

**LAPORAN PRAKTIKUM
TEKNIK PEMROGRAMAN**

DEFENSIVE PROGRAMMING

MINGGU KE-6



POLBAN

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PROGRAM STUDI SARJANA TERAPAN

TEKNIK INFORMATIKA

POLITEKNIK NEGERI BANDUNG

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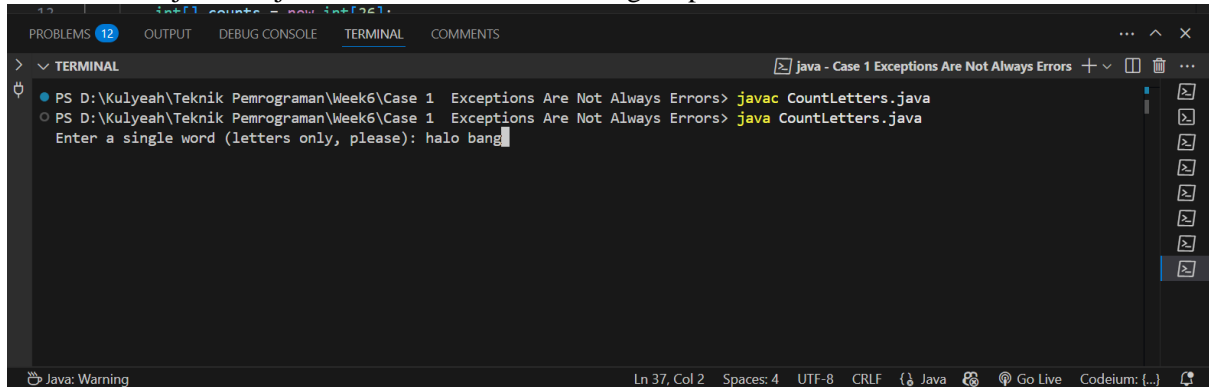
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<https://github.com/mailvlous/teknikPemrograman/tree/main/Week6>

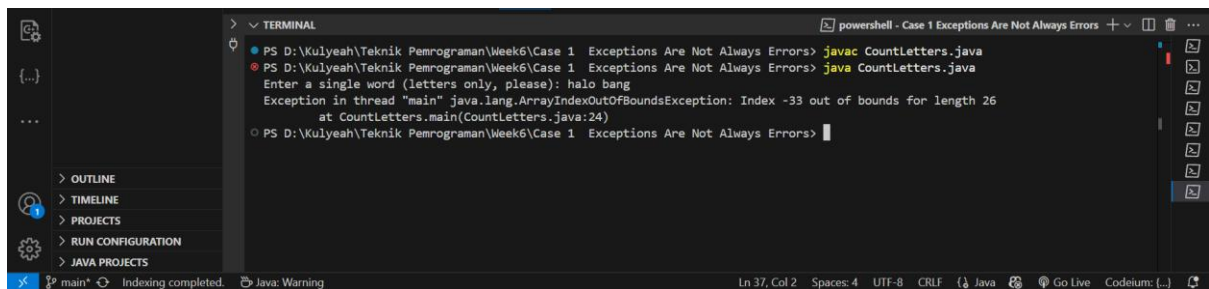
1. Case 1 : Exceptions Aren't Always Errors

```
// *****  
// CountLetters.java  
//  
// Reads a words from the standard input and prints the number of  
// occurrences of each letter in that word.  
//  
// *****  
import java.util.Scanner;  
  
public class CountLetters {  
    public static void main(String[] args) {  
        int[] counts = new int[26];  
        Scanner scan = new Scanner(System.in);  
  
        // Get word from user  
        System.out.print("Enter a single word (letters only, please): ");  
        String word = scan.nextLine();  
  
        // Convert to all upper case  
        word = word.toUpperCase();  
  
        // Count frequency of each letter in string  
        for (int i = 0; i < word.length(); i++) {  
            counts[word.charAt(i) - 'A']++;  
        }  
  
        // Print frequencies  
        System.out.println();  
        for (int i = 0; i < counts.length; i++) {  
            if (counts[i] != 0) {  
                System.out.println((char) (i + 'A') + ": " + counts[i]);  
            }  
        }  
  
        scan.close();  
    }  
}
```

Pada kode ini jika kita jalankan, lalu kita isi kata dengan spasi



Maka hasilnya akan terjadi exception



Exception ini terjadi di bagian



Program akan mengecek setiap huruf yang kemudian dikonversi dalam ASCII kode lalu setelah itu dikurangi oleh ASCII kode dari 'A' yaitu 65. Program tak akan mengalami exception jika yang diinput adalah huruf, itu karena dari A = 65 hingga Z = 90 jika dikurangi 65 maka akan menghasilkan lebih dari sama dengan 0. Program akan terjadi exception jika yang diinputkan adalah karakter yang jika diubah kedalam kode ASCII dibawah 65, yang mana jika misal SPACE dengan kode ASCII 32 diinputkan maka $32 - 65 = -33$. Program akan mengalami exception jika hasil operasi negative.

