



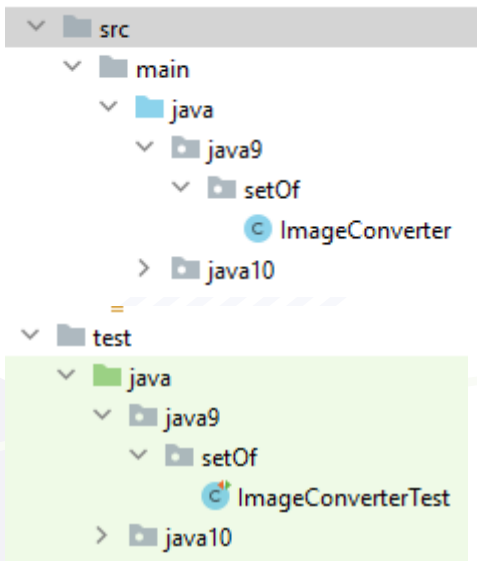
TRANSITION
TECHNOLOGIES

Java 9-17 Features

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Transition Technologies PSC

Repo








- Exercises to each Java version
- Useful comments
- Written tests for exercises



```
String getUsername(int id) {  
    // implement here  
    // get username from DataProvider.  
    // Return value or throw exception if there is no value  
  
    return "";  
}
```

```
@Test  
void shouldReturnUsernameForIdGreaterThan3() {  
    String username = dataService.getUsername(id: 4);  
  
    assertEquals(expected: "user-4", username);  
}
```



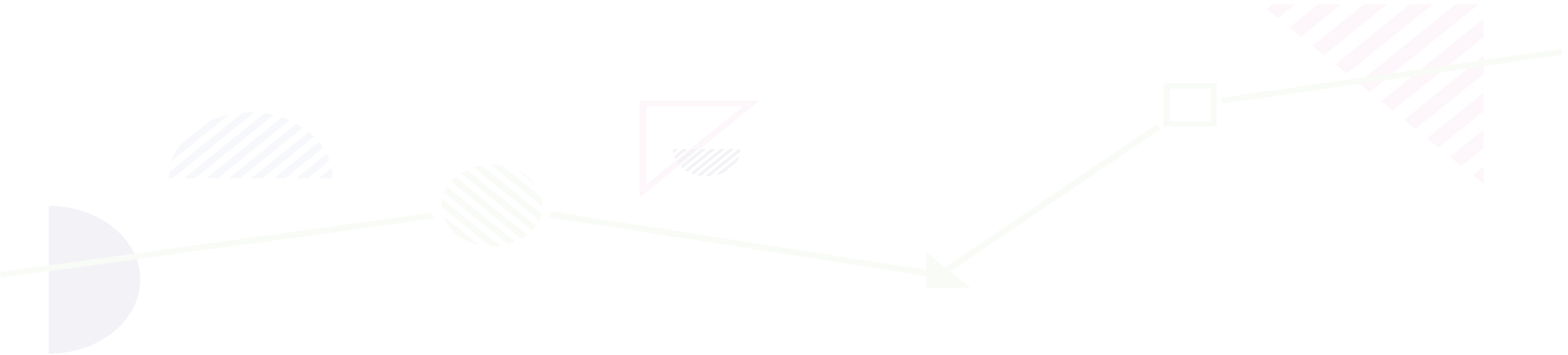
PROCEDURE						
						
Drain the washer fluid tank	Take 15mm Wrench	Unmount the washer fluid tank	Remove the washer fluid tank	Inspect the washer fluid tank	Replace the washer fluid tank	Refill the system
PART NUMBER	PART NUMBER	PART NUMBER	PART NUMBER	PART NUMBER	PART NUMBER	PART NUMBER
0000001245	0000001255	0000001273	0000001273	0000001273	0000001274	0000001274



Java 9

Java 9

- **Modular system**
- **New HTTP Client**
- **Interface Private Methods**
- **JShell**
- **Collection factory methods**



Modular system

java.base

```
// module-info.java
Module java.base {
    exports java.lang;
    exports java.io;
    exports java.net;
    exports java.util;
}
```

