

# Lab 01: Environment Setup and Java Basic

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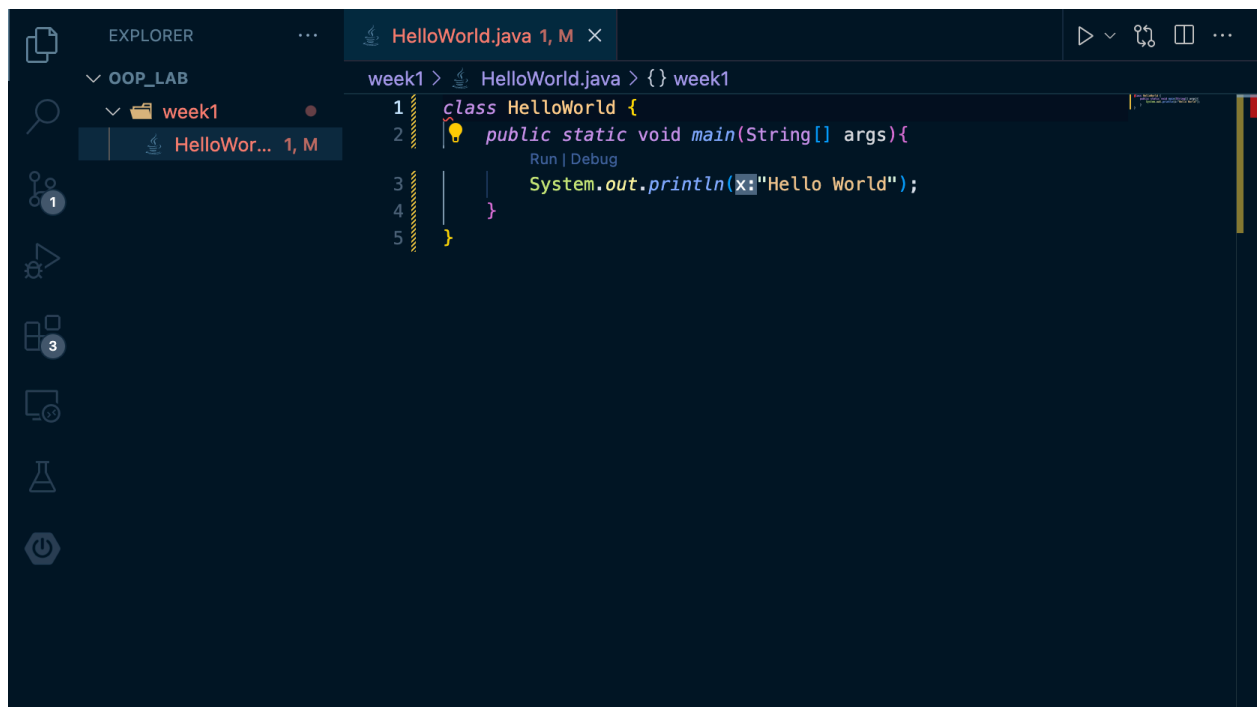
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## Getting started

