Practice 4

Deadline: 2 weeks from now. Should be checked onsite (during labs).

In this practice, you'll be using Java 8 Stream to perform simple data analysis. Specifically, we provide a `cities.txt` and an incomplete `Practice4.java` which reads `cities.txt`. You need to complete the four **TODOs** in `Practice4.java`, which:

1. Count how many cities there are for each state. The result is `Map<String, Long>`, where the key is the name of the state while the value is the number of cities in that state.
2. Count the total population for each state. The result is `Map<String, Integer>`, where the key is the name of the state while the value is the population of that state (i.e., sum of the population of each city in that state).
3. For each state, get the city of the longest name. The result is `Map<String, String>` or `Map<String, Optional<String>>`.
4. For each state, get the set of cities with >500,000 population. The result is `Map<String, Set<City>>`.

Note

- Check out `Collectors.groupingBy` and other available collectors in java.util.stream.Collectors.
- You may want to override the `toString` method for `City` to facilitate printing `City` objects.
- Your output doesn't have to have the exact same format as our sample output.

Sample Output

```
Q1: # of cities per state:
{DE=1, HI=1, TX=63, MA=22, MD=5, ME=1, IA=10, ID=5, MI=24, UT=12, I

Q2: population per state:
{DE=71292, HI=345610, TX=13748465, MA=2403297, MD=869891, ME=66214

Q3: longest city name per state:
DE:Wilmington,  HI:Honolulu,  TX:North Richland Hills,  MA:Springf

Q4: cities with >500,000 population for each state:
TX: [City{name='Fort Worth', state='TX', population=777992}, City{
MA: [City{name='Boston', state='MA', population=636479}]
MD: [City{name='Baltimore', state='MD', population=621342}]
MI: [City{name='Detroit', state='MI', population=701475}]
IL: [City{name='Chicago', state='IL', population=2714856}]
IN: [City{name='Indianapolis', state='IN', population=834852}]
NC: [City{name='Charlotte', state='NC', population=775202}]
AZ: [City{name='Tucson', state='AZ', population=524295}, City{name
NM: [City{name='Albuquerque', state='NM', population=555417}]
```

Evaluation

The practice will be checked by teachers or SAs. What will be tested:

1. That you understand every line of your own code, not just copy from somewhere
2. That your program compiles correctly (javac)
3. Correctness of the program logic
4. That the result is obtained in a reasonable time

Late submissions after the deadline will incur a 20% penalty, meaning that you can only get 80% of this practice's score.