Java Idioms

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Wednesday June 21, 2023
KCDC

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About Me

- Java Champion
- Author
- Developer at NYC bank for 21+ years
- FIRST Robotics Mentor

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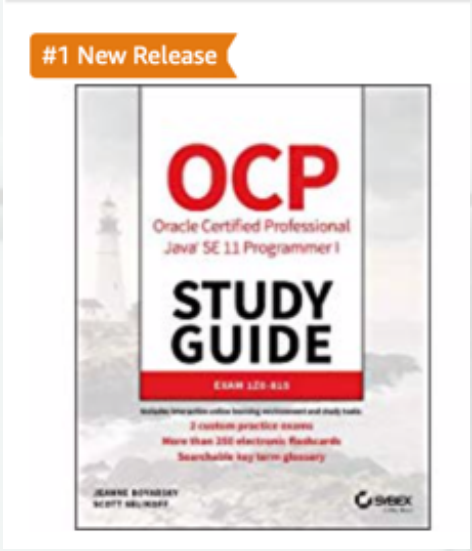
Pause for a Commercial



Java certs: 8/11/17

Book giveaway at end!

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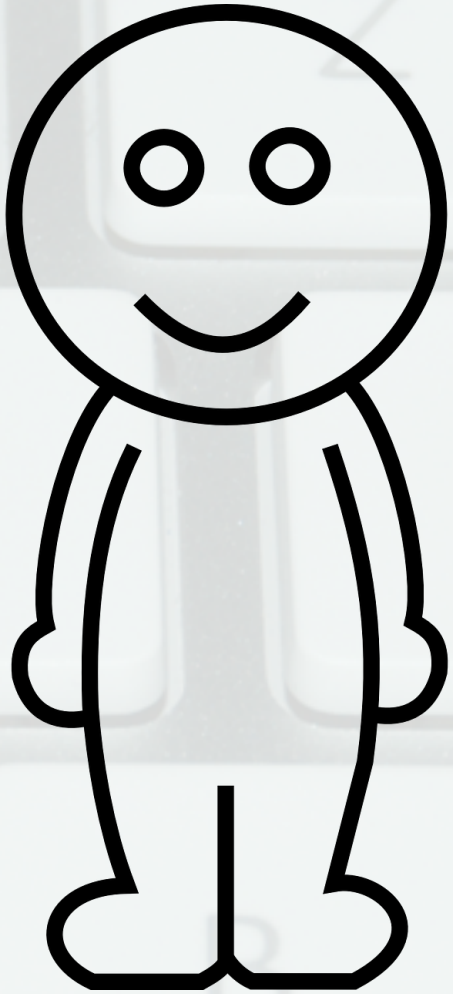
Disclaimer

- A bit of the material is from my books.
- Some of the material in this presentation may appear in our upcoming certification books.

Introductions



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Agenda

- Strings and Text Blocks
- Regular Expressions
- Collections & Streams
- File I/O + Other Useful APIs

Module Flow

- Review lab from previous module
- Lecture/review
- Hands on exercises
- 10 minute break

This means if a colleague needs to call you, the last 15-20 minutes of each hour is best.

Idiom

- Recurring construct
- Has meaning
- Common approach

Design Patterns

- Typically higher level
- May be language agnostic

Anti-Pattern

- Common “solution”
- Negative effects

Example #1 - What is it?

```
public class OnlyOne {

    private static OnlyOne instance;

    private OnlyOne(){}

    public static synchronized OnlyOne getInstance(){
        if(instance == null){
            instance = new OnlyOne();
        }
        return instance;
    }

}
```

Design Pattern (Singleton)

Example #2 - What is it?

```
public int countPositive(int[] nums) {
    int count = 0;
    for (int i = 0; i < nums.length; i++) {
        if (nums[i] > 0) {
            count++;
        }
    }
    return count;
}
```

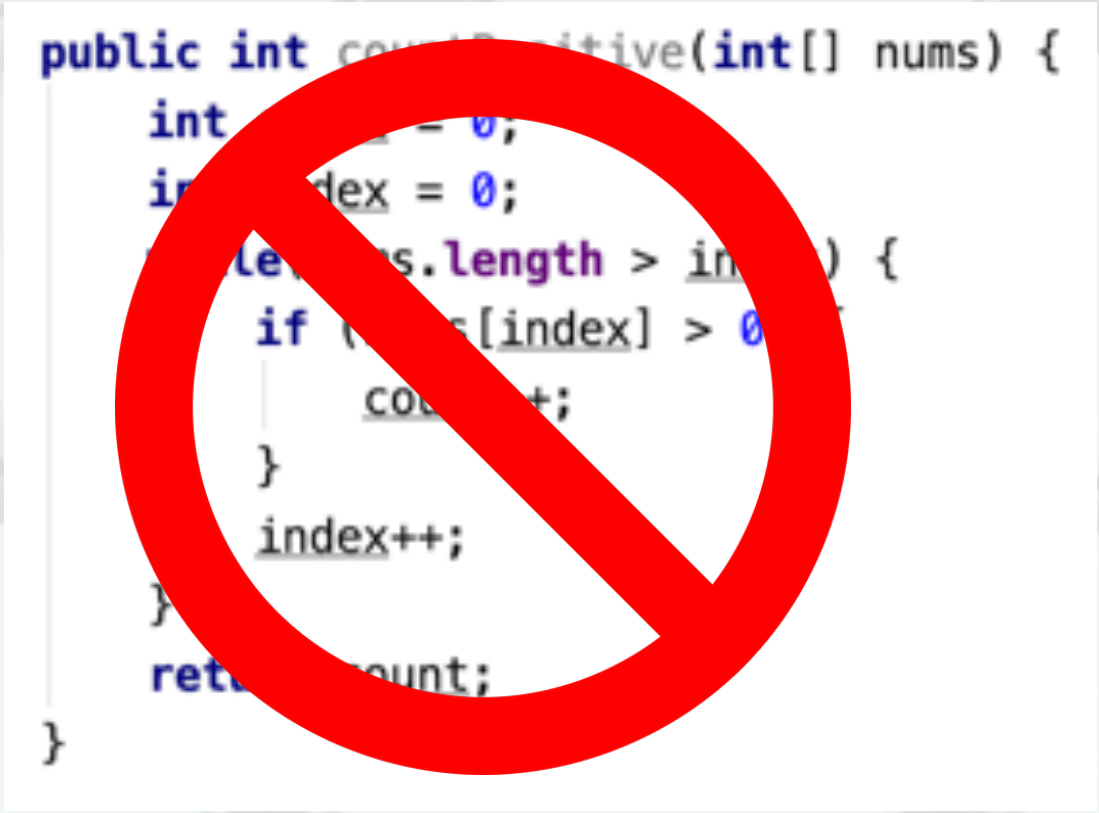
Idiom
(Pre-Java 8)