### Java Development Kit

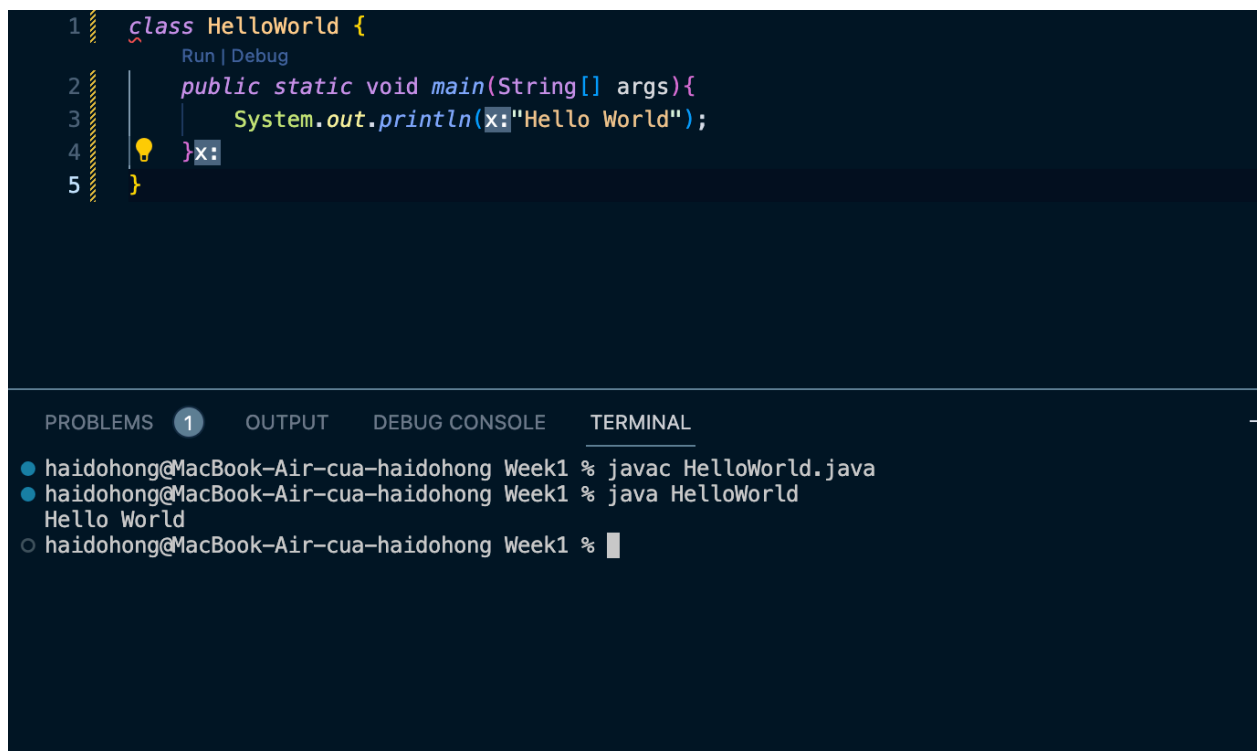
```
[haidohong@MacBook-Air-cua-haidohong oop_lab % cd ~  
[haidohong@MacBook-Air-cua-haidohong ~ % javac --version  
javac 20  
haidohong@MacBook-Air-cua-haidohong ~ % █
```

### Programming Text Editor



## First Program

Java programming steps



The very first Java Programs

```
week1 > HelloWorld.java > HelloWorld > main(String[])
1  class HelloWorld {
2      public static void main(String[] args){
3          System.out.println(x:"Xin chao \n cac ban!");
4          System.out.println(x:"Hello \t World");
5      }
6  }
```

PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL

```
haidohong@MacBook-Air-cua-haidohong Week1 % javac HelloWorld.java
haidohong@MacBook-Air-cua-haidohong Week1 % java HelloWorld
Xin chao
cac ban!
Hello    World
haidohong@MacBook-Air-cua-haidohong Week1 %
```

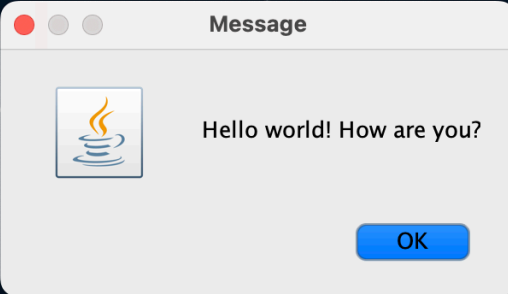
Write, compile the first dialog Java program

```
1  import javax.swing.JOptionPane;
2  public class FirstDialog {
3      public static void main(String[] args) {
4          JOptionPane.showMessageDialog(parentComponent:null, message:"Hello world! How are you?")
5          System.exit(status:0);
6      }
7  }
8
```

