Programming Paradigms
Lab 5

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Exercises

1. With the use of constructor, create a list holding the following values: `apples, oranges, pears`.
2. Create a list of doubles `1.0, 1.0, 2.0, 3.0, 5.0`. Use constructor, explicitly specify type of the list.
3. Try to create the same list but of different type than before. Is it possible? If yes, why? If not, why?
4. Create the same list using `::` operator.
5. What happens if you use `:::` instead of `::`?
6. Show the usage of methods: `head`, `tail`, `last` and `init`. Try to chain some of them.
7. Create an empty list. Check if it is empty using `isEmpty`. What happens if you call `head` or `tail` on an empty list?
8. Using `List.range` generator, create a list of numbers from 10 to 20.
9. Split the list you have just created into two lists - first one containing first 3 elements, second one containing the rest. Use one method to achieve that. Prove that split is correct by checking the lengths of the lists.
10. Generate numbers from 10 to 20. Transform the list to start from 0. Give the resulting list a name.
11. Print out all elements of the list you have just created.

12. Generate a list of elements from 50 to 100. Filter elements to keep only those dividable by 5. Save the result.

13. Check if all elements of the list from the previous example are dividable by 10.

14. Generate a list of numbers. Split the list that one of the resulting list contains odd numbers and other one the rest.

15. Generate a list of numbers from 1 to 5. Convert them to doubles.

16. Using the previous list, show the difference between `reduceLeft` and `reduceRight`. To do so, define a simple function that can be used by `reduceLeft` and `reduceRight`. Inside that function, print the attributes that are passed inside to see what values they take.

17. Similarly as above, show differences between `foldLeft` and `foldRight`. Use initial value different than 0.

18. Using `foldLeft` or `foldRight` (and other methods), calculate the product of squares of all integers between 5 and 10. Check if the result is correct.

19. Given is the following data structure and list:

```
case class Book(title: String, authors: List[String])

val books: List[Book] = List(
    Book("Structure and Interpretation of Computer Programs",
        List("Abelson, Harold", "Sussman, Gerald J.")),
    Book("Principles of Compiler Design",
        List("Aho, Alfred", "Ullman, Jeffrey")),
    Book("Programming in Modula-2",
        List("Wirth, Niklaus")),
    Book("Introduction to Functional Programming",
        List("Bird, Richard")),
    Book("The Java Language Specification",
        List("Gosling, James", "Joy, Bill", "Steele, Guy", "Bracha, Gilad")))
```

    Write a code that returns books if the author is Niklaus Wirth or Richard Bird.

20. Using the same list, count how many books were written by only 1 author, 2 authors and more than 2 authors. You can achieve that in just one chain of methods. You might need to check Scala documentation for other higher order methods.

21. Given is a list:

    ```
    List(2,4,4,4,5,5,7,9)
    ```

    Write a code that calculates the standard deviation of the given list - you can follow `https://en.wikipedia.org/wiki/Standard_deviation#Basic_examples`.