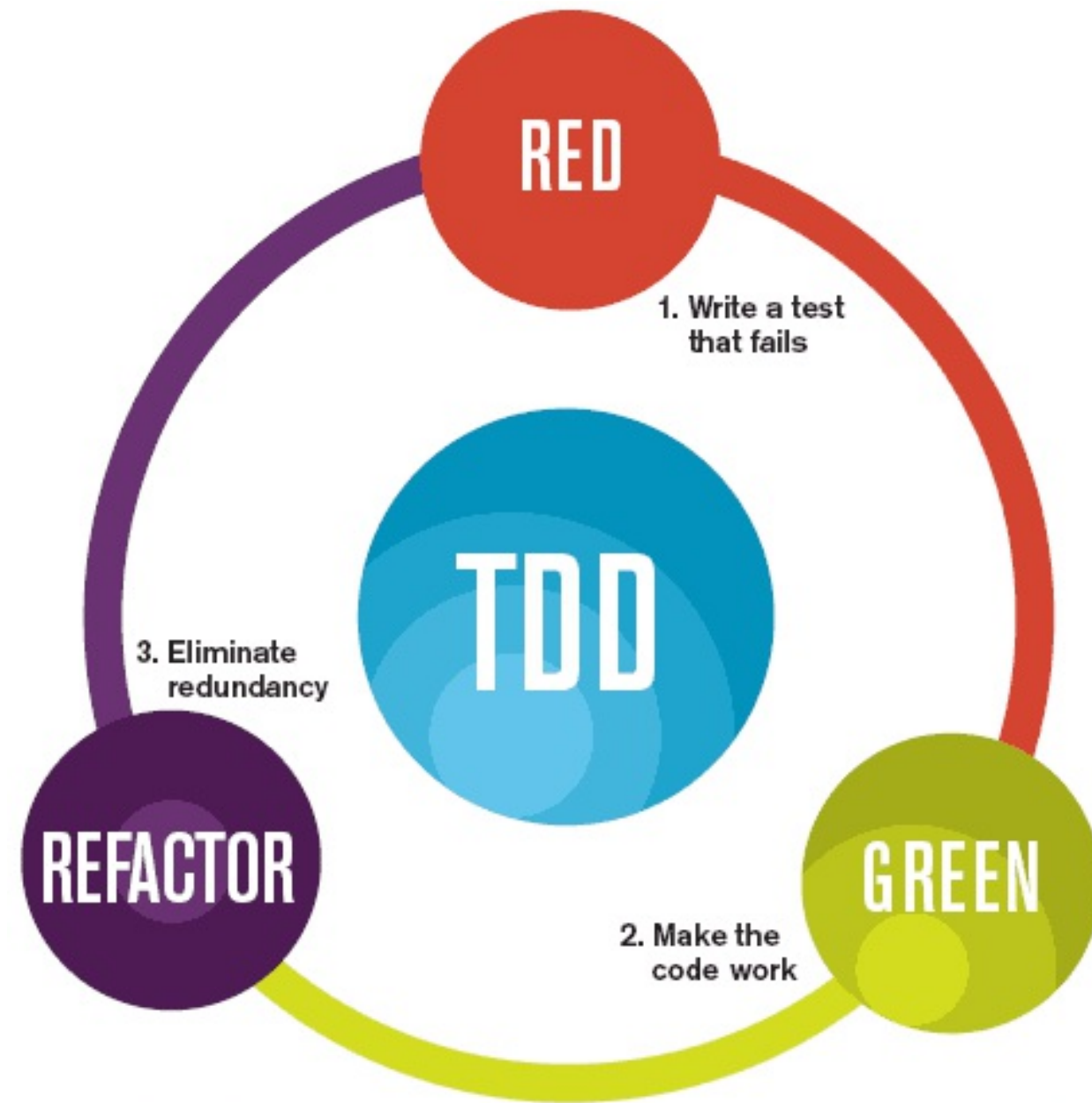


# Unit Testing and Python



# Test Driven Development (TDD)

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The mantra of Test-Driven Development (TDD) is "red, green, refactor."

# TDD Methodology

## "Strictly speaking"

1. Add a test
2. Run the test suite
  - Note: This should fail!
3. Write the minimum code to pass tests
4. Run test suite
5. Refactor & repeat