Exported Packages

java.io
java.time
java.util
java.net
java.lang

Concealed Packages

sun.security.provider
sun.nio.ch
sun.reflect.annotation

New HTTP Client

```
// using HttpURLConnection class
URL url = new URL("https://jsonplaceholder.typicode.com/todos/1");
HttpURLConnection con = (HttpURLConnection) url.openConnection();
con.setRequestMethod("GET");

con.setRequestProperty("header-name", "header-value");

BufferedReader in = new BufferedReader(
    new InputStreamReader(con.getInputStream()));
String inputLine;
StringBuffer content = new StringBuffer();
while ((inputLine = in.readLine()) != null) {
    content.append(inputLine);
}
in.close();

String response = content.toString();
```

```
// using HttpClient API
HttpRequest request = HttpRequest.newBuilder()
    .uri(new URI("https://jsonplaceholder.typicode.com/todos/1"))
    .GET()
    .header("header-name", "header-value")
    .build();

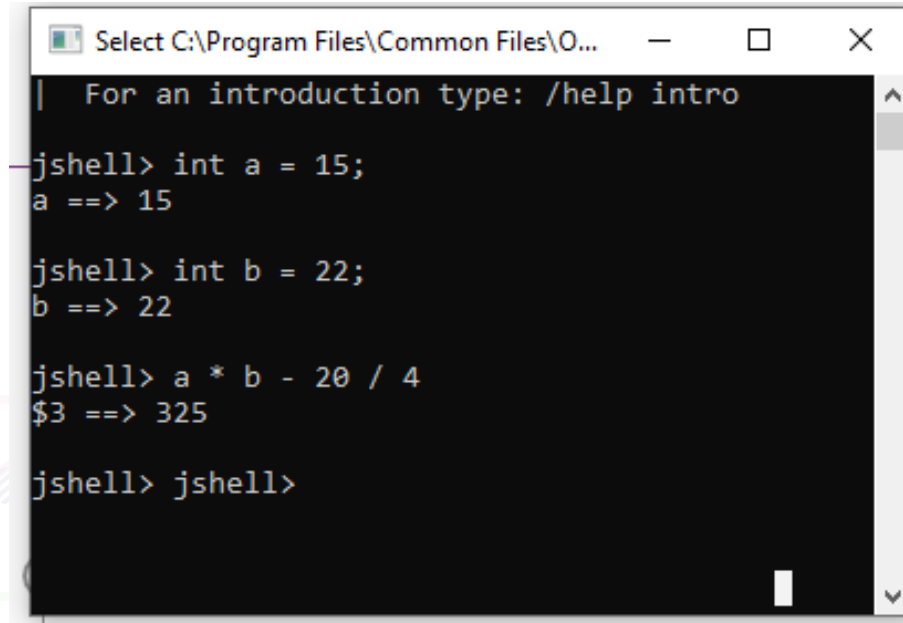
HttpResponse<String> response = HttpClient.newHttpClient()
    .send(request, HttpResponse.BodyHandler.asString());
```

Interface Private Methods

```
public interface InterfaceWithPrivateMethod {  
    default void processMethod(Integer input) {  
        // many code lines  
        // many code lines  
        // many code lines  
        // many code lines  
        // many code lines  
        Integer someConstant = input * 9;  
        // many code lines  
        // many code lines  
        // many code lines  
        // many code lines  
        if (someConstant < 1) {  
            throw new RuntimeException("Value lower than 1!");  
        } else if (someConstant.equals(81)) {  
            throw new RuntimeException("Value equals to 81!");  
        } else if (someConstant > 99) {  
            throw new RuntimeException("Value greater than 99!");  
        }  
    }  
}
```

```
public interface InterfaceWithPrivateMethod {  
    private static Integer getSomeNamedConstant() {  
        return 9;  
    }  
  
    default void processMethod(Integer input) {  
        // many code lines  
        // many code lines  
        // many code lines  
        // many code lines  
        // many code lines  
        Integer someConstant = input * getSomeNamedConstant();  
        // many code lines  
        // many code lines  
        // many code lines  
        // many code lines  
        verify(someConstant);  
    }  
  
    private void verify(Integer value) {  
        if (value < 1) {  
            throw new RuntimeException("Value lower than 1!");  
        } else if (value.equals(81)) {  
            throw new RuntimeException("Value equals to 81!");  
        } else if (value > 99) {  
            throw new RuntimeException("Value greater than 99!");  
        }  
    }  
}
```

Java REPL



A screenshot of a JShell terminal window. The window title bar shows the path "Select C:\Program Files\Common Files\O...". The terminal content is as follows:

```
| For an introduction type: /help intro  
jshell> int a = 15;  
a ==> 15  
  
jshell> int b = 22;  
b ==> 22  
  
jshell> a * b - 20 / 4  
$3 ==> 325  
  
jshell> jshell>
```