Example #3 - What is it?

```
public void doEverything() {
    try {
        doWork();
    } catch(Exception e) {
        // ignore
    }
}
```

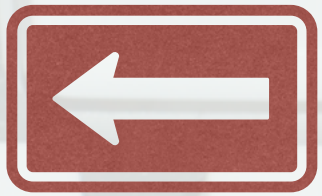
Anti-pattern
* catches “Exception”
* ignores exception

Example #4 - What is it?



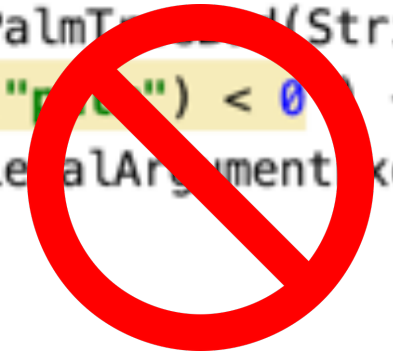
Agenda

- **Strings and Text Blocks**
- Regular Expressions
- Collections & Streams
- File I/O + Other Useful APIs



Is there a match?

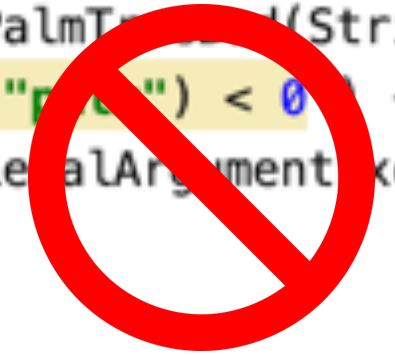
```
public void validatePalmTree(String tree) {
    if (tree.indexOf("palm") < 0) {
        throw new IllegalArgumentException("Not a palm tree");
    }
}
```



IntelliJ warning!

Is there a match?

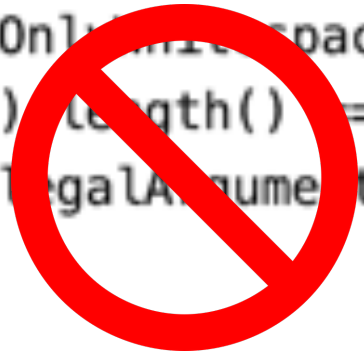
```
public void validatePalmTree(String tree) {
    if (tree.indexOf("palm") < 0) {
        throw new IllegalArgumentException("Not a palm tree");
    }
}
```



```
private void validatePalmTree(String tree) {
    if (! tree.contains("palm")) {
        throw new IllegalArgumentException("Not a palm tree");
    }
}
```

Only whitespace

```
public void validateOnlyWhitespaceBad(String string) {
    if (string.trim().length() == 0) {
        throw new IllegalArgumentException("Not blank");
    }
}
```



```
public void validateOnlyWhitespaceBetter(String string) {
    if (string.trim().isEmpty()) {
        throw new IllegalArgumentException("Not blank");
    }
}
```

Even Better

```
public void validateOnlyWhitespaceBitBetter(String string) {
    if (string.strip().isEmpty()) {
        throw new IllegalArgumentException("Not blank");
    }
}
```

Java 11

```
public void validateOnlyWhitespaceBest(String string) {
    if (string.isBlank()) {
        throw new IllegalArgumentException("Not blank");
    }
}
```

Java 11

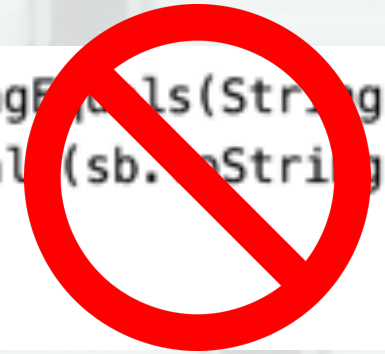
String Concatentation

```
public String builder() {
    StringBuilder builder = new StringBuilder();
    for (int i = 0;  i < 10; i++) {
        builder.append(i);
        builder.append(" ");
    }
    return builder.toString();
}

public String concat() {
    String result = "";
    for (int i = 0;  i < 10; i++) {
       result += i + " ";
    }
    return result;
}
```

Best choice changes over time

Equal?

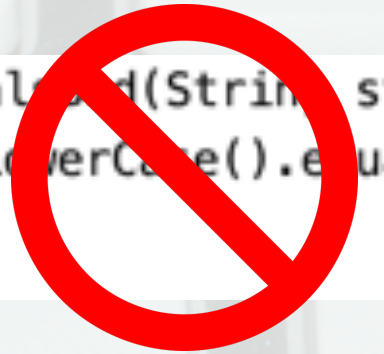


```
public boolean usingEquals(String str, StringBuilder sb) {
    return str.equals(sb.toString());
}
```

```
public boolean better(String str, StringBuilder sb) {
    return str.contentEquals(sb);
}
```

