Overview of Java

Supported Programming Paradigms

Douglas C. Schmidt

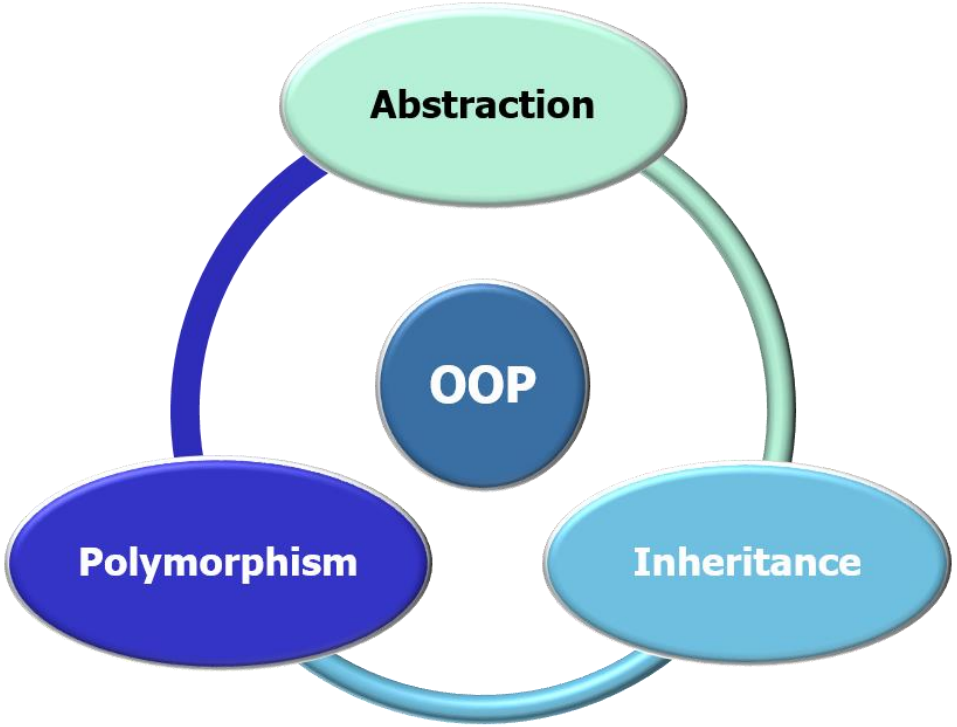
Learning Objectives in This Lesson

- Recognize the two programming paradigms supported by modern Java.

Naturally, these paradigms are also supported in versions above & beyond Java 8!

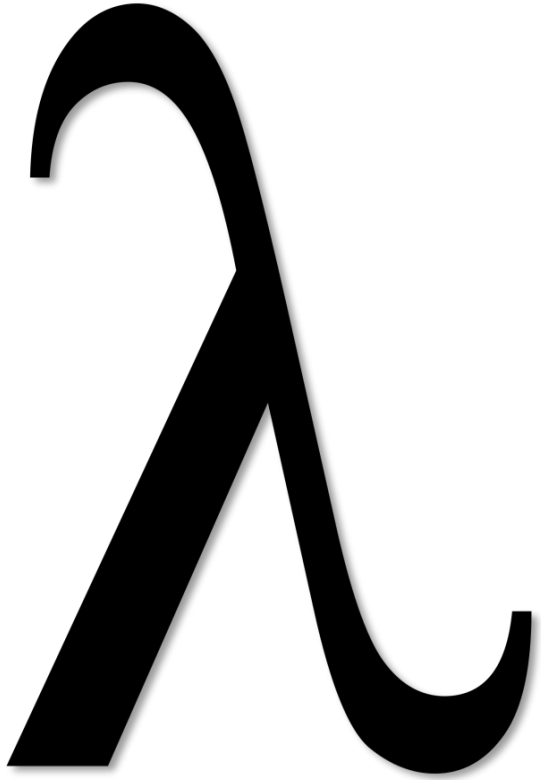
Learning Objectives in This Lesson

- Recognize the two programming paradigms supported by modern Java.
  - Object-oriented programming



Learning Objectives in This Lesson

- Recognize the two programming paradigms supported by modern Java.
  - Object-oriented programming
  - Functional programming



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  - Functional programming

We'll show some Java 8 code fragments that will be covered in more detail later.

