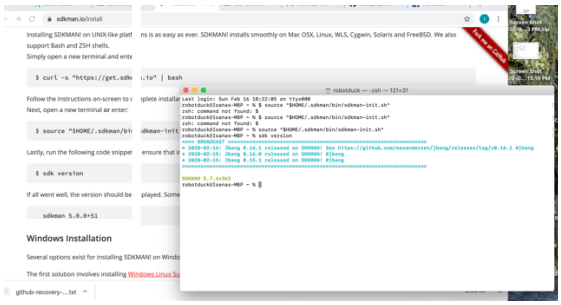
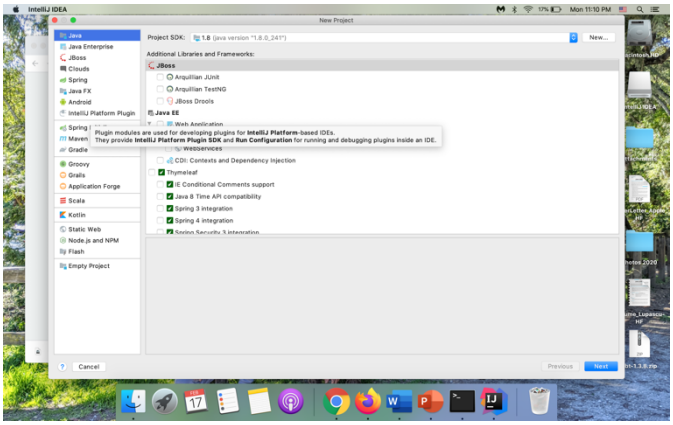
SETUP – SBT, SDKMAN, DIFFERENT IDE'S

1. Installed Java & SDKMan in Terminal



2. Installed IntelliJIDEA. Worked, took a few tries to load scala.



3. Set up sbt in terminal

4. Installed anaconda

5. Almond installation was **not** successful, could not connect to kernel through jupyter

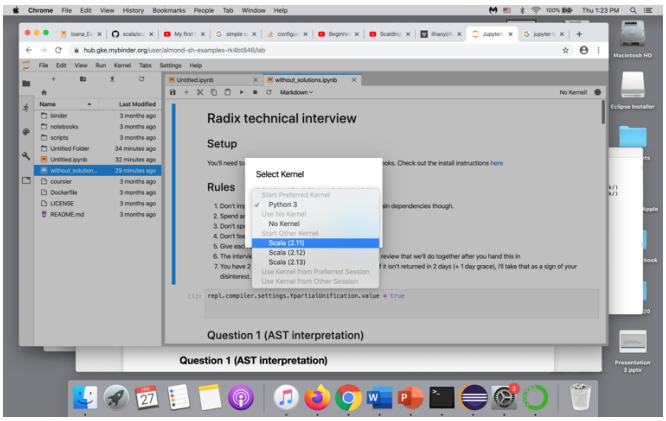
6. coursier launcher created successfully

