

# in28minutes

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## Learn Automation Testing with Java and Selenium

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Learn to automate tests with the most popular  
programming language step by step with 200+  
Hands on examples



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100,000+ Java beginners are learning from in28Minutes to become experts on APIs, Web Services and Microservices with Spring, Spring Boot and Spring Cloud.



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**Functional Programming with Java**

**Advanced Object Oriented Programming with Java**

**Basics of Programming with Java**

# About in28Minutes

*How did in28Minutes get to 100,000 learners across the world?*

Total Students ?

115,263

Top Student Locations

United States	27%
India	22%
Poland	3%
United Kingdom	3%
Canada	2%

Countries With Students

181

*We are focused on creating the awesome course (learning) experiences. Period.*

An awesome learning experience? What's that?

You need to get insight into the in28Minutes world to answer that.

You need to understand "*The in28Minutes Way*"

- What are our beliefs?
- What do we love?
- Why do we do what we do?
- How do we design our courses?

Let's get started on "*The in28Minutes Way*"!

# Getting Started

## Recommended Versions

Tool/Framework/Language	Recommended Version	More Details
Java	Java 10+	We will use JShell - New feature in Java 9
Eclipse	Eclipse Java EE Oxygen	Eclipse 4.7.2 or Greater
Having Fun	Infinity!	Be prepared to work hard while having a lot of hands-on fun!
Software Versions	Selenium 3+ Chrome 66+ Firefox 60+ JUnit 4+ TestNg 6+	We will help you install and download these!

## Github Repositories

Java - <https://github.com/in28minutes/java-a-course-for-beginners>

Automation Testing With Selenium - <https://github.com/in28minutes/automation-testing-with-java-and-selenium>

## Installation

- Github : <https://github.com/in28minutes...>
- PDF : <https://github.com/in28minutes...>

# Introduction To Java Programming With JShell

## Steps

- Step 00 - Getting Started with Programming
- Step 01 - Introduction to Multiplication Table challenge
- Step 02 - Launch JShell
- Step 03 - Break Down Multiplication Table Challenge
- Step 04 - Java Expression - An Introduction
- Step 05 - Java Expression - Exercises
- Step 06 - Java Expression - Puzzles
- Step 07 - Printing output to console with Java
- Step 08 - Printing output to console with Java - Exercise Statements
- Step 09 - Printing output to console with Java - Exercise Solutions
- Step 10 - Printing output to console with Java - Puzzles
- Step 11 - Advanced Printing output to console with Java
- Step 12 - Advanced Printing output to console with Java - Exercises and Puzzles
- Step 13 - Introduction to Variables in Java
- Step 14 - Introduction to Variables in Java - Exercises and Puzzles
- Step 15 - 4 Important Things to Know about Variables in Java
- Step 16 - How are variables stored in memory?
- Step 17 - How to name a variable?
- Step 18 - Understanding Primitive Variable Types in Java
- Step 19 - Understanding Primitive Variable Types in Java - Choosing a Type
- Step 20 - Java Assignment Operator
- Step 21 - Java Assignment Operator - Puzzles on Increment, Decrement and Compound Assignment
- Step 23 - Java Conditionals and If Statement - Introduction

- Step 24 - Java Conditionals and If Statement - Exercise Statements
- Step 25 - Java Conditionals and If Statement - Exercise Solutions
- Step 26 - Java Conditionals and If Statement - Puzzles
- Step 27 - Java For Loop to Print Multiplication Table - Introduction
- Step 28 - Java For Loop to Print Multiplication Table - Exercise Statements
- Step 29 - Java For Loop to Print Multiplication Table - Exercise Solutions
- Step 30 - Java For Loop to Print Multiplication Table - Puzzles
- Step 31 - Programming Tips : JShell - Shortcuts, Multiple Lines and Variables TODO  
Move up
- Step 32 - Getting Started with Programming - Revise all Terminology

## Exercises

### Expressions

- Write a Java expression to calculate the number of minutes in a day.
- Write a Java expression to calculate the number of seconds in a day.

### Printing Output to Console

- Print `Hello World` onto the console.
- Print `5 * 3` , as is.
- Print the calculated value of `5 * 3` .
- How do we now approach the Multiplication Table print problem, for the number `5` ?
- Print the number of seconds in a day, using the `System.out.println` method.
- Do a syntax revision for the code that you write for each of the above exercises. In your code, identify the following elements:
  - Numeric and string literals
  - Expressions
  - Operators
  - Operands
  - Method calls

### Advanced Printing Output to Console

- Print the following output by passing 4 values 5, 6, 7 and sum of the numbers: `5`



- 
- 
- `+ 6 + 7 = 18`

## Variables

- Create three integer variables `a` , `b` and `c` .
  - Write a statement to print the sum of these three variables.
  - Change the value of `a` , and then print this sum.
  - Then again, change the value of `b` and print this sum.

## If Statement

- Create four integer variables `a` , `b` , `c` and `d` . - Write an `if` statement to print if the sum of `a` and `b` is greater than the sum of `c` and `d` .
- Store three numerical values as proposed angles of a triangle in integer variables `angle1` , `angle2` and `angle3` . Create an `if` statement to state whether these three angles together can form a triangle. *Hint: A triangle is a closed geometric figure with three angles, whose sum must exactly equal 180 degrees* .
- Have a variable store an integer. Create an `if` statement to find out if it's an even number. *Hint: Use operator `###code#<`*.

## For Loop

- Repeat the entire process at arriving at the Multiplication Table Print problem, now for the number `7` . Start with fresh JShell session, if you're still using an existing one for quite some time (Rinse, and repeat!).
- Use the final solution to print Multiplication Tables for `6` and `10` .
- Print the integers from `1` to `10` .
- Print the integers from `10` to `1` .
- Print the squares of the integers from `1` to `10` .
- Print the squares of the first `10` even integers.
- Print the squares of the first `10` odd integers.

## Code Snippets

3\*4

```
System.out.println(3*4)
```

```
System.out.println("5 * 2 = 10")
```

3.0/2

```
System.out.println("5 * 2")
```

```
System.out.println(5 * 2)
```

```
System.out.println("Hello World") System.out.println(5*3)
```

```
System.out.println("5 * 3")
```

```
System.out.println(5*3) System.out.println("5 * 1 = 5")
```

```
System.out.println("5 * 2 = 5")
```

```
System.out.println("5 * 3 = 5")
```

```
System.out.println("24 * 60 * 60")
```

```
System.out.println(24 * 60 * 60)
```

```
System.out.println("Hello World")
```

```
System.out.println("Hello      World")
```

```
System.out.println(24      *      60      *      60)
```

```
System.out.println("Hello World")
```

```
System.out.println("HelloWorld")
```

```
System.out.println("hello world")
```

```
System.out.println("hello \"world")
```

```
System.out.println("hello \"world")
```

```
System.out.println("hello n world")
```

```
System.out.println("hello \n world")
```

```
System.out.println("hello \nworld")
```

```
System.out.println("hello\nworld")
```

```
System.out.println("hello\tworld")
```

```
System.out.println("hello \\ world")
```

```
System.out.println("hello \\\\ world")
```

```
Math.random()
```

```
System.out.println("hello \n world")
```

```
Math.min(23,45)
```

```
Math.min(23,4)
```

```
Math.max(23,4)
```

```
System.out.println("5 * 2 = 5")
```

```
System.out.println("5 * 2 = 10")
```

5\*2

```
System.out.printf("5 * 2 = 10")
System.out.printf("5 * 2 = 10").println()
System.out.printf("5 * 2 = 10 %d", 5*2).println()
System.out.printf("5 * 2 = %d", 5*2).println()
System.out.printf("%d %d %d", 5, 7, 5 * 7).println()
System.out.printf("%d * %d = %d", 5, 7, 5 * 7).println()
System.out.printf("%d + %d + %d = %d", 5, 6, 7, 5 + 6 +
7).println()
System.out.printf("%d + %d + %d = %d", 5, 6, 7).println()
System.out.printf("%d + %d + %d", 5, 6, 7).println()
System.out.printf("%d + %d + %d", 5, 6).println()
System.out.printf("%d + %d + %d", 5, 6, 7, 8).println()
System.out.printf("Print %s", "Testing").println()
System.out.printf("%d + %d + %d", 5.5, 6.5, 7.5).println()
System.out.printf("%f + %f + %f", 5.5, 6.5, 7.5).println()
System.out.printf("5 * 2 = 10")
System.out.printf("%d * %d = %d", 5, 2, 5 * 2).println()
System.out.println("5 * 2 = 10")
System.out.printf("%d * %d = %d", 5, 2, 5 * 2).println()
System.out.printf("%d * %d = %d", 5, 1, 5 * 1).println()
System.out.printf("%d * %d = %d", 5, 2, 5 * 2).println()
System.out.printf("%d * %d = %d", 5, 3, 5 * 3).println()
System.out.printf("%d * %d = %d", 5, 4, 5 * 4).println()
number = 11
number
number = 12
number
number2 = 100
System.out.printf("%d * %d = %d", 5, 4, 5 * 4).println()
System.out.printf("%d * %d = %d", 5, i, 5 * i).println()
i
5 * i
i = 2
System.out.printf("%d * %d = %d", 5, i, 5 * i).println()
```

```

i = 3
System.out.printf("%d * %d = %d", 5, i, 5 * i).println()

i = 10
System.out.printf("%d * %d = %d", 5, i, 5 * i).println()
System.out.printf("a + b + c = a+b+c").println()
System.out.printf("%d + %d + %d = %d", a, b, c
,a+b+c).println() a = 50 System.out.printf("%d + %d + %d =
%d", a, b, c ,a+b+c).println()
b = 60
System.out.printf("%d + %d + %d = %d", a, b, c
,a+b+c).println()
int newVariable;
newVariable
int undeclaredVariable;
undeclaredVariable
5 * undeclaredVariable
a = 100
a = c
int noOfGoals;
int NoOfGoals;
int score;
short s;
float f = 4.0f;
float f2 = 4.5f;
double dbl = 4.5;
i = j
i
j
i = j
i = j * 2
i = i * 2
i = i + i
i = i - i
i = i - 1
i++

```

```
i

i++

i
i--
number = number + 1
number++ number-- ++number
--number number--
number
i = i + 2
i += 2
i -= 1
i *= 5
i
i /= 4
i %= 2
;
long l = 6_000_000_000l;
short numberOfGoals;
numberOfGoals++
numberOfGoals
numberOfGoals++
numberOfGoals
long populationOfTheWorld;
double average;
char ch = 'A';
ch = 'B'
char grade = 'C';
grade = 'A'
grade
boolean isEven;
isEven = true
boolean isPrime;
boolean isItRainingToday;
boolean areYouEnjoyingTheCourse;
```

```
areYouEnjoyingTheCourse = true
System.out.printf("%d * %d = %d", 5, i, 5*i);

System.out.printf("%d * %d = %d", 5, i, 5*i).println()
System.out.printf("%d * %d = %d", 5, i, 5*i).println()
System.out.printf("%d * %d = %d", 5, i, 5*i).println() i =
7
System.out.printf("%d * %d = %d", 5, i, 5*i).println()
i = 10 i < 5
i > 5
i <= 5
i <= 10
i >= 10
System.out.println("i is less than 5");
i
if (i<5)
    System.out.println("i is less than 5");
i
i = 4
if (i<5)
    System.out.println("i is less than 5");
int number1 = 5;
int number2 = 7;
if (number2>number1)
System.out.println("number2 is greater than number1");
number2 = 3
if (number2>number1)
System.out.println("number2 is greater than number1");
int a = 1;
int b = 2;
int c = 3;
int d = 1;
if(a+b > c +d)
System.out.println("a+b is greater than c+d");
a = 6
if(a+b > c +d)

System.out.println("a+b is greater than c+d");
```

```

if ( a + b > c + d

)

    System.out.println("a+b is greater than c+d"); int
angle1 = 20; int angle2 = 60;
int angle3 = 50;
if(angle1 + angle2 + angle3 == 180)
    System.out.println("Valid Triangle");
angle3 += 50
angle3
angle1
angle2
if(angle1 + angle2 + angle3 == 180)
    System.out.println("Valid Triangle");
int number = 10;
number % 2
9 % 2
8 % 2
if (number % 2 == 0)
System.out.println("number is even");
if (number % 2 == 0)
System.out.println("number is even");
number = 9
if (number % 2 == 0)
System.out.println("number is even");
i > 5
i = 5
i == 5
i == 6
if(i==5)
System.out.println("i is odd");
if(i==5)
System.out.println("i is odd");
    System.out.println("i is prime");
i == 6
i = 6

```

```
if(i==5)

System.out.println("i is odd");
    System.out.println("i is prime"); if(i==5) {
System.out.println("i is odd");
System.out.println("i is prime"); }
if(i==5) {
System.out.println("i is prime");
}
System.out.printf("%d * %d = %d", 5, i, 5*i).println()
System.out.printf("%d * %d = %d", 5, i, 5*i).println()
i = i + 1
System.out.printf("%d * %d = %d", 5, i, 5*i).println()
i = i + 1
System.out.printf("%d * %d = %d", 5, i, 5*i).println()
for( i =1; i<=10; i++) {
    System.out.printf("%d * %d = %d", 5, i, 5*i).println();
}
for( i =1; i<=10; i++) {
    System.out.printf("%d * %d = %d", 6, i, 6*i).println();
}
for( i =1; i<=10; i++) {
    System.out.printf("%d * %d = %d", 7, i, 7*i).println();
}
int table = 7;
for( i =1; i<=10; i++) {
    System.out.printf("%d * %d = %d", table, i,
table*i).println();
}
table = 8
for( i =1; i<=10; i++) {
    System.out.printf("%d * %d = %d", table, i,
table*i).println();
}
table = 8

for( i =1; i<=10; i++)
```



```

{
    System.out.printf("%d * %d = %d", table, i,
table*i).println();
} table = 9
for( i =1; i<=10; i++) {
    System.out.printf("%d * %d = %d", table, i,
table*i).println();
}
for(i =1; i<=10; i++) {
    System.out.printf("%d", i).println();
}
for(i=10; i<=1 ;i--) {
    System.out.printf("%d", i).println();
}
for(i=10; i>=1 ;i--) {
    System.out.printf("%d", i).println();
}
for(i=10; i>=1 ;i = i - 2) {
    System.out.printf("%d", i).println();
}
for(i=9; i>=1 ;i = i - 2) {
    System.out.printf("%d", i).println();
}
for(i =1; i<=10; i++) {
    System.out.printf("%d", i * i).println();
}
for(i =2; i<=10; i = i + 2) {
    System.out.printf("%d", i * i).println();
}
for(i =2; i<=20; i = i + 2) {
    System.out.printf("%d", i * i).println();
}
for(i =1; i<=10; i++) {
    System.out.printf("%d", (2 * i) * (2 * i) ).println();
}

```

```

for(i =1; i<=20; i = i + 2)  {
    System.out.printf("%d", i * i).println();
} int i = 1;
for ( ;i<=10 ;i++ );
i
for (i=1 ;i<=10 ;i++ );
int j;
for (i=1, j=2 ;i<=10 ;i++, j++ );
i
j
for (i=1, j=2 ;i<=10 ;i++, j--);
i
j
for(;;);
for(int i=1; i<=10; i++) {
System.out.println("No 1");
System.out.println("No 2");
}
for(int i=1; i<=10; i++) {
System.out.println("No 1");
System.out.println("No 2");
}
    System.out.println("i is less than 5");

```

# Introduction To Methods – Multiplication Table

## Steps

- Step 00 - Section 02 - Methods - An Introduction
- Step 01 - Your First Java Method - Hello World Twice and Exercise Statements
- Step 02 - Introduction to Java Methods - Exercises and Puzzles
- Step 03 - Programming Tip - Editing Methods with JShell
- Step 04 - Introduction to Java Methods - Arguments and Parameters
- Step 05 - Introduction to Java Method Arguments - Exercises
- Step 06 - Introduction to Java Method Arguments - Puzzles and Tips
- Step 07 - Getting back to Multiplication Table - Creating a method
- Step 08 - Print Multiplication Table with a Parameter and Method Overloading
- Step 09 - Passing Multiple Parameters to a Java Method
- Step 10 - Returning from a Java Method - An Introduction
- Step 11 - Returning from a Java Method - Exercises
- Step 99 - Methods - Section Review

## Exercises

### Methods - Basics

- Write and execute a method named `sayHelloWorldThrice` to print `Hello World` thrice.
- Write and execute a method that prints the following four statements:
  - `I've created my first variable`
  - `I've created my first loop`
  - 
  -

- - I've created my first method
  - I'm excited to learn Java

## Method Parameters

1. Write a method `printNumbers(int n)` that prints all successive integers from `1` to `n`.
2. Write a method `printSquaresOfNumbers(int n)` that prints the squares of all successive integers from `1` to `n`.