Collection factory methods

List::of, Set::of

```
// immutable list  
List<Integer> list = List.of(1, 2, 3);
```

```
// immutable set  
Set<Integer> set = Set.of(1, 2, 3);
```








```
// when try to add element  
java.lang.UnsupportedOperationException  
at java.base/java.util.ImmutableCollections.uoe(ImmutableCollections.java:1  
at java.base/java.util.ImmutableCollections$AbstractImmutableCollection.add  
at java9.setOf.ImageConverter.getAvailableFileKeys(ImageConverter.java:14)  
at java9.setOf.ImageConverterTest.name(ImageConverterTest.java:16)  
at java.base/jdk.internal.reflect.NativeMethodAccessorImpl.invoke0(Native M
```

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Java 9 Exercises



PROCEDURE						
						
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Java 10

Java 10

- Local Variable Type Inference
- Unmodifiable Collections
- New Optional.orElseThrow() Method



Local Variable Type Inference

```
// without var  
String text = "example-text";  
// text = 5;  
User myUser = new User();  
Map<String, Integer> myMap = new HashMap<>();
```

```
// with var  
var text = "example-text";  
// text = 5;  
var myUser = new User();  
var myMap = new HashMap<String, Integer>();
```

```
// illegal use  
var x;  
var x = null;  
  
class User {  
    var myField;  
}
```

Unmodifiable Collections

Collectors::toUnmodifiableList
Collectors::toUnmodifiableSet
Collectors::toUnmodifiableMap

List::copyOf
Set::copyOf
Map::copyOf



```
@Test
void shouldToUnmodifiableCollectorReturnUnmodifiableList() {
    List<Integer> integers = Arrays.asList(1, 2, 3);

    List<Integer> result = integers.stream()
        .collect(Collectors.toUnmodifiableList());

    assertThrows(UnsupportedOperationException.class, () -> {
        result.add(4);
    });
}
```

```
@Test
void shouldCopyOfReturnUnmodifiableList() {
    List<Integer> integers = Arrays.asList(1, 2, 3);

    List<Integer> result = List.copyOf(integers);

    assertThrows(UnsupportedOperationException.class, () -> {
        result.add(4);
    });
}
```

New Optional.orElseThrow() Method








Preferred alternative to get() method

```
Optional<Integer> integerOptional = Optional.of(1);  
Integer integer = integerOptional.orElseThrow();
```

java.util.NoSuchElementException: No value present












PROCEDURE						
						
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Java 10 Exercises

PROCEDURE						
						
Drain the washer fluid tank	Take 15mm Wrench	Unmount the washer fluid tank	Remove the washer fluid tank	Inspect the washer fluid tank	Replace the washer fluid tank	Refill the system
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Java 11

Java 11

- Many new String methods
- New Files methods
- Script running
- Local-variable syntax for lambda



Many new String methods

isBlank

```
"ABC".isBlank();    //false
" ABC ".isBlank();  //false
"  ".isBlank();     //true
"".isBlank();       //true
"\n".isBlank();     //true
"\r".isBlank();     //true
```

strip stripLeading stripTrailing

```
" ABC ".strip();    // "ABC"
" ABC ".stripLeading(); // "ABC "
" ABC ".stripTrailing(); // "  ABC"
```

lines

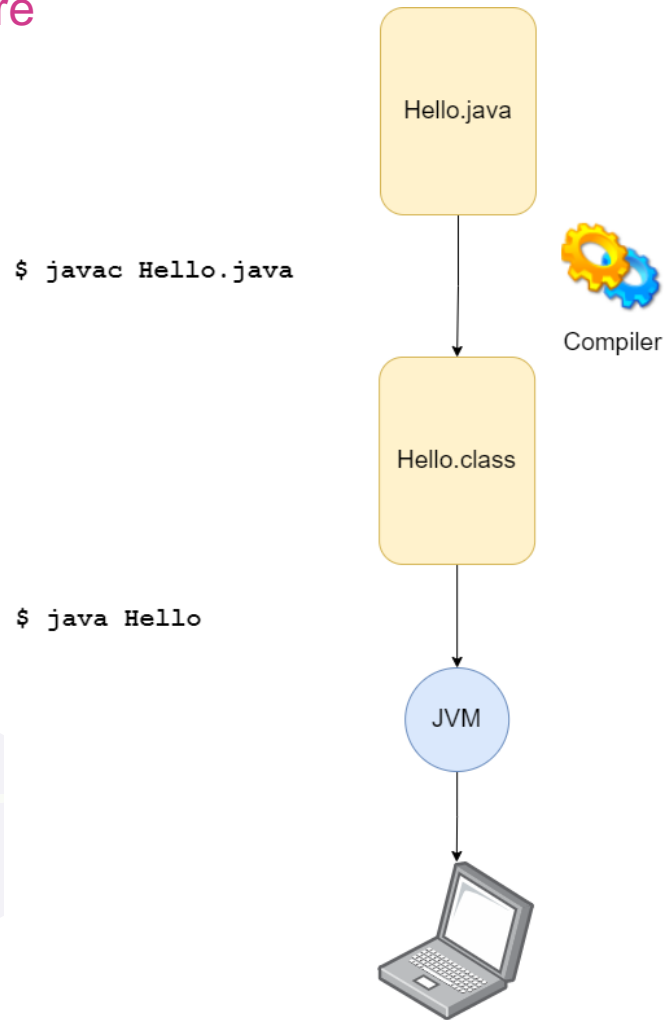
```
"String operations \r in Java \nare soooo \r\neasy".lines()
// "String operations", " in Java", " are soooo", "easy"
```