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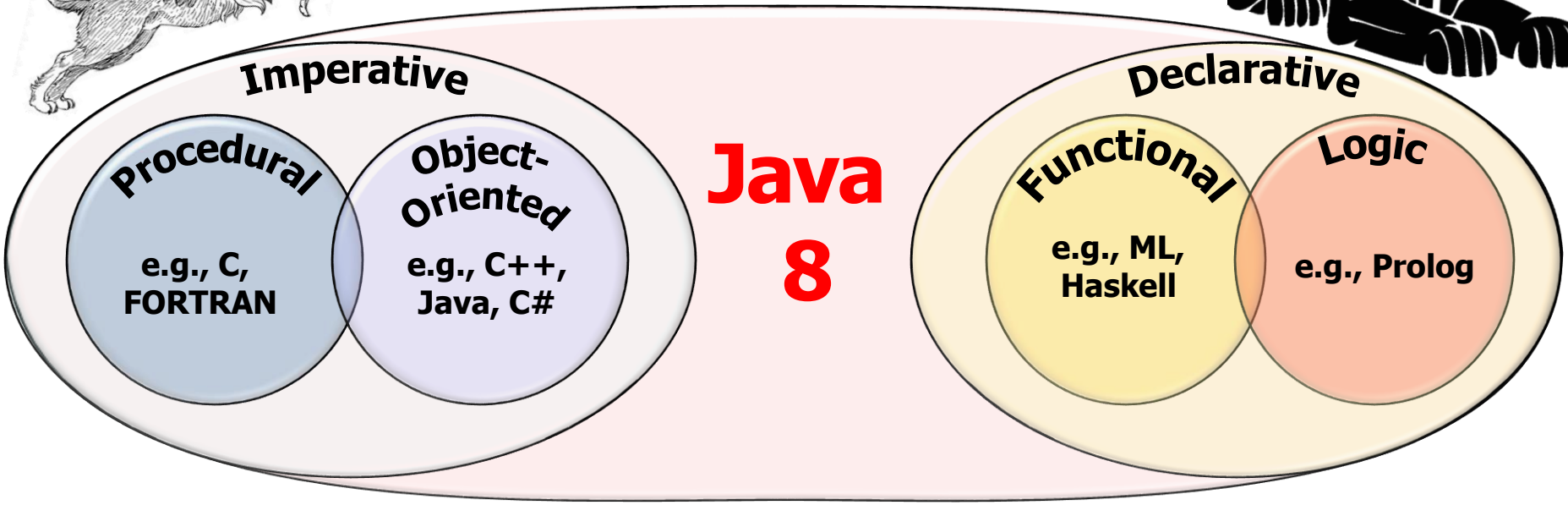
Overview of Programming Paradigms in Java 8

Overview of Programming Paradigms in Java 8

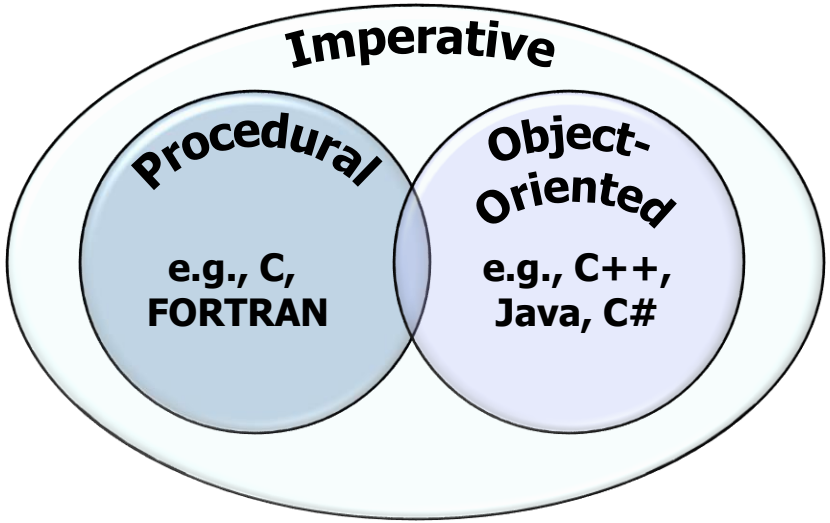
- Java 8 is a "hybrid" that combines the object-oriented & functional paradigms.



