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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.

Hide Answer

### 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]

```

Hide Answer

### ▼ 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.

Hide Answer

### ▼ 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();
        }
    }
)

```

```
}
)
```

Hide Answer

## ▼ 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()
```

Hide Answer

## 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]

```

Hide Answer

### ▼ 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)`.

Hide Answer

### ▼ 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);
        }
    }
)

```

Hide Answer

### ▼ 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());

```

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Hide Answer

### ▼ 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());
```

Hide Answer

## 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.

Hide Answer

### ▼ 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.

Hide Answer

### ▼ 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.

Hide Answer

### ▼ 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

Hide Answer

### ▼ 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.

Hide Answer

### ▼ 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();
```

Hide Answer

## 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
```

Hide Answer

### ▼ 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
```

Hide Answer

### ▼ 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

Hide Answer

### ▼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

Hide Answer

## 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
```

Hide Answer

## 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

Hide Answer

## 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());
```

Hide Answer

### ▼ 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.

Hide Answer

### ▼ 30.8.3

Show the output of the following code?

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

ABC

Hide Answer

### ▼ 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

Hide Answer

▼ **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();
```

Hide Answer