Case Insensitive Equal

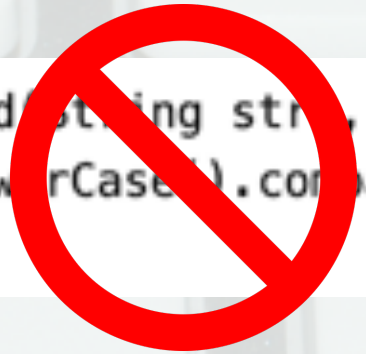
```
public boolean equal  d(Strin  str1, String str2) {
    return str1.toL erCa e().e uals(str2.toLowerCase());
}
```



```
public boolean equalsBetter(String str1, String str2) {
    return str1.equalsIgnoreCase(str2);
}
```

Case Insensitive Compare

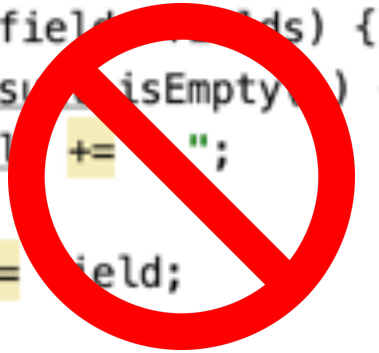
```
public int compareBad(String str1, String str2) {
    return str1.toLowerCase().compareTo(str2.toLowerCase());
}
```



```
public int compareBetter(String str1, String str2) {
    return str1.compareToIgnoreCase(str2);
}
```

Creating Csv

```
public String commaSeparatedBad(List<String> fields) {
    String result = "";
    for (String field : fields) {
        if (! result.isEmpty()) {
            result += ",";
        }
        result += field;
    }
    return result;
}
```

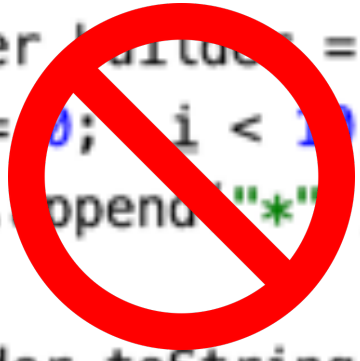


Better to use Commons CSV Library

```
public String commaSeparated(List<String> fields) {
    return String.join( delimiter: ",", fields);
}
```

Multiples

```
public String tenStarsBad() {
    StringBuilder builder = new StringBuilder();
    for (int i = 0; i < 10; i++) {
        builder.append("*");
    }
    return builder.toString();
}
```



```
public String tenStars() {
    return "*".repeat(10);
}
```

Java 11

Formatting

```
public void printPi() {
    double pi = 3.14159265359;
    System.out.format("%s is %3.2f to the nearest %d digits",
            "Pi", pi, 2);
}
```

- %s - string
- %d - int
- %f - float/double (minimum width/precision)
- %n - new line

Formatting

```
public String justFormat() {
    var pi = 3.14159265359;
    var formatString = "%s is %3.2f to the nearest %d digits";
    return formatString.formatted( ...args: "Pi", pi, 2);
}
```

Java 15

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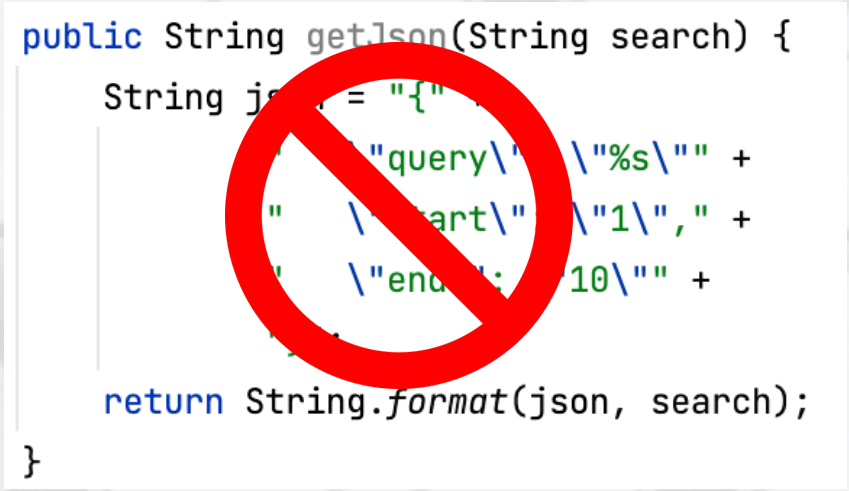
Text Blocks



```
public String getJson(String search) {
    String json = "{" +
            "\"query\": \"%s\"" +
            "\"start\": \"1\"," +
            "\"end\": \"10\"" +
            "}";
    return String.format(json, search);
}
```

```
public String getJson(String search) {
    String json = """
        {
        "query": "%s"
        "start": "1"
        "end": "10"
        }""";
    return String.format(json, search);
}
```

Java 15
(adds line breaks)

@jeanneboyarsky

Text Blocks

```
public void xml() {
    String textBlock = """
    <session>
        <speaker>
            "Jeanne Boyarsky"
        </speaker>
    </session>""";
}
```

