:\Belajar Bahasa Java>cd BuatanSendiri
E:\Belajar Bahasa Java\BuatanSendiri>javac determinan.java
E:\Belajar Bahasa Java\BuatanSendiri>dir
Volume in drive E is Dataku
Volume Serial Number is 9069-3F01

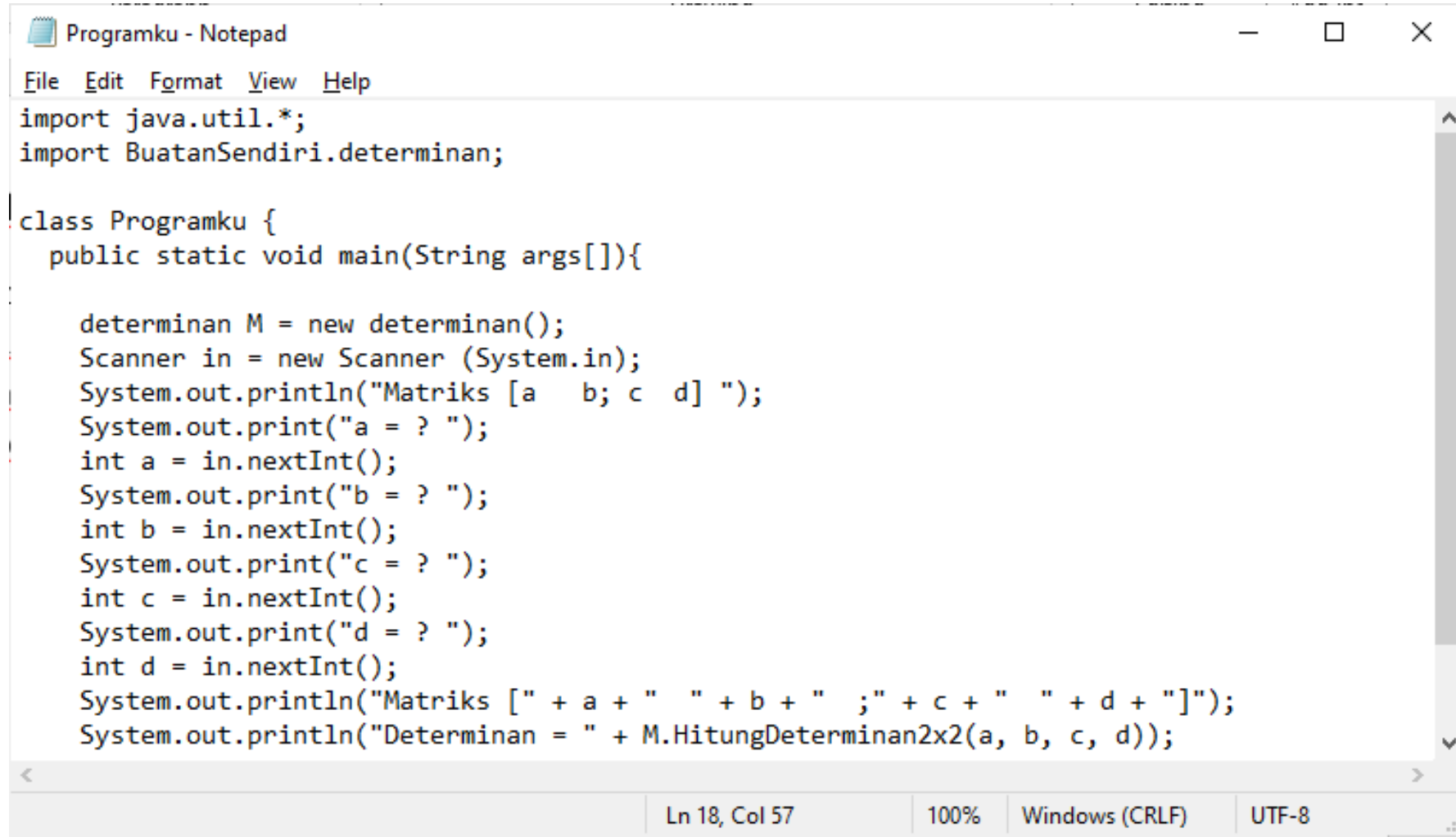
Directory of E:\Belajar Bahasa Java\BuatanSendiri

09/10/2023  09:45 AM    <DIR>          .
09/10/2023  09:45 AM    <DIR>          ..
09/10/2023  09:46 AM                295 determinan.class
09/10/2023  09:21 AM                250 determinan.java
                2 File(s)              545 bytes
                2 Dir(s)  1,818,767,360 bytes free

