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Chapter 30 Check Point Questions

Section 30.1

▼30.1.1

What are the benefits of using aggregate operations on collection streams for processing data?

Using aggregate operations on collection streams simplifies coding and improves performance.

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Section 30.2

▼30.2.1

Show the output of the following code?

```
Character[] chars = {'D', 'B', 'A', 'C'};
System.out.println(Stream.of(chars).sorted().findFirst().get());
System.out.println(Stream.of(chars).sorted(
  java.util.Comparator.reverseOrder()).findFirst().get());
System.out.println(Stream.of(chars)
  .limit(2).sorted().findFirst().get());
System.out.println(Stream.of(chars).distinct()
  .skip(2).filter(e -> e > 'A').findFirst().get());
System.out.println(Stream.of(chars)
  .max(Character::compareTo).get());
System.out.println(Stream.of(chars)
  .max(java.util.Comparator.reverseOrder()).get());
System.out.println(Stream.of(chars)
  .filter(e -> e > 'A').findFirst().get());
System.out.println(Stream.of(chars)
  .allMatch(e -> e >= 'A'));
System.out.println(Stream.of(chars)
  .anyMatch(e -> e > 'F'));
System.out.println(Stream.of(chars)
  .noneMatch(e -> e > 'F'));
Stream.of(chars).map(e -> e + "").map(e -> e.toLowerCase())
  .forEach(System.out::println);

Object[] temp = Stream.of(chars).map(e -> e + "Y")
  .map(e -> e.toLowerCase()).sorted().toArray();
System.out.println(java.util.Arrays.toString(temp));
```

```
A
D
B
C
```

```
D
A
D
true
false
true
d
b
a
c
[ay, by, cy, dy]
```

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▼30.2.2

What is wrong in the following code?

```
Character[] chars = {'D', 'B', 'A', 'C'};
Stream<Character> stream = Stream.of(chars).sorted();
System.out.println(stream.findFirst());
System.out.println(stream.skip(2).findFirst());
```

A stream can only have one terminal operation. Once you apply stream.findFirst() . the stream is destroyed.

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▼30.2.3

Rewrite (a) using a method reference and an anonymous inner class and (b) using lambda expression and an anonymous inner class.

```
(a) sorted((s1, s2) -> s1.compareToIgnoreCase(s2))
(b) forEach(System.out::println)
```

```
(a)
Use a method reference:
  sorted(String::compareToIgnoreCase);
Use an anonymous inner class:
sorted(new Comparator<String>() {
  @Override
  public int compare(String s1, String s2) {
    return s1.compareToIgnoreCase(s2);
  }
});

(b)
Use a lambda expression:
  forEach(e -> System.out.println())

Use an anonymous inner class:
forEach(
   new java.util.function.Consumer<String>() {
     public void accept(String e) {
       System.out.println();
     }
```

```
    }
  )
```

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▼30.2.4

Given a map of the type Map<String, Double>, write an expression that returns the sum of all the values in map. For example, if the map contains {"john", 1.5} and {"Peter", 1.1}, the sum is 2.6.

```
map.entrySet().stream().mapToDouble(e -> e.getValue()).sum()
```

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Section 30.3

▼30.3.1

Show the output of the following code?

```
int[] numbers = {1, 4, 2, 3, 1};
System.out.println(IntStream.of(numbers)
  .sorted().findFirst().getAsInt());
System.out.println(IntStream.of(numbers)
  .limit(2).sorted().findFirst().getAsInt());
System.out.println(IntStream.of(numbers).distinct()
  .skip(1).filter(e -> e > 2).sum());
System.out.println(IntStream.of(numbers).distinct()
  .skip(1).filter(e -> e > 2).average().getAsDouble());
System.out.println(IntStream.of(numbers).max().getAsInt());
System.out.println(IntStream.of(numbers).max().getAsInt());
System.out.println(IntStream.of(numbers)
  .filter(e -> e > 1).findFirst().getAsInt());
System.out.println(IntStream.of(numbers)
  .allMatch(e -> e >= 1));
System.out.println(IntStream.of(numbers)
  .anyMatch(e -> e > 4));
System.out.println(IntStream.of(numbers).noneMatch(e -> e > 4));
IntStream.of(numbers).mapToObj(e -> (char)(e + 50))
  .forEach(System.out::println);

Object[] temp = IntStream.of(numbers)
  .mapToObj(e -> (char)(e + 'A')).toArray();
System.out.println(java.util.Arrays.toString(temp));
```

```
1
1
7
3.5
4
4
4
true
false
true
3
6
```

```
4
5
3
[B, E, C, D, B]
```

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▼30.3.2

What is wrong in the following code?

```
int[] numbers = {1, 4, 2, 3, 1};
DoubleSummaryStatistics stats =
  DoubleStream.of(numbers).summaryStatistics();
System.out.printf("The summary of the stream is\n%-10s%10d\n" +
  "%-10s%10.2f\n%-10s%10.2f\n%-10s%10.2f\n%-10s%10.2f\n",
  "  Count:", stats.getCount(), "  Max:", stats.getMax(),
  "  Min:", stats.getMin(), "  Sum:", stats.getSum(),
  "  Average:", stats.getAverage());
```

numbers is an int array, you have to use IntStream.of(numbers) rather than DoubleStream.of(numbers).

