# Java: Did You Know That?

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DevNexus

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# About Me

- **Java Champion**
- **Author**
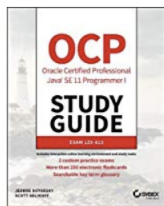- **Developer at NYC bank for 17+ years**
- **FIRST Robotics Mentor**

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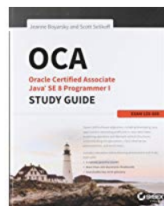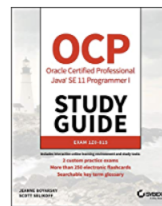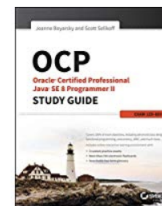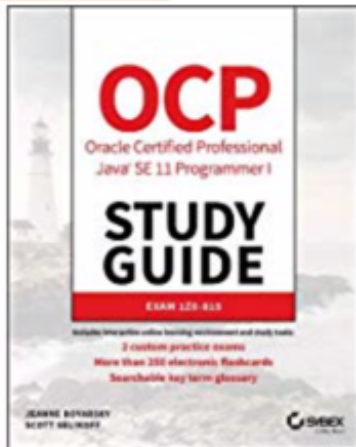
# With Contributions By

- **Janeice DelVecchio**
- **Elena Felder**
- **Scott Selikoff**

# Removing in a Loop

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# Removing in a Loop

```java
List<String> list = new ArrayList<>();
list.add("red");
list.add("alliance");
list.add("blue");
list.add("alliance");

for(String current : list) {
    list.remove(current);
}

System.out.println(list);
```

Output:
ConcurrentModificationException

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# Removing in a Loop

```java
List<String> list = new ArrayList<>();
list.add("red");
list.add("alliance");

for(String current : list) {
    list.remove(current);
}

System.out.println(list);
```

Output:
[alliance]

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# Behavior Explanation

1. List starts as [red, alliance]
2. First iteration through loop, current = red
3. In loop, remove red
4. Now list is [alliance]
5. For loop checks size.
6. Size = 1; already saw one element
7. Done!

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# Behavior Explanation

1. vs List as [red, alliance, blue, alliance]
2. Size = 3 after removal and saw one
3. Not Done!
4. Exception

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# Removing in a Loop

```java
List<String> list = new CopyOnWriteArrayList<>()
list.add("red");
list.add("alliance");
list.add("blue");
list.add("alliance");

for(String current : list) {
    list.remove(current);
}
```

Output:
[]

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# Creating a Set

# Creating a Set

```java
String[] words = { "all", "the", "words",
    "in", "the", "world" };

Set<String> set = new HashSet<>(
    Arrays.asList(words));

System.out.println(set);
```

Output:
[all, the, world, in, words]

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# Creating a Set

```java
String[] words = { "all", "the", "words",
    "in", "the", "world" };

Set<String> set = Set.of(words);


System.out.println(set);
```

Output:
IllegalArgumentException: duplicate element: the

# Behavior Explanation

1. Set.of() takes varargs.
2. Doc says can't have duplicates

# Backed Collection

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# Collection

```java
Map<String, String> map = new HashMap<>();
map.put("Braves", "Atlanta");
map.put("Mets", "NYC");

Set<String> keys
    = new HashSet<>(map.keySet());
keys.remove("Mets");

System.out.println(map);
```

{Mets=NYC, Braves=Atlanta}

# Collection

```java
Map<String, String> map = new HashMap<>();
map.put("Braves", "Atlanta");
map.put("Mets", "NYC");

Set<String> keys = map.keySet();
keys.remove("Mets");

System.out.println(map);
```

{Braves=Atlanta}

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# **Behavior Explanation**

1. keySet() and entrySet() are backed collections
2. When change either, it affects original map

# Overloading

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# Overloading

```java
public void check(Number number) {
    System.out.print("Number "); }
public void check(Integer integer) {
    System.out.print("Integer "); }
public void delegator(Number number) {
    check(number); }

Integer num = Integer.valueOf(42);
Overloading target = new Overloading();
target.check(num);
target.delegator(num);
```

