Learning objective: manipulate Java Streams (sequential data-processing operations and basic collectors).

We assume that a class `Dish` is defined with the methods: `getType`, `isVegetarian`, `getCalories` and `getName`. All dishes are stored into `menu`, which is a list.

**Exercise 1: external vs. internal iteration**
Which stream operation would you use to refactor the following code?

```java
List<Dish> vegetarianDishes = new ArrayList<>();
for (Dish d: menu) {
    if (d.isVegetarian())
        vegetarianDishes.add(d);
}
```

What would be the resulting code?

**Exercise 2: external vs. internal iteration**
Which stream operation would you use to refactor the following code?

```java
List<String> highCaloricDishes = new ArrayList<>();
Iterator<String> iterator = menu.iterator();
while (iterator.hasNext()) {
    Dish dish = iterator.next();
    if (dish.getCalories() > 300)
        highCaloricDishes.add(d.getName());
}
```

What would be the resulting code?

**Exercise 3: mapping**
Given a list of numbers, how would you return a list of the square of each number? For example, given [1, 2, 3, 4, 5] you should return [1, 4, 9, 16, 25].

**Exercise 4: filtering/slicing**
Given a list of `Dish` with method `getType`, write the stream that puts in a list the first two meat dishes?

**Exercise 5: nested streams**
Write a stream that puts in a list only the integers from a first list that are contained in second one (like `List::retainAll`). For example, given the lists [1, 2, 3] and [1, 2, 4], the resulting list is [1, 2]. The solution must exhibit a nested stream.

**Exercise 6: flatMap**
Given a list of lists of numbers, how would you return a single flattened list of all nested numbers? For example, given a list [[1, 2, 3], [2, 3, 4], [3, 4, 5]], you should return [1, 2, 3, 2, 3, 4, 3, 4, 5].

**Exercise 7: flatMap**
Given a list of strings, how would you return a list of all distinct sorted capitalized characters? For example, given two strings 'dcb' and 'abc', you should return ['A', 'B', 'C', 'D'].

1
Exercise 8: flatMap

Given two lists of numbers, how would you return all pairs of numbers? For example, given a list [1, 2, 3] and a list [3, 4] you should return [[1, 3], [1, 4], [2, 3], [2, 4], [3, 3], [3, 4]]. For simplicity, you can represent a pair as an array with two elements.

How would you extend the previous example to return only pairs whose sum is divisible by 3?

Exercise 9: reducing

How would you count the number of dishes in a stream using the `map` and `reduce` methods (i.e. without `count`)?

Exercise 10: peek

`list` is a `List<Integer>` containing all integers from 2 to 4.

What is the output when executing this stream?

```java
list.stream()
    .peek(System.out::println)
    .filter(i -> i % 2 == 0)
    .peek(System.out::println)
    .map(i -> -i)
    .peek(System.out::println)
    .sorted()
    .toList();
```

Exercise 11: intermediate vs. terminal operations

In the stream pipeline that follows, identify the intermediate and terminal operations?

```java
long count = menu.stream()
    .filter(dish -> dish.getCalories() > 300)
    .distinct()
    .limit(3)
    .count();
```

Exercise 12: equivalence

Is it possible to rewrite any instruction that uses `anyMatch` with either `noneMatch` or `allMatch`? When possible, propose how to rewrite these instructions given a predicate `pred()`.

Exercise 13: short-circuiting

Which of the following operations allows short-circuiting? `skip` - `findFirst` - `dropWhile` - `filter`

Exercise 14: intermediate vs. terminal operations

Which of the following operations is terminal? `dropWhile` - `map` - `skip` - `toList`