

LEC 09

CSE 122

Maps

BEFORE WE START

*Talk to your neighbors:**What is your favorite form of potato?*Music: [122 24wi Lecture Tunes](#) ❄️

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TAs

Ailsa	Chaafen	Helena	Megana	Sahej
Alexander	Chloe	Jessie	Mia	Shivani
Ambika	Claire	Katharine	Minh	Smriti
Andy	Colin	Kavya	Nicolas	Steven
Arkita	Colton	Ken	Poojitha	Vinay
Atharva	Connor	Kyle	Rohini	Zane
Autumn	Elizabeth	Logan	Ronald	
Ayush	Hannah	Marcus	Rucha	


Questions during Class?

Raise hand or send here

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Lecture Outline

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

Announcements

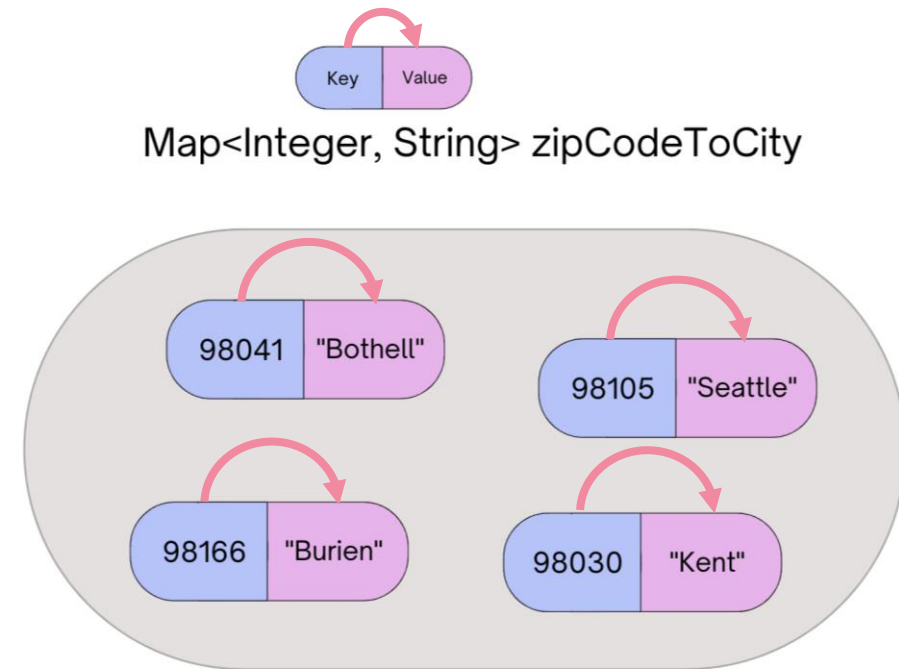
- Reminder; Quiz 1 is Tuesday, February 13
- Resubmission Cycle 2 (R2) form open now
 - Due Tuesday, February 6 by 11:59 PM
 - Eligible Assignments: **C0**, P0, C1
- Programming Assignment 2 (P2) released later today!
 - Due Thursday, **February 15** by 11:59pm

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Map ADT

- Data structure to map keys to values
 - Keys can be any* type; Keys must be unique
 - Values can be any type
- Example: Mapping nucleotides to counts in P0!
- 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

- Interface: Map
- Implementations: TreeMap, HashMap

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

// adding elements to the above Map
favArtistToSong.put("Iron Maiden", "Wasted Years");
favArtistToSong.put("Foxyes", "Body Talk");
favArtistToSong.put("Vampire Weekend", "Campus");

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

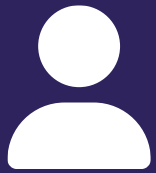
Programming with Maps in Java

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

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```

- A. `m.put(98178, "Tukwila");`
- B. `m.remove(98178);`
- C. `m.put(98126, "Seattle");`
- D. `m.get(98178, "Seattle");`
- E. `m.put(98101, "Seattle");`

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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, Yueying=AA, Sharon=AB, Steven=AB, Zewditu=BA}
```

And `taSections` stores the following map

```
{Ayush=BA, Marcus=AA, Rohini=AB, Colin=AC}
```

```
AC: Alan - Colin  
AB: Jerry - Rohini  
AB: Sharon - Rohini  
AB: Steven - Rohini  
AA: Yueying - Marcus  
BA: Zewditu - Ayush
```

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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'.