Variable Usage,
Making HTTP requests,
Exceptions
How hard was second code review assignment?

A) Easy  
B) Moderate  
C) Challenging  
D) Unreasonable
How long did second assignment take?

A) Less than 2 hours
B) 2 to 4 hours
C) 4 to 6 hours
D) 6 to 8 hours
E) More than 8 hours
Client / Server Architecture

- Server maintains durable state
- Clients connect to server to access/modify state
  - Server supports multiple clients simultaneously

The Client makes request for service to server.
* The server responds to that request.
Server state typically kept as “tables”

- Managed by databases
  - E.g., Movies table at themoviedb.org

<table>
<thead>
<tr>
<th>id</th>
<th>title</th>
<th>original_title</th>
<th>original_language</th>
<th>popularity</th>
<th>vote_count</th>
<th>vote_average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- We won’t do server-side stuff in CS 126.
Application Programming Interfaces (API)

- APIs are the interface between the client and server
- Like everything, there are good & bad APIs
- Some best practices to be aware of
RESTful APIs

- REST = Representational State Transfer
- Stateless, client-server, cacheable communications protocol
- Generally built on HTTP/HTTPS
- Supports Creating, Reading, Updating & Deleting (CRUD)
- Language/Platform independent
- REST operations should be self-contained

Nice overview:
- https://twincl.com/programming/*6af/rest-api-design
REST Concepts: Verbs

- **Standard Verbs:**
  - GET: Read an existing resource (IDEMPOTENT, SAFE)
  - POST: Create a new resource ()
  - PUT: Update an existing resource (IDEMPOTENT)
  - DELETE: Delete an existing resource (IDEMPOTENT)

- **Other Standard Verbs:**
  - OPTIONS: Get list of what verbs are allowed(IDEM, SAFE)
  - HEAD: Get headers (e.g., metadata) of GET (IDEM, SAFE)
  - PATCH: Update part of existing resource ()

- You can create your own, but some discourage it
REST Concepts: Nouns (a.k.a. resources)

- Mostly Describe Resources
  - /movies, /movies/17, /movies/17/reviews
  - Prefer plurals, use numbers to index into collection
  - Narrow selection through use of query string
    - /movies?genre=13&year=2015

- Can also specify utility APIs
  - /search?q=keyword&order=alphabetical
    - Note: query parameters: key=value pairs
    - separated from resource by a ?
    - separated from each other by &
Interacting with a REST API

- **Hyper Text Transport Protocol (HTTP)**
  - Client makes requests, server responds

- **Uniform Resource Locators (URL) to specify server/resource**
  - `http://host.name.here:port/path/to/resource` (or https)
  - Port defaults to 80

- **Requests:**
  - A verb (e.g., GET), a URL, and an HTTP version
  - Request headers and optional message body

- **Responses:**
  - Status code: 200 (OK), 401 (Unauthorized), 404 (Not Found)
  - Response headers and optional message body
In Java

- Easy with the power of libraries
  1. **java.net.URL**

```java
URL url = new URL("http://google.com"); // throws MalformedURLException
InputStream inStream = url.openStream();
InputStreamReader inStreamReader =
   new InputStreamReader(inStream, Charset.forName("UTF-8"));
```

*https://docs.oracle.com/javase/7/docs/api/java/net/URL.html*
Even easier with better libraries

http://unirest.io/java.html

```java
HttpResponse<String> response =
    Unirest.get(url)
    .header("user-key", Zomato.API_KEY)
    .asString();

if (response.getStatus() == 200) {
    String json = response.getBody();
    ...
}
```
Announcements

- Check your moderator assignment. It might have been updated earlier this week. Go to the right code review!

- Make sure that you are doing your own work! We look for plagiarism (sharing of code).

- Make sure that you protect your code. Don’t publish it in any way. You are liable for facilitating plagiarism if you do.
If statements

- What is wrong with:

```java
if (winner == true) {
    aFunctionCall(arg1, arg2);
}
```
Which is better?