Solusi:

Mari kita buat try catch exception seperti ini

```
// *****
// CountLetters.java
//
// Reads a words from the standard input and prints the number of
// occurrences of each letter in that word.
//
// *****
import java.util.Scanner;

public class CountLetters {
    public static void main(String[] args) {
        int[] counts = new int[26];
        Scanner scan = new Scanner(System.in);

        try {
            // Get word from user
            System.out.print("Enter a single word (letters only, please): ");
            String word = scan.nextLine();

            // Convert to all upper case
            word = word.toUpperCase();

            // Count frequency of each letter in string
            for (int i = 0; i < word.length(); i++) {
                counts[word.charAt(i) - 'A']++;
            }

            // Print frequencies
            System.out.println();
            for (int i = 0; i < counts.length; i++) {
                if (counts[i] != 0) {
                    System.out.println((char) (i + 'A') + ": " + counts[i]);
                }
            }
        } catch (ArrayIndexOutOfBoundsException e) {
            System.out.println("Tolong gunakan huruf A-Z");
        }

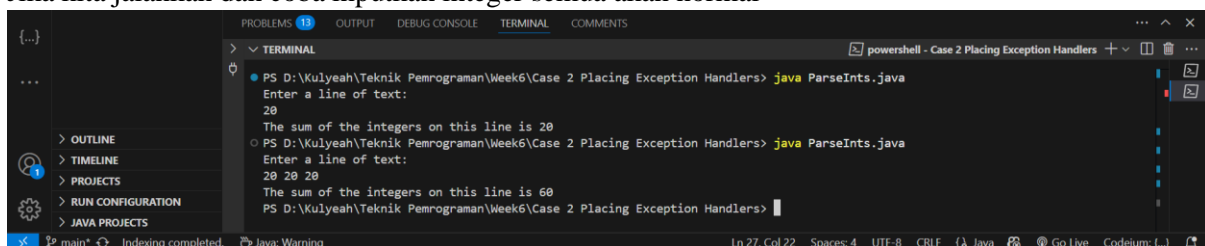
        scan.close();
    }
}
```

Kita akan buat exception yang jika terkena `ArrayIndexOutOfBoundsException` maka program akan memberi perintah untuk “Tolong gunakan huruf A-Z”.

2. Case 2 : Placing Exception Handlers

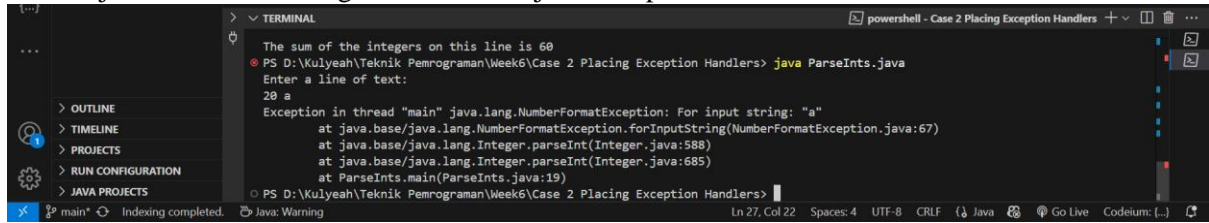
```
// *****  
// ParseInts.java  
//  
// Reads a line of text and prints the integers in the line.  
//  
// *****  
import java.util.Scanner;  
  
public class ParseInts {  
    public static void main(String[] args) {  
        int val, sum = 0;  
        Scanner scan = new Scanner(System.in);  
  
        // Prompt user for input  
        System.out.println("Enter a line of text:");  
        Scanner scanLine = new Scanner(scan.nextLine());  
  
        while (scanLine.hasNext()) {  
            val = Integer.parseInt(scanLine.next());  
            sum += val;  
        }  
  
        // Print the sum of integers  
        System.out.println("The sum of the integers on this line is " + sum);  
  
        // Close scanners  
        scan.close();  
        scanLine.close();  
    }  
}
```

