**Python Competency Check #2: Airport Travel**

I have provided five .csv files containing information on customer demands across different regions, airports, and fare classes. Consider each “Zip2” as a location, meaning Zip2 of 29 is any place that has a Zip Code that starts with 29 (e.g., Clemson). Further, the following bullets describe the information contained in each file:

* **“PaxDemand”** sheet shows the average weekly demand of each “Zip2”.
* **“PaxDemandDist”** sheet shows the average weekly demand’s breakdown by destination airport and class. For example, the data corresponds to Origin Zip2 “1”, Destination Airport “ABE” and “First Class” indicates a percentage of 0.074%, which means the weekly demand from “1” to “ABE” using “First Class” accounts for 0.074% of total demand out of “1”.
* **“TicketPrices”** sheet shows the cost per ticket, given the Origin (i.e., Zip2), a Destination (i.e., an airport) and the class (i.e., First Class, Business Class, Main Cabin…).
* **“AirportRegions”** sheet shows the region of each airport.
* **“Zip2Regions”** sheet shows the region of each Zip2 location.

**Tasks:**

Create Python code to perform the following analyses:

1. (5 points) Determine the number of airports in each region.
2. (5 points) Which region contains the most Zip2 values?
3. (10 points) Generate a new .csv file report that shows the expected weekly passenger arrivals and expected weekly revenue for each airport.
4. (10 points) Generate a new .csv file report that shows the expected weekly passenger arrivals and expected weekly revenue for each region.
5. (20 points) Remove a randomly generated airport as a possible destination for flights from a user-entered Zip2 (e.g., we can no longer fly from Zip2 “17” to airport “ABE”). Renormalize the percentages associated with each of the remaining airports and fare classes accordingly. To be clear, PaxDemand is not impacted by this change, but rather only the distribution is to be adjusted.
6. (30 points) Assume you have learned that actual Passenger Demand follows a uniform distribution within +/-10% of the mean value of historical PaxDemand. Using the Uniform distribution, generate 100 instances of Passenger Demand using the given mean values in PaxDemand. Find the new mean value and standard deviation, then calculate the 95% confidence interval for Weekly Revenue based on this updated Passenger Demand and display that information in an appropriately formatted .csv output file.
7. (10 points) Using PaxDemandDist, group all locations by OrigZip2 and find the mean value per class. The following is an example of how the grouped data should be appear:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Orig Zip2** | **Number of Airports** | **First Class** | **Business Class** | **Main Cabin** | **Economy** |
| 1 | 17 | 0.16 | 2.89 | 2.54 | 0.29 |
| 2 | 17 | 0.20 | 2.87 | 2.53 | 0.28 |
| (…) | (…) | (…) | (…) | (…) | (…) |

1. (10 points) Create a .csv file containing a summary by quarter of the mean value per fare class contained in TicketPrices.