HowToDoInJava

Sorting Streams in Java

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苗 Last Updated: March 4, 2022 🛛 By: Lokesh Gupta 🗈 Java 8 🗣 Java Sorting, Java Stream Basics
```

Learn to **sort streams** of numbers, strings and custom types in ascending (**natural order**) and descending orders (**reverse order**) in Java.

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1. Basics of Sorting the Streams

The *Stream* interface provides the *sorted()* method that returns a stream consisting of the elements of a given stream, sorted according to the natural order. It is an <u>overloaded method</u>:

- Stream sorted(): sorted according to natural order.
- Stream sorted(comparator): sorted according to the provided Comparator.

Note that both methods are intermediate operations so we still need to call a terminal operation to trigger the sorting.

Pseudo Code

```
List<Person> sortedList = unsortedStream.sorted(Person::firstName)
    .collect(Collectors.toList());
```

2. Sorting Custom Types

For demonstration purposes, we are using the custom class **Person**. This class has only three fields: id, first name and last name.

By default, two persons are considered equal if their id is equal.

Default sorting is by id field

```
import java.util.Objects;

public class Person implements Comparable<Person> {
    private Integer id;
    private String fname;
    private String lname;

    //Constructor, Setters and Getters are hidden for brevity

    @Override
    public int compareTo(Person p) {
        return this.getId().compareTo(p.getId());
    }
}
```

2.1. Default Sorting

By default, the sorted() method uses the Comparable.compareTo() method implemented by the Person class.

As *Person* class compares the instances using the value of *id* field, so when we sort the stream of *Person* instances – we get the instances **sorted by** *id*. The default sorting is in the **natural order**.

Natural Sorting

Person [id=2, fname=Lokesh, lname=Gupta]
Person [id=3, fname=Brian, lname=Clooney]

```
Person [id=4, fname=Brian, lname=Clooney]
Person [id=5, fname=Lokesh, lname=Gupta]
```

The same is true for reverse sorting as well. we can sort the *Person* instances in **reverse order** by passing the reverse comparator obtained from *Comparator.reverseOrder()* method into the *sorted()* method.

Reverse Ordering

Person [id=1, fname=Lokesh, lname=Gupta]

2.2. Custom Sorting

What if we want to **sort the** *Person* **instances by their first name**. The default sort does not support it, so we need to create our custom comparator.

FirstNameSorter.java

```
import java.util.Comparator;
import com.howtodoinjava.core.streams.Person;

public class FirstNameSorter implements Comparator<Person>{

    @Override
    public int compare(Person p1, Person p2) {
        if(p1.getFname() == null || p2.getFname() == null) {
            throw new IllegalArgumentException("Unnamed Person found in the system");
        }
        return p1.getFname().compareToIgnoreCase(p2.getFname());
    }
}
```

Now pass the *FirstNameSorter* instance to the *sorted()* method. This time, sorting will use the *compare()* method written in *FirstNameSorter*.

Sorting with first name

```
List<Person> sortedList = personStream.sorted(new FirstNameSorter())
    .collect(Collectors.toList());
sortedList.forEach(System.out::println);
```

Output

```
Person [id=6, fname=Alex, lname=Kolen]
Person [id=4, fname=Brian, lname=Clooney]
Person [id=3, fname=Brian, lname=Clooney]
Person [id=1, fname=Lokesh, lname=Gupta]
Person [id=5, fname=Lokesh, lname=Gupta]
Person [id=2, fname=Lokesh, lname=Gupta]
```

Similarly, to **sort the instances by the first name in reverse order**, we can reverse any comparator using its *reverse()* method.

Reverse Sorting by First Name

2.3. Class cannot be cast to class java.lang.Comparable

Please note that if our custom class *Person* does not implement the Comparable interface then we will get the ClassCastException in runtime while doing the natural sorting.

```
Exception in thread "main" java.lang.ClassCastException: class com.howtodoinjava.core.streams cannot be cast to class java.lang.Comparable (com.howtodoinjava.core.streams.sort.Person is module of loader 'app'; java.lang.Comparable is in module java.base of loader 'bootstrap') at java.base/java.util.Comparators $NaturalOrderComparator.compare(Comparators.java:47) at java.base/java.util.TimSort. countRunAndMakeAscending(TimSort.java:355) at java.base/java.util.TimSort. sort(TimSort.java:220) at java.base/java.util.Arrays. sort(Arrays.java:1307)
```

3. Sorting Stream of Numbers

3.1. Ascending Order

Java programs to sort a stream of numbers using Stream.sorted() method.

Ascending sort example

Program output.

Output

1

2

3

5

3.2. Descending Order

To sort in reverse order, use Comparator.reverseOrder() in sorted() method.

Descending sort example

4. Sorting Stream of Strings

Java programs to sort a stream of strings using Stream.sorted() method in ascending and descending order.

Sort stream of strings

Program output.

Output

ABCDE

E D C B A

Happy Learning!!

Sourcecode on Github

Was this post helpful? Let us know if you liked the post. That's the only way we can improve. Yes No

Recommended Reading:

- 1. Boxed Streams in Java
- 2. Using 'if-else' Conditions with Java Streams
- 3. Creating Infinite Streams in Java
- 4. Applying Multiple Conditions on Java Streams
- 5. Finding Max and Min from List using Streams
- 6. Sorting a Stream by Multiple Fields in Java
- 7. Java Streams API
- 8. Creating Streams in Java
- 9. Primitive Type Streams in Java
- O. Java Sorting Array of Strings in Alphabetical Order



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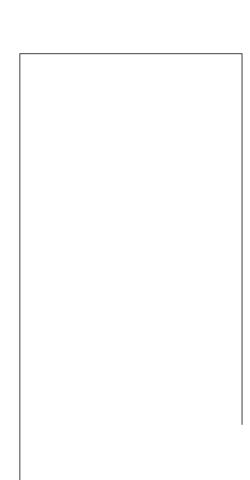
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