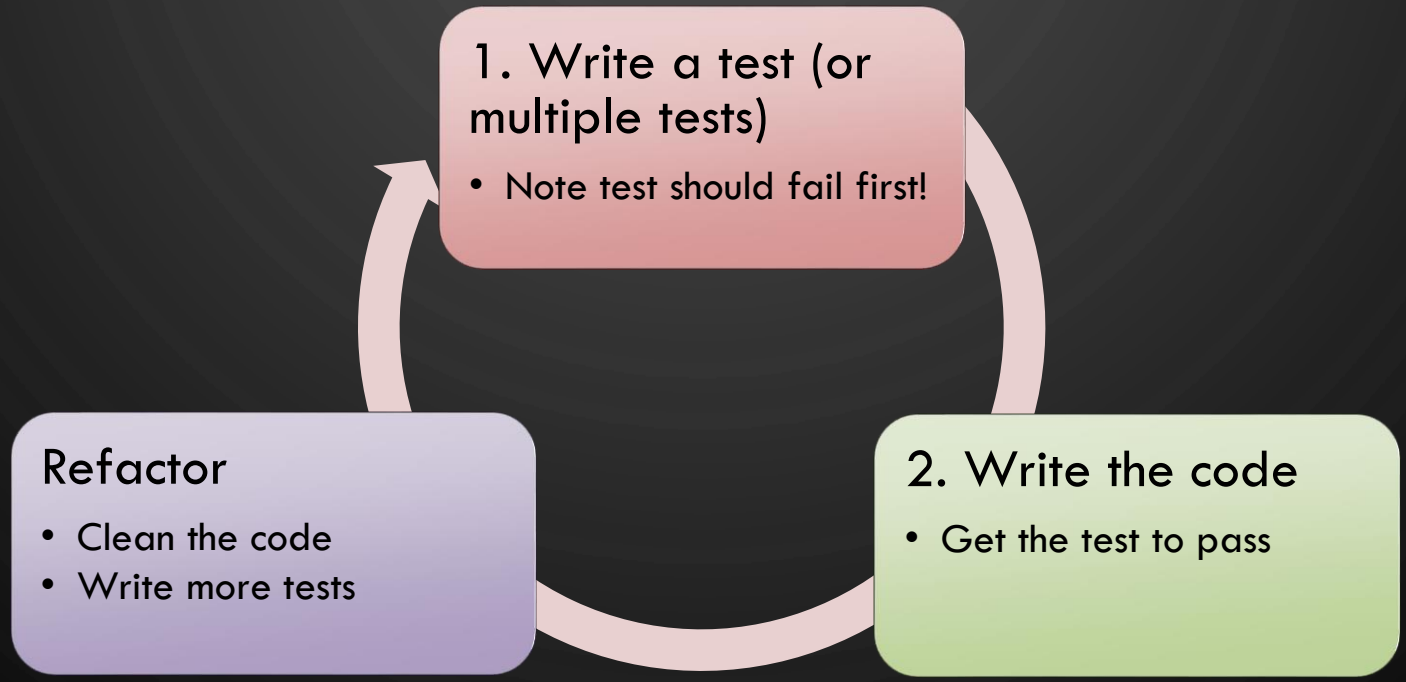
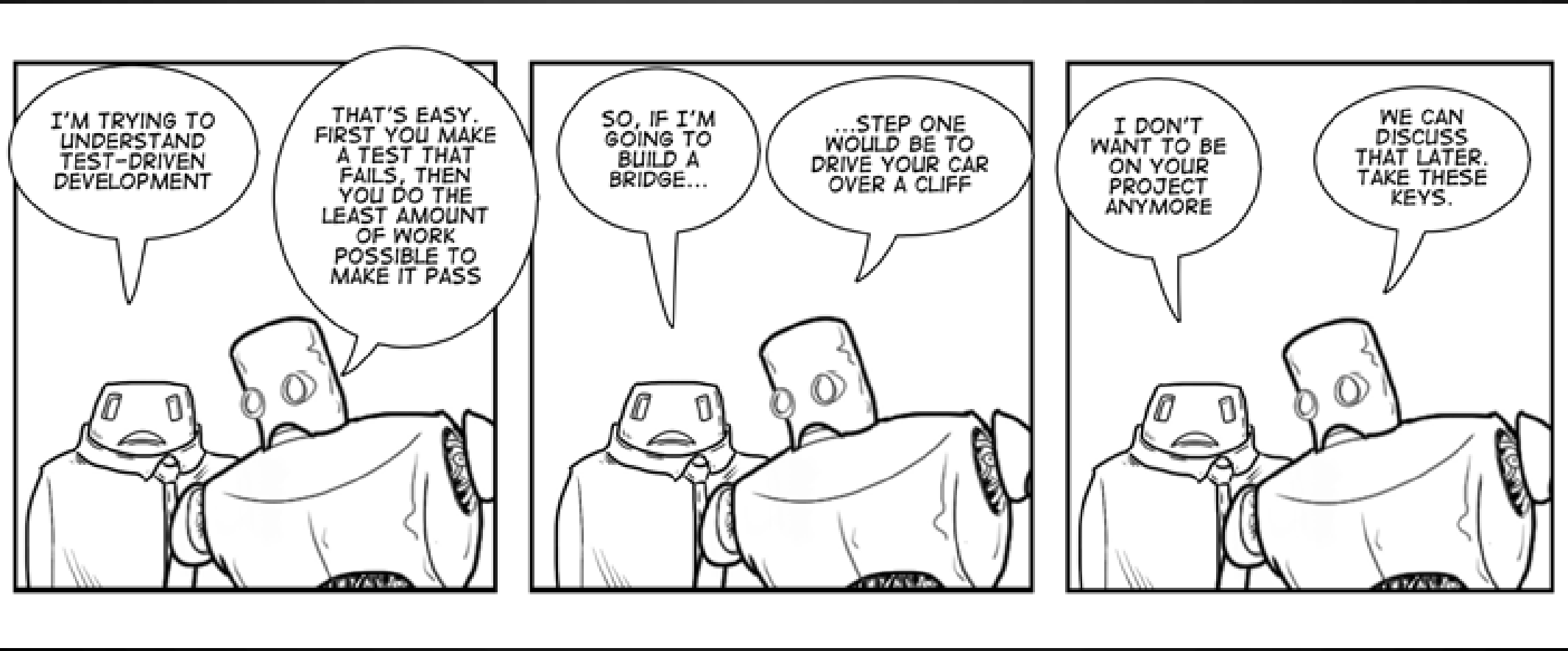
DEVELOPMENT AND TESTING