## Return value from Methods

1. Write a method that returns the sum of three integers.
2. Write a method that takes as input two integers representing two angles of a triangle, and computes the third angle. *Hint: The sum of the three angles of a triangle is 180 degrees.*

## Code Snippets

```
3 * 4
$2
$2 * 3
for( i =1; i<=10; i++) {
System.out.printf("%d * %d = %d", table, i,
table*i).println();
}
for( i =1; i<=10; i++) {
    System.out.printf("%d * %d = %d", table, i,
table*i).println();
}
for( i =1; i<=10; i++) {
    System.out.printf("%d * %d = %d", table, i,
table*i).println();
}
for( i =1; i<=10; i++) {
    System.out.printf("%d * %d = %d", table, i,
table*i).println();
```

```

}
int table = 7;
for( i =1; i<=10; i++) {
System.out.printf("%d * %d = %d", table, i,
table*i).println(); }
table = 8 for( i =1; i<=10; i++) {

System.out.printf("%d * %d = %d", table, i,
table*i).println();
}
System.out.println("Hello World")
System.out.println("Hello World")
System.out.println("Hello World")
System.out.println("Hello World");
    System.out.println("Hello World");
System.out.println("Hello World");
    System.out.println("Hello World");
sayHelloWorldTwice()
sayHelloWorldTwice()
void sayHelloWorldThrice(){
    System.out.println("Hello World");
    System.out.println("Hello World");
    System.out.println("Hello World");
}
sayHelloWorldThrice()
printLearningExperience()
printLearningExperience()
void NameOfMethod(){
}
void nameOfMethod(){
}
void sayHelloWorldTwice(){
    System.out.println("HelloWorld");
    System.out.println("HelloWorld");
}

```

```

} sayHelloWorldTwice()

void printLearningExperience() {
System.out.println("I've created sdf first variable");
System.out.println("I've created fsadjf first method");
System.out.println("I've created fsajdf1 first loop");
System.out.println("I'm excited fasdf1kjfskfsd learn
Java"); }
printLearningExperience()

sayHelloWorldThrice() sayHelloWorldTwice() sayHelloWorld(1)
sayHelloWorld(1)
sayHelloWorld(2)
sayHelloWorld(2)
sayHelloWorld(4)
sayHelloWorld(6)
void sayHelloWorld(int noOfTimes) {
    for(int i=1; i<=noOfTimes; i++) {
        System.out.println("Hello World");
    }
}
sayHelloWorld(6)
sayHelloWorld(3)
sayHelloWorld(2)
void printNumbers(int n) {
    for(int i=1; i<=n; i++) {
        System.out.println(i);
    }
}
printNumbers(10)
printNumbers(3)
void printSquaresOfNumbers(int n) {
    for(int i=1; i<=n; i++) {
        System.out.println(i*i);
    }
}
} printSquaresOfNumbers(5)
printSquaresOfNumbers(3)

```

```

sayHelloWorld(4)

for( i =1; i<=10; i++) {
    System.out.printf("%d * %d = %d", table, i,
table*i).println(); }
int i; for(i=1;i<=10;i++)
    System.out.printf("%d * %d = %d", 5, i, 5 *
i).println(); for(i=1;i<=10;i++)

{
    System.out.printf("%d * %d = %d", 5, i, 5 *
i).println();
}
void printMultiplicationTable() {
    for(int i=1;i<=10;i++) {
        System.out.printf("%d * %d = %d", 5, i, 5 *
i).println();
    }
}
printMultiplicationTable()

void printMultiplicationTable(int table) {
    for(int i=1;i<=10;i++) {
        System.out.printf("%d * %d = %d", table, i,
table * i).println();
    }
}

printMultiplicationTable(6)
printMultiplicationTable(7)
printMultiplicationTable()
printMultiplicationTable(6)
Math.max(1,2)
void sum(int firstNumber,int secondNumber) {
    int sum = firstNumber +

```

```

secondNumber;
    System.out.println(sum);
}
sum(5, 10) void sum(int firstNumber,int secondNumber, int
thirdNumber) {
    int sum = firstNumber + secondNumber + thirdNumber;
    System.out.println(sum); }
sum(5, 10, 15) Math.max(4,5)
$110 int max = Math.max(15, 25);

max
sum(1, 10)
int sumOfTwoNumbers(int firstNumber, int secondNumber) {
    int sum = firstNumber + secondNumber;
    return sum;
}
sumOfTwoNumbers(1,1)
int sum = sumOfThreeNumbers(2,3,4);
calculateThirdAngle(20, 50)
int sumOfThreeNumbers(int firstNumber, int secondNumber,
int thirdNumber) {
    int sum = firstNumber + secondNumber + thirdNumber;
    return sum;
}
sumOfThreeNumbers(1,2,3)
sumOfThreeNumbers(15,2,3)
int calculateThirdAngle(int angle1, int angle2) {
    int angle3 = 180 - (angle1 + angle2);
    return angle3;
}
calculateThirdAngle(20, 20)
calculateThirdAngle(20, 20)

```



# Introduction To Java Platform

## Steps

- Step 00 - Section 03 - Overview Of Java Platform - Section Overview
- Step 01 - Overview Of Java Platform - An Introduction - java, javac, bytecode and JVM
- Step 02 - Java Class and Object - First Look
- Step 03 - Create a method in a Java class
- Step 04 - Create and Compile Planet.java class
- Step 05 - Run Planet class with Java - Using a main method
- Step 06 - Play and Learn with Planet Class
- Step 07 - JDK vs JRE vs JVM

## Code Snippets (Including Output)

```
jshell> System.out.println("I love JShell");  
I love JShell
```

```
jshell> class Country {  
    ...> }  
| created class Country
```

```
jshell> Country india = new Country()  
india ==> Country@6e06451e
```

```
jshell> Country usa = new Country()  
usa ==> Country@6e1567f1
```

```
jshell> class Planet
```

```

{
    ...> }
| created class Planet

jshell> Planet planet = new Planet()
planet ==> Planet@56ef9176

jshell> Planet earth = new Planet()

earth ==> Planet@1ed4004b

jshell> Planet venus = new Planet()
venus ==> Planet@25bbe1b6

jshell> void printMultiplicationTable() {
    ...>     for(int i=1;i<=10;i++) {
    ...>         System.out.printf("%d * %d = %d", 5, i, 5 *
i).println();
    ...>     }
    ...> }
| created method printMultiplicationTable()

jshell> void printMultiplicationTable(int table) {
    ...>     for(int i=1;i<=10;i++) {
    ...>         System.out.printf("%d * %d = %d", table, i,
table * i).println();
    ...>     }
    ...> }
| created method printMultiplicationTable(int)

jshell>

jshell> /methods
| void | void printMultiplicationTable()
| void printMultiplicationTable(int)

```

```

jshell>

jshell> class Planet {
    ...> }
| modified class Planet

jshell> Planet earth = new Planet()
earth ==> Planet@73846619

jshell> Planet venus = new Planet()
venus ==> Planet@4bec1f0c

jshell> class Planet {
    ...>     void revolve() {
    ...>         System.out.println("Revolve");
    ...>     }
    ...> }
| replaced class Planet
|   update replaced variable planet, reset to null
|   update replaced variable earth, reset to null
|   update replaced variable venus, reset to null

jshell> Planet earth = new Planet()
earth ==> Planet@192b07fd

jshell> Planet venus = new Planet()
venus ==> Planet@64bfbc86

jshell> Planet.revolve()
| Error:
| non-static method revolve() cannot be referenced from a
static context
| Planet.revolve()
| ^-----^

jshell> earth.revolve()
Revolve

```

```
jshell> venus.revolve()
```

```
Revolve
```

```
jshell> class Country {
```

```
    ...>     void comingSoon() {
```

```
    ...>         System.out.println("Coming Soon");
```

```
    ...>
```

```
}
```

```
    ...> }
```

```
| replaced class Country
```

```
|     update replaced variable country, reset to null
```

```
|     update replaced variable india, reset to null
```

```
|     update replaced variable usa, reset to null
```

```
jshell> Country india = new Country()
```

```
india ==> Country@60c6f5b
```

```
jshell> Country netherlands = new Country()
```

```
netherlands ==> Country@3c0f93f1
```

```
jshell> india.comingSoon()
```

```
Coming Soon
```

```
jshell> netherlands.comingSoon()
```

```
Coming Soon
```

```
jshell> /list Country
```

```
27 : class Country {
```

```
    void comingSoon() {
```

```
        System.out.println("Coming Soon");
```

```
    }
```

```
}
```

```
jshell> /list
```

Planet

```
22 : class Planet
```

```
{  
    void revolve() {  
        System.out.println("Revolve");  
    }  
}
```

jshell>

## /03-IntroductionToJavaPlatform/Planet.java

```
class Planet {  
  
    void revolve() {  
        System.out.println("Revolve");  
    }  
  
    public static void main(String[] args) {  
        Planet earth = new Planet();  
        earth.revolve();  
    }  
}
```

# Introduction To Eclipse-First Java Project

## Steps

- Step 00 - Intro to Section and Installing Eclipse
- Step 01 - Creating a New Java Project with Eclipse
- Step 02 - Your first Java class with Eclipse
- Step 03 - Writing Multiplication Table Java Program with Eclipse
- Step 04 - Adding more methods for Multiplication Table Program
- Step 05 - Programming Tip 1 : Refactoring with Eclipse
- Step 06 - Programming Tip 2 : Debugging with Eclipse
- Step 07 - Programming Tip 3 : Eclipse vs JShell - How to choose?

## Code Examples

/04-IntroductionToEclipse-FirstJavaProject/src/com/in28minutes/firstjavaproject/HelloWorld.java

```
package com.in28minutes.firstjavaproject;

public class HelloWorld {

    public static void main(String[] args) {

    }

}
```

## /04-IntroductionToEclipse- FirstJavaProject/src/com/in28minutes/firstjavaproject/KeyboardShortcuts.java

```
package com.in28minutes.firstjavaproject;

public class KeyboardShortcuts {
    public static void main(String[] args) {
        int i = 0;
        System.out.println(i);
    }
}
```

## /04-IntroductionToEclipse- FirstJavaProject/src/com/in28minutes/firstjavaproject/MultiplicationTable.java

```
package com.in28minutes.firstjavaproject;

public class MultiplicationTable {

    void print() {
        print(5);
    }

    void print(int table) {
        print(table, 1, 10);
    }

    void print(int table, int from, int to) {
        for (int i = from; i <= to; i++) {
            System.out.printf("%d X %d = %d",
table, i, table * i).println();
        }
    }
}
```

```
    }  
  
}
```

## /04-IntroductionToEclipse- FirstJavaProject/src/com/in28minutes/firstjavaproject/MultiplicationTableRunner.java

```
package com.in28minutes.firstjavaproject;  
  
public class MultiplicationTableRunner {  
  
    public static void main(String[] args) {  
        MultiplicationTable table = new  
MultiplicationTable();  
        table.print();  
  
        //table.print(6);  
        //table.print(6, 11, 20);  
    }  
  
}
```

## /04-IntroductionToEclipse- FirstJavaProject/src/com/in28minutes/firstjavaproject/MutliplicationTableBeforeRefactoring.java

```
package com.in28minutes.firstjavaproject;  
  
public class MutliplicationTableBeforeRefactoring {  
    void print() {  
        for (int i = 1; i <= 10; i++) {  
            System.out.printf("%d X %d = %d",  
5, i, 5 * i).println();  
        }  
    }  
  
}
```



```
void print(int table)

{
    for (int i = 1; i <= 10; i++) {
        System.out.printf("%d X %d = %d",
table, i, table * i).println();
    }
}

void print(int table, int from, int to) {
    for (int i = from; i <= to; i++) {
        System.out.printf("%d X %d = %d",
table, i, table * i).println();
    }
}
}
```

# Introduction To Object Oriented Programming

## Steps

- Step 00 - Introduction to Object Oriented Programming - Section Overview
- Step 01 - Introduction to Object Oriented Programming - Basics
- Step 02 - Introduction to Object Oriented Programming - Terminology - Class, Object, State and Behavior
- Step 03 - Introduction to Object Oriented Programming - Exercise - Online Shopping System and Person
- Step 04 - Create Motor Bike Java Class and a couple of objects
- Step 05 - Exercise Solutions - Book class and Three instances
- Step 06 - Introducing State of an object with speed variable
- Step 07 - Understanding basics of Encapsulation with Setter methods
- Step 08 - Exercises and Tips - Getters and Generating Getters and Setters with Eclipse
- Step 09 - Puzzles on this and initialization of member variables
- Step 10 - First Advantage of Encapsulation
- Step 11 - Introduction to Encapsulation - Level 2
- Step 12 - Encapsulation Exercises - Better Validation and Book class
- Step 13 - Introduction to Abstraction
- Step 14 - Introduction to Java Constructors
- Step 15 - Introduction to Java Constructors - Exercises and Puzzles
- Step 16 - Introduction to Object Oriented Programming - Conclusion

## Exercises

- In each of the following systems, identify the basic entities involved, and organize
- them using object oriented terminology:
  - Online Shopping System

- Person
- Provide Better Encapsulation and Validation for Book and MotorBike class
- Create a constructor for Book class and create three instances

## Code Examples

/05-  
IntroductionToObjectOrientedProgramming/src/com/in28minutes/oops/Book.java

```
package com.in28minutes.oops;

public class Book {

    private int noOfCopies;

    public Book(int noOfCopies) {
        this.noOfCopies = noOfCopies;
    }

    public void setNoOfCopies(int noOfCopies) {
        if (noOfCopies > 0)
            this.noOfCopies = noOfCopies;
    }

    public void increaseNoOfCopies(int howMuch) {
        setNoOfCopies(this.noOfCopies + howMuch);
    }

    public void decreaseNoOfCopies(int howMuch) {
        setNoOfCopies(this.noOfCopies - howMuch);
    }

}
```

/05-

## IntroductionToObjectOrientedProgramming/src/com/in28minutes/oops/BookRunner.java

```
package com.in28minutes.oops;

public class BookRunner {

    public static void main(String[] args) {
        // Create a new class called Book
        // Create three instances
        Book artOfComputerProgramming = new
Book(100);

        Book effectiveJava = new Book(50);
        Book cleanCode = new Book(40);

        artOfComputerProgramming.setNoOfCopies(100);
        effectiveJava.setNoOfCopies(50);
        cleanCode.setNoOfCopies(45);
    }

}
```