incidental whitespace

quote not escaped

no trailing new line

essential whitespace

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Other “new” APIs

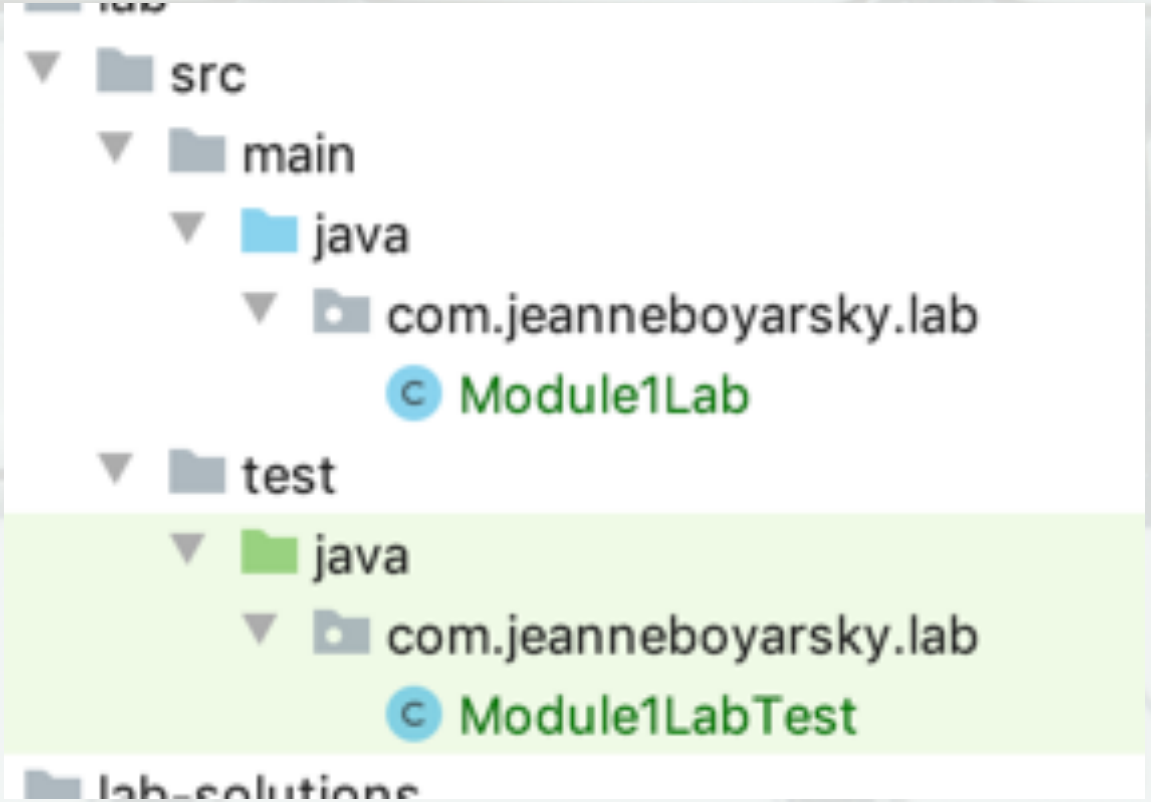
API	Introduced
stripLeading() stripTrailing() lines()	11
indent(number)	12
transform(function)	12
stripIndent() translateEscapes()	15
indexOf(ch, beginIndex, endIndex) indexOf(str, beginIndex, endIndex)	21
splitWithDelimiters(regex, limit)	21

Review - What best API?

- Check if String empty?
- Duplicate String?
- Merge Strings?
- Compare case sensitive strings?
- Compare non-case sensitive strings?

Lab

Do NOT use streams or lambdas in this lab



Lab & Break

https://github.com/boyarsky/2023-kcdc-java-idioms

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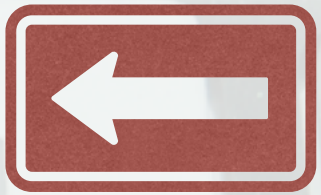

Lab Review

- Any questions?
- How did you solve Tic Tac Toe?

Remove all Numbers

```
public static String removeAll(String text) {
    return text.replaceAll( regex: "[0-9]",  replacement: "");
}
```

Note replaceAll

What are two ways to remove blank spaces too?

Remove leading pattern

```
public static String removeLeadingNumbers(String text) {
    return text.replaceFirst( regex: "^[0-9]+",  replacement: "");
}
```

Three changes:
replaceFirst()
^
+

Remove trailing pattern

```
public static String removeTrailingPeriod(String text) {
    return text.replaceFirst( regex: "\\.$",  replacement: "");
}
```

Watch escaping

Remove middle

```
public static String removeMiddle(String csv) {
    String anyCharsExceptComma = "[^,]*";
    String captureCharsWithoutComma = '(' + anyCharsExceptComma + ')';
    char comma = ',';
    String regex = captureCharsWithoutComma + comma
            + anyCharsExceptComma + comma + captureCharsWithoutComma;
    return csv.replaceFirst(regex,  replacement: "$1,$2");
}
```

Off by one error?

Ugly regex

```
public static String removeMiddle(String csv) {
    return csv.replaceFirst( regex: "([^,]*),[^,]*,([^,]*)",
                             replacement: "$1,$2");
}
```

Better regex

```
public static String removeMiddle(String csv) {
    String anyCharsExceptComma = "[^,]*";
    String captureCharsWithoutComma = '(' + anyCharsExceptComma + ')';
    char comma = ',';
    String regex = captureCharsWithoutComma + comma
            + anyCharsExceptComma + comma + captureCharsWithoutComma;
    return csv.replaceFirst(regex, replacement: "$1,$2");
}
```

Regex quick reference

0 or more	*
1 or more	+
0 or 1	?
any	.
three x's	x{3}

range	[0-9]
Not in range	[^0-9]
Digit	\d
White space	\s
Word	\w

Brainstorm

How many ways can we match one or more using at most 2 x characters?

Splitting on a Regex

```
public static String[] nameParts(String text) {
    return text.split( regex: "[ ,]+");
}
```

Contains only digits

```
public static boolean isOnlyDigits(String text) {
    return text.matches( regex: "\\d+");
}
```

Contains any digits

```
public static boolean atLeastOneDigit(String text) {
    return text.matches( regex: ".*\\d.*");
}
```

More to regex

Case Insensitive

```
public static String replaceShort(String text) {
    return text.replaceAll( regex: "[xX]{3}",  replacement: "");
}
```

Case Insensitive

```
public static String replaceLong(String text) {
    return text.replaceAll( regex: "(?i)www\\.google\\.com",  replacement: "");
}
```

Multi Line Replace

```
public static String remove(String text) {
    return text.replaceAll( regex: "(?m)^\\s(.*)$",
                replacement: "$1");
}
```

a
b
c

(?m)
Also $1

Dot All

```
public static String remove(String text) {
    return text.replaceAll( regex: "(?s)<form>.*</form>",
            replacement: "<form></form>");
}
```

```
<form>
  <input />
  <textarea />
</form>
```

(?s)