PROBLEMS 4 OUTPUT DEBUG CONSOLE TERMINAL

```
/" && javac HelloNameDialog.java && java HelloNameDialog
haidohong@MacBook-Air-cua-haidohong week1 % cd "/Users/haidohong/Programming/java/oop_lab/week
/" && javac
haidohong@Ma haidohong/Programming/java/oop_lab/week
/" && javac
howTwoNumbe t have been initialized
strN

error
haidohong@Ma haidohong/Programming/java/oop_lab/week1/" && java
ShowTwoNum woNumber.java
haidohong@Ma woNumber
haidohong@Ma NameDialog.java
haidohong@MacBook-Air-cua-haidohong week1 % java HelloNameDialog
haidohong@MacBook-Air-cua-haidohong week1 %
haidohong@MacBook-Air-cua-haidohong week1 % javac FirstDialog.java
haidohong@MacBook-Air-cua-haidohong week1 % java FirstDialog
```

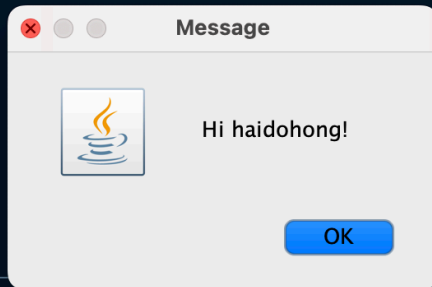


Write, compile the first input dialog Java application

```

1  import javax.swing.JOptionPane;
2  public class HelloNameDialog {
3      public static void main(String[] args) {
4          String result;
5          result = JOptionPane.showInputDialog(message:"Please enter your name");
6          JOptionPane.showMessageDialog(parentComponent:null, "Hi " + result + "!");
7          System.exit(status:0);
8      }
9  }
10

```



PROBLEMS 4 OUTPUT DEBUG CONSOLE TERMINAL

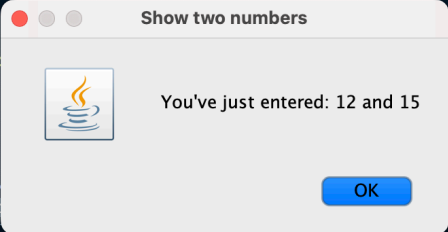
```

● haidohong@MacBook-Air-cua-haidohong week1 % cd "/Users/haidohong/Programming/java/oop_lab/week
1/" && javac FirstDialog.java && java FirstDialog
● haidohong@MacBook-Air-cua-haidohong week1 % cd "/Users/haidohong/Programming/java/oop_lab/week
1/" && javac HelloNameDialog.java && java HelloNameDialog
● haidohong@MacBook-Air-cua-haidohong week1 % cd "/Users/haidohong/Programming/java/oop_lab/week
1/" && javac HelloNameDialog.java && java HelloNameDialog
⊗ haidohong@MacBook-Air-cua-haidohong week1 % cd "/Users/haidohong/Programming/java/oop_lab/week
1/" && javac ShowTwoNumber.java && java ShowTwoNumber
ShowTwoNumber.java:18: error: variable strNum2 might not have been initialized
    strNotification += strNum2;
                        ^
1 error
● haidohong@MacBook-Air-cua-haidohong week1 % cd "/Users/haidohong/Programming/java/oop_lab/week1/" && java
c ShowTwoNumber.java && java ShowTwoNumber
● haidohong@MacBook-Air-cua-haidohong week1 % javac ShowTwoNumber.java
● haidohong@MacBook-Air-cua-haidohong week1 % java ShowTwoNumber
● haidohong@MacBook-Air-cua-haidohong week1 % javac HelloNameDialog.java
○ haidohong@MacBook-Air-cua-haidohong week1 % java HelloNameDialog

```

Show Two Number

```
1 import javax.swing.JOptionPane;
2
3 public class ShowTwoNumber {
4     public static void main(String[] args) {
5         String strNum1, strNum2;
6         String strNotification = "You've just entered: ";
7
8         strNum1 = JOptionPane.showInputDialog(parentComponent:null,
9         message:"Please input the first number: ",
10         title:"Input the first number",
11         JOptionPane.INFORMATION_MESSAGE);
12
13         strNotification += strNum1 + " and ";
14
15         strNum2 = JOptionPane.showInputDialog(parentComponent:null,
16         message:"Please input the second number: ",
17         title:"Input the second number",
18         JOptionPane.INFORMATION_MESSAGE);
19
20         strNotification += strNum2;
21         JOptionPane.showMessageDialog(null, strNotification, title:"Show two numbers", JOptionPane.INFORMATION_MESSAGE);
22         System.exit(0);
23     }
24 }
```