See www.deadcoderising.com/why-you-should-embrace-lambdas-in-java-8

Overview of Programming Paradigms in Java 8

- Object-oriented programming is an "imperative" paradigm.

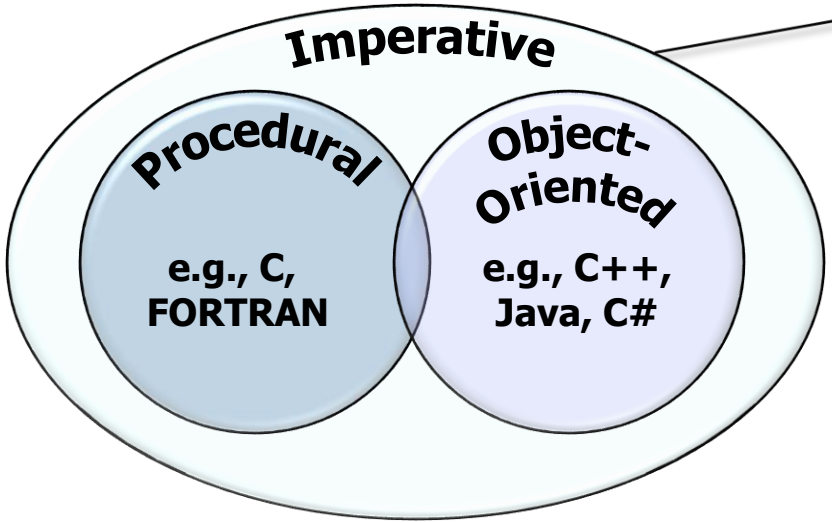


See en.wikipedia.org/wiki/Imperative_programming

Overview of Programming Paradigms in Java 8

- Object-oriented programming is an "imperative" paradigm.
  - e.g., a program consists of commands for the computer to perform.

Imperative programming focuses on describing how a program operates via statements that change its state.



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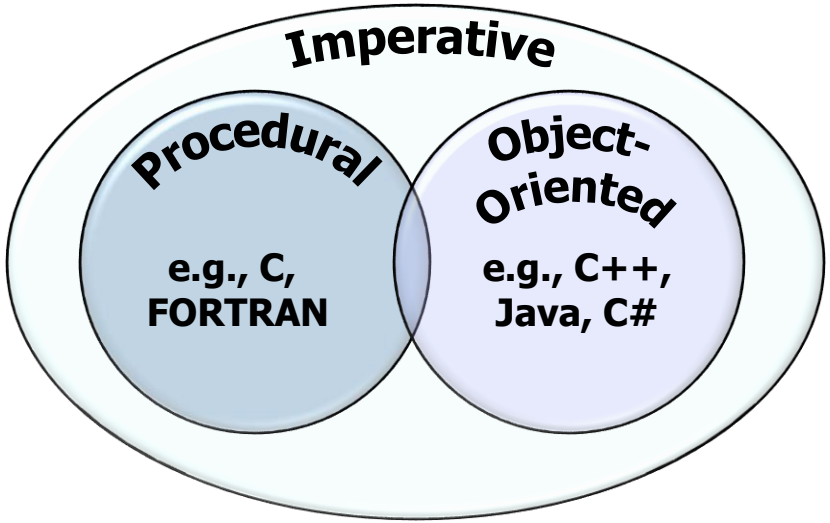


```
List<String> zap(List<String> lines,
                 String omit) {
  List<String> res =
    new ArrayList<>();
  for (String line : lines)
    if (!omit.equals(line))
      res.add(line);
  return res;
}
```