Pattern Idiom

```
public static Set<String> getTags(String text) {
    Set<String> tags = new TreeSet<>();
    String openTag = "<";
    String closeTag = ">";
    String tagContents = "[^/>]+";
    String regex = openTag + "(" + tagContents + ")" + closeTag;
    Pattern pattern = Pattern.compile(regex);
    Matcher matcher = pattern.matcher(text);
    while (matcher.find()) {
        String tagName = matcher.group(1);
        tags.add(tagName);
    }
    return tags;
}
```

Pattern Replace

```
public static String sanitize(String text) {
    String number = "[0-9]{1,3}";
    String dot = "\\.";
    String regex = number + dot + number + dot + number + dot + number;
    Pattern pattern = Pattern.compile(regex);
    Matcher matcher = pattern.matcher(text);
    StringBuilder builder = new StringBuilder();
    while (matcher.find()) {
        String ip = matcher.group();
        matcher.appendReplacement(builder, replacement: "xxx");
    }
    matcher.appendTail(builder);
    return builder.toString();
}
```

Review - How do I?

- Match digit?
- Remove a single match?
- Treat dot as any character?
- Match a character 100 times?
- Loop through matches?
- Match a period?

Lab & Break

https://github.com/boyarsky/2023-kcdc-java-idioms

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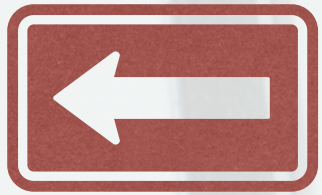


Lab Review

- Any questions?
- Did you like replaceAll() or Pattern better?
- What was hardest?

Create a Set

```
public Set<Integer> createSet() {
    return new HashSet<>(Arrays.asList(1, 2, 3));
}
```

```
public Set<Integer> createSet() {
    return Set.of(1, 2, 3);
}
```

Java 9

Create a List

```
public List<Integer> createList() {
    return Arrays.asList(1, 2, 3);
}
```

```
public List<Integer> createList() {
    return List.of(1, 2, 3);
}
```

Java 9

Mutable List

```
public List<Integer> createMutableList() {
    return new ArrayList<>(Arrays.asList(1, 2, 3));
}
```

```
public List<Integer> createMutableList() {
    return new ArrayList<>(List.of(1, 2, 3));
}
```

Java 9

Mutable Copy

```
public <T> List<T> constructor(List<T> original) {
    return new ArrayList<>(original);
}
```

Immutable Copy

```
public <T> List<T> copyOf(List<T> original) {
    return List.copyOf(original);
}
```

Java 10

Synchronized View

```
public <T> List<T> synchronizedList(List<T> original) {
    return Collections.synchronizedList(original);
}
```

Unmodifiable View

```
public <T> List<T> unmodifiableList(List<T> original) {
    return Collections.unmodifiableList(original);
}
```

Create a Map

```
public Map<String, Integer> createMap() {
    Map<String, Integer> map = new HashMap<>();
    map.put("a", 1);
    map.put("b", 2);
    return map;
}
```

Create a Map

```
public Map<String, Integer> createMap() {
    return Map.of( k1: "a",  v1: 1,
                   k2: "b",  v2: 2);
}
```

```
public Map<String, Integer> createMapClearer() {
    return Map.ofEntries(
            Map.entry( k: "a",  v: 1),
            Map.entry( k: "b",  v: 2));
}
```

Java 9

Sorting

```
public void sortAlphabetically(List<String> list) {
    Collections.sort(list);
    list.sort(Comparator.naturalOrder());
}
```

```
public void sortBackwards(List<String> list) {
    Collections.sort(list);
    list.sort(Comparator.reverseOrder());
}
```

Sorting

```
public void sortByLength(List<String> list) {
    list.sort(Comparator.comparing(String::length));
}
```

```
public void sortByLengthReversed(List<String> list) {
    list.sort(Comparator.comparing(String::length).reversed());
}
```

Removing from a List

```
public void remove(List<String>list, String target) {
    list.remove(target);
}
```

```
public void removeWithoutEquals(List<Name>list, String target) {
    list.removeIf(n -> target.equals(n.getFirstName()));
}
```

Element in List

```
public boolean findMatch(List<String>list, String target) {
    return list.contains(target);
}
```

```
public boolean findMatchWithoutEquals(List<Name>list, String target) {
    return list.stream()
            .anyMatch(n -> target.equals(n.getFirstName()));
}
```

Replacing

```
public void doubleString(List<String> list) {
    list.replaceAll(s -> s + s);
}
```

Venn Diagram?

```
public Set<Integer> union(Set<Integer> set, Collection<Integer> nums) {
    Set<Integer> copy = new HashSet<>(nums);
    copy.addAll(set);
    return copy;
}
```

```
public Set<Integer> intersection(Set<Integer> set, Collection<Integer> nums) {
    Set<Integer> copy = new HashSet<>(nums);
    copy.retainAll(set);
    return copy;
}
```

```
public Set<Integer> distinct(Set<Integer> set, Collection<Integer> nums) {
    Set<Integer> copy = new HashSet<>(set);
    copy.removeAll(nums);
    return copy;
}
```

Defaulting

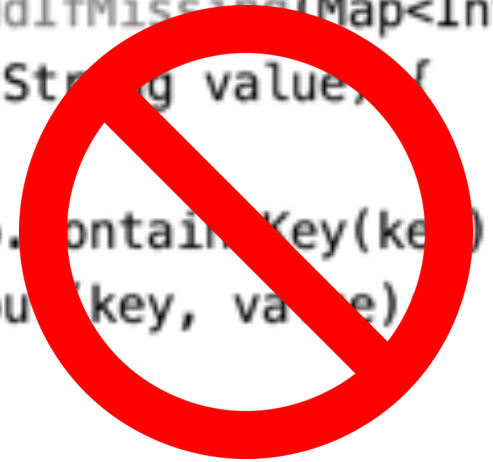
```
public int total(Map<String, Integer> map,
                 String key1, String key2) {

    return map.getOrDefault(key1, defaultValue: 0)
            + map.getOrDefault(key2, defaultValue: 0);
}
```