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▼30.3.3

Rewrite the following code that maps an int to a Character using an anonymous inner class?

```
mapToObj(e -> (char)(e + 50))
```

```
mapToObj(
  new java.util.function.IntFunction<Character>() {
    public Character apply(int e) {
      return (char)(e + 50);
    }
  }
)
```

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▼30.3.4

Show the output of the following code.

```
int[][] m = {{1, 2}, {3, 4}, {5, 6}};
System.out.println(Stream.of(m)
  .mapToInt(e -> IntStream.of(e).sum()).sum());
```

21

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▼30.3.5

Given an array names in Listing 30.1, write the code to display the total number of characters in names.

```
System.out.println("The number of characters in array names is " +
    Stream.of(names).mapToInt(e -> e.length()).sum());
```

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Section 30.4

▼30.4.1

What is a stateless method? What is a stateful method?

A stateless method can apply to the elements in the stream independent from the others. A stateful method must consider all the elements in order to produce a result.

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▼30.4.2

How do you create a parallel stream?

You can create a parallel stream by invoking the parallel() method on a stream or invoking the parallelStream() method from a collection object such as a list or a set.

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▼30.4.3

Suppose names is a set of strings, which of the following two streams is better?

```
Object[] s = set.parallelStream().filter(e -> e.length() > 3)
  .sorted().toArray();

Object[] s = set.parallelStream().sorted()
  .filter(e -> e.length() > 3).toArray();
```

The former is better than the latter because the stream size is smaller after applying the filter method. This will make the sorted() method to run faster.

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▼30.4.4

What will be the output of the following code?

```
int[] values = {3, 4, 1, 5, 20, 1, 3, 3, 4, 6};
System.out.print("The values are ");
  IntStream.of(values)
    .forEach(e -> System.out.print(e + " "));
```

The values are 3 4 1 5 20 1 3 3 4 6

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▼30.4.5

What will be the output of the following code?

```
int[] values = {3, 4, 1, 5, 20, 1, 3, 3, 4, 6};
System.out.print("The values are ");
  IntStream.of(values).parallel()
    .forEach(e -> System.out.print(e + " "));
```

The output is unpredictable due to using a parallel stream with forEach method.

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▼30.4.6

Write a statement to obtain an array of 1000 random double values between 0.0 and 1.0, excluding 1.0.

```
Random r = new Random();
double[] numbers = r.doubles(1000, 0.0, 1.0).toArray();
```

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Section 30.5

▼30.5.1

Show the output of the following code.

```
int[] values = {1, 2, 3, 4};
System.out.println(IntStream.of(values)
  .reduce(0, (e1, e2) -> e1 + e2));
System.out.println(IntStream.of(values)
  .reduce(1, (e1, e2) -> e1 * e2));
System.out.println(IntStream.of(values).map(e -> e * e)
  .reduce(0, (e1, e2) -> e1 + e2));
System.out.println(IntStream.of(values).mapToObj(e -> "" + e)
  .reduce((e1, e2) -> e1  + " " + e2).get());
System.out.println(IntStream.of(values).mapToObj(e -> "" + e)
  .reduce((e1, e2) -> e1  + ", " + e2).get());
```

```
10
24
30
1 2 3 4
1, 2, 3, 4
```

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▼30.5.2

Show the output of the following code.

```
int[][] m = {{1, 2}, {3, 4}, {5, 6}};
System.out.println(Stream.of(m)
  .map(e -> IntStream.of(e).reduce(1, (e1, e2) -> e1 * e2))
  .reduce(1, (e1, e2) -> e1 * e2));
```

```
720
```

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▼30.5.3

Show the output of the following code.

```
int[][] m = {{1, 2}, {3, 4}, {5, 6}, {1, 3}};
Stream.of(m).map(e -> IntStream.of(e))
```

```
  .reduce((e1, e2) -> IntStream.concat(e1, e2))
  .get().distinct()
  .forEach(e -> System.out.print(e + " "));
```