7. Installed giter8template

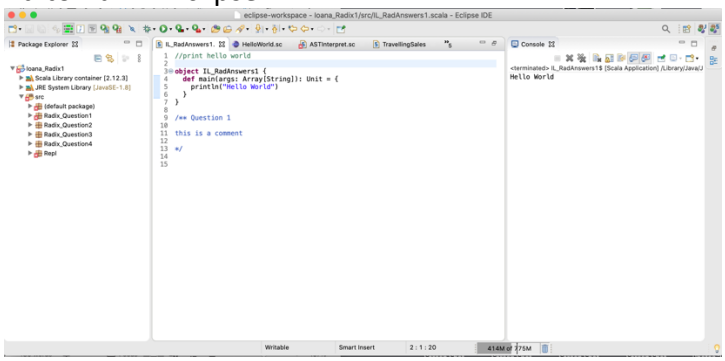
8. Installed, set up Eclipse

9. Finally started to work in an IDE that made sense (Eclipse), created directory and started working in scala

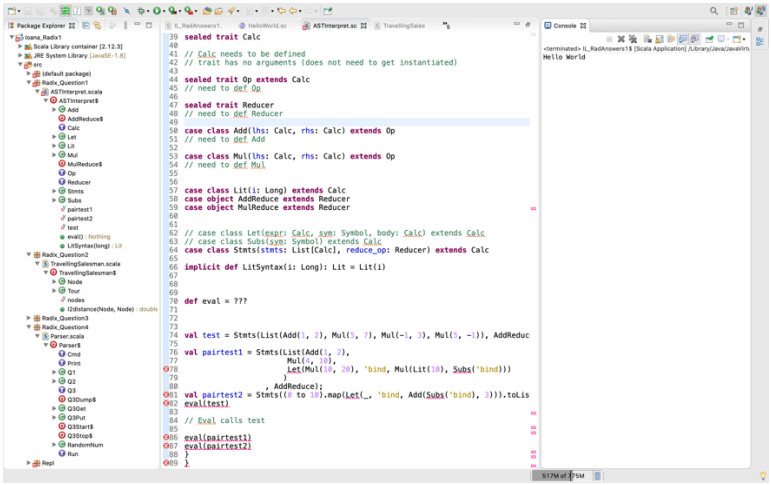
10. Discovered Binder, was able to open jupyter lab with scala kernel working successfully



11. Got HelloWorld to Run in Eclipse



12. Organized directory, file structure to see how Classes, Traits, Etc look in Scala



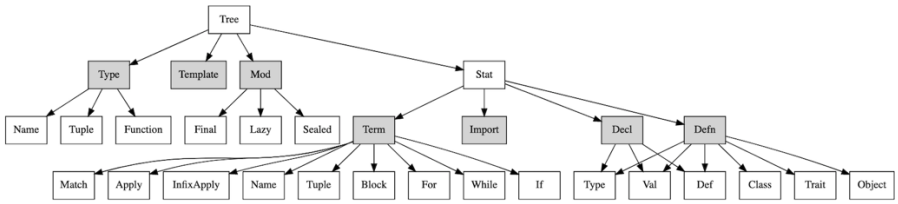
QUESTION 1 – AST

An AST has several properties that aid the further steps of the compilation process.

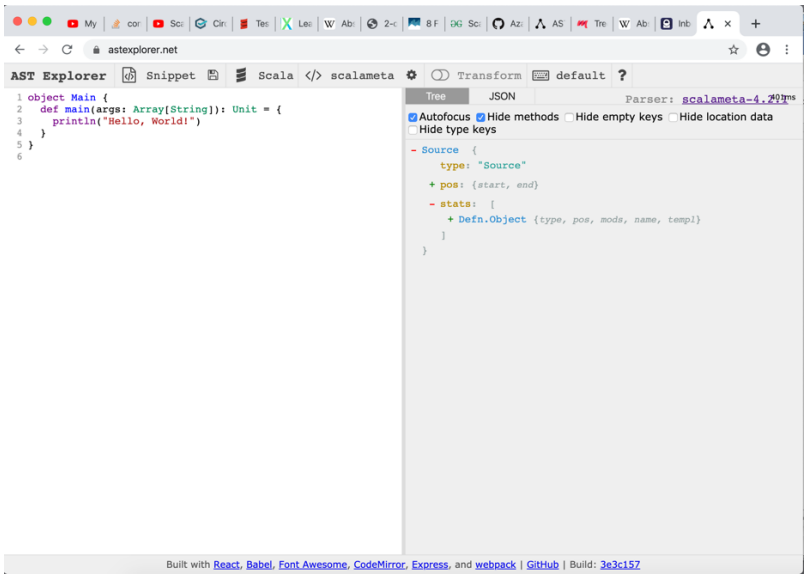
AST is a tree representation of the abstract syntactic structure of source code written in a programming language

Parse trees are typically built by a parser during the source code translation and compiling process.

