CMPS 312 Mobile Application Development
Lab 3-Dart OOP and Lambdas

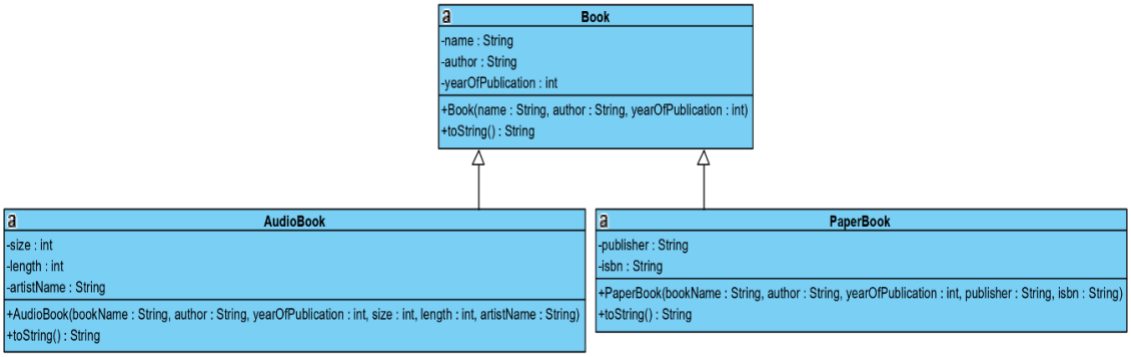
Objective

1. Practice Object Oriented Programming (OOP) using Dart
2. Read and parse JSON data
3. Practice processing collections using lambdas
4. Practice extension functions

PART A – OOP

Exercise 1

1. Create an project named **Books**
2. Create a package called **model**.
3. Implement the following class hierarchy inside the model package.



- The toString() of Book should return **Name, Author, Year of Publication**.
- The toString() of PaperBook should return **Name**, **Author, Year of Publication, Publisher, ISBN**.
- The toString() of AudioBook should return **Name**, **Author, Year of Publication, Size, Length, ArtistName** (e.g., ***Name: Ali Baba and the Forty Thieves, Author: Hanna Diyab***).

4. Create a main function to test your implementation.
5. In the main function create a List having 2 audio books and 2 paper books.
6. Display the details of each book using the list's built in forEach method.

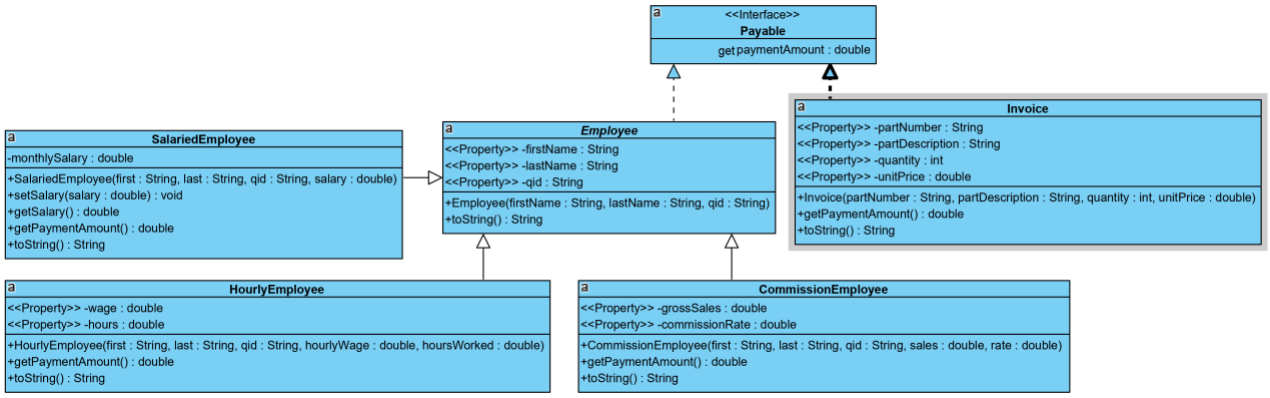
Sample Output

```
Book Name : Android
Author Name : Baaji
Year Of Publication : 1/2/2019
Publisher : Sanford
Isbn : 100-11-13


Book Name : How to get Rich
Author Name : Ali
Year Of Publication : 1/2/2019
Size : 100
Length : 25
Artist Name : Black Panter
```

Exercise 2

1. Create an project named **Payroll**
2. Create a package named **model**
3. Implement the following class hierarchy inside the **model** package