1 2 3 4 5 6

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▼30.5.4

Show the output of the following code.

```
int[][] m = {{1, 2}, {3, 4}, {5, 6}, {1, 3}};
System.out.println(
  Stream.of(m).map(e -> IntStream.of(e))
    .reduce((e1, e2) -> IntStream.concat(e1, e2))
    .get().distinct().mapToObj(e -> e + "")
    .reduce((e1, e2) -> e1 + ", " + e2).get());
```

1, 2, 3, 4, 5, 6, 1, 3

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Section 30.6

▼30.6.1

Show the output of the following code.

```
int[] values = {1, 2, 3, 4, 1};
List<Integer> list = IntStream.of(values).mapToObj(e -> e)
  .collect(Collectors.toList());
System.out.println(list);

Set<Integer> set = IntStream.of(values).mapToObj(e -> e)
  .collect(Collectors.toSet());
System.out.println(set);

Map<Integer, Integer> map = IntStream.of(values).distinct()
  .mapToObj(e -> e)
  .collect(Collectors.toMap(e -> e, e -> e.hashCode()));
System.out.println(map);

System.out.println(
  IntStream.of(values).mapToObj(e -> e)
    .collect(Collectors.summingInt(e -> e)));

System.out.println(
  IntStream.of(values).mapToObj(e -> e)
    .collect(Collectors.averagingDouble(e -> e)));
```

```
[1, 2, 3, 4, 1]
[1, 2, 3, 4]
{1=1, 2=2, 3=3, 4=4}
11
2.2
```

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Section 30.7

▼30.7.1

Show the output of the following code.

```
int[] values = {1, 2, 2, 3, 4, 2, 1};
IntStream.of(values).mapToObj(e -> e).collect(
  Collectors.groupingBy(e -> e, TreeMap::new,
    Collectors.counting())).
  forEach((k, v) -> System.out.println(k + " occurs " + v
      + (v > 1 ? " times " : " time ")));

IntStream.of(values).mapToObj(e -> e).collect(
  Collectors.groupingBy(e -> e, TreeMap::new,
    Collectors.summingInt(e -> e))).
  forEach((k, v) -> System.out.println(k + ": " + v));

MyStudent[] students = {
  new MyStudent("John", "Johnson", "CS", 23, 89.2),
  new MyStudent("Susan", "Johnson", "Math", 21, 89.1),
  new MyStudent("John", "Peterson", "CS", 21, 92.3),
  new MyStudent("Kim", "Yao", "Math", 22, 87.3),
  new MyStudent("Jeff", "Johnson", "CS", 23, 78.5)};

Stream.of(students)
  .sorted(Comparator.comparing(MyStudent::getLastName)
    .thenComparing(MyStudent::getFirstName))
  .forEach(e -> System.out.println(e.getLastName() + ", " +
                e.getFirstName()));

Stream.of(students).collect(Collectors.
  groupingBy(MyStudent::getAge, TreeMap::new,
    Collectors.averagingDouble(MyStudent::getScore))).
  forEach((k, v) -> System.out.printf("%10s%10.2f\n", k, v));
```

```
1 occurs 2 times
2 occurs 3 times
3 occurs 1 time
4 occurs 1 time
1: 2
2: 6
3: 3
4: 4
Johnson, Jeff
Johnson, John
Johnson, Susan
Peterson, John
Yao, Kim
        21     90.70
        22     87.30
        23     83.85
```

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Section 30.8

▼30.8.1
Can the following code be used to replace line 19 in Listing 30.7?

```
DoubleStream.of(numbers).filter(e -> e >
  DoubleStream.of(numbers).average()).count());
```

No. You have to use:

```
DoubleStream.of(numbers).filter(e -> e >
  DoubleStream.of(numbers).average().getAsDouble()).count());
```

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▼30.8.2
Can the following code be used to replace lines 15-16 in Listing 30.8?

```
Stream.of(chars).forEach(e -> {
  int count = 0;
  System.out.print(e + (++count % 20 == 0 ? "\n" : " ")); });
```

No. count will always be 0.

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▼30.8.3
Show the output of the following code?

```
String s = "ABC";
Stream.of(s.toCharArray()).forEach(ch ->
  System.out.println(ch));
```

ABC

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▼30.8.4
Show the output of the following code? (The toCharacterArray method is presented in Listing 30.9)

```
String s = "ABC";
Stream.of(toCharacterArray(s.toCharArray())).forEach(ch ->
  System.out.println(ch));
```

```
A
B
C
```

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▼30.8.5
Write the code to obtain a one-dimensional array list of strings from a two-dimensional array matrix of strings.

```
String[] list = Stream.of(m).map(e -> Stream.of(e)).
  reduce((e1, e2) -> Stream.concat(e1, e2)).get().toArray();
```

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