E:\Belajar Bahasa Java\BuatanSendiri>
```

# Cara menggunakan *package* buatan sendiri

- Tulis `Programku.java` yang memanggil *method* di dalam *package* `BuatanSendiri`, impor *package* `BuatanSendiri.determinan`
- Simpan `Programku.java` di dalam folder proyek Java yang sedang kita dikembangkan



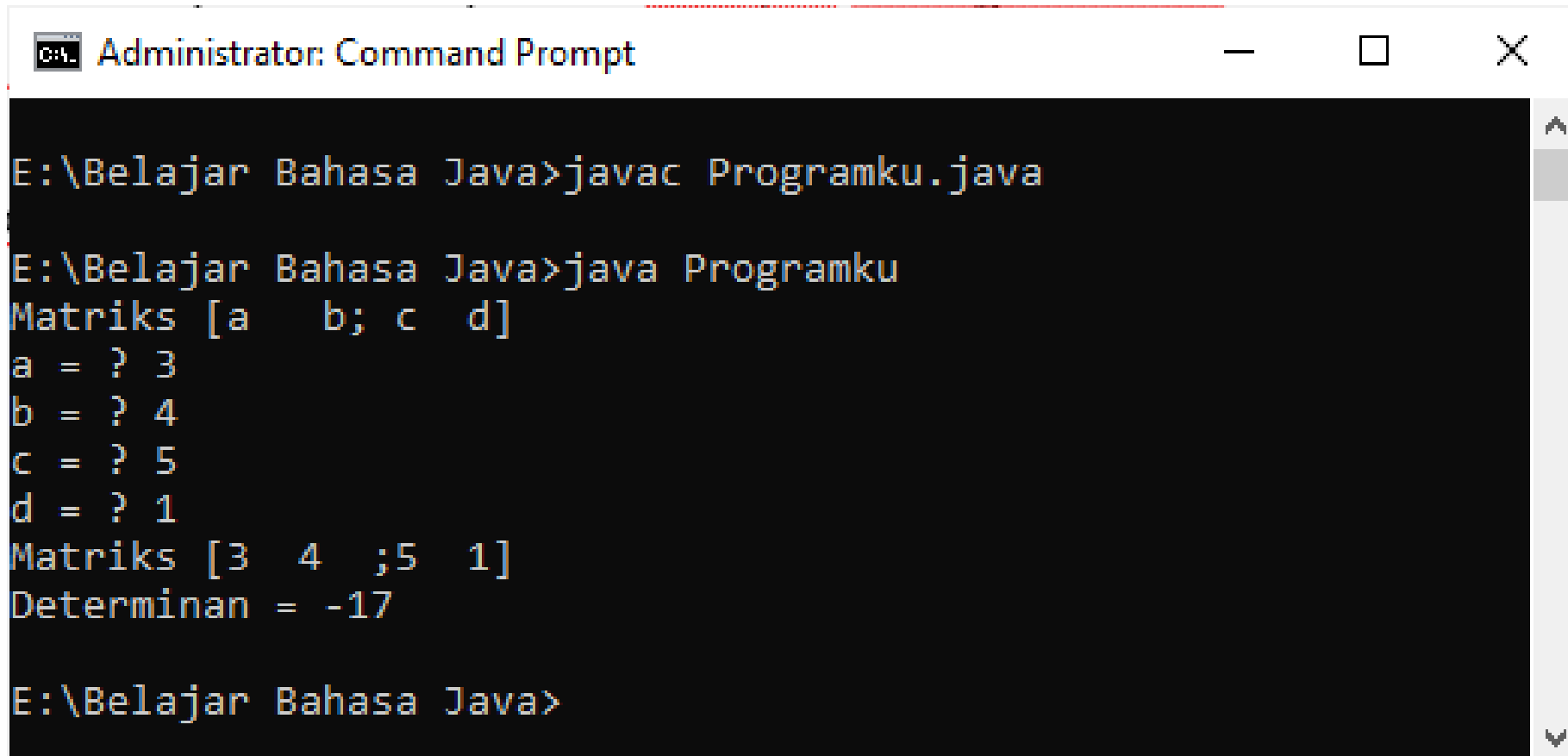
```
Programku - Notepad
File Edit Format View Help
import java.util.*;
import BuatanSendiri.determinan;

class Programku {
    public static void main(String args[]){

        determinan M = new determinan();
        Scanner in = new Scanner (System.in);
        System.out.println("Matriks [a  b; c  d] ");
        System.out.print("a = ? ");
        int a = in.nextInt();
        System.out.print("b = ? ");
        int b = in.nextInt();
        System.out.print("c = ? ");
        int c = in.nextInt();
        System.out.print("d = ? ");
        int d = in.nextInt();
        System.out.println("Matriks [" + a + " " + b + " ;" + c + " " + d + "]");
        System.out.println("Determinan = " + M.HitungDeterminan2x2(a, b, c, d));
    }
}
```

Ln 18, Col 57 | 100% | Windows (CRLF) | UTF-8

- Kompilasi program `Programku.java` sampai menghasilkan `Programku.class`
- *Run* program `Programku`



```
Administrator: Command Prompt
E:\Belajar Bahasa Java>javac Programku.java
E:\Belajar Bahasa Java>java Programku
Matriks [a  b; c  d]
a = ? 3
b = ? 4
c = ? 5
d = ? 1
Matriks [3  4  ;5  1]
Determinan = -17
E:\Belajar Bahasa Java>
```

# Referensi

Materi “Pengantar Pemrograman Bahasa Java” diambil dari berbagai sumber, antara lain:

1. Arief Bahtiar S.T, M.T, Ivan Kurniawan, *Fundamental Java 2 Platform Application Developer*, ComLabs IT Course ITB.
2. Adi Nuralim, *Java Virtual Machine*, <http://belajarjava-19.blogspot.co.id/2011/05/java-virtual-machine-jvm.html>, tanggal akses 3 September 2015
3. Dunia Ilkom, <https://www.duniailkom.com/tutorial-oop-java-cara-membuat-package-dan-proses-import/>
4. Wikipedia