/05-

## IntroductionToObjectOrientedProgramming/src/com/in28minutes/oops/MotorBike.java

```
package com.in28minutes.oops;

public class MotorBike {
    //state
    private int speed; //member variable

    //constructors
    MotorBike() {
        this(5);
    }
}
```

```

    }

    MotorBike(int speed) {
        this.speed = speed;
    }

    //behavior
    public int getSpeed() {
        return speed;
    }

    public void setSpeed(int speed) {
        if(speed > 0 )
            this.speed = speed;
    }

    public void increaseSpeed(int howMuch) {
        setSpeed(this.speed + howMuch);
    }

    public void decreaseSpeed(int howMuch) {
        setSpeed(this.speed - howMuch);
    }

    void start() {
        System.out.println("Bike Started");
    }
}

```

/05-  
[IntroductionToObjectOrientedProgramming/src/com/in28minutes/oops/MotorBikeRunner.java](#)

```

package com.in28minutes.oops;

public class MotorBikeRunner {

    public static void main(String[] args) {

```

```
MotorBike ducati = new MotorBike(100);

MotorBike honda = new MotorBike(200);

MotorBike somethingElse = new MotorBike();

System.out.println(ducati.getSpeed());

System.out.println(honda.getSpeed());

System.out.println(somethingElse.getSpeed());


    ducati.start();

    honda.start();

    //ducati.setSpeed(100);

    ducati.increaseSpeed(100);

    honda.increaseSpeed(100);

    ducati.decreaseSpeed(250);

    honda.decreaseSpeed(250);


    System.out.println(ducati.getSpeed());

    System.out.println(honda.getSpeed());

}

}
```

// Create a new class called Book

// Create three instances

```
// Art Of Computer Programming
// Effective Java
// Clean Code
```

## /05- IntroductionToObjectOrientedProgramming/entireoutput- constructor-puzzles.txt

```
Last login: Mon Jan 29 10:33:44 on ttys000
Rangas-MacBook-Pro:~ rangaraokaranam$ jshell
| Welcome to JShell -- Version 9.0.1
| For an introduction type: /help intro

jshell> class Cart {
...> };
| created class Cart

jshell> Cart cart1 = new Cart();
cart1 ==> Cart@3f49dace

jshell> class Cart {
...>     Cart() {
...>     }
...> };
| replaced class Cart
| update replaced variable cart1, reset to null

jshell> Cart cart1 = new Cart();

cart1 ==> Cart@59494225

jshell> class Cart {
...>     Cart() {
...>         System.out.println("Constructor is
called");
...>     }
...> }
| modified class Cart
```

```
jshell> Cart cart1 = new Cart();
```

```
Constructor is called
```

```
cart1 ==> Cart@6e1567f1
```

```
jshell>
```



# Primitive Data Types And Alternatives

## Steps

- Step 00 - Primitive Data Types in Depth - Section Overview
- Step 01 - Basics about Java Integer Data Types - Casting, Operators and More
- Step 02 - Java Integer Data Types - Puzzles - Octal, Hexadecimal, Post and Pre increment
- Step 03 - Java Integer Data Types - Exercises - BiNumber - add, multiply and double
- Step 04 - Java Floating Point Data Types - Casting , Conversion and Accuracy
- Step 05 - Introduction to BigDecimal Java Class
- Step 06 - BigDecimal Puzzles - Adding Integers
- Step 07 - BigDecimal Exercises - Simple Interest Calculation
- Step 08 - Java Boolean Data Type - Relational and Logical Operators
- Step 09 - Java Boolean Data Type - Puzzles - Short Circuit Operators
- Step 10 - Java Character Data Type char - Representation and Conversion
- Step 11 - Java char Data Type - Exercises 1 - isVowel
- Step 12 - Java char Data Type - Exercises 2 - isDigit
- Step 13 - Java char Data Type - Exercises 3 - isConsonant, List Upper Case and Lower Case Characters
- Step 14 - Primitive Data Types in Depth - Conclusion

## Exercises

### Big Decimal

- Calculate formula for Simple Interest Formula
  - $\text{Total Amount} = \text{principal} + \text{principal} * \text{interest} * \text{noOfYears};$

```
SimpleInterestCalculator calculator
```

```

=
        new SimpleInterestCalculator("4500.00", "7.5");
BigDecimal totalValue =
        calculator.calculateTotalValue(5); // 5 years
System.out.println(totalSum);

```

char data type

Implement MyChar class

```

MyChar myChar = new MyChar('c');
System.out.println(myChar.isVowel());
        // 'a', 'e', 'i', 'o', 'u' and Capitals
System.out.println(myChar.isDigit());
System.out.println(myChar.isAlphabet());
MyChar.printLowerCaseAlphabets();
MyChar.printUpperCaseAlphabets();

```

## Code Examples

[/06-PrimitiveDataTypesAndAlternatives/commands.txt](#)

```

Byte.SIZE
Byte.BYTES
Byte.MAX_VALUE
Byte.MIN_VALUE
Short.BYTES
Integer.BYTES
Long.BYTES
Integer.MAX_VALUE
Short.MAX_VALUE
Byte.SIZE
Byte.MIN_VALUE
Byte.MAX_VALUE
Short.BYTES

```

```

Integer.BYTES

```

```
Long.BYTES
Integer.MAX_VALUE
byte c = 13;
long l = 5000000000001; i = (int) l
l = i
int eight = 010;
int sixteen = 0x10;
int fifteen = 0XF; int big = 0XBBAACC; Short.MAX_VALUE

short s = (short) i;
int i1 = s;
i
i
i
i
34.5
34.56789
double dbl = 34.5678;
float f2 = (float)dbl;
dbl++
dbl--
dbl % 5
float f = i;
34.56789876 + 34.2234
number1.add(number2);
number1
BigDecimal number3 = number1.add(number2);
number1
BigDecimal number1 = new BigDecimal("34.56789876");
BigDecimal number10 = new BigDecimal(34.2234);
BigDecimal number11 = new BigDecimal("34.56789876");
number10.add(number11)
number10.multiply(number11)

BigDecimal number = new BigDecimal("11.5");

BigDecimal number2 = new BigDecimal("23.45678");

number.add(number2)
number.add(new BigDecimal(i))
```

```
number.multiply(new BigDecimal(i)) number.divide(new
BigDecimal(100))
number.divide(new BigDecimal("100.01234"))
number.divide(new BigDecimal("100.012"))
number.divide(new BigDecimal("100.12")) number.divide(new
BigDecimal("100.1")) number.divide(new BigDecimal("1001"))

number.divide(new BigDecimal("100"))
boolean isValue = false;
i > 7
i >= 7
i < 7
i <= 7
i == 6
i == 7
i == 8
i = 8
i = 7
i == 7
i > 15
i >= 15
i <= 25
i >= 15 && i <= 25
i = 30
i >= 15 && i <= 25
i = 5
i >= 15 && i <= 25
true && true
true && false
false && true
false && false

false || true
false || true

true || false
true || true
false || false
false ^ false false ^ true
true ^ false
```

```

true ^ true !true
!false int x = 6;
!(x>7)

!(x>7)
true || ++i==11
i
int i = 10;
int j = 15;
j > 15 && i++ > 5
j
i
j > 15 & i++ > 5
j
i
i++;
i++;
char ch2 = '\u0022';
char ch3 = '\u00A2';
ch++
ch
++ch
++ch
ch + 5
ch
(int)ch
ch
System.out.println(ch);

char ch = '\t';
System.out.println(ch);

System.out.println(ch);
(int)'1'
(int)'0' (int)'9'
(int)'2'
(int)'a' (int)'z'
(int)'A' (int)'Z'

        for (char ch = 'A'; ch <= 'Z'; ch++) {
            System.out.println(ch);

```

```
}

        for (char ch = 'A'; ch <= 'Z'; ch++) {
            System.out.println(ch);
        }

        for (char ch = 'A'; ch <= 'C'; ch++) {
            System.out.println(ch);
        }
}
```

## /06- PrimitiveDataTypesAndAlternatives/src/com/in28minutes/pri mitive/datatypes/BiNumber.java

```
package com.in28minutes.primitive.datatypes;

public class BiNumber {
    private int number1;
    private int number2;

    public int getNumber1() {
        return number1;
    }

    public void setNumber1(int number1) {
        this.number1 = number1;
    }

    public int getNumber2() {
        return number2;
    }

    public void setNumber2(int number2) {
        this.number2 = number2;
    }

    public BiNumber(int number1, int number2)
```

```

{
    this.number1 = number1;
    this.number2 = number2;
}

public int add() {
    return number1 + number2;
}

public int multiply() {
    return number1 * number2;
}

public void doubleValue() {
    this.number1 *= 2;
    this.number2 *= 2;
}
}

```

## /06-PrimitiveDataTypesAndAlternatives/src/com/in28minutes/primitive/datatypes/BiNumberRunner.java

```

package com.in28minutes.primitive.datatypes;

public class BiNumberRunner {

    public static void main(String[] args)

    {
        BiNumber numbers = new BiNumber(2, 3);

        System.out.println(numbers.add()); //2+3

        System.out.println(numbers.multiply()); //2*3
    }
}

```

```

        numbers.doubleValue(); //Double both numbers

System.out.println(numbers.getNumber1()); //4

System.out.println(numbers.getNumber2()); //6
    }

}

```

## /06-PrimitiveDataTypesAndAlternatives/src/com/in28minutes/primitive/datatypes/MyChar.java

```

package com.in28minutes.primitive.datatypes;

public class MyChar {

    private char ch;

    public MyChar(char ch)

    {

        this.ch = ch;

    }

    public boolean isVowel() {
        //'a' e i o u or A E I O

U
        if(ch == 'a' || ch == 'A')
            return

true;

        if(ch == 'e' || ch ==

'E')

            return true;
    }
}

```



```

        if(ch == 'i' || ch == 'E')
            return true;

        if(ch == 'o' || ch == 'O')
            return true;

        if(ch == 'u' || ch == 'U')
            return true;

        return false;
    }

    public boolean isDigit() {
        if(ch >= 48 && ch <=57) //between '0' and
'9'

            return true;

        return false;
    }

    public boolean isAlphabet() {
        if(ch >= 97 && ch <=122) //between 'a' and
'z'

            return true;

        if(ch >= 65 && ch <=90) //between 'A' and
'Z'

            return true;

        return false;
    }

    public boolean isConsonant() {
        //Alphabet and it is not VOWEL
        //! [a , e, i ,o , u]

```

```

        if(isAlphabet() && !isVowel())
            return true;

        return false;

    }

    public static void printLowerCaseAlphabets() {
        //'a' to 'z'
        for (char ch = 'a'; ch <= 'z'; ch++) {
            System.out.println(ch);
        }
    }

    public static void printUpperCaseAlphabets() {
        for (char ch = 'A'; ch <= 'Z'; ch++) {
            System.out.println(ch);
        }
    }

}

```

## /06- PrimitiveDataTypesAndAlternatives/src/com/in28minutes/pri mitive/datatypes/MyCharRunner.java

```

package com.in28minutes.primitive.datatypes;

public class MyCharRunner {

    public static void main(String[] args) {
        MyChar myChar = new MyChar('B');

        System.out.println(myChar.isVowel());

        //'a', 'e', 'i', 'o', 'u' and Capitals
        System.out.println(myChar.isDigit());
    }
}

```

```

        System.out.println(myChar.isAlphabet());
// 'a' to 'z' or 'A' to 'Z'

        System.out.println(myChar.isConsonant());

        MyChar.printLowerCaseAlphabets();
        MyChar.printUpperCaseAlphabets();
    }

}

```

## /06- PrimitiveDataTypesAndAlternatives/src/com/in28minutes/primitive/datatypes/SimpleInterestCalculator.java

```

package com.in28minutes.primitive.datatypes;

import java.math.BigDecimal;

public class SimpleInterestCalculator
{

    BigDecimal principal;

    BigDecimal interest;

    public SimpleInterestCalculator(String principal,
String interest) {
        this.principal = new BigDecimal(principal);
        this.interest = new
BigDecimal(interest).divide(new BigDecimal(100));
    }

    public BigDecimal calculateTotalValue(int
noOfYears) {

        // Total Value = principal + principal *

```

```

        interest * noOfYears;

        BigDecimal noOfYearsBigDecimal = new
BigDecimal(noOfYears);

        BigDecimal totalValue =
principal.add(principal.multiply(interest).multiply(noOfYea
rsBigDecimal));

        return totalValue;

    }

}

```

## /06- PrimitiveDataTypesAndAlternatives/src/com/in28minutes/pri mitive/datatypes/SimpleInterestCalculatorRunner.java

```

package com.in28minutes.primitive.datatypes;

import java.math.BigDecimal;

public class SimpleInterestCalculatorRunner {

    public static void main(String[] args) {

        SimpleInterestCalculator calculator =
            new
SimpleInterestCalculator("4500.00",

        "7.5");

        BigDecimal totalValue =

calculator.calculateTotalValue(5); // 5 years
        //6187.50000
        System.out.println(totalValue);

    }

}

```

# Conditionals – If, Switch and More..

## Steps

- Step 00 - Conditionals with Java - Section Overview
- Step 01 - Introduction to If Else Statement
- Step 02 - Introduction to Nested If Else
- Step 03 - If Else Statement - Puzzles
- Step 04 - If Else Problem - How to get User Input in Java?
- Step 05 - If Else Problem - How to get number 2 and choice from user?
- Step 06 - If Else Problem - Implementing with Nested If Else
- Step 07 - Java Switch Statement - An introduction
- Step 08 - Java Switch Statement - Puzzles - Default, Break and Fall Through
- Step 09 - Java Switch Statement - Exercises - isWeekDay, nameOfMonth, nameOfDay
- Step 10 - Java Ternary Operation - An Introduction
- Step 11 - Conditionals with Java - Conclusion

## Exercises

### If and Nested If Else - Design a Menu

- Ask User for input
  - Enter two numbers
  - Choose an Operation
    - add
    - multiply
    - divide
    - subtract
- ◦ ◦ ...

