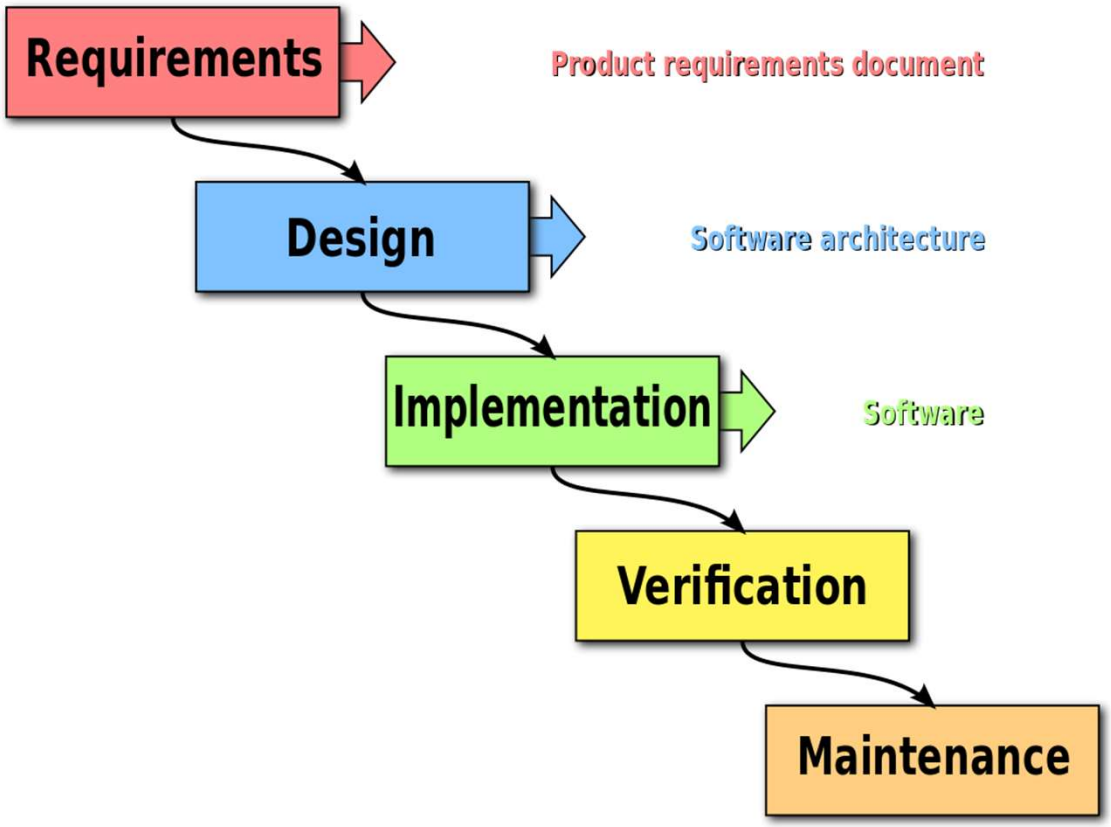
MODULE 1: INTRODUCTION TO PROGRAMMING

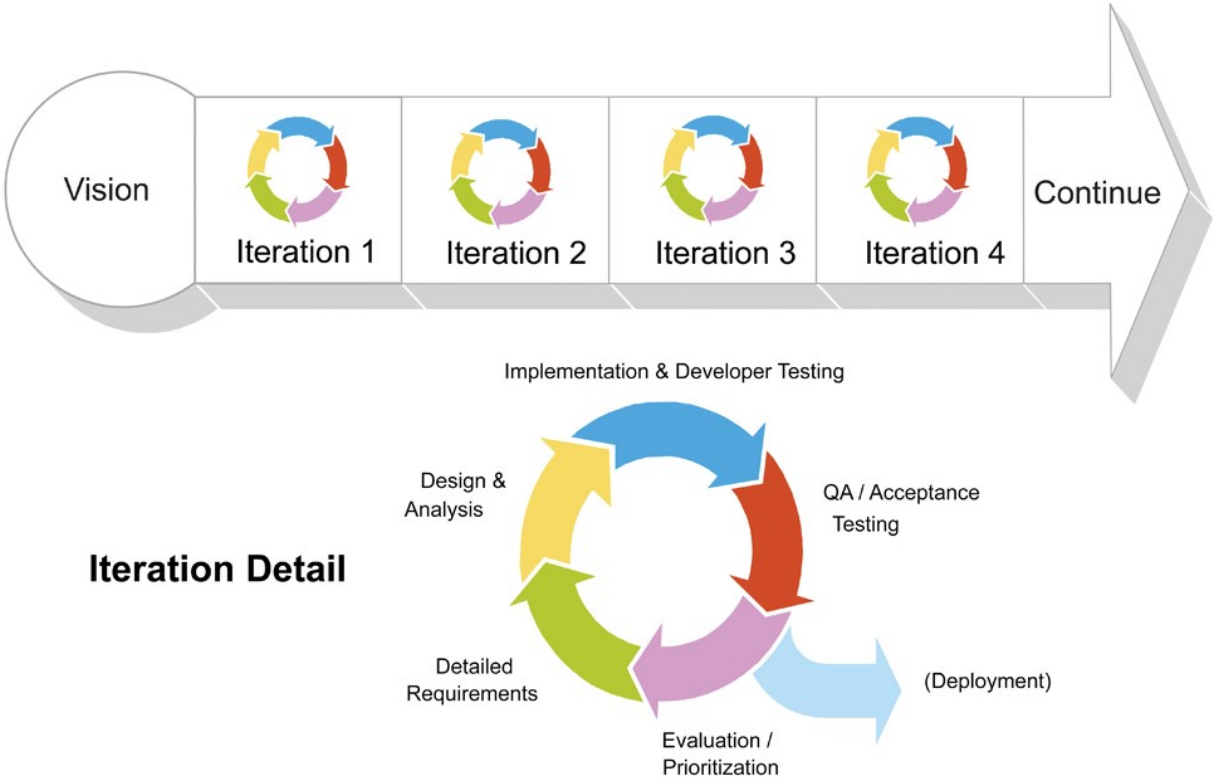
Unit Testing

- *How do we verify that the components of code that we write are correct and that changes don't cause unintended consequences?*

SDLC: Waterfall



SDLC: Agile



SDLC

- Waterfall or Agile?

Testing Overview

- Manual Testing
  - Manual tests are no more than the tester using the program as an end user would, and then determining whether or not the program acts appropriately.
- Automated Testing
  - Automated tools run test that repeat predefined actions, comparing a developing program’s expected and actual outcomes.

Manual Testing

- Pros:
  - Short-term cost is lower
  - More likely to find real user issues
  - Very flexible
- Cons:
  - Certain tasks are difficult to do manually
  - Not very stimulating
  - Can’t reuse tests

Automate Testing

- Pros:
  - Runs tests quickly and effectively
  - Can be cost effective
  - More interesting
  - Everyone can see results
- Cons:
  - Tools can be expensive
  - Tools still take time
  - Tools have limitations

Testing Overview

- Exploratory Testing
  - Explores the functionality of the system looking for defects, missing features, or other opportunities for improvement.
- Regression Testing
  - Validates that existing functionality continues to operate as expected.

Testing Overview

- Unit Testing
  - Low level of testing performed by programmers that validates individual “units” of code function as intended by the programmer.
- Integration Testing
  - Validates the integration between units of code or code and outside dependencies such as databases or network resources.