repeat

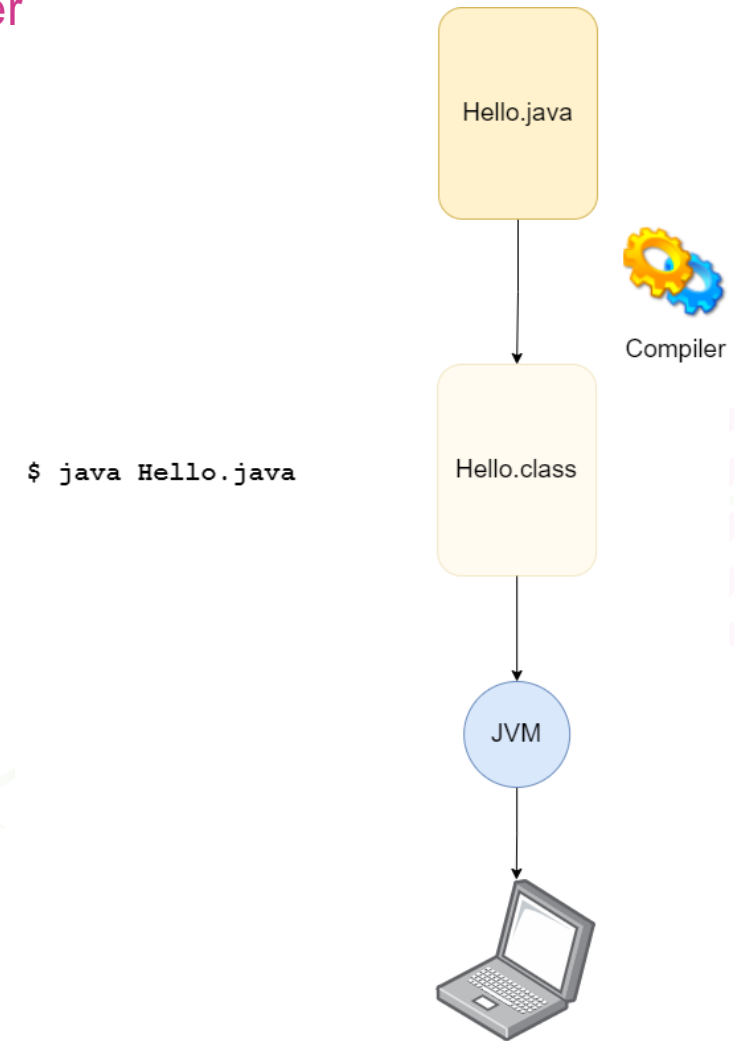
```
"ha".repeat(10); // "hahahahahahahahaha"
```

Script running

Before



After



New Files methods

Files::writeString








Files::readString

```
Path file = Files.createTempFile( prefix: "filename", suffix: ".txt");
```

```
Files.writeString(file, csq: "Some text");
```








```
String fileContent = Files.readString(file);
```




