LEC 08

CSE 122

Maps

Questions during Class?

Raise hand or send here

sli.do #cse122

BEFORE WE START

Slido vote & chat with your neighbors:

What one song would you add to our quarter's playlist below? 👇

Music: 122 26sp Lecture Jams 🎧

Instructor: Elba Garza

TAs:

David	Caleb	Cole	Yang
William	Neha	Blake R.	Cady
Dani	Wesley	Carson	Diya
Rohan	Isis	Sushma	
Andrew	Colin	Connor	
Ava	Naomi	Mahima	
Shreyank	Hanna	Nicolae	
Nicole	Blake P.	Ivory	

Lecture Outline (1/5)

- Announcements
- Map Review
- Debrief PCM: CountWords
- Practice: joinRosters
- Practice: mostFrequentStart

Announcements/Reminders

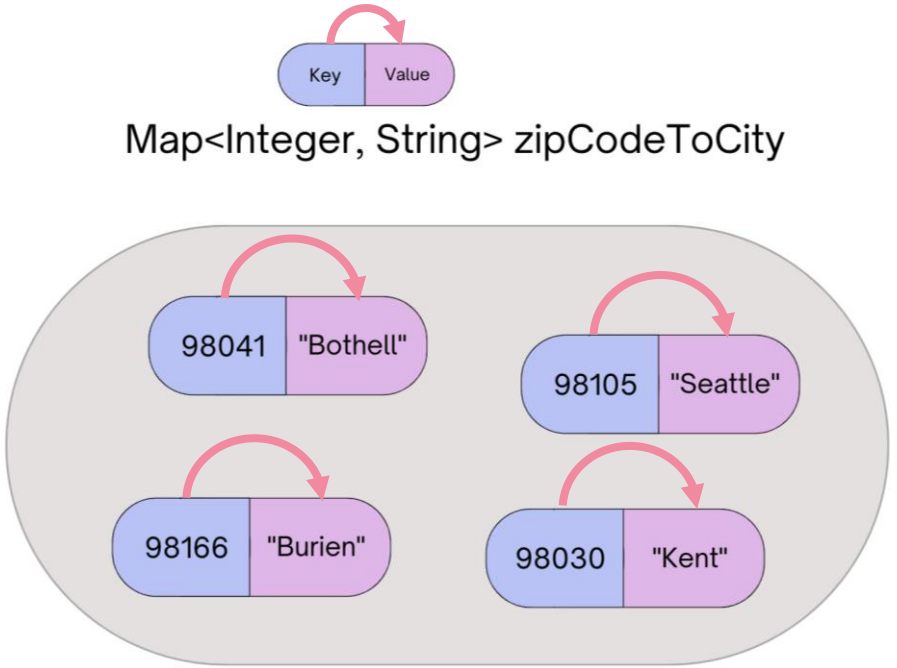
- Programming Assignment 1 (P1) due tomorrow by 11:59pm PT!
- Resubmission Cycle 2 (R2) form opens tomorrow
  - Due Tuesday, May 5th by 11:59pm PT
  - Eligible Assignments: **C0**, P0, C1
- Reminder: Quiz 1 is Thursday, May 7th
  - Quiz 0 results coming soon™!
- Programming Assignment 2 (P2) releasing Friday!
  - Due **Tuesday**, **May 12th** by 11:59pm PT

Lecture Outline (2/5)

- Announcements
- **Map Review**
- Debrief PCM: CountWords
- Practice: joinRosters
- Practice: mostFrequentStart

Map ADT

- Data structure to map keys to values
  - Keys can be any* type; Keys must be unique
  - Values can be any type
- Operations
  - `put(key, value)`: Associate key to value
    - 🚨 Overwrites duplicate keys 🚨
  - `get(key)`: Get value for key
  - `remove(key)`: Remove key/value pair



*Same as Python's `dict`

Programming with Maps in Java (1/2)

- Interface: `Map`
- Implementations: `TreeMap`, `HashMap`

```
// Making a Map
Map<String, String> favArtistToSong = new TreeMap<>();

// adding elements to the above Map
favArtistToSong.put("PinkPantheress", "Stateside");
favArtistToSong.put("Rosalía", "La Perla");
favArtistToSong.put("Taylor Swift", "Dress");
favArtistToSong.put("Taylor Swift", "State of Grace"); // Overwrite!

// Getting a value for a key
String song = favArtistToSong.get(”PinkPantheress");
System.out.println(song);
```