Output:
Number Integer

# Overloading

```java
public void check(Number number) {
    System.out.print("Number "); }
public void check(Integer integer) {
    System.out.print("Integer "); }
public void delegator(Number number) {
    check(number); }

Number num = Integer.valueOf(42);
Overloading target = new Overloading();
target.check(num);
target.delegator(num);
```

Output:
Number Number

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# Behavior Explanation

1. Method chosen at compile time, not runtime.
2. (vs polymorphism on objects)

==

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# Equality

```
Integer int1 = Integer.valueOf(8);
Integer int2 = Integer.valueOf(8);
System.out.println((int1 == int2)
    + " " + int1.equals(int2));
```

true true

# Equality

```
Integer int1 = Integer.valueOf(8_000);
Integer int2 = Integer.valueOf(8_000);
System.out.println((int1 == int2)
    + " " + int1.equals(int2));
```

false true

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# **Behavior Explanation**

1. Wrapper classes cache small values
2. Lesson: always use equals() for objects

# var and inference

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# var and inference

```
List<Integer> x1 = List.of();
List<Integer> x2 = List.of(1, 2, 3);
Stream.of(x1, x2)
        .flatMap(x -> x.stream())
        .map(x -> x + 1)
        .forEach(System.out::print);
```

Output:
234

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# var and inference

```java
List<Integer> x1 = List.of();
var x2 = List.of(1, 2, 3);
Stream.of(x1, x2)
        .flatMap(x -> x.stream())
        .map(x -> x + 1)
        .forEach(System.out::print);
```

Output:
234

# var and inference

```
var x1 = List.of();
var x2 = List.of(1, 2, 3);
Stream.of(x1, x2)
        .flatMap(x -> x.stream())
        .map(x -> x + 1)
        .forEach(System.out::print);
```

Compiler error:
Operator '+' cannot be applied to capture<?>, int

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# Behavior Explanation

1. var x2 = List.of(1,2,3)
2. x2 is a List<Integer>
3. var x1 = List.of()
4. x1 is a not a List<Integer>
5. Stream.of(x1, x2) is a Stream<List<? extends Object>>
6. flatMap makes Stream<? extends Object>
7. Object doesn't go with +

# Sorting Characters

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# Sorting Characters

```java
Stream<String> ohMy = Stream.of(
    "lions", "tigers", "bears");

Comparator<Character> c =
    Comparator.naturalOrder();

System.out.println(ohMy.collect(
    Collectors.groupingBy(String::length,
    Collectors.mapping(s ->
    s.charAt(0), Collectors.minBy(c)))));
```

Output:
{5=Optional[b], 6=Optional[t]}

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# Sorting Characters

```java
Stream<String> ohMy = Stream.of(
    "lions", "tigers", "bears");

System.out.println(ohMy.collect(
    Collectors.groupingBy(String::length,
    Collectors.mapping(s ->
    s.charAt(0), Collectors.minBy(
    Comparator.naturalOrder()))))));
```

Compiler error
No suitable method found for….

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# The actual message

Error:(18, 51) java: no suitable method found for groupingBy(String::length,java.util.stream.Collector<java.lang.Object,capture#1 of ?,java.util.Optional<T>>)
    method java.util.stream.Collectors.<T,K>groupingBy(java.util.function.Function<? super T,? extends K>) is not applicable
      (cannot infer type-variable(s) T,K
       (actual and formal argument lists differ in length))
    method java.util.stream.Collectors.<T,K,A,D>groupingBy(java.util.function.Function<? super T,? extends K>,java.util.stream.Collector<? super T,A,D>) is not applicable
      (inference variable U has incompatible upper bounds java.lang.Object,java.lang.Comparable<? super T>,T,T)…

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# The other message

Error:(19, 52) java: cannot find symbol
  symbol:   method charAt(int)
  location: variable s of type java.lang.Object

# **Behavior Explanation**

1. char != Character
   Inferred type check fails
2. Propagates error to other call
3. But, this suggests a
   workaround…

# Sorting Characters

```java
Stream<String> ohMy = Stream.of(
    "lions", "tigers", "bears");

System.out.println(ohMy.collect(
    Collectors.groupingBy(String::length,
    Collectors.mapping((String s) ->
    s.charAt(0), Collectors.minBy(
    Comparator.naturalOrder())))));
```