PROCEDURE						
						
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Java 11 Exercises

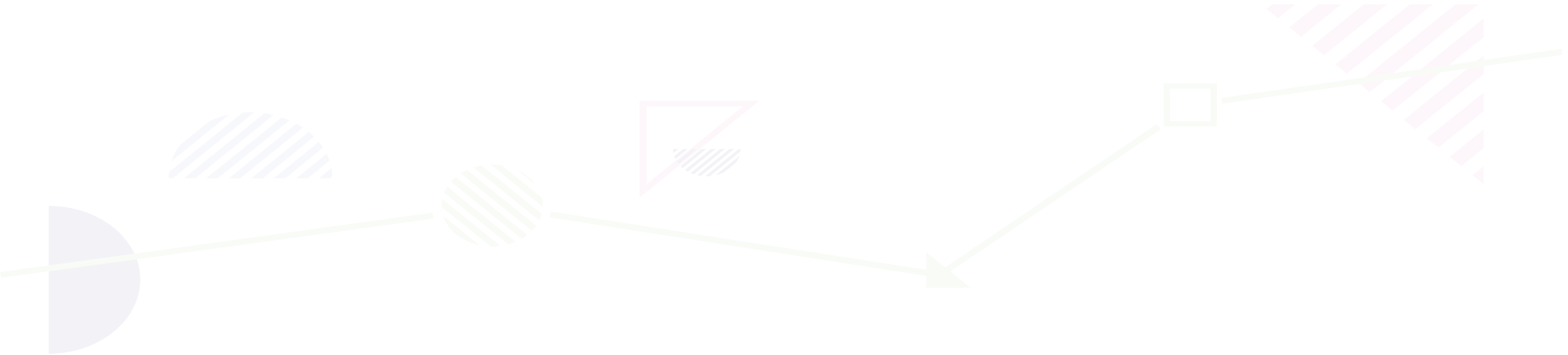
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Java 12

Java 12

- New String methods
- Teeing Collector
- `File::mismatch` method



New String methods

indent(int n)

```
String text = "Hello\nCode!";  
System.out.println(text);  
  
String textWithIndent = text.indent(10);  
System.out.println(textWithIndent);
```

Hello
Code!

Hello
Code!

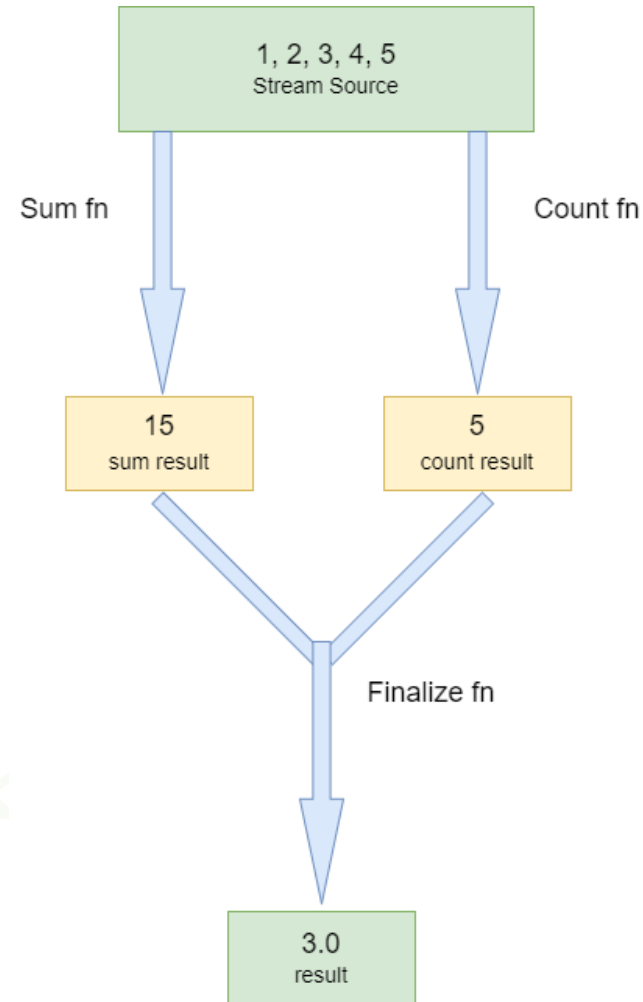
transform

```
String text = "Some text";  
  
String transformed = text  
    .transform(s -> s.replace(target: "Some", replacement: "Any"));  
System.out.println(transformed);
```

Some text
Any text

Teeing Collector

```
double mean = Stream.of(1, 2, 3, 4)
    .collect(Collectors.teeing(
        Collectors.summingDouble(i -> i),
        Collectors.counting(),
        (sum, count) -> sum / count
    ));
```