- Publish Result

```
Enter Number1:
```

```
2
```

```
Enter Number2:
```

```
4
```

```
1 - Add
```

```
2 - Subtract
```

```
3 - Divide
```

```
4 - Multiply
```

```
Choose Operation: 4
```

```
Result is - 8
```

## Switch

- `public static boolean isWeekDay(int dayNumber) {`
  - input - number of day 0 (Sunday) to 6(Saturday)
  - return if the day is a Week Day.
- `public static String determineNameOfMonth(int monthNumber) {`
  - input - number of month 1(January) to 12(December)
  - output - Name of month
- `public static String determineNameOfDay(int dayNumber) {`
  - input - number of day 0 (Sunday) to 6(Saturday)
  - Return the day of week in text

## Code Examples

### /07-Conditionals/commands.txt

```
if(true)

{
    System.out.println("True");
}

if(false) {
```

```

        System.out.println("True");
    }
    if(i==3) {
        System.out.println("True");
    }

    if(i<2) {
        System.out.println("True");
    }
    if(i<=3 || i>=35) {
        System.out.println("True");
    }
    if(i<=3 && i>=35) {
        System.out.println("True");
    }
    if (i==3) {
        System.out.println("True");
    } else {
        System.out.println("i is not 3");
    }
    i = 5
    if (i==3) {
        System.out.println("True");
    } else {
        System.out.println("i is not 3");
    }
    if(i==1) {
        System.out.println("i");
    }
    switch (i) {
        case 1 :

            System.out.println("1");
            case 5 : System.out.println("5");
            default : System.out.println("default");
    }
    i = 1 switch (i)

```

```

{
    case 1 : System.out.println("1");
    case 5 : System.out.println("5");
    default : System.out.println("default"); } switch (i)

{
    case 1 : System.out.println("1"); break;
    case 5 : System.out.println("5"); break;
    default : System.out.println("default"); break;
}
boolean isEven;
int i =5;
if(i%2==0) {
    isEven = true;
} else {
    isEven = false;
}
isEven
i = 6
if(i%2==0) {
    isEven = false;
}
if(i%2==0) {
    isEven = true;
} else {
    isEven = false;
}
isEven
isEven = ( i%2==0 ? true : false )

i = 6
isEven = ( i%2==0 ? true : false )
i = 7
isEven = ( i%2==0 ? true : false )
i = 6
String even = ( i%2 ==0 ? "YES" : "NO" );

```



/07-

## Conditionals/src/com/in28minutes/ifstatement/examples/IfStatementRunner.java

```
package com.in28minutes.ifstatement.examples;

public class IfStatementRunner {

    public static void main(String[] args) {
        puzzle5();
    }

    private static void puzzle1() {
        int k = 15;
        if (k > 20) {
            System.out.println(1);
        } else if (k > 10) {
            System.out.println(2);
        } else if (k < 20) {
            System.out.println(3);
        } else {
            System.out.println(4);
        }
    }

    private static void puzzle2() {
        int l =

15;

        if (l < 20)
            System.out.println("l<20");//
        if (l > 20)
            System.out.println("l>20");
        else
            System.out.println("Who am I?");//
    }
}
```

```
}
```

```
private static void puzzle3()

{
    int m =

15;

    if(m>20)
        if(m<20)
            System.out.println("m>20");
        else
            System.out.println("Who am I?");
}
```

```
private static void puzzle5() {
    int number = 5;
    if(number < 0)
        number = number + 10;
    number++;
    System.out.println(number);
}
```

```
private static void basicNestedIfElse()

{
    int i = 24;
    // i is 25
    // i is 24
    // i is neither 25 or 24
    if (i == 25) {
        System.out.println("i = 25");
    } else if (i == 24) {
        System.out.println("i = 24");
    } else if (i == 23) {
```

```

        System.out.println("i = 23");
    } else {
        System.out.println("i != 24 and i
!=25 and i !=23");
    }
}
}
}

```

## /07- Conditionals/src/com/in28minutes/ifstatement/examples/M enuRunner.java

```

package com.in28minutes.ifstatement.examples;

import java.util.Scanner;

public class MenuRunner {
    public static void main(String[] args) {
        // Type obj = new Type(argument);
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter Number1: ");
        int number1 = scanner.nextInt();

        System.out.print("Enter Number2:

");

        int number2 = scanner.nextInt();

        System.out.println("Choices Available are

");

        System.out.println("1 - Add");
        System.out.println("2 - Subtract");
        System.out.println("3 - Divide");
        System.out.println("4 - Multiply");

        System.out.print("Enter Choice: ");
    }
}

```

```

        int choice = scanner.nextInt();

        System.out.println("Your Choices are");
        System.out.println("Number1 " +

number1);

        System.out.println("Number2 " +

number2);

        System.out.println("Choice " +

choice);

        performOperationUsingSwitch(number1,
number2, choice);
    }

    private static void
performOperationUsingNestedIfElse(int number1, int number2,
int choice) {
        if (choice == 1) {
            System.out.println("Result " +
(number1 + number2));
        } else if (choice == 2) {
            System.out.println("Result " +
(number1 -

number2));
        } else if (choice == 3)

{
            System.out.println("Result " +
(number1 / number2));
        } else if (choice == 4) {
            System.out.println("Result " +
(number1 * number2));
        } else {
            System.out.println("Invalid
Operation");
        }
    }

```

```

    }

    private static void performOperationUsingSwitch(int
number1, int number2, int choice) {
        switch (choice) {
            case 1:
                System.out.println("Result " +
(number1 + number2));

                break;
            case
2:
                System.out.println("Result " +
(number1 - number2));
                break;
            case 3:
                System.out.println("Result " +
(number1 / number2));
                break;
            case 4:
                System.out.println("Result " +
(number1 *
number2));
                break;
            default:
                System.out.println("Invalid
Operation");
                break;
        }
    }
}

```

## witchExercisesRunner.java

```
package com.in28minutes.ifstatement.examples;

public class SwitchExercisesRunner {

    public static void main(String[] args) {
        System.out.println(isWeekDay(5));
    }

    public static boolean isWeekDay(int dayNumber) {
        switch(dayNumber)
        {
            //case 0 :
            //case 6 : return false;
            case 1 :
            case 2 :
            case 3 :
            case 4
            :
            case 5 : return true;
            }

        return false;
    }

    public static String determineNameOfDay(int
dayNumber) {
        switch (dayNumber) {
            case 0:
                return "Sunday";
            case 1:
                return "Monday";
            case 2:
                return "Tuesday";
```

```

        case 3:
            return "Wednesday";
        case 4:
            return "Thursday";
        case 5:
            return "Friday";
        case 6:
            return "Saturday";
    }

    return "Invalid_day";
}
}

```

## /07- Conditionals/src/com/in28minutes/ifstatement/examples/SwitchStatementRunner.java

```

package com.in28minutes.ifstatement.examples;

public class SwitchStatementRunner {
    public static void main(String[] args) {
        puzzle4();
    }

    private static void puzzle1() {
        int number = 2;
        switch (number) {
            case 1:
                System.out.println(1);
            case 2:
                System.out.println(2);
            case 3:
                System.out.println(3);
            default:
                System.out.println("Default");
        }
    }
}

```

```

    }

    private static void puzzle2() {
        int number = 2;
        switch (number) {
            case 1:
                System.out.println(1);
                break;
            case 2:
            case
3:
                System.out.println("Number is 2 or
3");

            break;

            default:
                System.out.println("Default");
                break;
        }
    }

    private static void puzzle3()
{
        int number = 10;
        switch (number) {
            case 1:
                System.out.println(1);
                break;
            case 2:
                System.out.println(2);
                break;
            case 3:
                System.out.println(3);
                break;

```



```

        default:
            System.out.println("Default");
            break;
    }
}

```

```

private static void puzzle4() {
    int number = 10;
    switch (number) {
        default:
            System.out.println("Default");

```

```

    break;

    case 1:
        System.out.println(1);

```

```

    break;

    case

```

2:

```

        System.out.println(2);
        break;
    case

```

3:

```

        System.out.println(3);
        break;
    }
}

```

```

private static void puzzle5() {
    long l = 15;
    /*switch(l){

        */
}

```

```
        private static void puzzle6() {  
            int number = 10;  
            int i = number * 2;  
            switch (number) {  
                //case number>5:  
                System.out.println("number>5");  
            }  
        }  
    }  
}
```

# Loops

## Steps

- Step 00 - Java Loops - Section Introduction
- Step 01 - Java For Loop - Syntax and Puzzles
- Step 02 - Java For Loop - Exercises Overview and First Exercise Prime Numbers
- Step 03 - Java For Loop - Exercise - Sum Upto N Numbers and Sum of Divisors
- Step 04 - Java For Loop - Exercise - Print a Number Triangle
- Step 05 - While Loop in Java - An Introduction
- Step 06 - While Loop - Exercises - Cubes and Squares upto limit
- Step 07 - Do While Loop in Java - An Introduction
- Step 08 - Do While Loop in Java - An Example - Cube while user enters positive numbers
- Step 09 - Introduction to Break and Continue
- Step 10 - Selecting Loop in Java - For vs While vs Do While

## Exercises

### For Loop

Implement MyNumber class with behavior shown in the example below:

```
MyNumber number = new MyNumber(9);

number.isPrime(); //Is a number Prime?
//Hint : 5 => true, 7 => true, 11 => true, 6 => false

int sum = number.sumUptoN(); //Sum of numbers upto n?
//1 + 2 + 3 + 4 + 5 + 6

int sumOfDivisors = number.sumOfDivisors();
```

```
number.printANumberTriangle();  
//1  
//1 2  
//1 2 3  
  
//1 2 3 4   //1 2 3 4 5
```

## While

Implement WhileNumberPlayer class with behavior shown in the example below:

```
WhileNumberPlayer player = new  
WhileNumberPlayer(30); //limit  
  
player.printSquaresUptoLimit();  
//For limit = 30, output would be 1 4 9 16 25  
  
player.printCubesUptoLimit();  
//For limit = 30, output would be 1 8 27
```

## Choosing Loops

### Thinking Exercise

- What would we use for the Menu
- If we would want to run the Menu again and again?

Enter Number1:

2

Enter Number2:

4

1 - Add

2 - Subtract

3 - Divide

4 - Multiply

5 - Exit

Choose Operation: 4

Result is 8

Choose Operation: 1

Result is

6

Choose Operation: 5

Thank You!

## Code Examples

[/08-Loops/commands.txt](#)

```
for (int i = 0; i<= 10; i++) {  
    System.out.print (i + " ");  
}  
for (int i = 0; i<= 10; i = i + 2) {  
    System.out.print (i + " ");  
}  
for (int i = 1; i<= 10; i = i + 2) {  
    System.out.print (i + " ");  
}  
for (int i = 11; i<= 10; i = i + 2) {  
    System.out.print (i + " ");  
}  
for (int i = 11; i<= 20;) {  
    System.out.print (i + " ");  
    i++;  
}  
for (; i<= 30;i++) {  
    System.out.print (i + " ");  
}  
  
9 % 2  
9 % 3  
  
if (i>2)
```

```

{
    System.out.println("i>2");
}
int i = 3; if (i>2) {
    System.out.println("i>2"); }
i = 0
while (i <5) {
    System.out.println(i);
    i++;
}
i
i = 6
while (i < 5) {
    System.out.println(i);
    i++;
}
i = -2
while (i < 5) {
    System.out.println(i);
}
while (i < 5) {
    System.out.println(i);
    i++;
}
i
while (i < 5) {
    System.out.print(i + " ");
    i++;
}
i
i = 1
do {
    System.out.print(i + "

");
    i++;

```

```

} while (i<5);
i = 10

while (i < 5)    {
    System.out.print(i + " ");
    i++; }
do {
    System.out.print(i + " ");
    i++;
} while (i<5);
for(i=1;i<=10;i++) {
    if(i==5)
        break;
    System.out.print(i + " ");
}
for(i=1;i<=10;i++) {
    if(i%2==0)
        break;
    System.out.print(i + " ");
}
for(i=1;i<=10;i++) {
    if(i%2==0)
        continue;
    System.out.print(i + " ");
}
for(i=1;i<=10;i++) {
    if(i%2!=0)
        continue;
    System.out.print(i + " ");
}

```

## /08- Loops/src/com/in28minutes/loops/DoWhileRepeatedQuestionRunner.java

```

package com.in28minutes.loops;

import java.util.Scanner;

public class DoWhileRepeatedQuestionRunner

```

```

{

    public static void main(String[] args) {

        Scanner scanner = new Scanner(System.in);
        int number = -1;

        do {
            if (number != -1) {
                System.out.println("Cube is
" + (number * number * number));
            }
            System.out.print("Enter a number:
");

            number = scanner.nextInt();
        } while (number >= 0);
        System.out.print("Thank You! Have Fun!");
    }

}

```

</08-Loops/src/com/in28minutes/loops/MyNumber.java>

```

package com.in28minutes.loops;

public class MyNumber {

    private int number;

    public MyNumber(int number) {
        this.number = number;
    }

    public boolean isPrime()

    {

        // 2 to number-1

```



by 2?

```
// How can check if a number is divisible
```

```
if (number < 2) {
    return false;
}

for (int i = 2; i <= number - 1; i++) {
    if (number % i == 0) {
        return false;
    }
}

return true;
}
```

```
public int sumUptoN() {
    int sum = 0;

    for (int i = 1; i <= number; i++) {
        sum = sum + i;
    }

    return sum;
}
```

```
public int sumOfDivisors() {
    // 6 except 1 , 6 => 2,3
    // 2 + 3 + 4 + 5

    int sum =
```

```
0;
```

```
for (int i = 2; i <= number - 1; i++) {
    if (number % i == 0)
```

```
{
```

```
    sum = sum + i;
```

```

        }

        }

        return sum;
    }

    public void printNumberTriangle() {
        // 1
        // 1 2
        // 1 2 3
        // 1 2 3 4
        // 1 2 3 4 5

        for (int i = 1; i <= number; i++) {
            for (int j = 1; j <= i; j++) {
                System.out.print(j + " ");
            }
            System.out.println();
        }
    }

}

```

## /08- Loops/src/com/in28minutes/loops/MyNumberRunner.java

```

package com.in28minutes.loops;

import com.in28minutes.loops.MyNumber;

public class MyNumberRunner {

    public static void main(String[] args)

    {

        MyNumber number = new MyNumber(5);
    }
}

```

```

        boolean isPrime = number.isPrime();
        System.out.println("isPrime " + isPrime);

        int sum = number.sumUptoN();
        System.out.println("sumUptoN " + sum);

        int sumOfDivisors = number.sumOfDivisors();
        System.out.println("sumOfDivisors " +
sumOfDivisors);

        number.printNumberTriangle();
    }

}

```

## /08- Loops/src/com/in28minutes/loops/WhileNumberPlayer.java

```

package com.in28minutes.loops;

public class WhileNumberPlayer {

    private int limit;

    public WhileNumberPlayer(int limit) {
        this.limit = limit;
    }

    // For limit = 30, output would be 1 4 9 16 25

    public void printSquaresUptoLimit() {
        int i = 1;
        while (i * i < limit) {
            System.out.print(i * i + "

");
            i++;
        }
    }
}

```

```

    }
    System.out.println();
}

// For limit = 27, output would be 1 8 27
public void printCubesUptoLimit() {
    int i = 1;
    while (i * i * i <= limit) {
        System.out.print(i * i * i + " ");
        i++;
    }
    System.out.println();
}
}

```

## /08- Loops/src/com/in28minutes/loops/WhileNumberPlayerRunner.java

```

package com.in28minutes.loops;

public class WhileNumberPlayerRunner {
    public static void main(String[] args) {
        WhileNumberPlayer player = new
WhileNumberPlayer(27);

        player.printSquaresUptoLimit();
        player.printCubesUptoLimit();

    }
}

```

# Reference Types

## Steps

- Step 00 - Java Reference Types - Section Introduction
- Step 01 - Reference Types - How are they stored in Memory?
- Step 02 - Java Reference Types - Puzzles
- Step 03 - String class - Introduction and Exercise - Print each word and char on a new line
- Step 04 - String class - Exercise Solution and Some More Important Methods
- Step 05 - Understanding String is Immutable and String Concat, Upper Case, Lower Case, Trim methods
- Step 06 - String Concatenation and Join, Replace Methods
- Step 07 - Java String Alternatives - StringBuffer and StringBuilder
- Step 08 - Java Wrapper Classes - An Introduction - Why and What?
- Step 09 - Java Wrapper Classes - Creation - Constructor and valueOf
- Step 10 - Java Wrapper Classes - Auto Boxing and a Few Wrapper Constants - SIZE, BYTES, MAX\_VALUE and MIN\_VALUE
- Step 11 - Java Dates - Introduction to LocalDate, LocalTime and LocalDateTime
- Step 12 - Java Dates - Exploring LocalDate - Creation and Methods to play with Date
- Step 13 - Java Dates - Exploring LocalDate - Comparing Dates and Creating Specific Dates
- Step 14 - Java Reference Types - Conclusion

