LEC 08

CSE 122

Maps

Questions during Class?

Raise hand or send here

sli.do #cse122

BEFORE WE START

Talk to your neighbors:

What is your least favorite root vegetable?

Music: Miya's 23wi CSE 122 Playlist

Instructors Tristan Huber & Hunter Schafer

TAs

Ambika, Andrew, Audrey, Autumn, Ayush, Ben, Colton, Di, Eesha, Elizabeth, Evelyn, Jacob, Jaylyn, Jin, Joe, Kevin, Leon, Megana, Melissa, Mia, Poojitha, Rishi, Rucha, Shivani, Shreya, Steven, Suhani, Yijia, Ziao

Lecture Outline

- Announcements
- Map Review
- Debrief PCM: Count Words
- Practice: joinRosters
- Practice: mostFrequentStart

Announcements

- Quiz 1 is Tuesday, Feb 7
- Retake and Resubmission forms for next week will be posted later today
- C1 due tomorrow (Thurs, Feb 2)
- P2 released Fri, Feb 3

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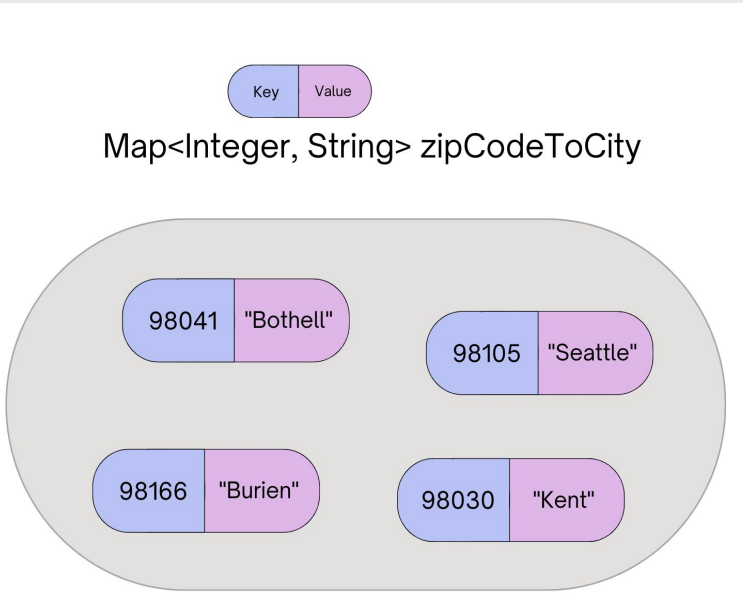
🎉 NEW DATA STRUCTURE DAY!! 🎉

(PCM) Map - What is it good for?

What is it?

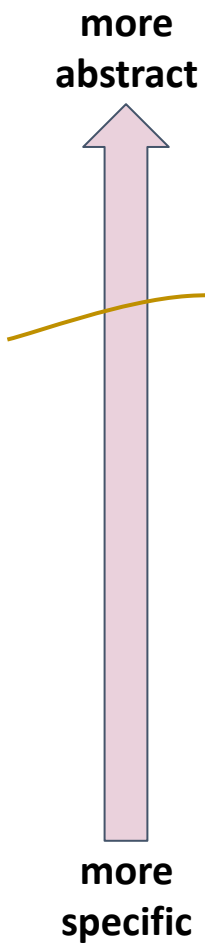
- Keeps associations between *unique* keys and (non-unique) values
- All *keys* are one type. All *values* are one type
  - But a *keys* might be a different type from *values*
- Dynamically sized



What is Map particularly good at?

- `put(key, value)` - associates key with a value
- `get(key)` - returns the value associated with a key (if any)
- put and get are either super fast (HashMap) or quite fast (TreeMap)

(PCM) Abstract Data Types



ADT

Examples: queue, stack, list, set, map (aka dictionary)

Language agnostic

Language specific

Interface

Examples: `Queue<>`, `List<>` `Set<>`, `Map<>`

Implementation

Examples: `ArrayList`, `LinkedList`, `array`, `Stack`, `2D array`, `HashSet`, `TreeSet`, `HashMap`, `TreeMap`

(PCM) Programming with Maps

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

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

// adding elements to the above Map
favArtistToSong.put("Steve Lacy", "Dark Red");
favArtistToSong.put("The Cranberries", "Linger");
favArtistToSong.put("Umi", "Bet");

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

(PCM) Programming with Maps

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
`keySet()`	returns a set of all keys in the map
`values()`	returns a collection of all values in the map
`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}"`

(PCM) Map Implementations

- One `Map` Interface
- Two `Map` implementations*
  - `TreeMap` – Pretty fast, sorted keys
  - `HashMap` – Extremely fast, unsorted keys

*similar to the TreeSet and HashSet implementations

```
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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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, Nina=AA, Sharon=AB, Steven=AB, Tanya=BA}
```

And `taSections` stores the following map

```
{Ben=BA, Melissa=AA, Andrew=AB, Atharva=AC}
```

```
AC: Alan – Atharva
AB: Jerry – Andrew
AA: Nina - Melissa
AB: Sharon – Andrew
AB: Steven – Andrew
BA: Tanya - Ben
```

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- **Practice: mostFrequentStart** 

mostFrequentStart

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

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 3 and modify the `Set` to only contain `Strings` starting with 'l'.