PROBLEMS 4 OUTPUT DEBUG CONSOLE TERMINAL

Error: Could not find or load main class FirstDialog  
Caused by: java.lang.NoClassDefFoundError: FirstDialog (wrong name: week1/FirstDialog)

- haidohong@MacBook-Air-cua-haidohong week1 % cd "/Users/haidohong/Programming/java/oop\_lab/week1/" && javac FirstDialog.java && java FirstDialog
- haidohong@MacBook-Air-cua-haidohong week1 % cd "/Users/haidohong/Programming/java/oop\_lab/week1/" && javac HelloNameDialog.java && java HelloNameDialog
- haidohong@MacBook-Air-cua-haidohong week1 % cd "/Users/haidohong/Programming/java/oop\_lab/week1/" && javac ShowTwoNumber.java && java ShowTwoNumber

ShowTwoNumber.java:18: error: variable strNum2 might not have been initialized  
strNotification += strNum2;  
^

1 error

- haidohong@MacBook-Air-cua-haidohong week1 % cd "/Users/haidohong/Programming/java/oop\_lab/week1/" && javac ShowTwoNumber.java && java ShowTwoNumber
- haidohong@MacBook-Air-cua-haidohong week1 % javac ShowTwoNumber.java
- haidohong@MacBook-Air-cua-haidohong week1 % java ShowTwoNumber

Sum, difference, product and quotient

```

1  import java.util.Scanner;
2  public class NumberOperations {
    Run | Debug
3      public static void main(String[] args) {
4          Scanner console = new Scanner(System.in);
5          System.out.print(S:"Enter the first number: ");
6          double num1 = console.nextDouble();
7          System.out.print(S:"Enter the second number: ");
8          double num2 = console.nextDouble();
9          System.out.println("Sum " + num1 + " + " + num2 + " = " + (num1 + num2));
10         System.out.println("Difference " + num1 + " - " + num2 + " = " + (num1 - num2));
11         System.out.println("Product " + num1 + " * " + num2 + " = " + (num1 * num2));
12         if (num2 == 0){
13             System.out.println(x:"Since the second number is 0, cannot divide.");
14         } else {
15             System.out.println("Quotient " + num1 + " / " + num2 + " = " + (num1 / num2));
16         }
17     }
18
19 }

```

PROBLEMS 5 OUTPUT DEBUG CONSOLE TERMINAL

```

● haidohong@MacBook-Air-cua-haidohong week1 % cd "/Users/haidohong/Programming/java/oop_lab/week1/"
  && java
  c NumberOperations.java && java NumberOperations
  Enter the first number: 6
  Enter the second number: 0
  Sum 6.0 + 0.0 = 6.0
  Difference 6.0 - 0.0 = 6.0
  Product 6.0 * 0.0 = 0.0
  Since the second number is 0, cannot divide.
● haidohong@MacBook-Air-cua-haidohong week1 % cd "/Users/haidohong/Programming/java/oop_lab/week1/"
  && java
  c NumberOperations.java && java NumberOperations
  Enter the first number: 4
  Enter the second number: 0.1
  Sum 4.0 + 0.1 = 4.1
  Difference 4.0 - 0.1 = 3.9
  Product 4.0 * 0.1 = 0.4
  Quotient 4.0 / 0.1 = 40.0
○ haidohong@MacBook-Air-cua-haidohong week1 %