## Exercises

### String

- Take a piece of Text into a String.
  - Print each character in the text on a separate line
  - Print each word in the text on a separate line

# Code Examples

/09-ReferenceTypes/commands.txt

```
class Planet {  
}  
  
Planet jupiter = new Planet();  
int i = 5;  
class Animal {  
    int id;  
    Animal(int id) {  
        this.id = id;  
    }  
}  
Animal nothing;  
nothing = cat  
nothing.id = 10  
cat.id  
nothing = dog  
nothing.id  
int j = i;  
j = 6  
i  
i == j  
j = 5  
i == j  
Animal dog = new Animal(12);  
Animal cat = new Animal(10);  
Animal ref = cat;  
Animal dog2 = new Animal(12);  
cat == dog  
cat == ref  
dog == dog2  
1  
2
```

12.34

```
"Test".length()
BigDecimal bd = new BigDecimal("1.0");
str.charAt(0)
str.charAt(2) str.charAt(3)

String biggerString = "This is a lot of text";
str.substring(5)
biggerString.substring(5)
biggerString.substring(5,13)
str.charAt(13)
biggerString.charAt(13)
biggerString.charAt(456)
someString.length()
someString.charAt(5)
for(int i= 0; i<someString.length(); i++) {
    System.out.println(someString.charAt(i));
}
someString.indexOf("lot")
someString.charAt(10)
someString.charAt('i')
someString.indexOf('i')
someString.lastIndexOf('i')
someString.contains("text")
String someString = "This is a lot of text again";
someString.startsWith("This")
someString.startsWith("jfsdklfj")
someString.endsWith("jfsdklfj")
someString.endsWith("in")
someString.endsWith("ain")
someString.endsWith("again")
someString.endsWith("againfsda")
someString.isEmpty()
"fjsadlkfj".isEmpty()
```

```
"".isEmpty()

"true".equals("true")
"value".equals("value")

str.equals("value") str.equals("VAlue")
str.equalsIgnoreCase("VAlue") str.concat("is awesome");

str
String anotherString = str.concat(" is awesome");
str
anotherString
String string2 = anotherString.concat(".");
str
anotherString
string2
str.toUpperCase()
str.toLowerCase()
str2.trim()
String str2 = "  in28Minutes is awesome.  ";
str2.trim()
1 + 2
"1" + "2"
"1" + 2
"1" + 23
1 + 23
1 + 2 + "3"
"1" + 2 + 3
System.out.println("Value is " + 20)
System.out.println("Value is " + 20 + 20)
System.out.println("Value is " + (20 + 20))
String.join(",", "2", "3", "4")
String.join(",", "A", "B", "C")
String.join(",", "A")
String.join(",", "A", "B")
"abcd".replace('a', 'z');
```



```
"abcd".replace("ab", "xyz");

String str = "jdsfja ";
"123" + "123" + "1234" + "123456"
sb.append(" 123")

sb sb
sb.setCharAt(1, 'e')

sb
StringBuilder sb = new StringBuilder("test");
Integer integer1 = new Integer("5234");
Integer integer2 = new Integer("5234");
Integer i1 = new Integer(5);
Integer i2 = new Integer(5);
Integer i3 = Integer.valueOf(5);
Integer i4 = Integer.valueOf(5);
i1 == i2
i3 == i4
Integer integer = Integer.valueOf("4567");
int i = integer.intValue();
Float f = Float.valueOf("12.45");
f.floatValue()
f.intValue()
Integer eight = Integer.valueOf(8);
Integer.toBinaryString(eight);
Integer.toHexString(eight);
Integer eightyEight = Integer.valueOf(88);
Integer.toHexString(eightyEight);
seven++
seven
seven == sevenAgain
Integer seven = 7;
Integer sevenAgain = 7;
seven == sevenAgain
Integer.MAX_VALUE
Integer.MIN_VALUE
```

Integer.SIZE

Integer.BYTES

import java.time.LocalDate;

import java.time.LocalDateTime; import java.time.\*;

today.getYear()

today.getDayOfWeek()

today.getDayOfMonth()

today.getDayOfYear()

today.getMonth()

today.getMonthValue()

today.isLeapYear()

today.lengthOfYear()

today.lengthOfMonth()

today.plusDays(100)

today.plusMonths(100)

today.plusYears(100)

today.minusYears(100)

LocalDate hundredYearsBefore = today.minusYears(100);

today

LocalDateTime now = LocalDateTime.now();

LocalDate today = LocalDate.now();

LocalDate yesterady = LocalDate.of(2018, 01, 31);

LocalDate yesterday = LocalDate.of(2018, 01, 31);

today

yesterday

today.withYear(2016)

today.withDayOfMonth(20)

today.withMonth(3)

today.withDayOfYear(120)

today.isBefore(yesterday)

today.isAfter(yesterday)

# Arrays And ArrayList

## Steps

- Step 00 - Introduction to Array and ArrayList - Section Introduction with a Challenge
- Step 01 - Understanding the need and Basics about an Array
- Step 02 - Java Arrays - Creating and Accessing Values - Introduction
- Step 03 - Java Arrays - Puzzles - Arrays of Objects, Primitive Data Types, toString and Exceptions
- Step 04 - Java Arrays - Compare, Sort and Fill
- Step 05 - Java Arrays - Exercise - Create Student Class - Part 1 - Total and Average Marks
- Step 06 - Java Arrays - Exercise - Create Student Class - Part 2 - Maximum and Minimum Mark
- Step 07 - Introduction to Variable Arguments - Need
- Step 08 - Introduction to Variable Arguments - Basics
- Step 09 - Introduction to Variable Arguments - Enhancing Student Class
- Step 10 - Java Arrays - Using Person Objects and String Elements with Exercises
- Step 11 - Java String Arrays - Exercise Solutions - Print Day of Week with Most number of letters and more
- Step 12 - Adding and Removing Marks - Problem with Arrays
- Step 13 - First Look at ArrayList - An Introduction
- Step 14 - First Look at ArrayList - Refactoring Student Class to use ArrayList
- Step 15 - First Look at ArrayList - Enhancing Student Class with Add and Remove Marks
- Step 16 - Introduction to Array and ArrayList - Conclusion

## Exercises

## Student Class

```
Student student = new Student (name, list of marks);
int number = student.getNumberOfMarks();
int sum = student.getTotalSumOfMarks();
int maximumMark = student.getMaximumMark();
int minimumMark = student.getMinimumMark();
BigDecimal average = student.getAverageMarks();

student.addNewMark(35);
student.removeMarkAtIndex(5);
```

## String Arrays

- Create a string array with days of the week
  - "Sunday", "Monday", "Tuesday", "Wednesday"
  - "Thursday", "Friday", "Saturday"
- Find the day with most number of letters in it
  - Longest String
- Print days of the week backwards

## Code Examples

/10-  
[ArraysAndArrayList/src/com/in28minutes/arrays/StringRunner.java](#)

```
package com.in28minutes.arrays;

public class StringRunner {

    public static void main(String[] args) {

        String[] daysOfWeek = { "Sunday", "Monday",
            "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday"
```

```

};

        String dayWithMostCharacters =

        "";

        for (String day : daysOfWeek)

        {

                if (day.length() >
dayWithMostCharacters.length()) {
                        dayWithMostCharacters =

                        day;

                }

        }

        System.out.println("Day with Most number of
characters " + dayWithMostCharacters);

        for (int i = daysOfWeek.length - 1; i >= 0;
i--) {

                System.out.println(daysOfWeek[i]);

        }

        }

}

```

/10-  
[ArraysAndArrayList/src/com/in28minutes/arrays/Student.java](#)

```

package com.in28minutes.arrays;

import java.math.BigDecimal;

```

```
import java.math.RoundingMode;
import java.util.ArrayList;
import java.util.Collections;

public class Student {

    private String name;

    private ArrayList<Integer> marks = new

ArrayList<Integer>();

    public Student(String name, int... marks)
{
    this.name =    name;

    for (int mark : marks) {
        this.marks.add(mark);
    }
}

    public int getNumberOfMarks() {
        return marks.size();
    }

    public int getTotalSumOfMarks() {
        int sum = 0;
        for (int mark : marks) {
            sum += mark;
        }
    }
}
```

```

        }

        return sum;

    }

    public int getMaximumMark() {
        return Collections.max(marks);
    }

    public int getMinimumMark() {
        return Collections.min(marks);
    }

    public BigDecimal getAverageMarks()
{
        int sum = getTotalSumOfMarks();
        int number =

getNumberOfMarks();

        return new BigDecimal(sum).divide(new

BigDecimal(number), 3, RoundingMode.UP);

    }

    public String toString() {
        return name + marks;
    }

    public void addNewMark(int mark) {
        marks.add(mark);
    }

```

```
public void removeMarkAtIndex(int index) {  
  
    marks.remove(index);  
  
}  
  
}
```

## /10- ArraysAndArrayList/src/com/in28minutes/arrays/StudentRunner.java

```
package com.in28minutes.arrays;  
  
import java.math.BigDecimal;  
  
public class StudentRunner {  
  
    public static void main(String[] args) {  
  
        Student student = new Student("Ranga", 97,  
98,  
100);  
  
        int number = student.getNumberOfMarks();  
        System.out.println("number of marks : " +  
  
number);  
  
        int sum =  
  
student.getTotalSumOfMarks();  
        System.out.println("sum of marks : " +
```



```
sum);

        int maximumMark = student.getMaximumMark();
        System.out.println("maximum of marks : " +
maximumMark);

        int minimumMark =

student.getMinimumMark();
        System.out.println("minimum of marks : " +
minimumMark);

        BigDecimal average =
student.getAverageMarks();
        System.out.println("average : " + average);


        System.out.println(student);

        student.addNewMark(35);


        System.out.println(student);

        student.removeMarkAtIndex(1);

        System.out.println(student);

    }

}
```

# Object Oriented Programming Again

## Steps

- Step 00 - Object Oriented Programming - Level 2 - Section Introduction
- Step 01 - Basics of Designing a Class - Class, Object, State and Behavior
- Step 02 - OOPS Example - Fan Class - Deciding State and Constructors
- Step 03 - OOPS Example - Fan Class - Deciding Behavior with Methods
- Step 04 - OOPS Exercise - Rectangle Class
- Step 05 - Understanding Object Composition with Customer Address Example
- Step 06 - Understanding Object Composition - An Exercise - Books and Reviews
- Step 07 - Understanding Inheritance - Why do we need it?
- Step 08 - Object is at top of Inheritance Hierarchy
- Step 09 - Inheritance and Overriding - with toString() method
- Step 10 - Java Inheritance - Exercise - Student and Employee Classes
- Step 11 - Java Inheritance - Default Constructors and super() method call
- Step 12 - Java Inheritance - Puzzles - Multiple Inheritance, Reference Variables and instanceof
- Step 13 - Java Abstract Class - Introductio

- Step 14 - Java Abstract Class - First Example - Creating Recipes with Template Method
- Step 15 - Java Abstract Class - Puzzles
- Step 16 - Java Interface - Example 1 - Gaming Console - How to think about Interfaces?
- Step 17 - Java Interface - Example 2 - Complex Algorithm - API defined by external team
- Step 18 - Java Interface - Puzzles - Unimplemented methods, Abstract Classes, Variables, Default Methods and more
- Step 19 - Java Interface vs Abstract Class - A Comparison
- Step 20 - Java Interface Flyable and Abstract Class Animal - An Exercise
- Step 21 - Polymorphism - An introduction

## Exercises

Creating a simple class

- public class Rectangle
  - length, width;
  - What constructors?
  - What Operations?

Object Composition - Book and Reviews

Book > id, name, author

*Reviews > id, description, rating*

```
Book book =  
    new Book(123, "Object Oriented Programming with Java",  
            "Ranga");
```

```
book.addReview(  
    new Review(10, "Great Book", 5));  
book.addReview(  
    new Review(101, "Awesome", 5);  
  
System.out.println(book);
```

## Inheritance

Setup an Inheritance Hierarchy and implement toString in Employee class

- Person
  - name, phone, email;
- Student
  - college, class
- Employee
  - title, employer, employeeGrade, salary
  - toString (print all values including those of Person)

## Interface and Abstract Class

### interface Flyable

- void fly();
- Bird "with wings"
- Aeroplane "with fuel"
- Flyable flyingObjects = {new Bird(), new Aeroplane()};
- Loop and invoke fly method

### abstract class Animal

- void bark()
- Dog "Bow Bow"
- Cat "Meow Meow"
- Animal[] animals = {new Cat(), new Dog()};

- Loop and invoke bark method

## Code Examples

/commands.txt

```
class Pet extends Animal {
    public void groom() {
        System.out.println("Groom");
    }
}
dog.toString()
dog.groom()
Pet pet = new Dog();
pet.groom()
pet instanceof Pet
pet instanceof Dog
pet instanceof Animal
pet instanceof Object
animal instanceof Pet
animal instanceof Dog
animal instanceof Object
class Animal {
    public void bark() {
        System.out.println("TEst");
    }
}
animal.bark()
abstract class AbstractAnimal {
    abstract public void bark();
}
class Dog extends AbstractAnimal {
    public void bark() {
        System.out.println("Bow Bow");
    }
}
Dog dog = new Dog();
```

```
dog.bark()
abstract class AbstractTest {
}
abstract class Algorithm1 extends AbstractAlgorithm {
}
abstract class AbstractAlgorithm {
    private int stepCount;
    public int getStepCount() {
        return stepCount();
    }
}
class Implementation implements Interface2 {
    public void method2() { }
    public void method1() { }
}
abstract class ImplementationAbstract implements Interface2
{
    public void method1() { }
}
interface Interface3 {
    int test = 5;
}
interface Interface4 {
    default void print() {
        System.out.println("default");
    }
}
class Test implements Interface4 {
}
test.print()
class Test1 implements Interface4 {
    public void print() {
        System.out.println("override");
    }
}
```

```
Test1 test = new Test1(); test.print()

interface Interface1 {
    void method1();
}
interface Interface2 {
    void method2();
}
```

## /src/com/in28minutes/oops/level2/AbstractRecipe.java

```
package com.in28minutes.oops.level2;

public abstract class AbstractRecipe {

    public void execute() {
        getReady();
        doTheDish();
        cleanup();
    }

    abstract void getReady();
    abstract void doTheDish();
    abstract void cleanup();
}
```

## /src/com/in28minutes/oops/level2/Address.java

```
package com.in28minutes.oops.level2;

public class Address {
    private String line1;
    private String city;
    private String zip;
}
```

```

        //creation
        public Address(String line1, String city, String
zip) {
            super();
            this.line1 = line1;
            this.city = city;
            this.zip = zip;
        }

        public String toString() {
            return line1 + " " + city + " " + zip;
        }
    }
}

```

## /src/com/in28minutes/oops/level2/Book.java

```

package com.in28minutes.oops.level2;

import java.util.ArrayList;

public class Book {

    private int id;
    private String name;
    private String author;
    private ArrayList<Review> reviews = new ArrayList<>
();

    public Book(int id, String name, String author) {
        this.id = id;
        this.name = name;
        this.author = author;
    }
}

```



```

        public void addReview(Review review) {
            this.reviews.add(review);

        }

        public String toString() {
            return String.format("id =%d name = %s
author = %s Reviews = [%s]",
                                id, name, author, reviews);
        }
    }
}

```

/src/com/in28minutes/oops/level2/BookRunner.java

```

package com.in28minutes.oops.level2;

public class BookRunner {

    public static void main(String[] args) {
        Book book = new Book(123, "Object Oriented
Programming with Java",
                                "Ranga");
        book.addReview(new Review(10, "Great Book",
5));
        book.addReview(new Review(101, "Awesome",
5));

        System.out.println(book);

    }

}

