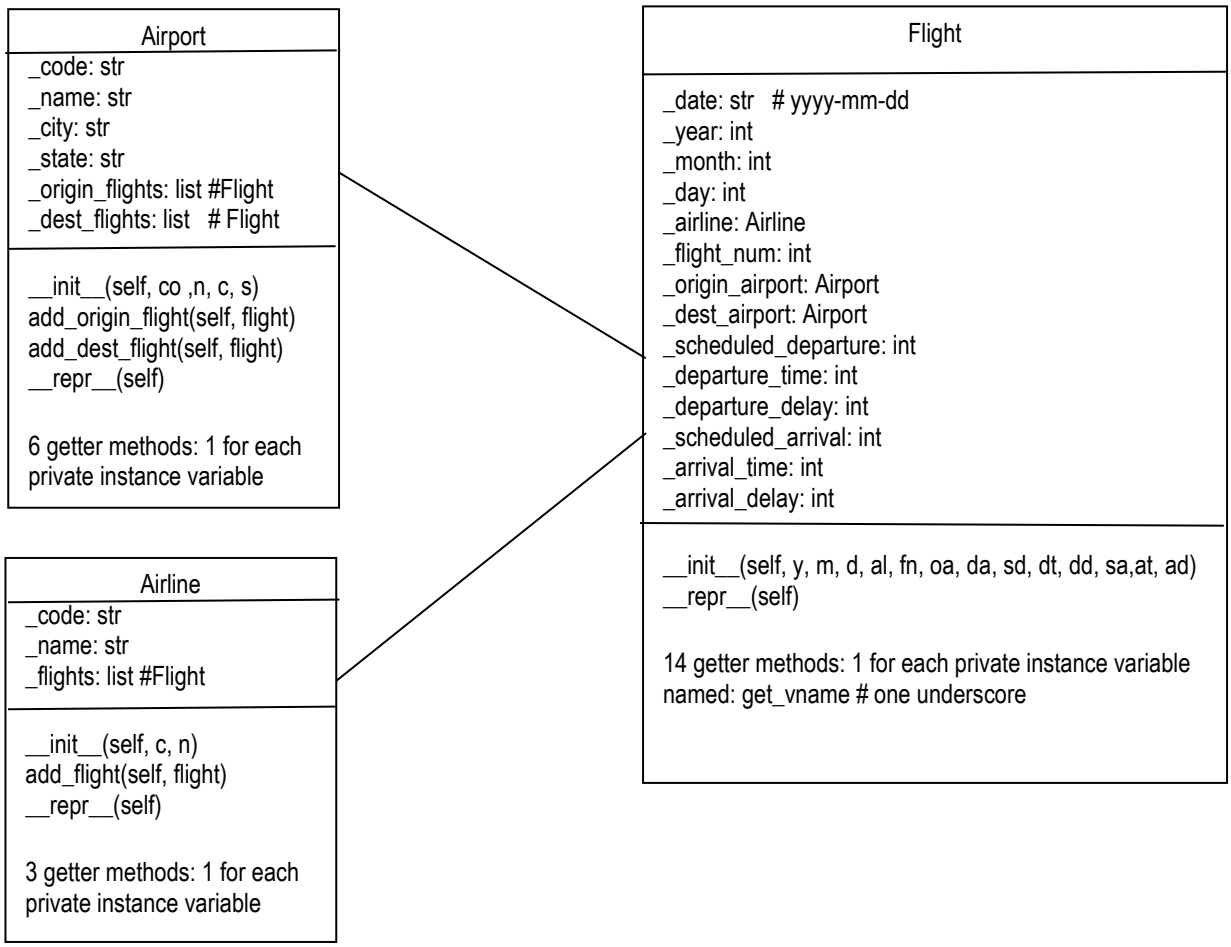
Python Programming Assignment
Due: Start of Class Friday, 5 March 2021

In this comprehensive programming assignment, you will combine the various components of the Python programming language that you learned this semester. The program processes data about airline flights provided in csv format, which is described later in this document. The program will process the CSV data by creating various objects and dictionaries, and then answering some questions about the data.

The assignment consists of 5 tests.

1. [**30**] This test is to determine whether your classes are created correctly. The Airport, Airline, and Flight classes must adhere to the requirements shown below. The test will create and print objects using __repr__ as well as calling the getter methods.



*Note: implement __repr__ to return a string representation of a tuple representing the values of the private instance variables.