Imperatively remove a given string from a list of strings

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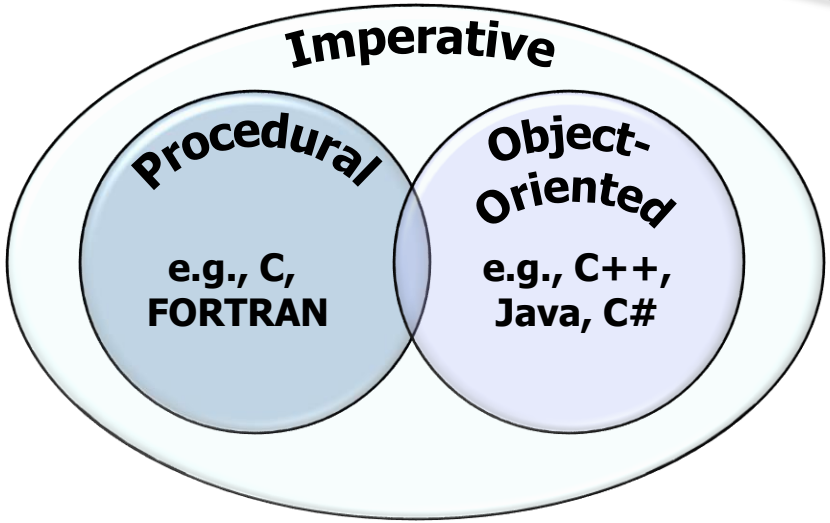
Create an empty list to hold results

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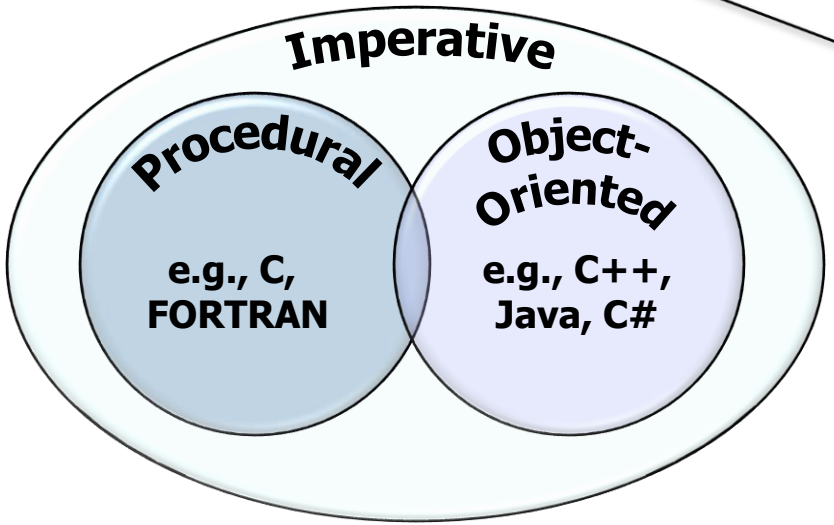
Iterate sequentially through each line

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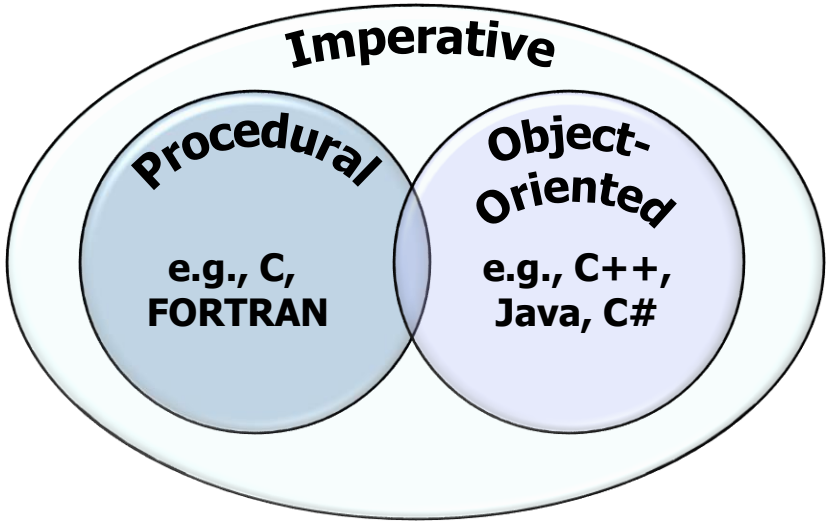