```

## /src/com/in28minutes/oops/level2/Customer.java

```
package com.in28minutes.oops.level2;

public class Customer {

    //state
    private String name;
    private Address homeAddress;
    private Address workAddress;

    //creating
    public Customer(String name, Address homeAddress) {
        this.name = name;
        this.homeAddress = homeAddress;
    }

    //operations
    public Address getHomeAddress() {
        return homeAddress;
    }

    public void setHomeAddress(Address homeAddress) {
        this.homeAddress = homeAddress;
    }

    public Address getWorkAddress() {
        return workAddress;
    }

    public void setWorkAddress(Address workAddress) {
        this.workAddress = workAddress;
    }

    public String toString()
```

```

{
    return String.format("name - [%s] home
address - [%s] work address - [%s])"
                        , name, homeAddress,
workAddress);
}

}

```

## /src/com/in28minutes/oops/level2/CustomerRunner.java

```

package com.in28minutes.oops.level2;

public class CustomerRunner {

    public static void main(String[] args) {
        Address homeAddress = new Address("line 1",
"Hyderabad", "500035");
        Customer customer = new Customer("Ranga",
homeAddress);
        System.out.println(customer);

        Address workAddress = new Address("line 1
for work", "Hyderabad", "500078");
        customer.setWorkAddress(workAddress);

        System.out.println(customer);
    }
}

```

## /src/com/in28minutes/oops/level2/Fan.java

```

package com.in28minutes.oops.level2;

```

```
public class Fan {

    //state
    private String make;
    private double radius;
    private String color;

    private boolean isOn;
    private byte speed; //0 to 5

    //creation
    public Fan(String make, double radius, String
color) {

        this.make = make;
        this.radius = radius;
        this.color = color;
    }

    public void switchOn() {
        this.isOn = true;
        setSpeed((byte)5);
    }

    public void switchOff() {
        this.isOn = false;
        setSpeed((byte)0);
    }

    public void setSpeed(byte speed) {
        this.speed = speed;
    }

    //print the state
    public String toString()
```

```

{
    return String.format("make - %s, radius - %f , color - %s , isOn - %b , speed - %d",
                           make, radius, color, isOn, speed);
}

}

```

## /src/com/in28minutes/oops/level2/FanRunner.java

```

package com.in28minutes.oops.level2;

public class FanRunner {
    public static void main(String[] args) {
        Fan fan = new Fan("Manufacturer 1",
0.34567, "GREEN");
        fan.switchOn();
        System.out.println(fan);
        fan.setSpeed((byte)3);
        System.out.println(fan);
        fan.switchOff();
        System.out.println(fan);
    }
}

```

## /src/com/in28minutes/oops/level2/inheritance/AnimalRunner.java

```

package com.in28minutes.oops.level2.inheritance;

abstract class Animal {
    abstract void bark();
}

```

```

class Dog extends Animal {
    public void bark() {
        System.out.println("Bow Bow");
    }
}

class Cat extends Animal {
    public void bark()

{
        System.out.println("Meow Meow");
    }
}

public class AnimalRunner {
    public static void main(String[] args) {
        Animal[] animals = {new Cat(), new Dog()};
        for(Animal animal:animals) {
            animal.bark();
        }

    }

}

```

/src/com/in28minutes/oops/level2/inheritance/Employee.java

```

package com.in28minutes.oops.level2.inheritance;

import java.math.BigDecimal;

public class Employee extends Person {
    private String title;
    private String employerName;
    private char employeeGrade;
    private BigDecimal salary;

```

```
public Employee(String name, String title) {
    super(name);
    this.title = title;
    System.out.println("Employee Constructor");
}

public String getTitle() {
    return
title;
}

public void setTitle(String title) {
    this.title = title;
}

public String getEmployerName() {
    return employerName;
}

public void setEmployerName(String employerName) {
    this.employerName = employerName;
}

public char getEmployeeGrade() {
    return employeeGrade;
}

public void setEmployeeGrade(char employeeGrade) {
    this.employeeGrade = employeeGrade;
}

public BigDecimal getSalary() {
    return salary;
}
```





```

        public void setSalary(BigDecimal salary) {
            this.salary = salary;
        }

        public String toString() {
            return super.toString() + "#" + title + "#" +
employerName + "#" + employeeGrade;
        }

    }
}

```

## /src/com/in28minutes/oops/level2/inheritance/Person.java

```

package com.in28minutes.oops.level2.inheritance;

public class Person extends Object{

    private String name;
    private String email;
    private String phoneNumber;

    public Person(String name) {
        System.out.println("Person Constructor");
        this.name = name;
    }

    public String getName() {
        return name;
    }

    public String getEmail() {
        return email;
    }

    public void setEmail(String email) {
        this.email = email;
    }
}

```

```
        public String getPhoneNumber() {
            return phoneNumber;
        }

        public void setPhoneNumber(String phoneNumber) {
            this.phoneNumber = phoneNumber;
        }

        public String toString() {
            return name + "#" + email + "#" + phoneNumber;
        }
    }
}
```

[/src/com/in28minutes/oops/level2/inheritance/Student.java](#)

```
package com.in28minutes.oops.level2.inheritance;

public class Student extends Person {
    private String collegeName;
    private int year;

    public Student(String name, String collegeName) {
        super(name);
        this.collegeName = collegeName;
    }

    public String getCollegeName() {
        return collegeName;
    }

    public void setCollegeName(String collegeName) {
        this.collegeName = collegeName;
    }
}
```

```
        public int getYear() {
            return year;
        }

        public void setYear(int year) {
            this.year = year;
        }
    }
}
```

/src/com/in28minutes/oops/level2/inheritance/StudentRunner.java

```
package com.in28minutes.oops.level2.inheritance;

public class StudentRunner {

    public static void main(String[] args) {

        //Student student = new Student();
        //student.setName("Ranga");

        //student.setEmail("in28minutes@gmail.com");

        /*
        Person person = new Person();
        person.setName("Ranga");
        person.setEmail("ranga@in28minutes.com");
        person.setPhoneNumber("123-456-7890");
        String value = person.toString();
        System.out.println(value);
        System.out.println(person);
        */

        Employee employee = new Employee("Ranga",
```

```
"Programmer Analyst");  
        //employee.setName("Ranga");  
        employee.setEmail("ranga@in28minutes.com");  
        employee.setPhoneNumber("123-456-7890");  
        employee.setEmployeeGrade('A');  
        employee.setTitle("Programmer Analyst");  
  
        System.out.print(employee);  
  
    } }
```

## /src/com/in28minutes/oops/level2/inheritance/StudentWithoutInheritance.java

```
package com.in28minutes.oops.level2.inheritance;  
  
public class StudentWithoutInheritance {  
  
    private String name;  
    private String email;  
    private String phoneNumber;  
  
    private String college;  
    private int year;  
  
    public String getName() {  
        return name;  
    }  
  
    public void setName(String name) {  
        this.name = name;  
    }  
}
```

```
public String getEmail() {  
    return email;  
}  
  
public void setEmail(String email) {  
    this.email = email;  
}  
  
public String getPhoneNumber()  
{  
    return phoneNumber;  
}  
  
public void setPhoneNumber(String phoneNumber) {  
    this.phoneNumber = phoneNumber;  
}  
  
public String getCollege() {  
    return college;  
}  
  
public void setCollege(String college)  
{  
    this.college = college;  
}  
  
public int getYear() {  
    return year;  
}  
  
public void setYear(int year) {  
    this.year = year;  
}
```



```
}  
  
}
```

/src/com/in28minutes/oops/level2/interfaces/ChessGame.java

```
package com.in28minutes.oops.level2.interfaces;  
  
public class ChessGame implements GamingConsole{  
  
    @Override  
    public void up()  
  
    {  
        System.out.println("Move piece up");  
    }  
  
    @Override  
    public void down() {  
        System.out.println("Move piece down");  
    }  
  
    @Override  
    public void left() {  
        System.out.println("Move piece left");  
    }  
  
    @Override  
    public void right() {  
        System.out.println("Move piece right");  
    }  
  
}
```

/src/com/in28minutes/oops/level2/interfaces/ComplexAlgorithm.java

```
package com.in28minutes.oops.level2.interfaces;

public interface ComplexAlgorithm {
    int complexAlgorithm(int number1, int number2);
}
```

/src/com/in28minutes/oops/level2/interfaces/DummyAlgorithm.java

```
package com.in28minutes.oops.level2.interfaces;

public class DummyAlgorithm implements ComplexAlgorithm{

    @Override
    public int complexAlgorithm(int number1, int
number2) {
        return number1 + number2;
    }

}
```

/src/com/in28minutes/oops/level2/interfaces/FlyableRunner.java

```
package com.in28minutes.oops.level2.interfaces;

interface Flyable{
    void fly();
}
```



```

class Bird implements Flyable{

    @Override
    public void fly() {
        System.out.println("with wings");
    }

}

class Aeroplane implements Flyable{

    @Override
    public void fly() {
        System.out.println("with fuel");
    }

}

public class FlyableRunner {

    public static void main(String[] args) {
        Flyable[] flyingObjects = { new Bird(), new
Aeroplane() };
        for(Flyable object : flyingObjects) {
            object.fly();
        }

    }

}

```

/src/com/in28minutes/oops/level2/interfaces/GameRunner.java

```

package com.in28minutes.oops.level2.interfaces;

public class GameRunner {

```



```

        public static void main(String[] args) {
            GamingConsole[] games = {new MarioGame(),
new    ChessGame()};

            for(GamingConsole game:games) {
                game.up();
                game.down();
                game.left();
                game.right();
            }

        }

    }
}

```

/src/com/in28minutes/oops/level2/interfaces/GamingConsole.java

```

package com.in28minutes.oops.level2.interfaces;

public interface GamingConsole {
    public void up();
    public void down();
    public void left();
    public void right();
}

```

/src/com/in28minutes/oops/level2/interfaces/MarioGame.java

```

package com.in28minutes.oops.level2.interfaces;

public class MarioGame implements GamingConsole{

    @Override
    public void up()

```

```

{
    System.out.println("Jump");
}

@Override
public void down() {
    System.out.println("Goes into a hole");
}

@Override
public void left() {
}

@Override
public void right() {
    System.out.println("Go Forward");
}
}

```

[/src/com/in28minutes/oops/level2/interfaces/Project.java](#)

```

package com.in28minutes.oops.level2.interfaces;

public class Project {

    interface Test {
        void
nothing();

        default void nothing1() {

        }
    }
}

```

```

    }

    class Class1 implements Test {

        @Override
        public void nothing() {
            // TODO Auto-generated method stub

        }

    }

    class Class2 implements Test

{

        @Override
        public void nothing() {
            // TODO Auto-generated method

stub

        }

    }

    public static void main(String[] args) {
        ComplexAlgorithm algorithm = new
RealAlgorithm();

System.out.println(algorithm.complexAlgorithm(10, 20));
    }

}

```

/src/com/in28minutes/oops/level2/interfaces/RealAlgorithm.  
java

```
package com.in28minutes.oops.level2.interfaces;

public class RealAlgorithm implements ComplexAlgorithm{

    @Override
    public int complexAlgorithm(int number1, int
number2) {
        return number1 * number2;
    }

}
```

/src/com/in28minutes/oops/level2/RecipeRunner.java

```
package com.in28minutes.oops.level2;

public class RecipeRunner

{

    public static void main(String[] args) {
        Recipe1 recipe = new Recipe1();
        recipe.execute();

        RecipeWithMicrowave recipeWithMicrowave =
new RecipeWithMicrowave();
        recipeWithMicrowave.execute();

    }

}
```

/src/com/in28minutes/oops/level2/RecipeWithMicrowave.jav

a

```
package com.in28minutes.oops.level2;

public class RecipeWithMicrowave extends AbstractRecipe{

    @Override
    void getReady() {
        System.out.println("Get the raw
materials");
        System.out.println("Switch on the
microwave");
    }

    @Override
    void doTheDish() {
        System.out.println("get stuff ready");
        System.out.println("Put it in the
microwave");
    }

    @Override
    void cleanup() {
        System.out.println("Cleanup the
utensils");
        System.out.println("Switch off the
microwave");
    }
}
```

/src/com/in28minutes/oops/level2/Rectangle.java

```
package com.in28minutes.oops.level2;
```

```
public class Rectangle {

    //state
    private int length;

    private int width;

    //creation
    public Rectangle(int length, int width) {
        this.length = length;
        this.width = width;
    }

    //operations

    public int getLength() {
        return length;
    }

    public void setLength(int length) {
        this.length = length;
    }

    public int getWidth() {
        return width;
    }

    public void setWidth(int width) {
        this.width = width;
    }

    public int area() {
        return length * width;
    }
}
```



```

    }

    public int perimeter() {
        return 2 * (length + width);
    }

    public String toString() {
        return String.format("length - %d width - %d area - %d perimeter - %d",
                                length, width, area(),
                                perimeter());
    }
}

```

/src/com/in28minutes/oops/level2/RectangleRunner.java

```

package com.in28minutes.oops.level2;

public class RectangleRunner {

    public static void main(String[] args) {
        Rectangle rectangle = new Rectangle(12,
        23);

        System.out.println(rectangle);
        rectangle.setWidth(25);
        System.out.println(rectangle);
    }
}

```

/src/com/in28minutes/oops/level2/Review.java

```

package com.in28minutes.oops.level2;

public class Review {

```

```

        private int id;
        private String description;
        private int rating;

        public Review(int id, String description, int
rating) {
            this.id =

id;

            this.description = description;
            this.rating = rating;
        }

        public String toString() {
            return id + " " + description + " " +
rating;
        }
    }
}

```

/src/com/in28minutes/oops/level2/Recipe1.java

```
package com.in28minutes.oops.level2;
```

```
public class Recipe1 extends AbstractRecipe {
```

```
    @Override
```

```
    void getReady() {
```

```
        System.out.println("Get the raw materials");
```

```
        System.out.println("Get the utensils");
```

```
    }
```

```
    @Override
```

```
    void doTheDish() {
```

```
        System.out.println("do the dish");
```

```
}

@Override
void cleanup() {
    System.out.println("Cleanup the utensils");
}

}
```

# Collections

## Steps

- Step 01 - Java Collections - Section Overview with Need For Collections
- Step 02 - List Interface - Introduction - Position is King
- Step 03 - List Interface - Immutability and Introduction of Implementations - ArrayList, LinkedList and Vector
- Step 04 - List Interface Implementations - ArrayList vs LinkedList
- Step 05 - List Interface Implementations - ArrayList vs Vector
- Step 06 - List Interface - Methods to add, remove and change elements and lists
- Step 07 - List and ArrayList - Iterating around elements
- Step 08 - List and ArrayList - Choosing iteration approach for printing and deleting elements
- Step 09 - List and ArrayList - Puzzles - Type Safety and Removing Integers
- Step 10 - List and ArrayList - Sorting - Introduction to Collections sort static method
- Step 11 - List and ArrayList - Sorting - Implementing Comparable Interface in Student Class
- Step 12 - List and ArrayList - Sorting - Providing Flexibility by implementing Comparator interface
- Step 13 - List and ArrayList - A Summary
- Step 14 - Set Interface - Introduction - No Duplication
- Step 15 - Understanding Data Structures - Array, LinkedList and Hashing
- Step 16 - Understanding Data Structures - Tree - Sorted Order
- Step 17 - Set Interface - Hands on - HashSet, LinkedHashSet and TreeSet
- Step 18 - Set Interface - Exercise - Find Unique Characters in a List
- Step 19 - TreeSet - Methods from NavigableSet - floor, lower, upper, subSet, head and tailSet
- Step 20 - Queue Interface - Process Elements in Order

- Step 21 - Introduction to PriorityQueue - Basic Methods and Customized Priority
- Step 22 - Map Interface - An Introduction - Key and Value
- Step 23 - Map Interface - Implementations - HashMap, Hashtable, LinkedHashMap and TreeMap
- Step 24 - Map Interface - Basic Operations
- Step 25 - Map Interface - Comparison - HashMap vs LinkedHashMap vs TreeMap
- Step 26 - Map Interface - Exercise - Count occurrences of characters and words in a piece of text
- Step 27 - TreeMap - Methods from NavigableMap - floorKey, higherKey, firstEntry, subMap and more
- Step 28 - Java Collections - Conclusion with Three Tips

## Exercises

### Set Interface

- Find unique characters in a list of characters
  - In Insertion Order
  - In Sort Order

### Map Interface

- Find number of occurrences of each character and word in a piece of text.