## The pragmatist's view:

- Add tests
- Run tests
- Write/fix code

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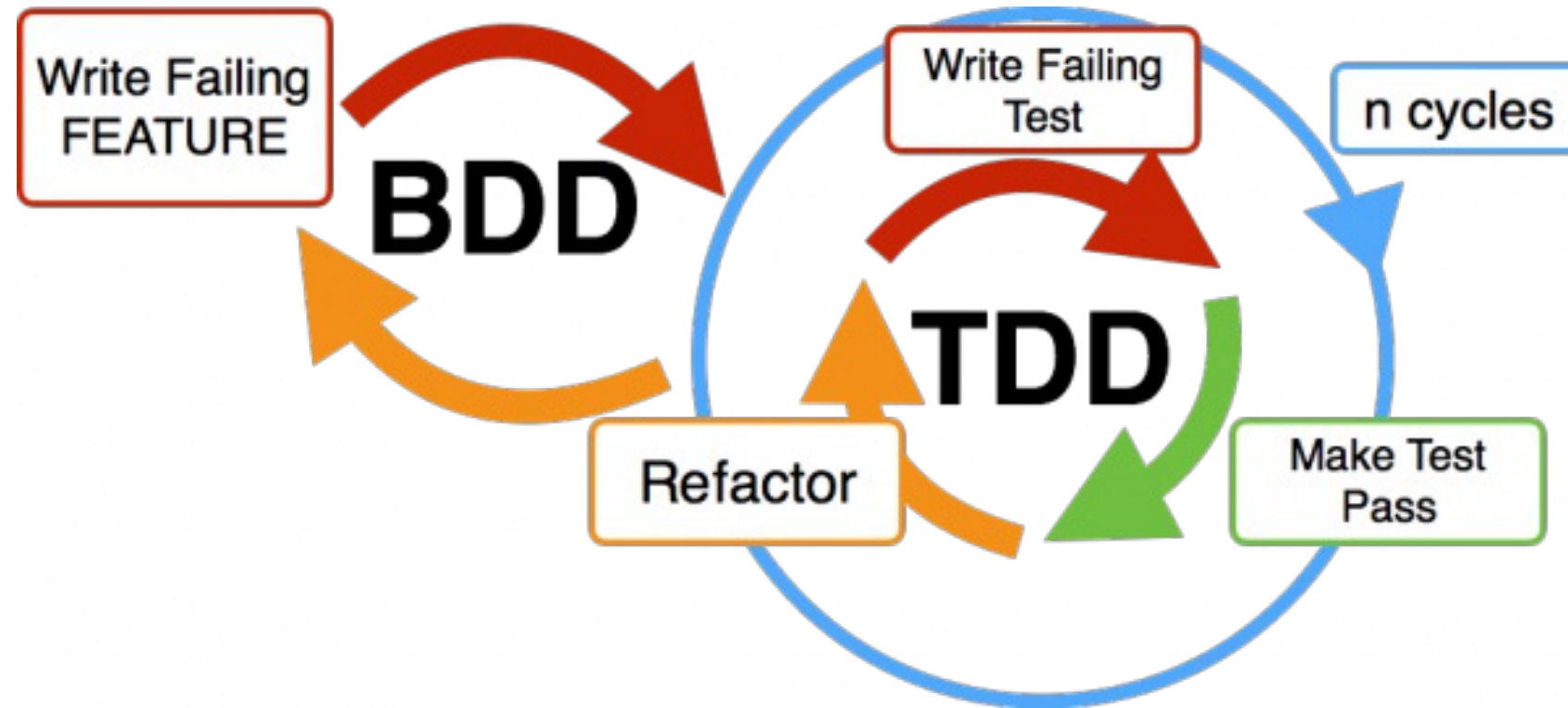
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- 
- TDD can unfairly focus on "micro-tests"
  - More tests != better tests, and do mean more maintenance

People study development methodologies, [here's one](#) just published that says TDD provides marginal benefit.

Takeaway? There is no "magic" way of doing things that will make your code bug-free.

# Behavior Driven Development



# Writing unit tests in Python

Python??

# Getting started, create `rpn.py`

```
#!/usr/bin/env python3

def calculate(arg):
    pass

def main():
    while True:
        calculate(input("rpn calc> "))

if __name__ == '__main__': # Note: that's "underscore underscore n a m e ..."
    main()
```

```
$ python3 rpn.py
rpn calc> type anything here and hit enter
rpn calc>
```



# Quick refresher on RPN calculators

Also a "stack-based" calculator

```
rpn calc> 1 1 +  
2.0  
rpn calc> 1 1 + 2 *  
4.0  
rpn calc> 1 2 3 +  
Error: Malformed expression
```

# Create `test_rpn.py`

```
import unittest
import rpn

class TestBasics(unittest.TestCase):
    def test_add(self):
        result = rpn.calculate("1 1 +")
        self.assertEqual(2, result)
```

- The name matters! Note that `test_rpn.py` tests `rpn.py`

```
$ python3 -m unittest
F
=====
FAIL: test_add (test_rpn.TestBasics)
-----
Traceback (most recent call last):
  File "/home/marcus/rpn_calc/test_rpn.py", line 8, in test_add
    self.assertEqual(2, result)
AssertionError: 2 != None
-----
```

# Don't forget **git**!

```
$ wc -l *.py
  11 rpn.py
   8 test_rpn.py
  19 total

# This is 19 lines of quality code here!
```

- Yes, we're committing *before anything works*
  - The structure is good
  - The *test harness works*

And let's not forget **make** while we're at it

Because why type 19 letters when you could type 4?

```
test:
    python3 -m unittest

.PHONY: test
```

# Live coding

PLEASE stop me and ask questions if you're confused

PLEASE yell at me to slow down if I go too fast

---

- Implement add
  - Need a stack for the calculator
  - Need to tokenize the input
  - Need to process tokens

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- Implement subtract
- Tests can expect failure: malformed input



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---

- Implement add
  - Need a stack for the calculator
  - Need to tokenize the input
  - Need to process tokens
- Add test for subtract
- Implement subtract
- Tests can expect failure: malformed input
- On your own: Tests and implementation for multiply, divide

# Some fancy Python and the big refactor

Motivation: Unwieldy if-else chain going

- Gets worse as more operands are added
- A modular design will allow flexibility

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Goal: Simplify parser code

- Is it a number? Then add to stack
- Else look up operator and execute

# Attendance: Push your code to gitlab

1. Go to <https://gitlab.eecs.umich.edu>
2. Click "New Project"
3. Name your project **exactly**: `c4cs-w17-rpn`
4. Set your project to **publicly visible**

Visibility Level (?)

- ☐  Private  
Project access must be granted explicitly to each user.
- ☐  Internal  
The project can be cloned by any logged in user.
- ☒  Public  
The project can be cloned without any authentication.

5. Scroll down and follow the directions for **existing folder or Git repository**
  - You shouldn't need to create a repo (we already did that)
  - **Make sure you've committed all your changes!**
  - `git remote add .....`
  - `git push -u origin master`
  - Your username is your unickname, and password is your umich.edu password