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```

Only add lines that don't match the `omit` *string*

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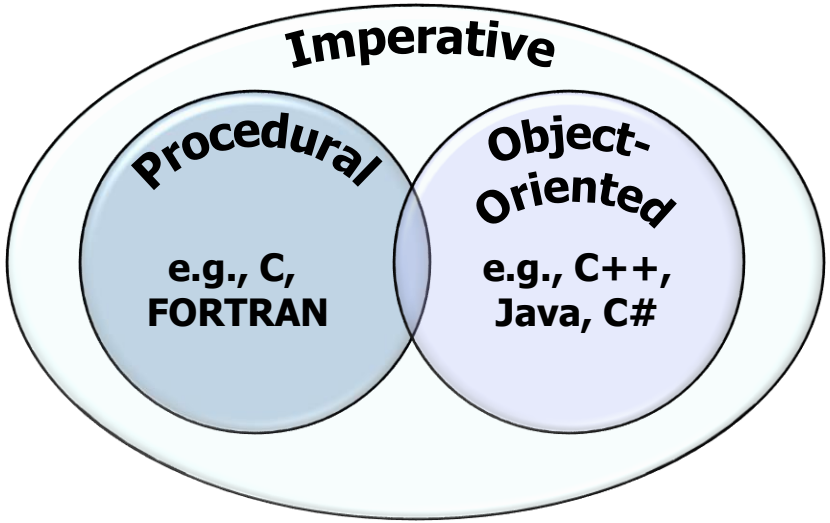


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```

Return the list of nonmatching lines

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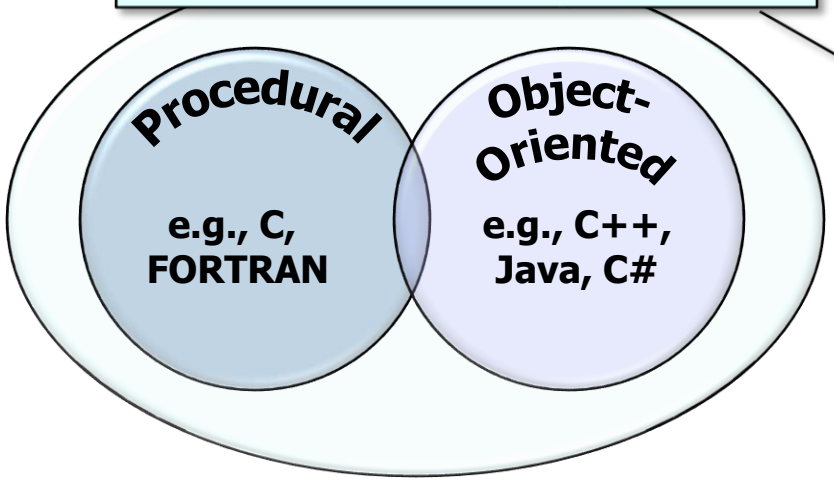
This sequential code applies the Accumulator anti-pattern.

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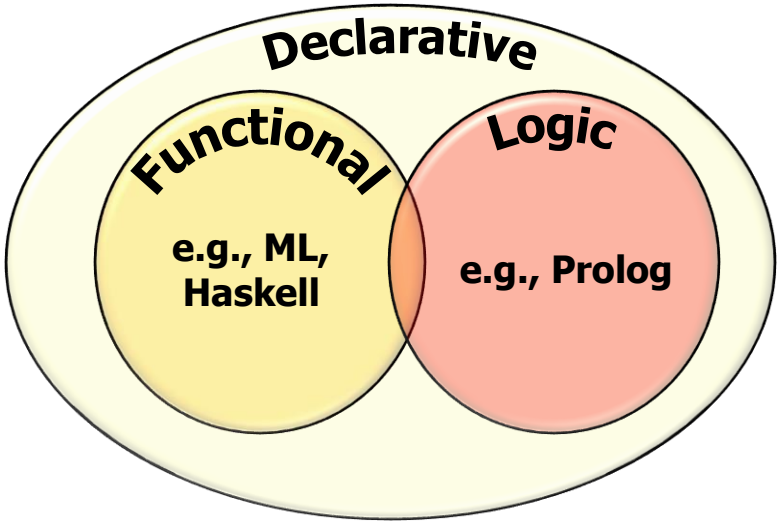
See www.ibm.com/developerworks/library/j-java-streams-2-brian-goetz

Overview of Programming Paradigms in Java 8

- Conversely, functional programming is a "declarative" paradigm.