Add to map if not present

```
public void addIfMissing(Map<Integer, String> map,
        int key, String value) {

    if (! map.containsKey(key)) {
        map.put(key, value);
    }
}
```



```
public void addIfMissing(Map<Integer, String> map,
        int key, String value) {

    map.putIfAbsent(key, value);
}
```

Other Useful Map Methods

- containsKey(), containsValue()
- entrySet()
- keySet(), values()
- remove(key)
- remove(key, value)
- replace(key, value)
- replace(key, oldValue, newValue)

Printing

```
public void printTwice(Set<Character> set) {
    set.forEach(c -> System.out.println(c));
    set.forEach(System.out::println);
}
```

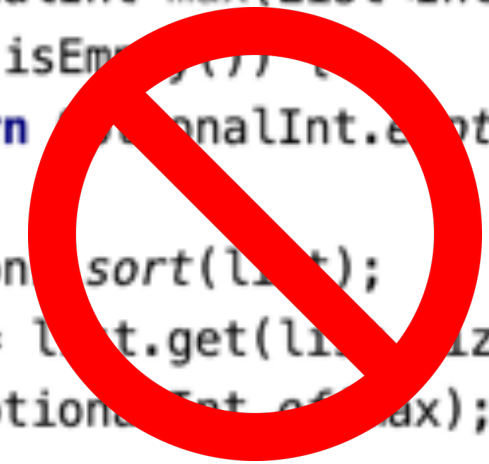
```
public void print(Map<Character, Double> map) {
    map.entrySet().forEach(System.out::println);
    map.forEach((k,v) -> System.out.println(k + v));
}
```

Review - How do I?

- Create an immutable copy
- Remove all values less than 5
- Update the value in a map if the current value is 10
- Return 0 if the value isn't found
- Find the intersection of two collections

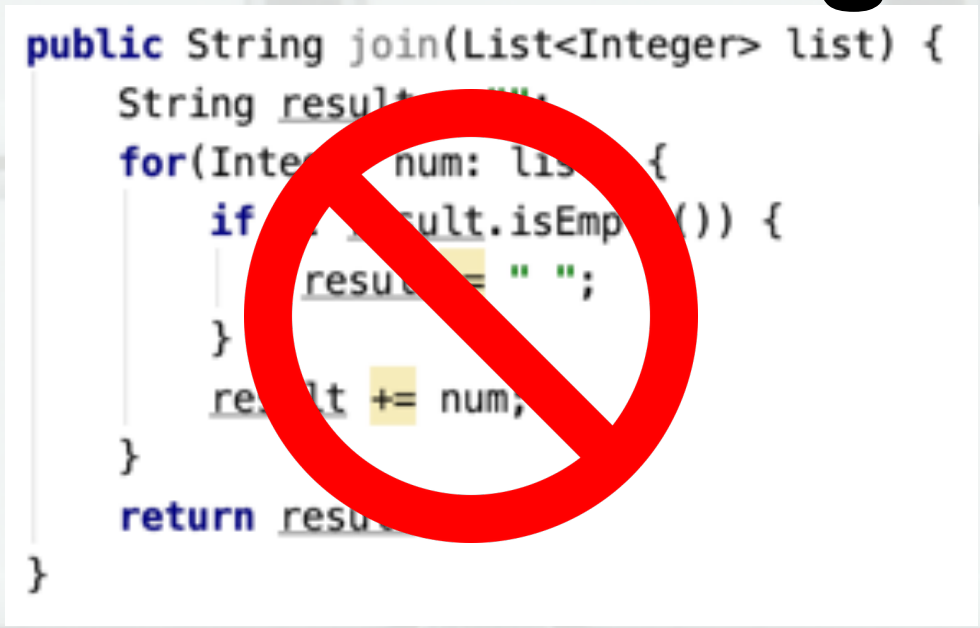
Find max

```
public OptionalInt max(List<Integer> list) {
    if (list.isEm
        return
    }
    Collection
    int max = l
    return Option
}
```



```
public OptionalInt maxStream(List<Integer> list) {
    return list.stream().mapToInt(x -> x).max();
}
```

Join a String

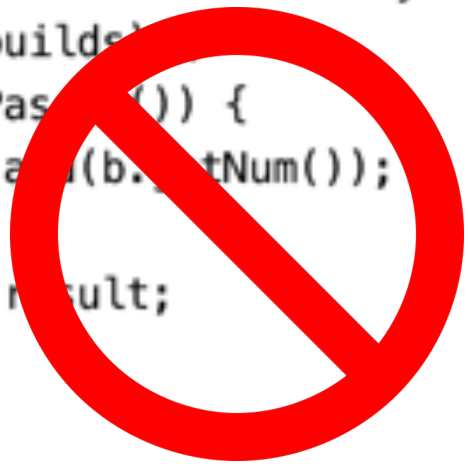


```
public String join(List<Integer> list) {
    String result = "";
    for(Integer num: list) {
        if (!result.isEmpty()) {
            result += " ";
        }
        result += num;
    }
    return result;
}
```

```
public String joinStream(List<Integer> list) {
    return list.stream()
            .map(Object::toString)
            .collect(Collectors.joining( delimiter: " " ));
}
```

Get First Elements

```
List<Integer> result = new ArrayList<>();
for (Build b: builds
    if (! b.isPas    ()) {
        result.a   (b.  tNum());
    } else {
        return r   ult;
    }
}
return result;
```

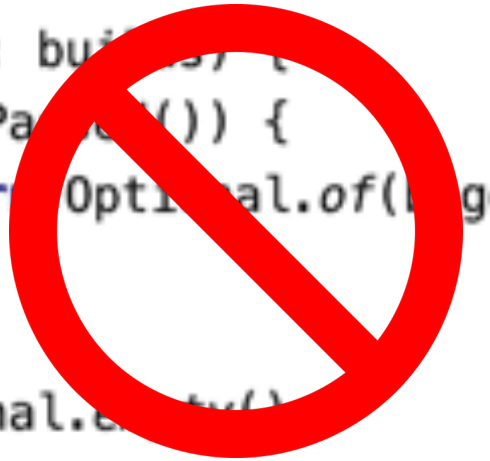


```
return builds.stream()  Stream<Build>
        .takeWhile(b -> ! b.isPassed())
        .map(Build::getNum)  Stream<Integer>
        .toList();
```