- Acceptance Testing
  - Performed from the perspective of a user of the system in order to verify that the functionality of the system satisfies user needs.

Testing Overview

- Unit Testing -> Integration Testing -> Acceptance Testing:
  - longer runtime
  - more expensive to write
  - harder to troubleshoot

Other Types of Testing

Who Does the Testing?

- Dedicated software testers, different skill sets, QA vs. QC
- **Developers test their own code for correctness**
- Business people test code for usability and acceptance

- Why write unit tests?

Properties of Unit Tests

- Fast - elapsed time of running a unit test should be measured in milliseconds
- Reliable / Repeatable - if a passed/failed once, it should pass/fail again, assuming no code changes
- Independent - a test should be able to be run independently of other tests and tests should not have interactions with one another
- Obvious - easy to determine why it failed

Three Parts to the Test

- **Arrange** - begin by arranging the conditions of the test, such as setting up test data
- **Act** - perform the action of interest, i.e. the thing we're testing
- **Assert** - validate that the expected outcome occurred by means of an assertion (e.g. a certain value was returned, a file exists, etc.

Unit Test Best Practices

- No external dependencies
- One *logical* assertion per test (i.e. each test should only contain one "concept")
- Test code should be of the same quality as production code
- Test boundary cases
- Test empty arrays, lists, or nulls
- A Test class per class file

LET'S CODE!

WHAT QUESTIONS DO YOU HAVE?