```

## Solving equations

```
1
2 public class SolvingEquations {
3     public static void FirstDegreeEquation(Double[] vars){
4         System.out.println(String.format("The equation: %fx + %f = 0", vars[0], vars[1]));
5         if (vars[0] == 0){
6             if (vars[1] == 0){
7                 System.out.println("The equation has infinite number of roots.");
8             } else {
9                 System.out.println("The equation has no roots.");
10            }
11        } else{
12            System.out.println("Root x = " + -vars[1] / vars[0]);
13        }
14    }
15    public static void SecondDegreeEquation(Double[] vars){
16        System.out.println(String.format("The equation: %fx^2 + %fx + %f = 0", vars[0], vars[1], vars[2]));
17        if (vars[0] == 0){
18            Double[] newVars = {vars[1], vars[2]};
19            SolvingEquations.FirstDegreeEquation(newVars);
20        } else{
21            Double delta = vars[1] * vars[1] - 4 * vars[0] * vars[2];
22            if (delta < 0) {
23                System.out.println("The equation has no roots.");
24            }
25            else {
26                if (delta == 0){
27                    System.out.println("Root x1 = x2 = " + -vars[1] / (2 * vars[0]));
28                } else {
29                    System.out.println("Root x1 = " + (-vars[1] + Math.sqrt(delta)) / (2 * vars[0]));
30                    System.out.println("Root x2 = " + (-vars[1] - Math.sqrt(delta)) / (2 * vars[0]));
31                }
32            }
33        }
34    }
35 }
```

PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL

- haidohong@MacBook-Air-cua-haidohong oop\_lab % cd "/Users/haidohong/Programming/java/oo\_p\_lab/" && javac SolvingEquations.java && java SolvingEquations  
The system of equation:  
1.000000x + 2.000000y = 1.000000  
3.000000x + 1.000000y = 2.000000  
Root x = -1.0  
root y = 1.0
- haidohong@MacBook-Air-cua-haidohong oop\_lab % cd "/Users/haidohong/Programming/java/oo\_p\_lab/" && javac SolvingEquations.java && java SolvingEquations  
The equation: 1.000000x + 2.000000 = 0  
Root x = -2.0  
The equation: 1.000000x^2 + 2.000000x + 1.000000 = 0  
Root x1 = x2 = -1.0  
The system of equation:  
1.000000x + 2.000000y = 1.000000  
3.000000x + 1.000000y = 2.000000  
Root x = -1.0  
root y = 1.0

```

        if (delta < 0) {
            System.out.println(x:"The equation has no roots.");
        }
        else {
            if (delta == 0){
                System.out.println("Root x1 = x2 = " + -vars[1] / (2 * vars[0]));
            } else {
                System.out.println("Root x1 = " + (-vars[1] + Math.sqrt(delta)) / (2 * vars[0]));
                System.out.println("Root x2 = " + (-vars[1] - Math.sqrt(delta)) / (2 * vars[0]));
            }
        }
    }
}

public static void LinearSystem(Double[][] vars) {
    double a = vars[0][0];
    double b = vars[0][1];
    double c = vars[1][0];
    double d = vars[1][1];
    double e = vars[0][2];
    double f = vars[1][2];
    System.out.println(x:"The system of equation: ");
    System.out.println(String.format(format:"%fx + %fy = %f", a, b, c));
    System.out.println(String.format(format:"%fx + %fy = %f", d, e, f));

    double detA = a * d - b * c;

    if (detA == 0) {
        System.out.println(x:"Error: The system of linear equations has no unique solution.");
        return;
    }

    double x = (d * e - b * f) / detA;
    double y = (a * f - c * e) / detA;

    System.out.println("Root x = " + x);
    System.out.println("root y = " + y);
}

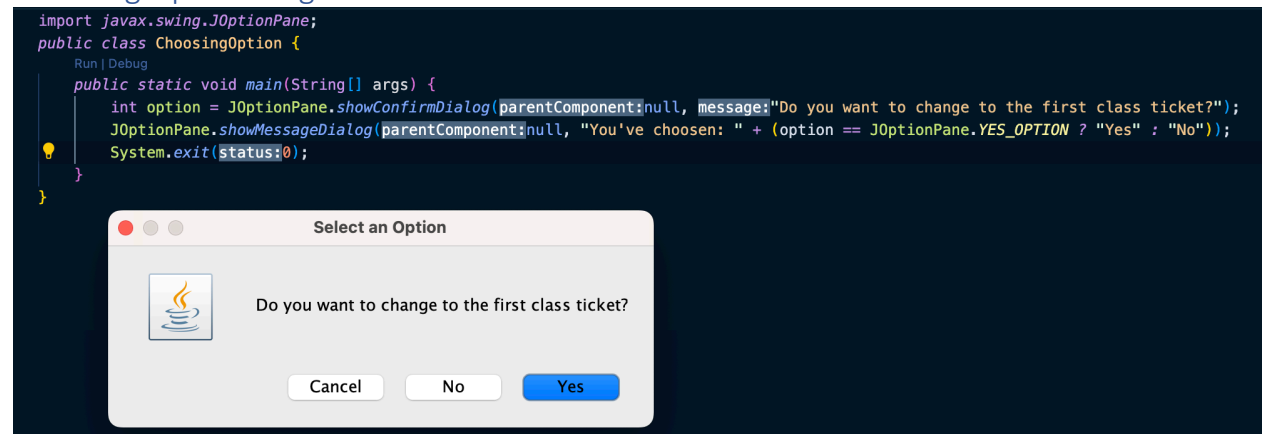
Run | Debug
public static void main(String[] args) {
    Double[] vars0 = { 1d, 2d};
    Double[] vars1 = { 1d, 2d, 1d};
    Double[][] vars2 = {{ 1d, 2d, 1d}, { 1d, 3d, 2d}};
    SolvingEquations.FirstDegreeEquation(vars0);
    SolvingEquations.SecondDegreeEquation(vars1);
    SolvingEquations.LinearSystem(vars2);
}