## Code Examples

/12-Collections/commands.txt

```
words.size()
words.isEmpty()
words.get(0)
words.contains("Dog");
words.contains("Cat");
words.indexOf("Cat")
words
words.indexOf("Dog")
words.add("Dog")
```

```

List<String> wordsLinkedList = new LinkedList<String>
(words);
List<String> wordsVector = new Vector<String>(words);
wordsArrayList.add("Dog")
wordsArrayList
wordsArrayList.add("Elephant")
wordsArrayList.add(2, "Ball")
wordsArrayList
wordsArrayList.add("Ball")
wordsArrayList
List<String> newList = List.of("Yak","Zebra");
wordsArrayList.addAll(newList)
wordsArrayList
wordsArrayList.set(6, "Fish")
wordsArrayList
wordsArrayList.remove(2)
wordsArrayList
wordsArrayList.remove("Dog")
wordsArrayList
wordsArrayList.remove("Dog")
for(int i=0; i < words.size(); i++) {
    System.out.println(words.get(i));
}
for(String word:words) {
    System.out.println(word);
}
Iterator wordsIterator = words.iterator();
while(wordsIterator.hasNext()) {
    System.out.println(wordsIterator.next());
}
List<String> wordsArrayList = new ArrayList<String>(words);
for(String word:words) {
    if(word.endsWith("at")) {
        words.remove(word);
    }
}

```

```

for(String word:wordsArrayList) {
    if(word.endsWith("at")) {
        wordsArrayList.remove(word);
    }
}
wordsArrayList
for(String word:words) {
    if(word.endsWith("at"))
        System.out.println(word);
}
for(String word:wordsAl) {
    if(word.endsWith("at")) {
        words.remove(word);
    }
}
for(String word:wordsAl) {
    if(word.endsWith("at")) {
        wordsAl.remove(word);
    }
}
wordsAl
List<String> words = List.of("Apple", "Bat" , "Cat");
List<String> wordsAl = new ArrayList<>(words);
Iterator<String> iterator = wordsAl.iterator();
while(iterator.hasNext()) {
    if(iterator.next().endsWith("at")) {
        iterator.remove();
    }
}
wordsAl
List value = List.of("A", 'A' , 1, 1.0);
value.get(2)
value.get(2) instanceof Integer
value.get(1) instanceof Character
value.get(3) instanceof Double
numbers.indexOf(101);

```

```
numbersAl.indexOf(101)
numbersAl.remove(101);
numbersAl.remove(101)
numbersAl.remove(Integer.valueOf(101))
numbersAl
List<Integer> numbersAl = new ArrayList<>(numbers);
Collections.sort(numbersAl);
numbersAl
set.add("Apple");
Set<String> hashset = new HashSet<>(set);
hashset.add("Apple")
hashset
Set<String> set = Set.of("A", "Z", "D", "C", "B");
hashSet.add("A")
hashSet.add("B")
hashSet
hashSet.add("C")
hashSet
hashSet.add("CA")
hashSet
hashSet.add("CAfsadfa")
hashSet
treeSet.add("Cat")
treeSet.add("Bat")
treeSet.add("Apple")
treeSet
hashSet.add("Cat");
hashSet.add("Bat");
hashSet.add("Apple");
hashSet
hashSet.add("Dog");
hashSet
hashSet.add("Elephant");
hashSet.add(5);
hashSet.add(4);
hashSet.add(3);
```



```
hashSet.add(2);
hashSet.add(1);
hashSet
Set<Integer> hashSet = new HashSet<>();
hashSet.add(589789);
hashSet.add(58978);
hashSet.add(5897);
hashSet.add(589);
hashSet.add(58);
hashSet.add(5);
hashSet
Set<Integer> linkedHashSet = new LinkedHashSet<>();
linkedHashSet.add(589789);
linkedHashSet.add(58978);
linkedHashSet.add(5897);
linkedHashSet.add(589);
linkedHashSet.add(58);
linkedHashSet.add(5);
linkedHashSet
Set<Integer> treeSet = new TreeSet<>();
treeSet.add(584567);
treeSet.add(58456);
treeSet.add(5845);
treeSet.add(584);
treeSet.add(58);
treeSet.add(5);
treeSet
numbers.add(765432);
numbers.add(76543);
numbers.add(7654);
numbers.add(765);
numbers.add(76);
numbers
numbers.add(765432);
numbers.add(76543);
numbers.add(7654);
```

```
numbers.add(765);
numbers.add(76);
numbers
numbers.add(765789);
numbers
numbers.add(76)
numbers
numbers.add(765432);
numbers.add(76543);
numbers.add(7654);
numbers.add(765);
numbers.add(76);
numbers
numbers.add(76)
List<Character> characters = List.of('A','Z','A', 'B',
    'Z','F');
TreeSet<Integer> numbers = new TreeSet<>
    (Set.of(65,54,34,12,99));
numbers.floor(40)
numbers.floor(34)
numbers.lower(34)
numbers.ceiling(34)
numbers.ceiling(36)
numbers.higher(34)
numbers
numbers.subSet(20,80)
numbers.subSet(34,54)
numbers.subSet(34,65)
numbers.subSet(34,true,65,true)
numbers.subSet(34,false,65,false)
numbers.headSet(50)
numbers.tailSet(50)
Queue<String> queue = new PriorityQueue<>();
queue.poll()
queue.offer("Apple")
queue.addAll(List.of("Zebra", "Monkey", "Cat"))
```

```
queue
queue.poll()
queue
queue.poll()
queue.poll()
queue.poll()
queue.poll()
map.put("R",1);
map
map.get("Z")
map.get("A")
map.get("C")
map.size()
map.isEmpty()
map.containsKey("A")
map.containsKey("F")
map.containsValue(3)
map
map.containsValue(4)
map.keySet()
map.values()
map
hashmap.put("F",5)
hashmap
hashmap.put("Z",11)
hashmap
Map<String, Integer> map = Map.of("A",3,"Z",5,"B",10);
Map<String, Integer> linkedHashmap = new LinkedHashMap<>
(map);
HashMap<String, Integer> hashmap = new HashMap<>();
hashmap.put("Z",5)
hashmap.put("A",15)
hashmap.put("F",25)
hashmap.put("L",250)
hashmap
LinkedHashMap<String, Integer> linkedHashMap = new
```

```
LinkedHashMap<>();
hashmap
linkedHashMap.put("F", 25)
linkedHashMap.put("A", 15)
linkedHashMap.put("Z", 5)
linkedHashMap.put("L", 250)
linkedHashMap
treemap.put("F", 25)
treemap.put("A", 15)
treemap.put("Z", 5)
treemap.put("L", 250)
treemap
TreeMap<String, Integer> treemap = new TreeMap<>();
treemap.put("F", 25)
treemap.put("Z", 5)
treemap.put("L", 250)
treemap.put("A", 15)
treemap.put("B", 25)
treemap.put("G", 25)
treemap
treemap.higherKey("C")
treemap.lowerKey("C")
treemap.lowerKey("B")
treemap.floorKey("B")
treemap.higherKey("B")
treemap.higherKey("C")
treemap.ceilingKey("B")
treemap.lowerKey("B")
treemap.floorKey("B")
treemap.firstEntry()
treemap.lastEntry()
treemap
treemap.subMap("C", "Y")
treemap.subMap("B", "Z")
treemap.subMap("B", true, "Z", true)
```

## /12-Collections/src/collections/MapRunner.java

```
package collections;

import java.util.HashMap;
import java.util.Map;

public class MapRunner {

    public static void main(String[] args) {
        String str = "This is an awesome occasion.
"
                    + "This has never happened
before.";

        Map<Character, Integer> occurrences = new
HashMap<>();

        char[] characters = str.toCharArray();

        for(char character:characters) {
            //Get the character
            Integer integer =
occurrences.get(character);
            if(integer==null) {
                occurrences.put(character,
1);
            } else {
                occurrences.put(character,
integer + 1);
            }
        }
    }
}
```

```

        System.out.println(occurrences);

        Map<String, Integer> stringOccurrences = new
HashMap<>();

        String[] words = str.split(" ");

        for(String word:words) {
            //Get the character
            Integer integer =
stringOccurrences.get(word);
            if(integer==null) {
                stringOccurrences.put(word,
1);
            } else {
                stringOccurrences.put(word,
integer + 1);
            }
        }

        System.out.println(stringOccurrences);

    }

}

```

## /12-Collections/src/collections/QueueRunner.java

```

package collections;

import java.util.Comparator;
import java.util.List;
import java.util.PriorityQueue;
import java.util.Queue;

```

```

class StringLengthComparator implements Comparator<String>
{
    @Override
    public int compare(String value1, String value2) {
        return Integer.compare(value2.length(),
                               value1.length());
    }
}

public class QueueRunner {

    public static void main(String[] args) {
        Queue<String> queue = new PriorityQueue<>
(10,
                                new
StringLengthComparator());
        queue.addAll(List.of("Zebra", "Monkey",
"Cat", "A",
                                "B", "C", "D", "E", "F",
"G"));
        queue.offer("Z");
        while (queue.peek() != null)
            System.out.println(queue.poll());
    }
}

```

## /12-Collections/src/collections/SetRunner.java

```

package collections;

import java.util.HashSet;
import java.util.LinkedHashSet;
import java.util.List;
import java.util.Set;

```

```

import java.util.TreeSet;

public class SetRunner {

    public static void main(String[] args) {
        List<Character> characters =
List.of('A','Z','A', 'B', 'Z','F');
        //unique - Set
        // Tree
        // Hash
        // LinkedHashMap

        Set<Character> treeSet = new TreeSet<>
(characters);

        System.out.println("treeSet "+ treeSet);

        Set<Character> linkedHashSet = new
LinkedHashSet<>(characters);
        System.out.println("linkedHashSet "+
linkedHashSet);

        Set<Character> hashSet = new HashSet<>
(characters);

        System.out.println("hashSet "+ hashSet);

    }

}

```

## /12-Collections/src/collections/Student.java

```

package collections;

public class Student implements Comparable<Student>{

```



```

private int id;
private String name;

public Student(int id, String name) {
    super();
    this.id = id;
    this.name = name;
}

public int getId() {
    return id;
}

public void setId(int id) {
    this.id = id;
}

public String getName() {
    return name;
}

public void setName(String name) {
    this.name = name;
}

public String toString() {
    return id + " " + name;
}

@Override
public int compareTo(Student that) {
    return Integer.compare(that.id, this.id);
}
}

```

```
package collections;

import java.util.ArrayList;
import java.util.Collections;
import java.util.Comparator;
import java.util.List;

class AscendingStudentComparator implements
Comparator<Student> {
    @Override
    public int compare(Student student1, Student
student2) {
        return Integer.compare(student1.getId(),
student2.getId());
    }
}

public class StudentsCollectionRunner {

    public static void main(String[] args) {
        List<Student> students = List.of(new
Student(1, "Ranga"),
                                new Student(100, "Adam"),
                                new Student(2, "Eve"));

        ArrayList<Student> studentsAl = new
ArrayList<>(students);

        System.out.println(studentsAl);

        Collections.sort(studentsAl);
        System.out.println("Desc " + studentsAl);

        //Collections.sort(studentsAl, new
```

```
AscendingStudentComparator());  
  
        studentsAl.sort(new  
AscendingStudentComparator());  
  
System.out.println("AscendingStudentComparator " +  
studentsAl);  
    }  
  
}
```

# Generics

# Steps

- Step 01 - Introduction to Generics - Why do we need Generics?
- Step 02 - Implementing Generics for the Custom List
- Step 03 - Extending Custom List with a Generic Return Method
- Step 04 - Generics Puzzles - Restrictions with extends and Generic Methods
- Step 05 - Generics and WildCards - Upper Bound and Lower Bound

# Code Examples

/13-  
Generics/src/com/in28minutes/generics/GenericsRunner.java

```
package com.in28minutes.generics;

import java.util.ArrayList;
import java.util.LinkedList;
import java.util.List;

public class GenericsRunner {

    static <X> X doubleValue(X value) {
        return value;
    }

    static <X extends List> void duplicate(X list) {
        list.addAll(list);
    }

    static double sumOfNumberList(
        List<? extends Number> numbers) {
        double sum = 0.0;
        for (Number number : numbers) {
            sum +=
```

```

        number.doubleValue();
    }
    return sum;
}

static void addACoupleOfValues(
    List<? super Number> numbers) {
    numbers.add(1);
    numbers.add(1.0);
    numbers.add(1.0f);
    numbers.add(11);
}

public static void main(String[] args) {
    List emptyList = new ArrayList<Number>();
    addACoupleOfValues(emptyList);
    System.out.println(emptyList);

    System.out.println(
        sumOfNumberList(List.of(1,
2, 3, 4, 5)));
    System.out.println(sumOfNumberList(
        List.of(1.1, 2.1, 3.1, 4.1,
5.1)));
    System.out.println(sumOfNumberList(
        List.of(11, 21, 31, 41,
51)));

    String value1 = doubleValue(new String());
    Integer number1 =
doubleValue(Integer.valueOf(5));
    ArrayList list1 = doubleValue(new
ArrayList());

    LinkedList<Integer> numbers = new

```

```

LinkedList<>(
                                List.of(1, 2, 3));
    duplicate(numbers);
    System.out.println(numbers);

    MyCustomList<String> list = new
MyCustomList<>();
    list.addElement("Element 1");
    list.addElement("Element 2");
    String value = list.get(0);

    System.out.println(value);

    MyCustomList<Integer> list2 = new
MyCustomList<>();
    list2.addElement(Integer.valueOf(5));
    list2.addElement(Integer.valueOf(7));
    Integer number = list2.get(0);
    System.out.println(number);

}

}

```

## /13- Generics/src/com/in28minutes/generics/MyCustomList.java

```

package com.in28minutes.generics;

import java.util.ArrayList;

public class MyCustomList<T>{

    ArrayList<T> list = new ArrayList<>();

```

```
    public void addElement(T element) {  
        list.add(element);  
    }  
  
    public void removeElement(T element) {  
        list.remove(element);  
    }  
  
    public String toString() {  
        return list.toString();  
    }  
  
    public T get(int index) {  
        return list.get(index);  
    }  
}
```