File::mismatch method

mismatch(Path path, Path path2) throws IOException

```
Path filePath1 = Files.createTempFile( prefix: "file1", suffix: ".txt");  
Files.writeString(filePath1, csq: "Java 12 is awesome");  
  
Path filePath2 = Files.createTempFile( prefix: "file2", suffix: ".txt");  
Files.writeString(filePath2, csq: "Java 12 is amazing");  
  
long mismatch = Files.mismatch(filePath1, filePath2);  
// 12
```










PROCEDURE						
						
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Java 12 Exercises



PROCEDURE						
						
Drain the washer fluid tank	Take 15mm Wrench	Unmount the washer fluid tank	Remove the washer fluid tank	Inspect the washer fluid tank	Replace the washer fluid tank	Refill the system
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Java 13

Java 13

- Switch Expressions update - Preview Feature
- Text Blocks – Preview Feature
- Z Garbage Collector improvements
- Minor Java API changes



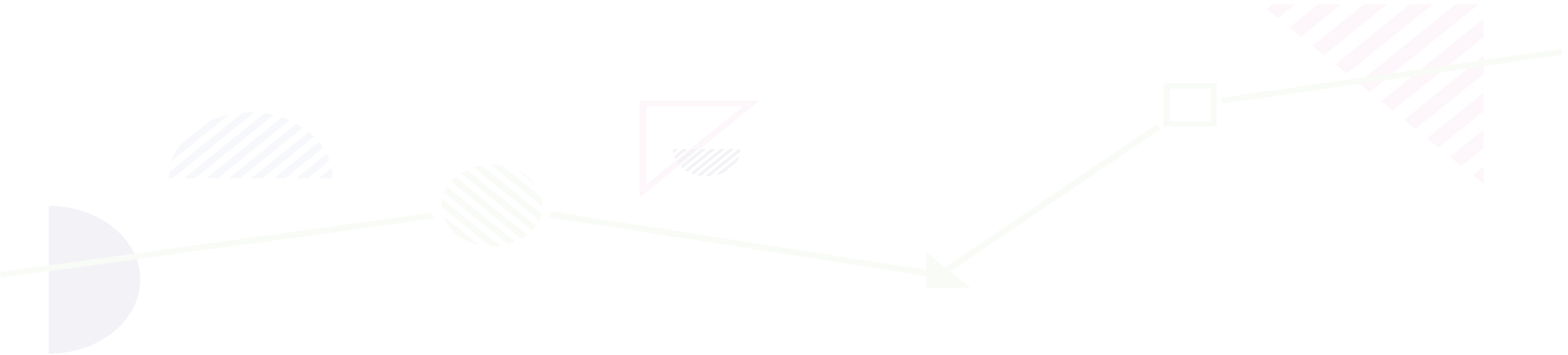
PROCEDURE						
						
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Java 14

Java 14

- Switch Expressions
- NullPointerExceptions update



Switch Expressions

Before

```
String season = "Winter";

String translation;
switch (season) {
    case "Spring": {
        translation = "wiosna";
        break;
    }
    case "Summer": {
        translation = "lato";
        break;
    }
    case "Autumn": {
        translation = "jesień";
        break;
    }
    case "Winter": {
        translation = "zima";
        break;
    }
    default: {
        translation = "nieznany";
    }
}
```

- Arrow case
- Eliminate the need of break statement

After

```
String season = "Winter";

String translation = switch (season) {
    case "Spring" -> "wiosna";
    case "Summer" -> "lato";
    case "Autumn" -> "jesień";
    case "Winter" -> "zima";
    default -> "nieznany";
};
```

NullPointerException update

Code

```
List<Student> warsawStudents = students.stream()  
    .filter(s -> s.getAddress().getCity().equals("Warszawa"))  
    .collect(Collectors.toList());
```



NullPointerException update








Before

```
Exception in thread "main" java.lang.NullPointerException
  at Test.lambda$main$0(scratch_2.java:114)
  at java.util.stream.ReferencePipeline$2$1.accept(ReferencePipeline.java:174)
  at java.util.ArrayList$ArrayListSpliterator.forEachRemaining(ArrayList.java:1382)
  at java.util.stream.AbstractPipeline.copyInto(AbstractPipeline.java:482)
  at java.util.stream.AbstractPipeline.wrapAndCopyInto(AbstractPipeline.java:472)
  at java.util.stream.ReduceOps$ReduceOp.evaluateSequential(ReduceOps.java:708)
  at java.util.stream.AbstractPipeline.evaluate(AbstractPipeline.java:234)
  at java.util.stream.ReferencePipeline.collect(ReferencePipeline.java:499)
  at Test.main(scratch_2.java:115)
```