> Syntax trees are a representation of source code that makes it easier to programmatically analyze programs. Scalameta has syntax trees that represent Scala programs.



AST Example



Eval - Needs to define test conditions. The traits and classes have no definition yet, so they need to be defined.

Test Condition 1: Variable types must be preserved.
Test Condition 2: the location of each declaration in source code must be preserved
Test Condition 3: The order of executable statements must be explicitly represented
Test Condition 4: Left and right components of binary operations must be stored
Test Condition 5: Components must be correctly identified.
Test Condition 6: Identifiers and their assigned values must be stored for assignment statements.

Resources: https://astexplorer.net/

QUESTION 2 – K-OPT HEURISTIC, TRAVELLING SALESMAN

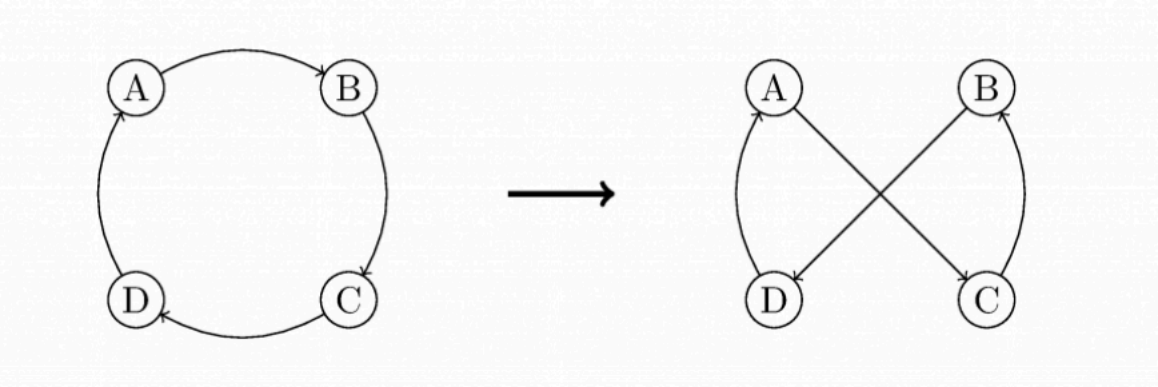
THINKING THROUGH TO A SOLUTION

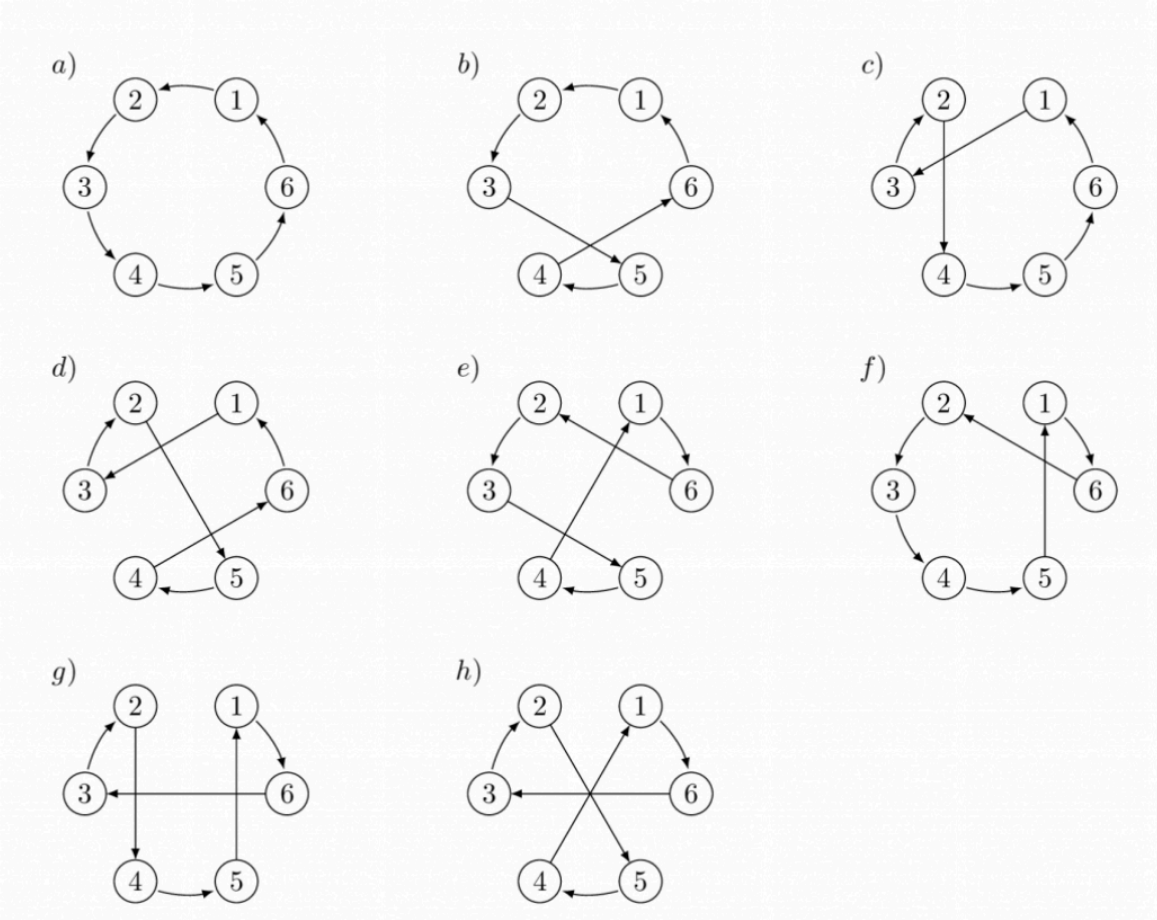
Goal: Optimize path, arrive at a place where no more improvement possible.

0. Start with 2-opt.

1. Need to define a route (point a to point b)
2. A node has x & y coordinates (ex. Node(i, j))
3. Define a first node
4. Define a second node
5. Define a route from node 1 to node 2 - 2optSwap(route, i, k)
6. Create a new route - take route[0] to route[i-1] and add them in order to new_route
7. Take route[i] to route[k] and add them in reverse order to new_route
8. Take route[k+1] to end and add them in order to new_route
9. return new_route