Jika kita jalankan dan coba inputkan integer semua akan normal



```
PS D:\Kulyeah\Teknik Pemrograman\Week6\Case 2 Placing Exception Handlers> java ParseInts.java  
Enter a line of text:  
20  
The sum of the integers on this line is 20  
PS D:\Kulyeah\Teknik Pemrograman\Week6\Case 2 Placing Exception Handlers> java ParseInts.java  
Enter a line of text:  
20 20 20  
The sum of the integers on this line is 60  
PS D:\Kulyeah\Teknik Pemrograman\Week6\Case 2 Placing Exception Handlers>
```

Namun jika kita isikan Strings maka akan terjadi Exception



```
PS D:\Kulyeah\Teknik Pemrograman\Week6\Case 2 Placing Exception Handlers> java ParseInts.java
The sum of the integers on this line is 60
Enter a line of text:
20 a
Exception in thread "main" java.lang.NumberFormatException: For input string: "a"
    at java.base/java.lang.NumberFormatException.forInputString(NumberFormatException.java:67)
    at java.base/java.lang.Integer.parseInt(Integer.java:588)
    at java.base/java.lang.Integer.parseInt(Integer.java:685)
    at ParseInts.main(ParseInts.java:19)
    at PS D:\Kulyeah\Teknik Pemrograman\Week6\Case 2 Placing Exception Handlers>
```

Itu terjadi karena kita menginputkan format yang tidak sesuai dengan tipe data variable val, sum, maka akan terjadi NumberFormatException

Solusi:

Mari kita buat try catch Exceptionnya

```

// *****
// ParseInts.java
//
// Reads a line of text and prints the integers in the line.
//
// *****
import java.util.Scanner;

public class ParseInts {
    public static void main(String[] args) {
        int val, sum = 0;
        Scanner scan = new Scanner(System.in);

        // Prompt user for input
        System.out.println("Enter a line of text:");
        String line = scan.nextLine();

        Scanner scanLine = new Scanner(line);

        while (scanLine.hasNext()) {
            try {
                val = Integer.parseInt(scanLine.next());
                sum += val;
            } catch (NumberFormatException e) {
                System.out.println("Tolong gunakan angka");
            }
        }

        // Print the sum of integers
        System.out.println("The sum of the integers on this line is " + sum);

        // Close scanners
        scan.close();
        scanLine.close();
    }
}

```

Jika kita inputkan ulang string maka yang terjadi sekarang adalah

```

PS D:\Kuliah\Teknik Pemrograman\Week6\Case 2 Placing Exception Handlers> java ParseInts.java
Enter a line of text:
awidoja
Tolong gunakan angka
The sum of the integers on this line is 0
PS D:\Kuliah\Teknik Pemrograman\Week6\Case 2 Placing Exception Handlers>

```


3. Case 3 : Throwing Exceptions

Pada file Factorials.java

```
Week6 > Case 3 Throwing Exceptions > Factorials.java > Language Support for Java(TM) by Red Hat > Factorials > main(String[])
1 import java.util.Scanner;
2
3 Codeium: Refactor | Explain
4 public class Factorials {
5     String keepGoing = "y";
6     Scanner scan = new Scanner(System.in);
7
8     while (keepGoing.equals(anObject:"y") || keepGoing.equals(anObject:"Y")) {
9         System.out.print(s:"Enter an integer: ");
10        int val = scan.nextInt();
11        System.out.println("Factorial(" + val + ") = " + MathUtils.factorial(val));
12        System.out.print(s:"Another factorial? (y/n) ");
13        keepGoing = scan.next();
14    }
15 }
16 }
17 }
```