```

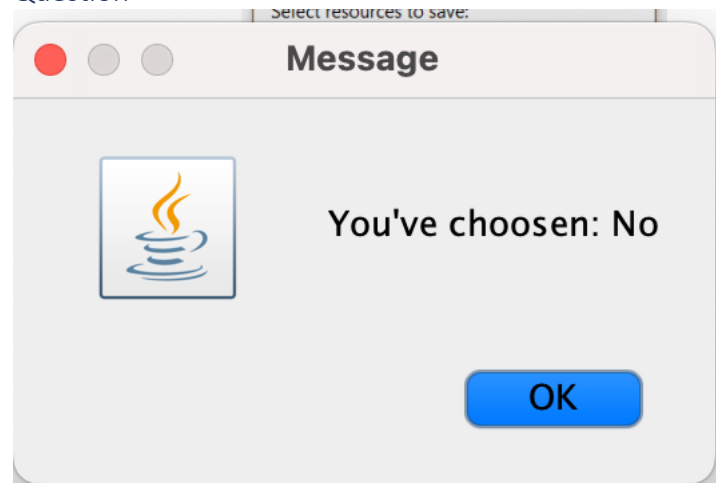


## Exercise

### Choosing Option Program



### Question



Input/Output from keyboard

```

1 import java.util.Scanner;
2
3 public class InputOutput {
4     Run | Debug
5     public static void main(String[] args) {
6         Scanner keyboard = new Scanner(System.in);
7
8         System.out.println(x:"What's your name?");
9         String strName = keyboard.nextLine();
10        System.out.println(x:"How old are you?");
11        int iAge = keyboard.nextInt();
12        System.out.println(x:"How tall are you (m)?");
13        double dHeight = keyboard.nextDouble();
14
15        System.out.println("Mrs/Ms. " + strName + ", " + iAge + " years old. Your height is " + dHeight + " m.");
16    }
17 }

```

PROBLEMS 5 OUTPUT DEBUG CONSOLE TERMINAL

```
*~*  
*****  
*****  
*****  
*****  
*****  
*****  
*****  
*****  
*****  
*****  
*****  
*****  
*****  
*****
```

● haidohong@MacBook-Air-cua-haidohong week1 % cd "/Users/haidohong/Programming/java/oop\_lab/week1/" && javac InputOutput.java && java InputOutput  
What's your name?  
Huong  
How old are you?  
20  
How tall are you (m)?  
1.65  
Mrs./Ms. Huong, 20 years old. Your height is 1.65.