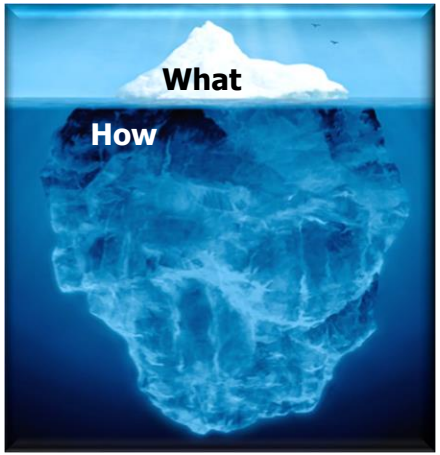


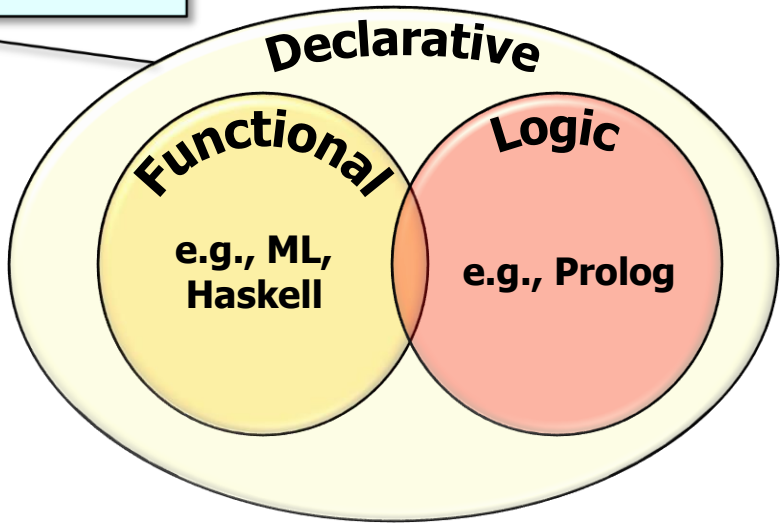
See en.wikipedia.org/wiki/Declarative_programming

Overview of Programming Paradigms in Java 8

- Conversely, functional programming is a "declarative" paradigm.
  - e.g., a program expresses computational logic *without* describing control flow or explicit algorithmic steps.

Declarative programming focuses largely on "what" computations to perform, not "how" to compute them.





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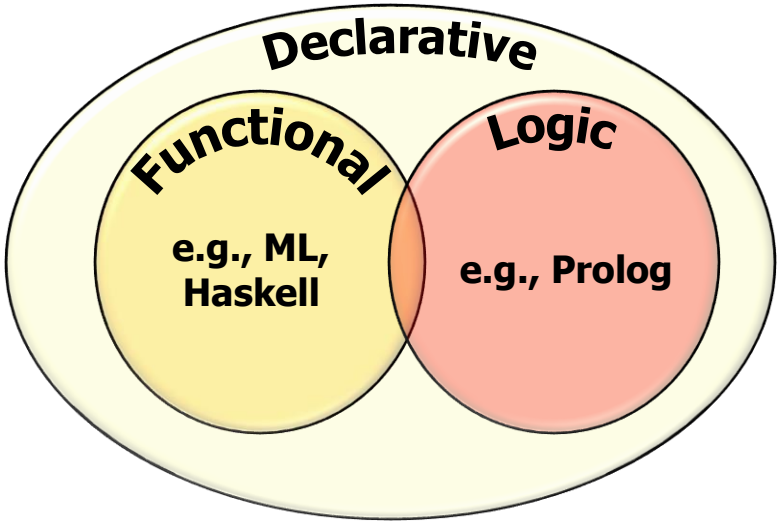
```
List<String> zap(List<String> lines,
                 String omit) {
  return lines
    .stream()
    .filter(not(omit::equals))
    .collect(toList());
}
```

Declaratively remove a given string from a list of strings.