- Note that the amount to pay for HourlyEmployee is *wage * hours*. For CommissionEmployee, it is *grossSales * commissionRate*. For Invoice, it is *quantity * unitPrice*.
- Make sure the **salary**, **rate** and **sales** are all non-negative numbers otherwise display a warning message. [hint: for data validation using init or set methods]

Test your implementation using the main method

```
void main() {
  // create payable list
  List<Payable> payables = [];
  payables.add(Invoice("01234", "Textbook", 2, 375.00));
  payables.add(Invoice("56789", "USB Disk", 3, 179.95));
  payables.add(SalariedEmployee("Ahmed", "Ali", "111-11-1111", 15000.00));
  payables.add(HourlyEmployee("Fatima", "Saleh", "222-22-2222", 160.75, 40.0));
  payables
      .add(CommissionEmployee("Samir", "Sami", "333-33-3333", 100000.0, 0.06));

  print("Invoices and Employees processed polymorphically:\n");

  // generically process each element in the list using forEach
  payables.forEach((payable) {
    // output current Payable and its appropriate payment amount
    print("$payable\n");

    // If SalariedEmployee, then increase the salary by 10%
    if (payable is SalariedEmployee) {
```

```
    double oldBaseSalary = payable.monthlySalary;
    payable.monthlySalary = oldBaseSalary * 1.1;
    print(
        "New salary with 10% increase is: QR ${payable.getPaymentAmount()}\n");}
});
```

```
Invoices and Employees processed polymorphically:

Part Number      : 01234
Part Description : Textbook
Payment Amount   : 750.0

Part Number      : 56789
Part Description : USB Disk
Payment Amount   : 539.8499999999999


First Name :Ahmed
Last Name  :Ali
QID        :111-11-1111
            Payment Amount : 15000.0

New salary with 10%% increase is: QR 16500.0


First Name :Fatima
Last Name  :Saleh
QID        :222-22-2222
            Payment Amount : 6430.0


First Name :Samir
Last Name  :Sami
QID        :333-33-3333
            Payment Amount : 6000.0
```

PART B – Lambdas Warmup exercises

Create a lambda function that takes ,

a) a number as input and returns its square.
b) two numbers as input and returns their sum.
c) a list of numbers as input and returns the sum of all the numbers in the list.
d) a list of strings as input and returns the length of the longest string in the list.
e) a list of strings as input and returns a new list that contains only the strings that start with the letter "A".
f) Create a custom extension method for integer lists that enables users to directly calculate the sum

Dart JSON Serialization and Deserialization Exercises

1. Create an application named **CovidTracker**
2. Copy the **covid-data.json** from **Lab 3 folde**r into a subdirectory named **data** under the root directory of your project (create the **data** subfolder yourself)
3. The most common format used for serialization in Dart is JSON. Dart provides built-in support for JSON through the dart:convert library.
4. Create a class called **CovidStat** (in a Dart file named covid-stat.dart). Derive CovidStat properties from the JSON object shown below. Note that some of the statistics could be null for some countries.

```dart
class CovidStat {
  late final int totalCases;
  late final int totalDeaths;
  late final int newDeaths;
  late final int totalRecovered;
  late final int newRecovered;
  late final int activeCases;
  late final int population;

  CovidStat(
      {required totalCases,
      required this.totalDeaths,
      required this.newDeaths,
      required this.totalRecovered,
      required this.newRecovered,
      required this.activeCases,
      required this.population});
```

5. Create a factory method named "fromJson" inside the CovidStat class that converts **Map<String, dynamic>** json to Covid Stat Object

6. Add **CovidStatRepository** object (in a Dart file named covid-stat-repository).

The init function of this object should **load** the json data in **data/covid-data.json** file into covidStats list.

The CovidStatRepository should implement the following functions that return:

- The **total COVID deaths around the world.**
- The total **active cases** for a specific **continent**.
- The **top five countries** with the **highest number of COVID cases.**
- The **top five countries** with the **lowest number of COVID cases.**
- The total **critical cases** of the neighboring countries of a given country. For example, if the country is Qatar then you should return all countries having the same region as Qatar and their respective critical cases. Finally sort those countries by population.
- The top three regions in a **continent** with the highest recovery
- The country with the **lowest death** in a **continent**.

7. Add a Dart file named **main** to test the functions in CovidStatRepository object. Test as you implement the functions of CovidStatRepository object. Do NOT leave the testing to the end.