# Exception Handling

## Steps

- Step 01 - Introduction to Exception Handling - Your Thought Process during Exception Handling
- Step 02 - Basics of Exceptions - NullPointerException and StackTrace
- Step 03 - Basics of Handling Exceptions - try and catch
- Step 04 - Basics of Handling Exceptions - Exception Hierarchy, Matching and Catching Multiple Exceptions
- Step 05 - Basics of Handling Exceptions - Need for finally
- Step 06 - Basics of Handling Exceptions - Puzzles
- Step 07 - Checked Exceptions vs Unchecked Exceptions - An Example
- Step 08 - Hierarchy of Errors and Exceptions - Checked and Runtime
- Step 09 - Throwing an Exception - Currencies Do Not Match Runtime Exception
- Step 10 - Throwing a Checked Exception - Throws in method signature and handling
- Step 11 - Throwing a Custom Exception - CurrenciesDoNotMatchException
- Step 12 - Write less code with Try with Resources - New Feature in Java 7
- Step 13 - Basics of Handling Exceptions - Puzzles 2
- Step 14 - Exception Handling - Conclusion with Best Practices

## Code Examples

/16-  
ExceptionHandling/src/com/in28minutes/exceptionhandling/  
CheckedExceptionRunner.java

```
package com.in28minutes.exceptionhandling;  
  
public class CheckedExceptionRunner
```

```

{

    public static void main(String[] args) {
        /*      try {
                    someOtherMethod();
                    Thread.sleep(2000);
                } catch (InterruptedException e)

        {
                    e.printStackTrace();
                }*/
        //someOtherMethod1();
        someOtherMethod2();

    }

    private static void someOtherMethod2() throws
RuntimeException{

    }

    private static void someOtherMethod() throws
InterruptedException{
        Thread.sleep(2000);
    }

}

```

/16-  
ExceptionHandling/src/com/in28minutes/exceptionhandling/  
ExceptionHandlingRunner.java

```

package com.in28minutes.exceptionhandling;

public class ExceptionHandlingRunner {

```

```

    public static void main(String[] args)

    {

        method1();
        System.out.println("Main Ended");
    }

    private static void method1()

    {

        method2();
        System.out.println("Method1 Ended");
    }

    private static void method2() {
        String str = null;
        str.length();
        System.out.println("Method2 Ended");
    }
}

```

/16-

ExceptionHandling/src/com/in28minutes/exceptionhandling/  
ExceptionHandlingRunner2.java

```

package com.in28minutes.exceptionhandling;

public class ExceptionHandlingRunner2 {

    public static void main(String[] args) {
        method1();
        System.out.println("Main Ended");
    }

    private static void method1() {
        method2();
        System.out.println("Method1 Ended");
    }
}

```

```

    }

    private static void method2()

{
    try
    {
        //String str = null;
        //str.length();
        int[] i = {1,2};
        int number = i[3];
        System.out.println("Method2
Ended");
    } catch (NullPointerException ex) {
        System.out.println("Matched
NullPointerException");
        ex.printStackTrace();
    } catch (ArrayIndexOutOfBoundsException ex)
    {
        System.out.println("Matched
ArrayIndexOutOfBoundsException");
        ex.printStackTrace();
    } catch (Exception ex) {
        System.out.println("Matched
Exception");
        ex.printStackTrace();
    }
}
}

```

/16-  
ExceptionHandling/src/com/in28minutes/exceptionhandling/  
FinallyRunner.java

```
package com.in28minutes.exceptionhandling;

import java.util.Scanner;

public class FinallyRunner {

    public static void main(String[] args)

    {

        Scanner scanner = null;

        try {

            scanner = new Scanner(System.in);
            int[] numbers = { 12, 3, 4, 5 };

            int number = numbers[21];

        } catch (Exception e) {
            e.printStackTrace();
        } finally {
            System.out.println("Before Scanner
Close");

            if(scanner!=null) {
                scanner.close();
            }

        }

        System.out.println("Just before closing out
main");
    }

}
```

/16-

## ExceptionHandling/src/com/in28minutes/exceptionhandling/ThrowingExceptionRunner.java

```
package com.in28minutes.exceptionhandling;

class Amount {

    private String currency;

    private int    amount;

    public Amount(String currency, int amount) {
        super();
        this.currency = currency;
        this.amount = amount;
    }

    public void add(Amount that) throws
CurrenciesDoNotMatchException {

        if(!this.currency.equals(that.currency)) {
            //throw new Exception("Currencies
Don't Match " + this.currency + " & " +that.currency );
            throw new
CurrenciesDoNotMatchException("Currencies Don't Match " +
this.currency + " & " +that.currency );
        }

        this.amount = this.amount + that.amount;
    }

    public String toString() {
        return amount + " " + currency;
    }
}
```

```

}

class CurrenciesDoNotMatchException extends Exception {
    public CurrenciesDoNotMatchException(String msg) {
        super(msg);
    }
}

public class ThrowingExceptionRunner {

    public static void main(String[] args) throws
CurrenciesDoNotMatchException {
        Amount amount1 = new Amount("USD",

10);

        Amount amount2 = new Amount("EUR", 20);
        amount1.add(amount2);
        System.out.println(amount1);
    }

}

```

## /16- ExceptionHandling/src/com/in28minutes/exceptionhandling/ TryWithResourcesRunner.java

```

package com.in28minutes.exceptionhandling;

import java.util.Scanner;

public class TryWithResourcesRunner {

    public static void main(String[] args) {
        try (Scanner scanner = new

```

```
Scanner(System.in)) {  
    int[] numbers = { 12, 3, 4, 5 };  
    int number = numbers[21];  
}  
}
```



# Java Tips

## Steps

- Java Tip 01 - Imports and Static Imports
- Java Tip 02 - Blocks
- Java Tip 03 - equals method
- Java Tip 04 - hashCode method
- Java Tip 05 - Class Access Modifiers - public and default
- Java Tip 06 - Method Access Modifiers - public, protected, private and default
- Java Tip 07 - Final classes and Final methods
- Java Tip 08 - Final Variables and Final Arguments
- Java Tip 09 - Why do we need static variables?
- Java Tip 09 - Why do we need static methods?
- Java Tip 10 - Static methods cannot use instance methods or variables
- Java Tip 11 - public static final - Constants
- Java Tip 12 - Nested Classes - Inner Class vs Static Nested Class
- Java Tip 13 - Anonymous Classes
- Java Tip 14 - Why Enum and Enum Basics - ordinal and values
- Java Tip 15 - Enum - Constructor, variables and methods
- Java Tip 16 - Quick look at inbuild Enums - Month, DayOfWeek

## Code Examples

/src/com/in28minutes/tips/access/package1/ClassAccessModifiers.java

```
package com.in28minutes.tips.access.package1;
```

```
//public, protected, (default), private
public class ClassAccessModifiers {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        ClassAccessModifiers c = new ClassAccessModifiers();

    }

}
```

/src/com/in28minutes/tips/access/package1/ExampleClass.java

```
package com.in28minutes.tips.access.package1;

public class ExampleClass {
    public void publicMethod() {}
    protected void protectedMethod() {}
    private void privateMethod() {}
    void defaultMethod() {}

    public static void main(String[] args) {
        ExampleClass exampleClass = new ExampleClass();
        exampleClass.privateMethod();
        exampleClass.protectedMethod();
        exampleClass.publicMethod();
        exampleClass.defaultMethod();
    }

}
```

/src/com/in28minutes/tips/access/package1/MethodAccessRunnerInsideSamePackage.java

```
package com.in28minutes.tips.access.package1;

public class MethodAccessRunnerInsideSamePackage {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        ExampleClass exampleClass = new ExampleClass();
        //exampleClass.privateMethod();
        exampleClass.protectedMethod();
        exampleClass.publicMethod();
        exampleClass.defaultMethod();
    }

}
```

## /src/com/in28minutes/tips/access/package2/ClassAccessModifiersRunnerInOtherPackage.java

```
package com.in28minutes.tips.access.package2;

import
com.in28minutes.tips.access.package1.ClassAccessModifiers;

//public, protected, (default), private
public class ClassAccessModifiersRunnerInOtherPackage {

    public static void main(String[] args) {
        ClassAccessModifiers c = new ClassAccessModifiers();
    }

}
```

## /src/com/in28minutes/tips/access/package2/MethodAccessRunnerInDifferentPackage.java

```
package com.in28minutes.tips.access.package2;
import com.in28minutes.tips.access.package1.ExampleClass;

public class MethodAccessRunnerInDifferentPackage {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        ExampleClass exampleClass = new ExampleClass();

        //exampleClass.privateMethod();
        //exampleClass.protectedMethod();
        exampleClass.publicMethod();
        //exampleClass.defaultMethod();

    }

}
```

## /src/com/in28minutes/tips/anonymous/AnonymousClassRunner.java

```
package com.in28minutes.tips.anonymous;

import java.util.ArrayList;
import java.util.Collections;
import java.util.Comparator;
import java.util.List;

public class AnonymousClassRunner
```

```

{

    public static void main(String[] args) {
        List<String> animals = new ArrayList<String>(
            List.of("Ant", "Cat", "Ball", "Elephant"));

        Comparator<String> lengthComparator = new
Comparator<String>() {
            @Override
            public int compare(String str1, String str2) {
                return Integer.compare(str1.length(),
str2.length());
            }
        };

        Collections.sort(animals,
            lengthComparator
        );
        System.out.println(animals);

    }

}

```

[/src/com/in28minutes/tips/blocks/BlocksRunner.java](#)

```

package com.in28minutes.tips.blocks;

public class BlocksRunner {
    public static final int SECONDS_IN_MINUTE = 60;
    public static final int MINUTES_IN_HOUR = 60;
    public static final int HOURS_IN_DAY = 24;
    public static final int SECONDS_IN_DAY
        = SECONDS_IN_MINUTE * MINUTES_IN_HOUR * HOURS_IN_DAY;

    public static void main(String[] args)

```

```
{  
    //System.out.print(Integer.MIN_VALUE);  
    System.out.print(SECONDS_IN_DAY);  
  
    //System.out.print("main");  
  
    {  
        int i;  
        //System.out.print("3>2");  
        //System.out.print("3>2");  
    }  
  
    //System.out.print(i);  
  
}  
  
}
```

/src/com/in28minutes/tips/eclipse/DummyForTest.java

```
package com.in28minutes.tips.eclipse;  
  
import java.util.ArrayList;  
import java.util.List;  
  
public class DummyForTest {  
  
    public void doSomething() {  
        List list = new ArrayList();  
    }  
  
}
```

/src/com/in28minutes/tips/eclipse/EclipseTipsAndTricks.java

```
package com.in28minutes.tips.eclipse;

import java.math.BigDecimal;
//PAIR PROGRAMMING

class TestBean {
    private int i; //i is awesome
    private String str;

    public TestBean() {
        /*
         fsadjflkas
         fskljdfalsk
        */
        super();
    }

    public TestBean(int i, String str) {
        super();
        this.i = i;
        this.str = str;
    }
    /* (non-Javadoc)
     * @see java.lang.Object#hashCode()
     */
    @Override
    public int hashCode() {
        final int prime = 31;
        int result = 1;
        result = prime * result + i;
        return result;
    }
    /*
```

```

(non-Javadoc)
 * @see java.lang.Object#equals(java.lang.Object)
 */
@Override
public boolean equals(Object obj) {
    if (this == obj) {
        return true;
    }
    if (obj == null) {
        return false;
    }
    if (getClass() != obj.getClass()) {
        return false;
    }
    TestBean other = (TestBean) obj;
    if (i != other.i) {
        return false;
    }
    return true;
}

/**
 * @return the i
 */
public int getI() {
    return i;
}

/**
 * @param i the i to set
 */
public void setI(int i) {
    this.i = i;
}

/**
 * @return the str
 */
public String getStr()

```



```

{
    return str;
}
/**
 * @param str the str to set
 */
public void setStr(String str) {
    this.str = str;
}

}

class Test implements Comparable<String> {

    @Override
    public int compareTo(String arg0) {
        return 0;
    }

}

public class EclipseTipsAndTricks {

    public static void main(String[] args) throws
InterruptedException {

        DummyForTest dt = new DummyForTest();
        dt.doSomething();
        BigDecimal bd = new BigDecimal(25);
        Thread.sleep(returnSomething());
    }

    private static int returnSomething() {
        return 1000 * 45 *

```

```
456;  
}  
  
}
```

## /src/com/in28minutes/tips/enums/EnumRunner.java

```
package com.in28minutes.tips.enums;  
  
import java.util.Arrays;  
  
public class EnumRunner {  
  
    public static void main(String[] args) {  
        Season season = Season.FALL;  
  
        Season season1 = Season.valueOf("WINTER");  
        System.out.println(season1);  
        System.out.println(Season.SPRING.ordinal());  
        System.out.println(Season.SPRING.getValue());  
  
        System.out  
            .println(Arrays.toString(Season.values()));  
    }  
  
}
```

## /src/com/in28minutes/tips/enums/Season.java

```
package com.in28minutes.tips.enums;  
public enum Season {  
    SPRING(4), SUMMER(1), WINTER(2), FALL(3) ;  
  
    private int
```

```
value;

private Season(int value) {
    this.value = value;
}

public int getValue() {
    return value;
}

//0,1,2,3
}
```

</src/com/in28minutes/tips>equals/EqualsRunner.java>

```
package com.in28minutes.tips.equals;

class Client {
    private int id;

    public Client(int id) {
        super();
        this.id = id;
    }

    @Override
    public int hashCode() {
        final int prime = 31;
        int result = 1;
        result = prime * result + id;
        return result;
    }

    @Override
    public boolean equals(Object that)
```

```

{
    if (this == that)
        return true;

    if (that == null)
        return false;
    if (getClass() != that.getClass())
        return false;
    Client other = (Client) that;
    if (id != other.id)
        return false;
    return true;
}

//equals
//hashCode

}

public class EqualsRunner {

    public static void main(String[] args) {
        Client c1 = new Client(1);
        Client c2 = new Client(1);
        Client c3 = new Client(2);
        System.out.println(c1.equals(c2));
        System.out.println(c1.equals(c3));

    }

}

```

## /src/com/in28minutes/tips/imports/ImportsRunner.java

```
package com.in28minutes.tips.imports;

//import java.lang.*; //DEFAULT
import java.math.BigDecimal;
import java.util.ArrayList;
//import java.util.Collections;

import static java.lang.System.out;
import static java.util.Collections.*;

public class ImportsRunner {

    public static void main(String[] args) {

        out.println("IMports");
        out.println("Static Imports");

        sort(new ArrayList<String>());

        BigDecimal db = null;

    }

}
```

## /src/com/in28minutes/tips/nonaccess/package1/FinalNonAccessModifierRunner.java

```
package com.in28minutes.tips.nonaccess.package1;

final class FinalClass {
```

```

}

//class SomeClass extends FinalClass{

//}

class SomeClass {
    final public void doSomething() {}
    public void doSomethingElse(final int arg) {
        //arg = 6;

    }
}

class ExtendingClass extends SomeClass {
    //public void doSomething() {}
}

public class FinalNonAccessModifierRunner {

    public static void main(String[] args) {
        final int i;
        i=5;

        //i = 7;

    }

}

```

/src/com/in28minutes/tips/nonaccess/package1/StaticModifierRunner.java

```

package com.in28minutes.tips.nonaccess.package1;

class

```

```
Player{
    private String name;

    private static int count =

0;

    public Player(String name) {
        super();
        this.name = name;
        count++;
    }

    static public int getCount() {
        return count;
    }

    public String getName() {
        System.out.println(count);
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

}

public class StaticModifierRunner {

    public static void main(String[] args) {
        Player player1 = new Player("Ronaldo");
    }
}
```

```
System.out.println(Player.getCount());

    Player player2 = new Player("Federer");

    System.out.println(Player.getCount());
}

}
```



# Automation Testing with Selenium

## Code Examples

<https://github.com/in28minutes/automation-testing-with-java-and-selenium/blob/master/code.md>



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