See github.com/douglascraigschmidt/LiveLessons/tree/master/Java8/ex0

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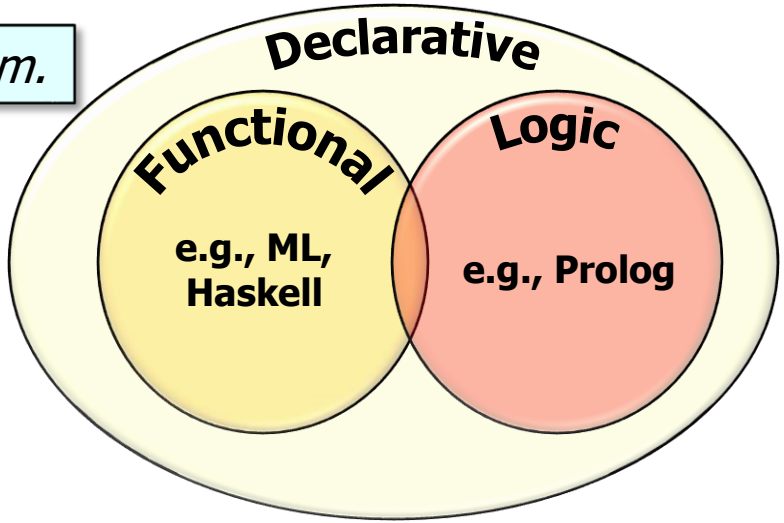
```

Convert list into a stream.



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    .stream()
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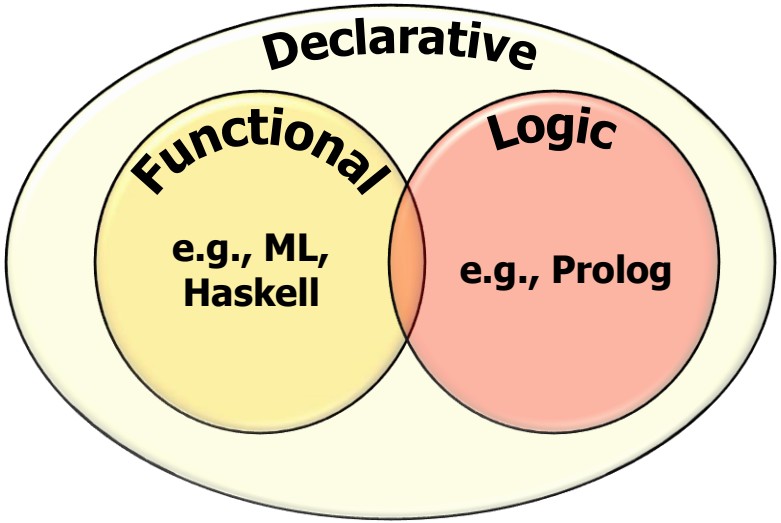
}
```