A
    if (count != 3) {
        return false;
    }
    return true;

B
    if (count == 3) {
        return true;
    }
    return false;

C) Both are fine

D) Both are lacking

if (condition) {
    return true;
} else {
    return false;
}
How can this be improved?

```java
if (func1(arg1, arg2)) {
    return true;
} else if(func2(arg1, arg2)) {
    return true;
}
```

How can this be improved?

```java
if (func1(arg1, arg2) || func2(arg1, arg2)) {
    return true;
}
```
What is wrong with this?

if (c.equals("*")) ||
    c.equals("/")) ||
    c.equals("+") ||
c.equals("-")) {

Are the following two things the same?

if (func1(arg1, arg2) ||
    func2(arg1, arg2)) {
    return true;
}

bool isGood = func1(arg1, arg2);
bool isOkay = func2(arg1, arg2);
if (isGood || isOkay) {
    return true;
}

A) Same   B) Different   C) I don’t know
Short-circuit evaluation

- Java stops evaluating conditionals as soon as knows the outcome:

  ```java
  false
  if ((0 == 1) && willNeverBeCalled()) { ... 
  if ((1 == 1) || willNeverBeCalled()) { ... 
  true
  ```

- In the above, the function will never be called.

- Short-circuiting can be useful
  - if ((pointer != null) && (pointer->field == VAL)) {
  - Be judicious on when you rely on short circuiting
switch (type) {

    // checks if the type is an open parenthesis
    case "(" :

        // comment relating to the condition
        if (someCondition) {

            // comment explaining why this return value
            return false;
        }

        if (anotherCondition) {

            // another explanatory comment
            return aFunctionCall(arg1, arg2, arg3);
        }

        // comment relating to final return value possibility
        else return anotherFunctionCall(anotherArg1);

    // if type is a closing parenthesis
    case ")" :

        // comment relating to this different condition
        if (aDifferentCondition) {

            // explanation of this return value
            return true;
        }

        if (anotherConditionToConsider) {

            // comment relating to this return value
            return aDifferentFunctionCall(arg1, arg2, arg3);
        }

        // checks if the next value in the input is an operator and returns accordingly
        else return aValue;

}
switch (type) {
    // checks if the type is an open parenthesis
    case "(":
        // comment relating to the condition
        if (someCondition) {
            // comment explaining why this return value
            return false;
        }
        if (anotherCondition) {
            // another explanatory comment
            return aFunctionCall(arg1, arg2, arg3);
        }
        // comment relating to final return value possibility
        else return (anotherFunctionCall(anotherArg1));

    // if type is a closing parenthesis
    case "):"
        // comment relating to this different condition
        if (aDifferentCondition) {
            // explanation of this return value
            return true;
        }
        if (anotherConditionToConsider) {
            // comment relating to this return value
            return aDifferentFunctionCall(arg1, arg2, arg3);
        }
        // checks if the next value in the input is an operator and returns accordingly
        else return aValue;

8-16% blank lines is “optimal”
Finish the sentence

- Initialize each variable ...

A) as early as possible.
B) as it is declared.
C) if necessary.
D) before every use.
Which is better?

A

```java
public void foo(int [] A) {
    for (int i = 0 ; i < A.length ; i ++) {
        ...
    }
    ...
    for (int i = 0 ; i < A.length ; i ++) {
        ...
    }
}
```

B

```java
public void foo(int [] A) {
    int i;
    for (i = 0 ; i < A.length ; i ++) {
        ...
    }
    ...
    for (i = 0 ; i < A.length ; i ++) {
        ...
    }
}
```
Which is better?

A

```java
int xPos = getPositionX();
int yPos = getPositionY();

int xTranslated = translate(xPos, XMATRIX);
int yTranslated = translate(yPos, YMATRIX);

System.out.println(xPos + "->" + xTranslated);
System.out.println(yPos + "->" + yTranslated);
```

B

```java
int xPos = getPositionX();
int xTranslated = translate(xPos, XMATRIX);
System.out.println(xPos + "->" + xTranslated);

int yPos = getPositionY();
int yTranslated = translate(yPos, YMATRIX);
System.out.println(yPos + "->" + yTranslated);
```
Which is better?

A

String nameString = getName();
System.out.println(nameString + "":"" + lookup(nameString));

nameString = getAlias();
markUsed(nameString);
return nameString;

B

String nameString = getName();
System.out.println(nameString + "":"" + lookup(nameString));

String aliasString = getAlias();
markUsed(aliasString);
return aliasString;
What (all) is wrong with this code?

public class Variables {
    final String invalid = "INVALID";
    private static String[] args;
    public static int MAX_LENGTH = 5;

    public static String handleIt(String argString) {
        args = argString.split(" ");
        return handleArgs(args);
    }

    public static String handleArgs() {
        int strLength;
        for (int i = 0; i < args.length; i++) {
            strLength = args[i].length();
            if (strLength > MAX_LENGTH) {
                return args[i] + ": " + strLength;
            }
        }
        return invalid;
    }
}

Read chapters 5 & 6 (Commenting) in book