Programming with Maps in Java (2/2)

Methods	Description
`put(`**key**`, `**value**`)`	adds a mapping from the given key to the given value; if the key already exists, replaces its value with the given one
`get(`**key**`)`	returns the value mapped to the given key (`null` if not found)
`containsKey(`**key**`)`	returns `true` if the map contains a mapping for the given key
`remove(`**key**`)`	removes any existing mapping for the given key
`clear()`	removes **all** key/value pairs from the map
`size()`	returns the number of key/value pairs in the map
`isEmpty()`	returns `true` if the map's size is 0
`toString()`	returns a string such as `"{a=90, d=60, c=70}"`
`keySet()`	returns a set of all keys in the map
`values()`	returns a collection of all values in the map

Map Implementations

- Our first data structures with marked differences in how their implementations behave
- One `Map` ADT / Interface
- Two `Map` implementations
  - `TreeMap` – Pretty fast, and sorted keys
  - `HashMap` – Extremely fast, unsorted keys

```
Map<String, Integer> map1 = new TreeMap<>();
Map<String, Integer> map2 = new HashMap<>();
...
```

Practice : Think

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Select the method calls required to modify the given map m as follows:

Assume m's contents are

```
98030="Kent"
98178="Seattle"
98166="Burien"
98041="Bothell"
```

We want to modify m so that its contents are

```
98030="Kent"
98178="Tukwila"
98166="Burien"
98041="Bothell"
98101="Seattle"
98126="Seattle"
```

A. `m.put(98178, "Tukwila");`

B. `m.remove(98178);`

C. `m.put(98126, "Seattle");`

D. `m.get(98178, "Seattle");`

E. `m.put(98101, "Seattle");`

Practice : Pair

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Select the method calls required to modify the given map m as follows:

Assume m's contents are

```
98030="Kent"
98178="Seattle"
98166="Burien"
98041="Bothell"
```

We want to modify m so that its contents are

```
98030="Kent"
98178="Tukwila"
98166="Burien"
98041="Bothell"
98101="Seattle"
98126="Seattle"
```

A. `m.put(98178, "Tukwila");`

B. `m.remove(98178);`

C. `m.put(98126, "Seattle");`

D. `m.get(98178, "Seattle");`

E. `m.put(98101, "Seattle");`

Lecture Outline (3/5)

- Announcements
- Map Review
- **Debrief PCM: CountWords**
- Practice: joinRosters
- Practice: mostFrequentStart

Lecture Outline (4/5)

- Announcements
- Map Review
- Debrief PCM: CountWords
- **Practice: joinRosters**
- Practice: mostFrequentStart

joinRosters

Write a method `joinRosters` that combines a `Map` from student name to quiz section, and a `Map` from TA name to quiz section and prints all pairs of students/TAs.

For example, if `studentSections` stores the following map:

```
{Alan=AC, Jerry=AB, Yueying=AA, Sharon=AB, Steven=AB, Zewditu=BA}
```

And `taSections` stores the following map

```
{Blake=BA, Nicolae=AA, Sushma=AB, Dani=AC}
```

```
AC: Alan - Dani
AB: Jerry - Sushma
AB: Sharon - Sushma
AB: Steven - Sushma
AA: Yueying - Nicolae
BA: Zewditu - Blake
```

Lecture Outline (5/5)

- Announcements
- Map Review
- Debrief PCM: CountWords
- Practice: joinRosters
- **Practice: mostFrequentStart**

mostFrequentStart (1/2)

Write a method called `mostFrequentStart` that takes a `Set` of words and does the following steps:

- Organizes words into “word families” based on which letter they start with
- Selects the largest “word family” as defined as the family with the most words in it
- Returns the starting letter of the largest word family (and if time, should update the Set of words to only have words from the selected family).

mostFrequentStart (2/2)

For example, if the `Set` words stored the values

```
["hello", "goodbye", "library", "literary", "little", "repel"]
```

The word families produced would be

```
'h' -> 1 word ("hello")
'g' -> 1 word ("goodbye")
'l' -> 3 words ("library", "literary", "little")
'r' -> 1 word ("repel")
```

Since `'l'` has the largest word family, we return `'l'` and modify the `Set` to only contain `Strings` starting with `'l'`.