After








```
Exception in thread "main" java.lang.NullPointerException: Cannot invoke "Address.getCity()" because the return value
of "Student.getAddress()" is null
  at Test.lambda$main$0(scratch_2.java:114)
  at java.base/java.util.stream.ReferencePipeline$2$1.accept(ReferencePipeline.java:178)
  at java.base/java.util.ArrayList$ArrayListSpliterator.forEachRemaining(ArrayList.java:1625)
  at java.base/java.util.stream.AbstractPipeline.copyInto(AbstractPipeline.java:509)
  at java.base/java.util.stream.AbstractPipeline.wrapAndCopyInto(AbstractPipeline.java:499)
  at java.base/java.util.stream.ReduceOps$ReduceOp.evaluateSequential(ReduceOps.java:921)
  at java.base/java.util.stream.AbstractPipeline.evaluate(AbstractPipeline.java:234)
  at java.base/java.util.stream.ReferencePipeline.collect(ReferencePipeline.java:682)
  at Test.main(scratch_2.java:115)
```



PROCEDURE						
						
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0000001245	0000001255	0000001273	0000001273	0000001273	0000001274	0000001274



Java 14 Exercises

PROCEDURE						
						
Drain the washer fluid tank	Take 15mm Wrench	Unmount the washer fluid tank	Remove the washer fluid tank	Inspect the washer fluid tank	Replace the washer fluid tank	Refill the system
PART NUMBER	PART NUMBER	PART NUMBER	PART NUMBER	PART NUMBER	PART NUMBER	PART NUMBER
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Java 15

Java 15

- Records
- Text blocks
- Helpful NPE enabled by default



Records

Before

```
class User {  
  
    private final String name;  
    private final String address;  
  
    public User(String name, String address) {  
        this.name = name;  
        this.address = address;  
    }  
  
    public String getName() {  
        return name;  
    }  
  
    public String getAddress() {  
        return address;  
    }  
  
    @Override  
    public int hashCode() {  
        return Objects.hash(name, address);  
    }  
  
    @Override  
    public boolean equals(Object obj) {  
        if (this == obj) {  
            return true;  
        } else if (!(obj instanceof User)) {  
            return false;  
        } else {  
            User other = (User) obj;  
            return Objects.equals(name, other.name)  
                && Objects.equals(address, other.address);  
        }  
    }  
  
    @Override  
    public String toString() {  
        return "Person [name=" + name + ", address=" + address + "];"  
    }  
}
```

After

```
record User(String name, String address) {  
}
```

Custom constructor

```
record User(String name, String address) {  
    public User {  
        Objects.requireNonNull(name);  
    }  
}
```

Text blocks

Before

```
String text = "Lorem ipsum dolor sit\n" +  
    "amet, consectetur '\n" +  
    "adipiscing elit. Aenean sit \" amet enim odio. \n" +  
    "Suspendisse quis dui finibus,\n" +  
    "\n" +  
    "\n" +  
    "\n" +  
    "tempor mi et,\n" +  
    "vehicula ex. Suspendisse commodo tris\n";
```







After

```
String textBlock = """  
    Lorem ipsum dolor sit  
    amet, consectetur '  
    adipiscing elit. Aenean sit " amet enim odio.  
    Suspendisse quis dui finibus,  
  
    tempor mi et,  
    vehicula ex. Suspendisse commodo tris  
    """;
```