- In the Airport class: include the number of origin_flights and the number of dest_flights – NOT the list of flights
  (code, name, city, state, number_origin_flights, number_dest_flights)
- In the Airline class: include the number of flights – NOT the list of flights
  (code, name, number_flights)
- In the Flight class, include the code for the airline and origin/destination airports
  (date, airline_code, flight_num, origin_airport_code, dest_airport_code,
  scheduled_departure, departure_time, departure_delay, scheduled_arrival, arrival_time, arrival_delay)

2. [**30**] This test will determine that you have created the following dictionaries correctly: (NOTE: You must process the csv only ONCE to create the dictionaries.)
    a. airline_dict[airline_code] = Airline object
    b. airport_dict[airport_code] = Airport object
    c. date_dict[yyyy-mm-dd] = list of Flight objects on that date ordered by scheduled departure time

    OUTPUT: This is the output of the following print commands –
    print(airline_dict)
    print(airport_dict)
    print(date_dict['2015-01-10'])

3. [**10**] Query 1: For each date in chronological order, which flight on that day had the longest ***arrival*** delay? Include duplicates, if any.

    OUTPUT:
    yyyy-mm-dd:
    flight tuple generated by __repr__
    …

4. [**10**] Query 2: For each airport, find the number of origin flights with departure delays more than 15 minutes and the number of destination flights with arrival delays more than 15 minutes.

    OUTPUT:
    airport tuple generated by __repr__
    origin delays: #
    destination delays: #

5. [**20**] Query 3: For each airline ***in alphabetical order***, determine the number of flights per day in chronological order from (origin, dest), ordered by (origin, dest), with percentage of on-time flights for that day which were within 15 minutes of their scheduled time.

    OUTPUT:
    airline name
    yyyy-mm-dd
    OOO DDD # #%
    …

You must structure the code as follows on repl.it using the template provided for the assignment.

Files:

- **main.py** – This contains the processing of the csv files to create the dictionaries. Note that there is code at the end of this file in the template that you cannot change. This file must NOT be structured as a class! Complete per the template.
- **airport.py** – This contains the class definition for airport that must satisfy the requirements in the UML diagram shown under test 1.
- **airline.py** – This contains the class definition for airline that must satisfy the requirements in the UML diagram shown under test 1.
- **flight.py** – This contains the class definition for flight that must satisfy the requirements in the UML diagram shown under test 1.
- **flights_info.csv** – Do NOT modify this file. This is the data file to use for the assignment.

Incremental Development Suggestions:
Work on the implementation of each test, saving a working version for each incorporated checkbox so that you can earn partial credit if you do not get ALL checkboxes implemented.

On the due date, you MUST do the following:

1. A signed PDF document that indicates the status of the implementation that you submitted for assessment along with a statement signed verifying that you followed the academic integrity policy. This document will be provided to you on the Canvas assignment description. Programs will not be assessed without this document that is ***completely*** filled out by indicating the test cases passed and signed by you that you followed the academic integrity policy.
2. You MUST submit the assignment on repl.it after running the test cases! This will indicate the number of tests passed, which will essentially determine your grade on the program.
3. A zip file downloaded from repl.it that contains all of the above files submitted in Canvas. NOTE: Canvas is the official record of your ASU work and essentially timestamps what you had working by the official deadline.

REMINDER: THIS IS AN INDIVIDUAL ASSIGNMENT!

Only programs that successfully execute will be considered for assessment.

Field Descriptions			
Key	**Type**	**Comment**	**Example Value**
Year	Integer	Year of flight trip.	2015
Month	Integer	Integer representation of month of flight trip.	1
Day	Integer	Day of the month of flight trip.	5
Airline	String	2 letter International Air Transport Association (IATA) code to identify airline operating flight.	"WN"
Airline Name	String	Name of airline operating flight.	"Southwest Airlines Co."
Flight Number	Integer	Numeric code used to identify flight. Ranges from 2 to 4 digits.	4657
Origin Airport	String	3 letter IATA code to identify the flight's starting airport.	"RNO"
Origin Name	String	Name of flight's origin airport.	"Reno/Tahoe International Airport"
Origin City	String	City of flight's origin airport.	"Reno"
Origin State	String	2 letter abbreviation of US state of flight's origin airport.	"NV"
Destination Airport	String	3 letter IATA code to identify flight's destination airport.	"LAS"
Destination Name	String	Name of flight's destination airport.	"McCarran International Airport"
Destination City	String	City of flight's destination airport.	"Las Vegas"
Destination State	String	2 letter abbreviation of US state of flight's destination airport.	"NV"
Schedule Departure	Integer	Integer representation of the UTC time of a flight's planned departure from origin airport. Times can fall in the range of 0 – 2359. First two digits are the hour and the second two numbers are the digits.	555
Departure Time	Integer	Integer representation of the UTC time of a flight's actual departure from origin airport.	550
Departure Delay	Integer	Number of minutes between flight's planned departure and actual departure. Negative value means flight departed ahead of schedule, 0 means flight departed on time, positive means the flight departed late.	-5
Scheduled Arrival	Integer	Integer representation of the UTC time of a flight's planned arrival at destination airport.	715
Arrival Time	Integer	Integer representation of the UTC time of a flight's actual arrival at destination airport.	707
Arrival Delay	Integer	Number of minutes between flight's planned arrival and actual arrival. Negative value means flight departed ahead of schedule, 0 means flight departed on time, positive means the flight departed late.	-8