Java 9 and 16

Get element

```
List<Integer> result = new ArrayList<>();
for (Build b: bu
    if (b.isPa
        retur Opti al.of( getNum());
    }
}
return Optional.e
```



```
return builds.stream()
        .dropWhile(b -> ! b.isPassed())
        .map(Build::getNum)
        .findFirst();
```

Java 9

Strings

```
public long countLinesWithQuestion(String text) {
    return text.lines()
            .filter(s -> s.contains("?"))
            .count();
}

public long countQuestionMarks(String text) {
    return text.chars()
            .filter(c -> c == '?')
            .count();
}
```

Useful Terminal Operations

- count()
- collect() - more on this next module
- allMatch(), anyMatch(), noneMatch()
- findFirst(), findAny()
- min()/max()
- forEach()
- toArray, toList()

Useful Intermediate Operations

- filter()
- map()
- distinct()
- limit(), skip()
- sorted()
- peek()

Review - What method can…

- Return whether 5/5 values == 7?
- Return whether >=1 values == 7?
- Make a stream smaller?
- Change the order of stream elements?
- Loop through stream elements?
- Ignore the first 2 elements?
- Ignore any elements are the first 2?

Infinite: Generating

```
public String tenStars() {
    return Stream.generate(() -> "*")
            .limit(10)
            .collect(Collectors.joining());
}
```

Infinite: Iterative

```
public String counting() {
    return Stream.iterate( seed: 1, i-> i+1)
            .limit(10)
            .map(Object::toString)
            .collect(Collectors.joining( delimiter: " "));
}
```

```
public String countingWithLimit() {
    return Stream.iterate( seed: 1, i -> i <= 10, i-> i+1)
            .map(Object::toString)
            .collect(Collectors.joining( delimiter: " "));
}
```

Java 9

FlatMap

```
List<String> first = List.of("a", "b");
List<String> second = List.of();
List<List<String>> listOfLists = List.of(first, second);

return listOfLists.stream()
        .flatMap(Collection::stream)
        .collect(Collectors.toList());
```

Creating Map

```
public Map<String,Integer> mapByName(List<String> list) {
    return list.stream()
            .collect(Collectors.toMap(
                    s -> s,
                    String::length));
}
```

Creating Map With Conflict

```
public Map<Integer,String> mapBySize(List<String> list) {
    return list.stream()
            .collect(Collectors.toMap(
                    String::length,
                    s -> s,
                    (a, b) -> a));
}
```

Grouping By Key

```
public Map<Integer,List<String>> grouping(List<String> list) {
    return list.stream()
            .collect(Collectors.groupingBy(String::length));
}
```

Partitioning By Key

```
public Map<Boolean,List<String>> partitioning(List<String> list) {
    return list.stream()
            .collect(Collectors.partitioningBy(String::isEmpty));
}
```

Grouping By Key

```
public Map<Integer,Long> groupingWithCount(List<String> list) {
    return list.stream()
            .collect(Collectors.groupingBy(
                    String::length,
                    Collectors.counting()));
}
```

Reduce

```
public Integer sum(List<Integer>list) {
    return list.stream()
            .reduce( identity: 0, (x, y) -> x+ y);
}
```

```
public Optional<Integer> min(List<Integer>list) {
    return list.stream()
            .reduce((x, y) -> x < y ? x : y);
}
```

Review

- Sources
  - generate()
  - iterate()
- Intermediate
  - flatMap()
- Terminal
  - reduce()
- Collectors
  - toMap()
  - groupingBy()
  - partitioningBy()

What method for?

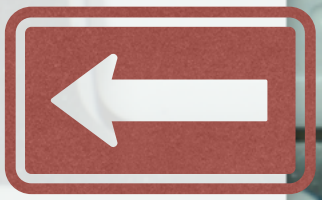
- Creating an infinite stream of a times table?
- Creating a Map that always has two keys?
- Creating a Map with a custom key/value?
- Returning an Optional representing the stream?

Lab & Break

https://github.com/boyarsky/2023-kcdc-java-idioms

Agenda

- Strings and Text Blocks
- Regular Expressions
- Collections & Streams
- **File I/O + Other Useful APIs**



Lab Review

- What did you come up with for takeWhile() or dropWhile()?
- Did you see how different methods are useful for different problems?

Records

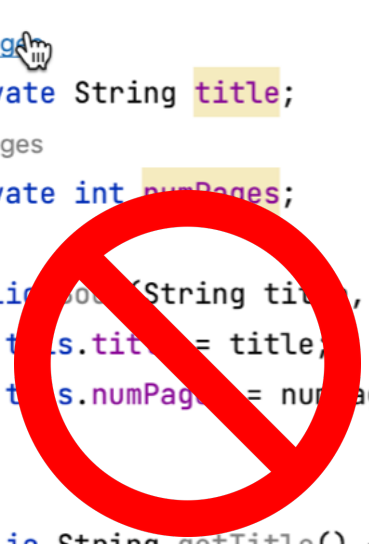
```
public class Book {

    2 usages
    private String title;
    2 usages
    private int numPages;

    public Book(String title, int numPages) {
        this.title = title;
        this.numPages = numPages;
    }

    public String getTitle() {
        return title;
    }

    public int getNumPages() {
        return numPages;
    }
```



Ran out of room on the screen

Java 16

@jeanneboyarsky

Records

```
public record Book (String title, int numPages) {
}
```

```
var book = new Book( title: "Breaking and entering", numPages: 289);

System.out.println(book.title());
System.out.println(book.toString());
```

Automatically get
* final record
* private final instance variables
* public accessors
* constructor taking both fields
* equals
* hashCode

Can @Override any methods (ex: backward compatibility for getters)