PROCEDURE						
						
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Java 15 Exercises

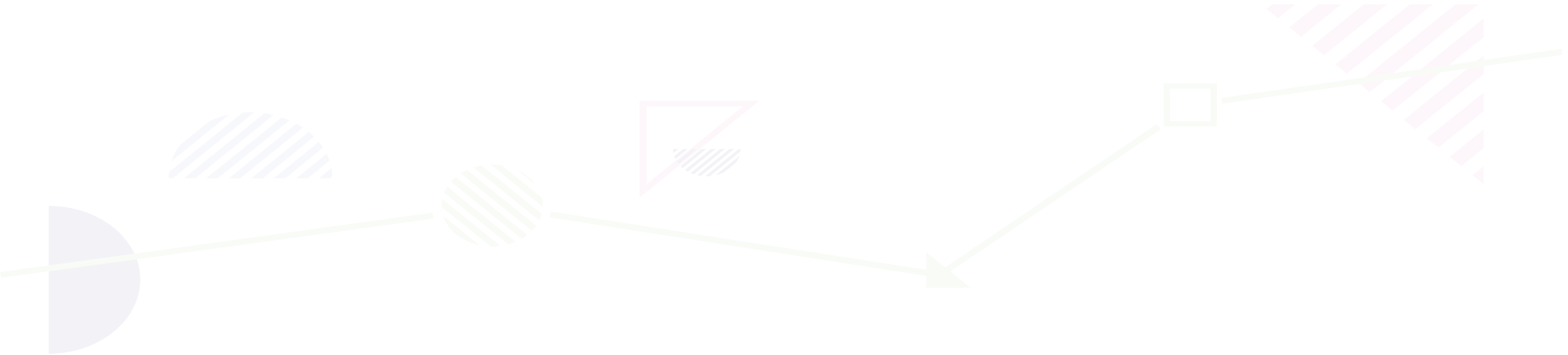
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Java 16

Java 16

- Pattern Matching For Instanceof
- Day Period Support
- New Stream.toList method



Pattern Matching For instanceof

```
// old
if (shape instanceof Circle) {
    Circle circle = (Circle) shape;
    return circle.getDisplayName();
}
```

```
//new
if (shape instanceof Circle circle) {
    return circle.getDisplayName();
}
```



Day Period Support

New DateTimeFormatter symbol

Alternative to am/pm

```
LocalTime date = LocalTime.parse("18:25:08.690791");  
DateTimeFormatter formatter = DateTimeFormatter.ofPattern("h B");  
  
date.format(formatter)  
// 6 in the afternoon
```



New Stream.toList method








New toList() method

```
//old  
List<Integer> list = Stream.of("1", "2", "3", "4")  
    .map(Integer::parseInt)  
    .collect(Collectors.toList());
```

```
//new  
List<Integer> list = Stream.of("1", "2", "3", "4")  
    .map(Integer::parseInt)  
    .toList();
```





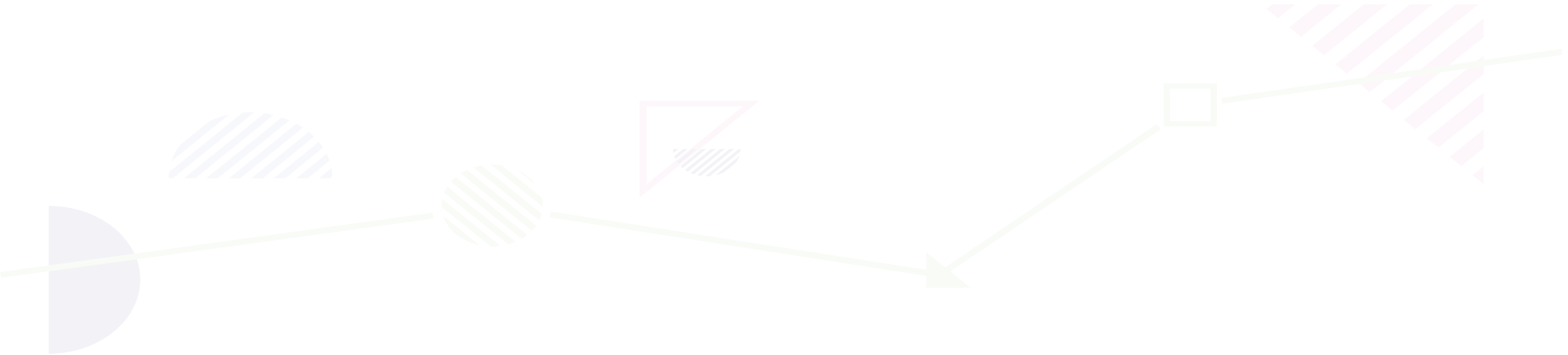
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Java 17

Java 17

- Always Strict Floating-Point
- Sealed Classes



Always Strict Floating-Point

Floating-point operations always in strict mode
Result independent of platform

```
public strictfp class SomeMathClass {}  
public strictfp interface Calulcator {}  
public strictfp void sum() {}
```



Sealed Classes

```
sealed class Bike permits Motorbike, Bicycle {  
}
```

```
non-sealed class Motorbike extends Bike {  
}
```

```
final class Bicycle extends Bike {  
}
```

non-sealed

open inheritance

sealed








restrict inheritance

final

block inheritance





PROCEDURE						
						
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Java 17 Exercises



TRANSITION
TECHNOLOGIES

Thanks for attention!



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