Project 3 uses

- Google Web API
  - allows programs to make Google queries
- GJ
- Design patterns

Google Web APIs

- Information and download at: [http://www.google.com/apis/](http://www.google.com/apis/)
- You will need a Google account to make Google queries
  - register at the above URL
  - we will provide a dummy implementation if you don’t want to do this
  - Only 1000 queries per day

GoogleSearchResultElement

- Selected methods:
  - public java.lang.String getURL();
  - public java.lang.String getTitle();
  - public java.lang.String getSnippet();
  - public java.lang.String getDirectoryTitle();
  - public java.lang.String getSummary();
  - public java.lang.String getHostName();
**GoogleMap**

- implements `Map<String, Iterator<GoogleSearchResultElement>>`
- Properties:
  - read-only
  - can’t enumerate keys or search for values
  - Singleton

**Sort of a hack**

- It is sort of a hack to write a Map adaptor for the Google APIs
- But there is no standard Function interface
- Allows passing of GoogleMap to code that expects a Map
- Won’t work if code tries to enumerate the keys of the Map

**Lazy Google queries**

- A normal google query only returns at most 10 elements at a time
  - don’t change this
- Iterator might be used to enumerate 1, 5, 15 or 50 elements
- Cache google query results
  - make new request when you need the next 10 elements

**LazyList<Value>**

- implements `List<Value>`
- has a `LazyList(Iterator<Value> i)` constructor
- Implements at least:
  - `Value get(int pos)`
  - `Iterator<Value> iterator()`
- Can throw `UnsupportedOperationException` for others
LazyList behavior

- Iterator passed to constructor is base iterator
- May not request any elements from base iterator unless element is required for operation on LazyList

CachedGoogleMap

- implements
  Map<String, Iterator<GoogleSearchResultElement>>
- Same behavior as CachedGoogleMap
- But caches/shares results from previous operations
  - using a LazyList
- Implementation hint:
  - use a Map<String, LazyList<GoogleSearchResultElement>>

Project rules

- Expect Generic Polymorphism to be used
- No warnings from GJ compiler
- No casts or instanceof in source code

Some cases to check

- Queries that only return a small number of pages
  - e.g., asdfghjklqwert
- Queries that return no pages
  - e.g., qazwsxedcrtgb12