Remove any line in the stream that matches the `omit` *param.*



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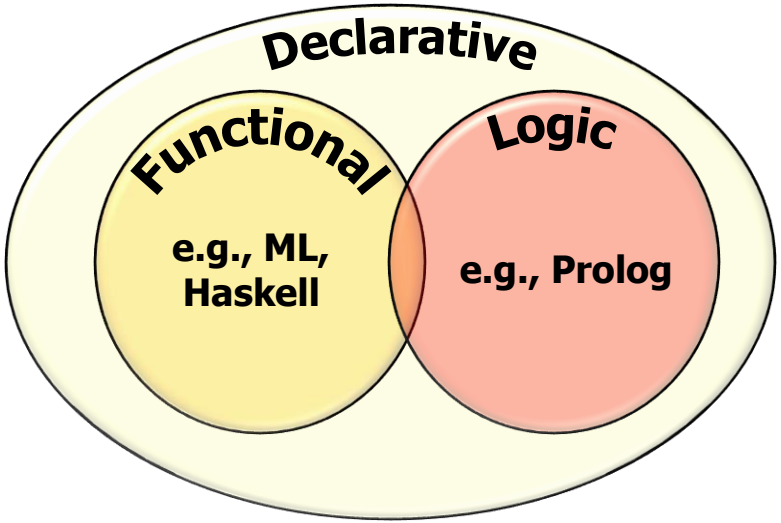
```

Collect all nonmatching lines into a list & return it to the caller.



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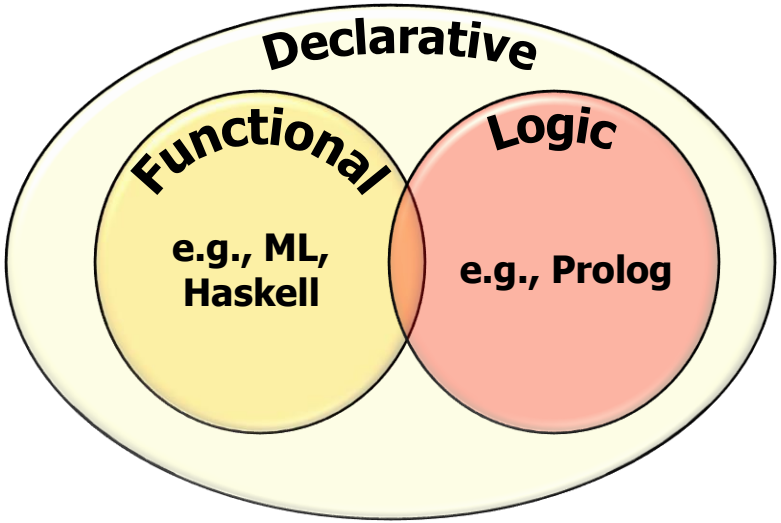
Note the "fluent" programming style with cascading method calls.



See en.wikipedia.org/wiki/Fluent_interface

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```
List<String> zap(List<String> lines,
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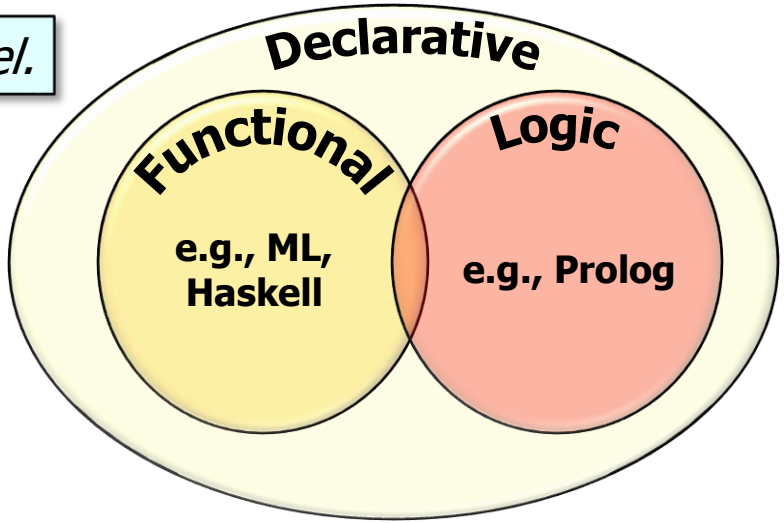
  return lines
    .parallelStream()
    .filter(not(omit::equals))
    .collect(toList());
}
```

Filter in parallel.



See docs.oracle.com/javase/tutorial/collections/streams/parallelism.html

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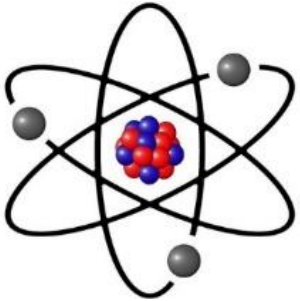

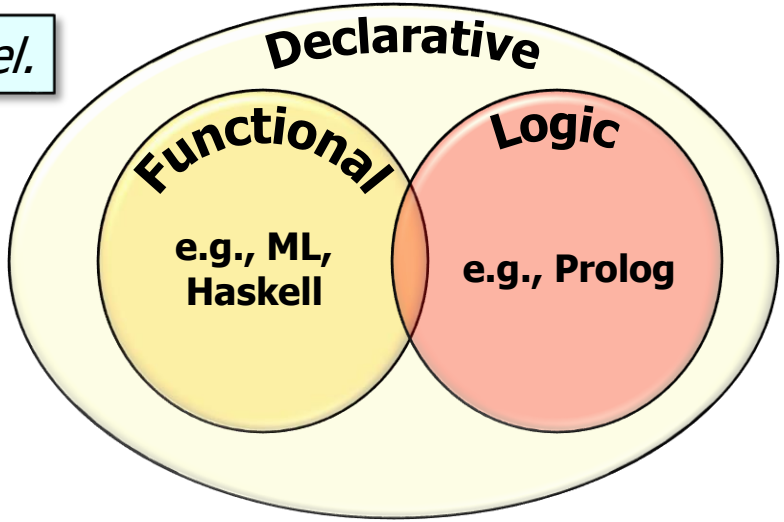

Code was parallelized with minuscule changes since it's declarative & stateless!