

# Unit Testing 1

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## Overview

- Introduction to Unit Testing
  - Why and How We Unit Test
  - Testing Pathways
  - Test Cases
  - Development and Testing
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## Learning Objectives

- Define unit testing
  - Identify testing pathways
  - Explore some test cases
  - Compare TDD (test driven development) and Non-TDD
  - Create a simple unit test
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## What is a Unit?

A "unit" of code is considered to be the smallest testable chunk of software which performs a very specific job / task.

```
def add_two_numbers(a, b):  
    return a + b
```

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## What is Unit Testing?

Unit Testing is then the process of executing this unit of code in isolation under certain conditions or scenarios to test its behaviour.

```
add_two_numbers(1, 1) # Expected 2  
add_two_numbers(-1, 0) # Expected -1  
add_two_numbers(1.00234, 0.3456) # Expected 1.34794  
add_two_numbers("test", 1) # Expected Error  
add_two_numbers() # Expected Error
```

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## Testing Pathways

When testing we refer to our test scenarios as following two distinct paths:

- ## Happy Path

## We test successful scenarios

## Unhappy Path

## We test unsuccessful scenarios

```
add_two_numbers("test", 1)
add_two_numbers(1)
add_two_numbers()
```

A happy path is a default scenario featuring no exceptional or error conditions, so the unhappy path is all the other scenarios where exceptional or error conditions happen.



## Brenan Keller

@brenankeller

Follow



A QA engineer walks into a bar. Orders a beer. Orders 0 beers. Orders 999999999999 beers. Orders a lizard. Orders -1 beers. Orders a ueicbksjdhd.

First real customer walks in and asks where the bathroom is. The bar bursts into flames, killing everyone.

1:21 PM - 30 Nov 2018

## Test Cases

We can also define certain *test cases* when we test:

- Common Case
  - Edge Case
  - Corner Case
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### Common Case

This occurs at normal operating parameters

```
add_two_numbers(100, 100)
```

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### Edge Case

This occurs at the extreme min / max parameter envelope

```
add_two_numbers(0, 10**10000)
```

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### Corner Case

This occurs outside of normal operating parameters

```
add_two_numbers("text", 10**10000)
```

Edge cases occur at an extreme (maximum or minimum) operating parameter. Corner cases occur outside of normal operating parameters, specifically when multiple environmental variables or conditions are simultaneously at extreme levels, even though each parameter is within the specified range for that parameter.

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### Why do we care?

- A good testing strategy outlines the operational envelope of our software.
- Failing tests indicate where we need to improve our software.
- Passing tests are an indicator of software quality and robustness.

```
robust_software == happy_users == happy_employer
```

Could mention some different contexts in which software is run and the affects of untested software. I.e a bug in Aviation vs a bug in Social Media.

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## Writing our first test

The Three A's:

1. Create Test Data (**A**ssemble)
  2. Execute the unit we're testing and pass in the test data (**A**ct)
  3. Verify the result matches our expectations (**A**ssert)
- 

```
def test_adds_two_numbers():  
    # Assemble  
    a = 7  
    b = 12  
    expected = 19  
  
    # Act  
    result = add_two_numbers(a, b)  
  
    # Assert  
    assert result == expected  
  
test_adds_two_numbers()
```

What path are we testing here? Happy / Unhappy? What case are we testing? Common / Edge / Corner?

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## Techniques for writing unit tests

Just as we write application code, we write test code in much the same way.

There are however two main approaches to writing unit-tests:

- Write the code then the tests (non TDD)
  - Write the tests then the code (TDD)
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## Non Test Driven Development

1. Read, understand, and process the feature or bug request.
  2. Implement the code that fulfils the requirement.
  3. Test the code works by writing a unit test.
  4. Clean up your code by refactoring.
  5. Rinse, lather and repeat.
- 

## Example

1. Write the code and hope it works:

```
def add_two_numbers(a, b):  
    return a + b
```

2. Write the test and hope it passes:

```
def test_add_two_numbers(a, b):  
    expected = 10  
    actual = add_two_numbers(5, 5)  
    assert expected == actual
```

3. Fix the code if the tests fails

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## Test Driven Development (TDD)

1. Read, understand, and process the feature or bug request.
  2. Translate the requirement by writing a unit test.
  3. Write the minimum amount of code to get the test to pass.
  4. Rinse, lather and repeat.
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### Step 1 - Implement the minimal amount of code needed to pass the test

```
def add_two_numbers(a, b):  
    return 10  
  
def test_add_two_numbers():  
    # Arrange  
    a = 5  
    b = 5  
    expected = 10  
  
    # Act  
    actual = add_two_numbers(a, b)  
  
    # Assert - pass  
    assert expected == actual  
  
test_add_two_numbers()
```

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### Step 2 - Fully implement function, get test to pass

```
def add_two_numbers(a, b):  
    return a + b  
  
def test_add_two_numbers():  
    # Arrange  
    a = 5  
    b = 5  
    expected = 10  
  
    # Act  
    actual = add_two_numbers(a, b)  
  
    # Assert - pass  
    assert expected == actual  
  
test_add_two_numbers()
```

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## Benefits of TDD

- Gets you into the dependency injection mindset, which will help your code to be more rigorous.
- Requires you to implement just enough code and prevents you predicting the future. It ensures requirements are understood and met explicitly. It saves time and improves velocity.
- Once you get a test to pass, you know that any refactoring of the code needs to work such that the test still passes. If it doesn't you've either implemented your functionality wrong, or the test was written incorrectly.

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## Exercise

Instructor to distribute exercise.

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## Learning Objectives Revisited

- Define unit testing
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## Terms and Definitions Recap

- **Unit**: The smallest testable chunk of code.
- **TDD**: Test Driven Development. The process of writing tests first.
- **Happy Path**: Successful test scenarios.
- **Unhappy Path**: Unsuccessful test scenarios.
- **Corner Case**: Outside normal parameters.

- **Edge Case:** Extreme min/max parameters.
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## Further Reading

- Unit Testing: [Best Practices](#)