Output:
{5=Optional[b], 6=Optional[t]}

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# URL Equality

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# Sorting Characters

```java
URL url1 = new URL("https://google.com");
URL url2 = new URL("https://google.com");
System.out.println(url1.equals(url2));
```

Output:
true

# Sorting Characters

```java
URL url1 = new URL("cloudURL");
URL url2 = new URL("cloudURL");
System.out.println(url1.equals(url2));
```

Output:
false if DNS resolution changes during program

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# Behavior Explanation

1. URL's equals method calls the URLStreamHandler's equals method
2. Which uses DNS resolution
3. Cloud URLs change often

Instead, use URI
https://news.ycombinator.com/item?id=21765788

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# Week of the Year

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# Week of Year

```java
LocalDate xmasEve = LocalDate.of(
    2019, Month.DECEMBER, 24);
WeekFields weekFields = WeekFields.of(
    Locale.getDefault());

int weekNumber = xmasEve.get(
    weekFields.weekOfWeekBasedYear());
int week = xmasEve.get(
    weekFields.weekOfYear());
System.out.println(weekNumber
    + " " + week);
```

Output:
52 52

# Week of Year

```java
LocalDate newYearsEve = LocalDate.of(
    2019, Month.DECEMBER, 31);
WeekFields weekFields = WeekFields.of(
    Locale.getDefault());

int weekNumber = newYearsEve.get(
    weekFields.weekOfWeekBasedYear());
int week = newYearsEve.get(
    weekFields.weekOfYear());
System.out.println(weekNumber
    + " " + week);
```

Output:
1 53

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# Behavior Explanation

1. Most years are 52 weeks + 1 day
2. 2020 started on a Wednesday.
3. The week based week starts the Sunday before
4. Whereas weekOfYear() returns 1-54

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# Week of Year

```java
LocalDate xmasEve = LocalDate.of(
    2019, Month.DECEMBER, 24);
DateTimeFormatter format =
    DateTimeFormatter.ofPattern(
    "yyyy-MM-dd");
DateTimeFormatter format2 =
    DateTimeFormatter.ofPattern(
    "YYYY-MM-dd");
System.out.println(xmasEve.format(format)
    + " " + xmasEve.format(format2));
```

Output:
2019-12-24 2019-12-24

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# Week of Year

```java
LocalDate newYearsEve = LocalDate.of(
    2019, Month.DECEMBER, 31);
DateTimeFormatter format =
    DateTimeFormatter.ofPattern(
    "yyyy-MM-dd");
DateTimeFormatter format2 =
    DateTimeFormatter.ofPattern(
    "YYYY-MM-dd");
System.out.println(
    newYearsEve.format(format) + " "
    + newYearsEve.format(format2));
```

Output:
2019-12-31 2020-12-31

# Behavior Explanation

1. y is year
2. Y is week of year
3. Be careful with week of year!

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Closing Resources

# JDBC

```java
PreparedStatement stmt =
    conn.prepareStatement(
    "update mytable set updated = now()");
try (stmt) {
    stmt.executeUpdate();
}
```

"Good"

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# JDBC

```
PreparedStatement stmt =
    conn.prepareStatement(
    "update mytable set updated = now()" +
    " where key = ?");

stmt.setString(1, "abc");
try (stmt) {
    stmt.executeUpdate();
}
```

Resource leak!

# Behavior Explanation

1. What happens if an exception is thrown while calling the PreparedStatement setter?
2. The try-with-resources doesn't run
3. Resource leak!

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# IO

```java
try (BufferedReader reader =
    Files.newBufferedReader(path)) {

    String line = null;
    while
      ((line = reader.readLine())!= null) {
      // process line
    }
}
```

No leak

# IO

```
Files.lines(path).count();
```

Resource leak!

# Behavior Explanation

1. Resource not closed by terminal operation
2. Affects
   1. find()
   2. lines()
   3. list()
   4. newDirectoryStream()
   5. walk()

# IO

```java
try (Stream<String> stream
    = Files.lines(path)) {

  stream.count();
}
```

Good

# PSA: Free Tools

- **PMD**

- **FindBugs**

- **CheckStyle**

- **SonarQube - examples:**

  - **No return in finally**

  - **Close resources**

  - **All sorts of bugs**

# Other Favorites?

???

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