○ haidohong@MacBook-Air-cua-haidohong week1 % █

## Draw triangle using stars

week1 >  Triangle.java >  Triangle >  main(String[])

```

1 import java.util.Scanner;
2 public class Triangle {
3     public static void main(String[] args) {
4         Scanner keyboard = new Scanner(System.in);
5         System.out.print(S:"Enter n: ");
6         int n = keyboard.nextInt();
7         for (int i = 1; i <= n; ++i){
8             for (int j = 0; j < n - i; ++j){
9                 System.out.print(C:" ");
10            }
11            for (int j = 0; j < 2 * i - 1; ++j){
12                System.out.print(C: '*');
13            }
14            System.out.println();
15        }
16    }
17 }

```

PROBLEMS 4 OUTPUT DEBUG CONSOLE TERMINAL

```

      *
     ***
    *****
   *****
  *****
 *****
*****

```

```
haidohong@MacBook-Air-cua-haidohong week1 % cd "/Users/haidohong/Programming/java/oop_lab/week1" && javac Triangle.java && java Triangle
```

Enter n: 10

```

      *
     ***
    *****
   ********
  **********
 ****
*****
*****
*****
*****
*****
*****
*****
*****
*****

```

```
○ haidohong@MacBook-Air-cua-haidohong week1 %
```

## Days in month

```
1  import java.util.Scanner;
2
3  public class E4DayInMonth {
4      public static boolean arrayContainsValue(String value, String[] arr){
5          for (String s : arr){
6              if (s.equals(value)) return true;
7          }
8          return false;
9      }
10     public static boolean leapYear(int year){
11         if (year % 100 == 0){
12             return year % 400 == 0;
13         }
14         return year % 4 == 0;
15     }
16
17     public static boolean validateYear(int year){
18         return year > 1900 && year < 3000;
19     }
20     public static int dayInMonth(String month, int year){
21         if (!E4DayInMonth.validateYear(year)) return -1;
22         String[][] monthsWith31Days = {
23             {"January", "Jan.", "Jan", "1"},
24             {"March", "Mar.", "Mar", "3"},
25             {"May", "May", "May", "5"},
26             {"July", "Jul.", "Jul", "7"},
27             {"August", "Aug.", "Aug", "8"},
28             {"October", "Oct.", "Oct", "10"},
29             {"December", "Dec.", "Dec", "12"}
30         };
31         String[][] monthsWith30Days = {
32             {"April", "Apr.", "Apr", "4"},
33             {"June", "Jun.", "Jun", "6"},
34             {"September", "Sept.", "Sep", "9"},
35             {"November", "Nov.", "Nov", "11"}
36         };
37         String[] February = {"February", "Feb.", "Feb", "2"};
38         for (String[] month30 : monthsWith30Days){
39             if (E4DayInMonth.arrayContainsValue(month, month30)) return 30;
```

PROBLEMS 7 OUTPUT DEBUG CONSOLE TERMINAL

- haidohong@Aircuahaidohong week1 % cd "/Users/haidohong/Programming/java/oop\_lab/week1/  
Enter month: 12  
Enter year: 2  
Invalid month/year.  
Enter month: Feb  
Enter year: 2000  
Feb, 2000 has 29 days
- haidohong@Aircuahaidohong week1 %

```

},
String[] February = {"February", "Feb.", "Feb", "2"};
for (String[] month30 : monthsWith30Days){
    if (E4DayInMonth.arrayContainsValue(month, month30)) return 30;
}
for (String[] month31 : monthsWith31Days){
    if (E4DayInMonth.arrayContainsValue(month, month31)) return 31;
}
if (E4DayInMonth.arrayContainsValue(month, February)){
    if (E4DayInMonth.leapYear(year)) return 29;
    else return 28;
}
return -1;
}
}
Run | Debug
public static void main(String[] args) {
    Scanner keyboard = new Scanner(System.in);
    String month;
    int year, days = -1;
    do {
        System.out.print(s:"Enter month: ");
        month = keyboard.nextLine();
        System.out.print(s:"Enter year: ");
        year = keyboard.nextInt();
        String tmp = keyboard.nextLine();
        days = E4DayInMonth.dayInMonth(month, year);
        if (days == -1) System.out.println(x:"Invalid month/year.");
    } while (days == -1);
    System.out.println(String.format(format:"%s, %d has %d days", month, year, days));
}
}