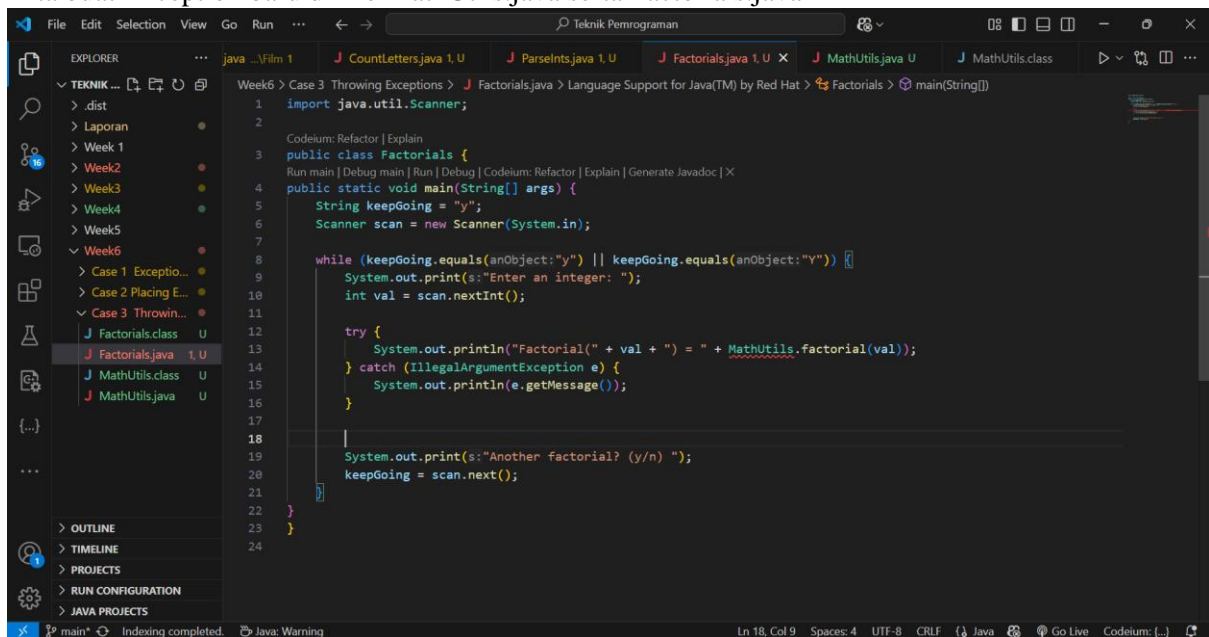
Pada file MathUtils.java

```
Codeium: Refactor | Explain
4 public class MathUtils {
5     // Returns the factorial of the given argument
6     Codeium: Refactor | Explain | X
7     public static int factorial(int n) {
8         int fac = 1;
9         for (int i = n; i > 0; i--) {
10             fac *= i;
11         }
12         return fac;
13     }
14 }
```

Dalam soal dikatakan bahwa jika kita menginputkan angka negative maka akan selalu menghasilkan 1. Untuk itu mari kita modifikasi agar throws an Exception.

Solusi:

Kita buat Exception baru di file MathUtils.java serta Factorials.java



The screenshot shows the IDE with the following state:

- Explorer:** Shows a project structure with folders for 'TEKNIK' and 'Week6'. Under 'Week6', there are files for 'Factorials.class', 'Factorials.java', 'MathUtils.class', and 'MathUtils.java'.
- Editor:** Displays the code for 'Factorials.java'. The code is identical to the previous snippet, but with a modification in the while loop. The line `keepGoing = scan.next();` is now enclosed in a try-catch block to handle `IllegalArgumentException`.
- Code:**

```
18 while (keepGoing.equals(anObject:"y") || keepGoing.equals(anObject:"Y")) {
19     System.out.print(s:"Enter an integer: ");
20     int val = scan.nextInt();
21     try {
22         System.out.println("Factorial(" + val + ") = " + MathUtils.factorial(val));
23     } catch (IllegalArgumentException e) {
24         System.out.println(e.getMessage());
25     }
26     keepGoing = scan.next();
27 }
```

```
1 // MathUtils.java
2 // Provides static mathematical utility functions.
3
4 public class MathUtils {
5     // Returns the factorial of the given argument
6     public static int factorial(int n) throws IllegalArgumentException {
7         if (n < 0) {
8             throw new IllegalArgumentException(s:"Factorial is not defined for negative numbers.");
9         }
10
11         int fac = 1;
12         for (int i = n; i > 0; i--) {
13             fac *= i;
14         }
15         return fac;
16     }
17 }
18
```

Sekarang jika kita menginputkan angka negative maka akan menghasilkan Excerption:

```
PS D:\Kulyeah\Teknik Pemrograman\Week6\Case 3 Throwing Exceptions> java Factorials.java
Enter an integer: -2
Factorial is not defined for negative numbers.
Another factorial? (y/n)
```