Different path options for different nodes:






```
repeat until no improvement is made {
    start_again:
    best_distance = calculateTotalDistance(existing_route)
    for (i = 1; i <= number of nodes eligible to be swapped - 1; i++) {
       for (k = i + 1; k <= number of nodes eligible to be swapped; k++) {
         new_route = 2optSwap(existing_route, i, k)
         new_distance = calculateTotalDistance(new_route)
          if (new_distance < best_distance) {
             existing_route = new_route
             best_distance = new_distance
             goto start_again
```

QUESTION 3 – SET UP A WEBSERVER

Approach 1: Installed minimalApplication-0.3.0 with Cask framework, using:

```
$ curl -L
https://github.com/lihaoyi/cask/releases/download/0.3.0/minimalApplication-
0.3.0.zip > cask.zip
$ unzip cask.zip
$ cd minimalApplication-0.3.0
```

We can run `find` to see what we have available:

```
$ find . -type f
./build.sc
./app/test/src/ExampleTests.scala
./app/src/MinimalApplication.scala
./mill
```

Most of what we're interested in lives in `app/src/MinimalApplication.scala`:

First resource**:** http://www.lihaoyi.com/post/SimpleWebandApiServerswithScala.html

Was not sure about validity/security of this code, stopped this approach, uninstalled.

Next Approach: try these frameworks https://nordicapis.com/8-frameworks-to-build-a-web-api-in-scala/

1. Play Framwork
2. Finch
3. Akka HTTP
4. Chaos

QUESTION 4 – FUNCTIONAL PROGRAMMING

Created directory in Eclipse with scala objects, did not get any further.