Creating a Path

```
Path path = Paths.get( first: "lecture/src");
```

```
Path path = Paths.get( first: "lecture",  ...more: "src");
```

```
File file = new File( pathname: "lecture/src");
Path path = file.toPath();
```

Absolute Path

```
System.out.println(path.toAbsolutePath());
```

```
if (path.isAbsolute()) {
```

Separators

```
System.out.println(File.separator);
System.out.println(File.pathSeparator);
System.out.println(System.getProperty("file.separator"));
System.out.println(System.getProperty("path.separator"));
```

Windows:
\\ and ;

Mac/Linux:
/ and :

Read File into String

```
public String readIntoString(Path path) throws IOException {
    return new String(Files.readAllBytes(path));
}
```

```
public String readIntoString(Path path) throws IOException {
    return Files.readString(path);
}
```

Java 11

Read File into List

```
public List<String> readIntoList(Path path) throws IOException {
    return Files.readAllLines(path);
}
```

Read File with Stream

```
public long numEmptyLines(Path path) throws IOException {
    try (Stream<String>lines = Files.lines(path)) {
        return lines.map(String::trim)
                .filter(String::isEmpty)
                .count();
    }
}
```

Write File from String

```
public void writeFile(Path path, String text) throws IOException {
    Files.write(path, text.getBytes());
}
```

```
public void writeFromString(Path path, String text) throws IOException {
    Files.writeString(path, text);
}
```

Java 11

Write File from List

```
public void writeFile(Path path, List<StringBuilder> list)
        throws IOException {
    Files.write(path, list);
}
```

Append To File

```
public void append(Path path, List<String> list)
        throws IOException {
    Files.write(path, list, StandardOpenOption.APPEND);
}
```

Walk Tree

```
public Collection<String> getAll(Path path) throws IOException {
    return Files.walk(path)
            .map(Path::toString)
            .collect(Collectors.toList());
}
```

Convert to unchecked

```
public Collection<String> readAll(Path path)
        throws IOException {

    return Files.walk(path)
            .map(this::readFile)
            .collect(Collectors.toList());
}

private String readFile(Path path) {
    try {
        return Files.readString(path);
    } catch (IOException e) {
        throw new UncheckedIOException(e);
    }
}
```

Or unchecked wrapper

Delete File

```
Files.delete(outputPath);
```

```
Files.deleteIfExists(outputPath);
```

What API to?

- Read file into a single string?
- Write a List to a file?
- Get rid of a file?
- List all files in directory?
- Add to a file?
- Process file as a Stream<String>?

Math

```
public int absoluteValue(int x) {
    return Math.abs(x);
}
```

```
public int biggest(int x, int y) {
    return Math.max(x, y);
}
```

Math

```
public int smallest(int x, int y) {
    return Math.min(x, y);
}
```

```
public double power(double x, double y) {
    return Math.pow(x, y);
}
```

Random

```
// 0 <= x < 1
public double randomMath() {
    return Math.random();
}
```

```
// 0 <= x < 1
public double random() {
    Random random = new Random();
    return random.nextDouble();
}
```

Random

```
// 0 <= x < max
public int randomIntUnderMax(int max) {
    Random random = new Random();
    return random.nextInt(max);
}
```

```
// 1 <= x <= max
public int randomIntOneToMax(int max) {
    Random random = new Random();
    return random.nextInt(max) + 1;
}
```

Random

```
public IntStream infiniteIntStream() {
    Random random = new Random();
    return random.ints();
}
```

```
public IntStream finiteIntStream() {
    Random random = new Random();
    return random.ints( streamSize: 5);
}
```

Random

```
// example: fe3957e5-d91a-48db-9631-260fedb0e341
public UUID uuid() {
    return UUID.randomUUID();
}
```

LocalDate

```
public LocalDate now() {
    return LocalDate.now();
}
```

```
public LocalDate presidentsDay() {
    return LocalDate.of( year: 2020, Month.FEBRUARY,  dayOfMonth: 17);
}
```

LocalDate

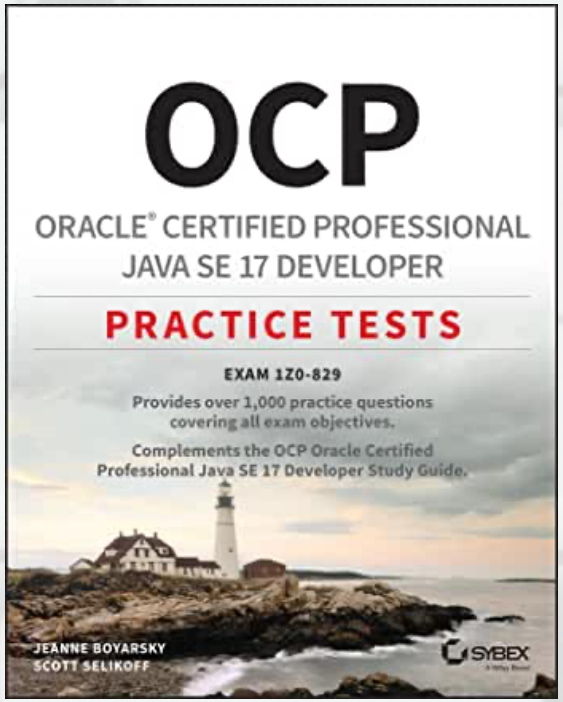
```
public LocalDate dateMath(LocalDate date) {
    return date.plusDays(4).minusWeeks(1);
}
```

```
@Test
void presidentsDay() {
    LocalDate actual = target.presidentsDay();
    assertEquals( expected: 2020, actual.getYear());
    assertEquals(Month.FEBRUARY, actual.getMonth());
    assertEquals( expected: 17, actual.getDayOfMonth());
}
```

What API to?

- Get today?
- Get July 4th of this year?
- Create a random number between 2 and 10?
- Get the largest value of two?
- Get a unique id?

Win a book



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Lab & Break

https://github.com/boyarsky/2023-kcdc-java-idioms