```

Working with array

week1 > SortingArr.java > SortingArr > main(String[])

```
1  import java.util.Arrays;
2  import java.util.Random;
3
4  public class SortingArr {
5      public static int[] randomIntegers(int n){
6          Random random = new Random();
7          int[] arr = new int[n];
8          for (int i = 0; i < n; ++i){
9              arr[i] = Math.abs(random.nextInt()) % 100;
10         }
11         return arr;
12     }
13     public static void main(String[] args) {
14         int[] arr = SortingArr.randomIntegers(n:10);
15         System.out.println(Arrays.toString(arr));
16         Arrays.sort(arr);
17         System.out.println(Arrays.toString(arr));
18         int arrSum = 0;
19         for (int num : arr) arrSum += num;
20         System.out.println("Sum: " + arrSum);
21         System.out.println("Average: " + arrSum * 1d / arr.length);
22     }
23 }
24
25
```

PROBLEMS 5 OUTPUT DEBUG CONSOLE TERMINAL

```
aidohong@MacBook-Air-cua-haidohong week1 % cd "/Users/haidohong/Programming/java/oop_lab/week1" && javac SortingArr.java && java SortingArr
61, 15, 11, 47, 60, 59, 70, 7, 59, 10]
7, 10, 11, 15, 47, 59, 59, 60, 61, 70]
um: 399
verage: 39.9
aidohong@MacBook-Air-cua-haidohong week1 %
```

## Matrix

week1 > E6Matrix.java > E6Matrix > randomMatrix(int, int)

```
1  import java.util.Arrays;
2  import java.util.Random;
3
4  public class E6Matrix {
5      public static int[][] randomMatrix(int m, int n){
6          Random random = new Random();
7          int[][] arr = new int[m][n];
8          for (int i = 0; i < m; ++i){
9              for (int j = 0; j < n; ++j){
10                 arr[i][j] = Math.abs(random.nextInt()) % 100;
11             }
12         }
13         return arr;
14     }
15     public static int[][] sumMatrix(int[][] arr1, int[][] arr2){
16         if (arr1.length != arr2.length || arr1[0].length != arr2[0].length) return null;
17         int m = arr1.length, n = arr1[0].length;
18         int[][] arr = new int[m][n];
19         for (int i = 0; i < m; ++i){
20             for (int j = 0; j < n; ++j){
21                 arr[i][j] = arr1[i][j] + arr2[i][j];
22             }
23         }
24         return arr;
25     }
26     public static void main(String[] args) {
27         int[][] arr1 = E6Matrix.randomMatrix(m:3, n:3);
28         System.out.println(x:"MATRIX 1");
29         for (int i = 0; i < arr1.length; ++i){
30             System.out.println(Arrays.toString(arr1[i]));
31         }
32     }
33 }
```

PROBLEMS 5 OUTPUT DEBUG CONSOLE TERMINAL

```
cd "/Users/haidohong/Programming/java/oop_lab/week1/" && javac E6Matrix.java && java E6Matrix
haidohong@Aircuahaidohong oop_lab % cd "/Users/haidohong/Programming/java/oop_lab/week1/" && javac
MATRIX 1
[79, 49, 44]
[99, 70, 47]
[84, 51, 55]
MATRIX 2
[93, 79, 12]
[98, 96, 87]
[11, 60, 89]
MATRIX SUM
[172, 128, 56]
[197, 166, 134]
[95, 111, 144]
haidohong@Aircuahaidohong week1 %
```

Run | Debug

```
public static void main(String[] args) {  
    int[][] arr1 = E6Matrix.randomMatrix(m:3, n:3);  
    System.out.println(x:"MATRIX 1");  
    for (int i = 0; i < arr1.length; ++i){  
        System.out.println(Arrays.toString(arr1[i]));  
    }  
    int[][] arr2 = E6Matrix.randomMatrix(m:3, n:3);  
    System.out.println(x:"MATRIX 2");  
    for (int i = 0; i < arr2.length; ++i){  
        System.out.println(Arrays.toString(arr2[i]));  
    }  
    int[][] arr3 = E6Matrix.sumMatrix(arr1, arr2);  
    if (arr2 != null){  
        System.out.println(x:"MATRIX SUM");  
        for (int i = 0; i < arr3.length; ++i){  
            System.out.println(Arrays.toString(arr3[i]));  
        }  
    }  
}
```