DEVELOPMENT (ONE OUT OF MANY PERSPECTIVES)

1. Solve
2. Implement
    1. Write test
    2. Write code
    3. Repeat
3. Integrate
4. Release

TEST DRIVEN DEVELOPMENT (TDD)




I'M TRYING TO UNDERSTAND TEST-DRIVEN DEVELOPMENT
THAT'S EASY. FIRST YOU MAKE A TEST THAT FAILS, THEN YOU DO THE LEAST AMOUNT OF WORK POSSIBLE TO MAKE IT PASS
SO, IF I'M GOING TO BUILD A BRIDGE...
...STEP ONE WOULD BE TO DRIVE YOUR CAR OVER A CLIFF
I DON'T WANT TO BE ON YOUR PROJECT ANYMORE
WE CAN DISCUSS THAT LATER. TAKE THESE KEYS.

PRACTICAL EXAMPLE

- Lets practice some TDD on the following example

You are tasked with implementing a feature for a company that determines the total amount of time a worker spends at their desk. He says the number of hours worked each day is already being measured and is stored in an internal array in the code base.

PRACTICAL EXAMPLE

- How do we solve this?
  - Compute the sum!

PRACTICAL EXAMPLE

- First we write a test
  - in other words, set up the scaffolding of the code instead of a function which you don't know if it works or not – and continue to struggle finding bugs

```
public static double sum(double[] arr) {
  return Double.POSITIVE_INFINITY; //note this clearly does not work and is thus failing
}

public static void main() {
  double[] arr = {0, 1, 1, 2, 3, 5, 8};
  if(sum(arr) != 20)
    System.out.println("Test failed?!?!?! I suck!"); //you don't, its supposed to fail!
}
```

PRACTICAL EXAMPLE

- Before we continue, lets review
  - Positives
    - Scaffolding, function interface, and test all implemented
    - We know it is good design
    - Tests to tell if the code is correct, before we struggle with debugging many lines of code
  - Negatives
    - Code isn't written until later…..but is that really that bad? NO
- In fact, with TDD you code FASTER and more EFFECTIVELY than without it

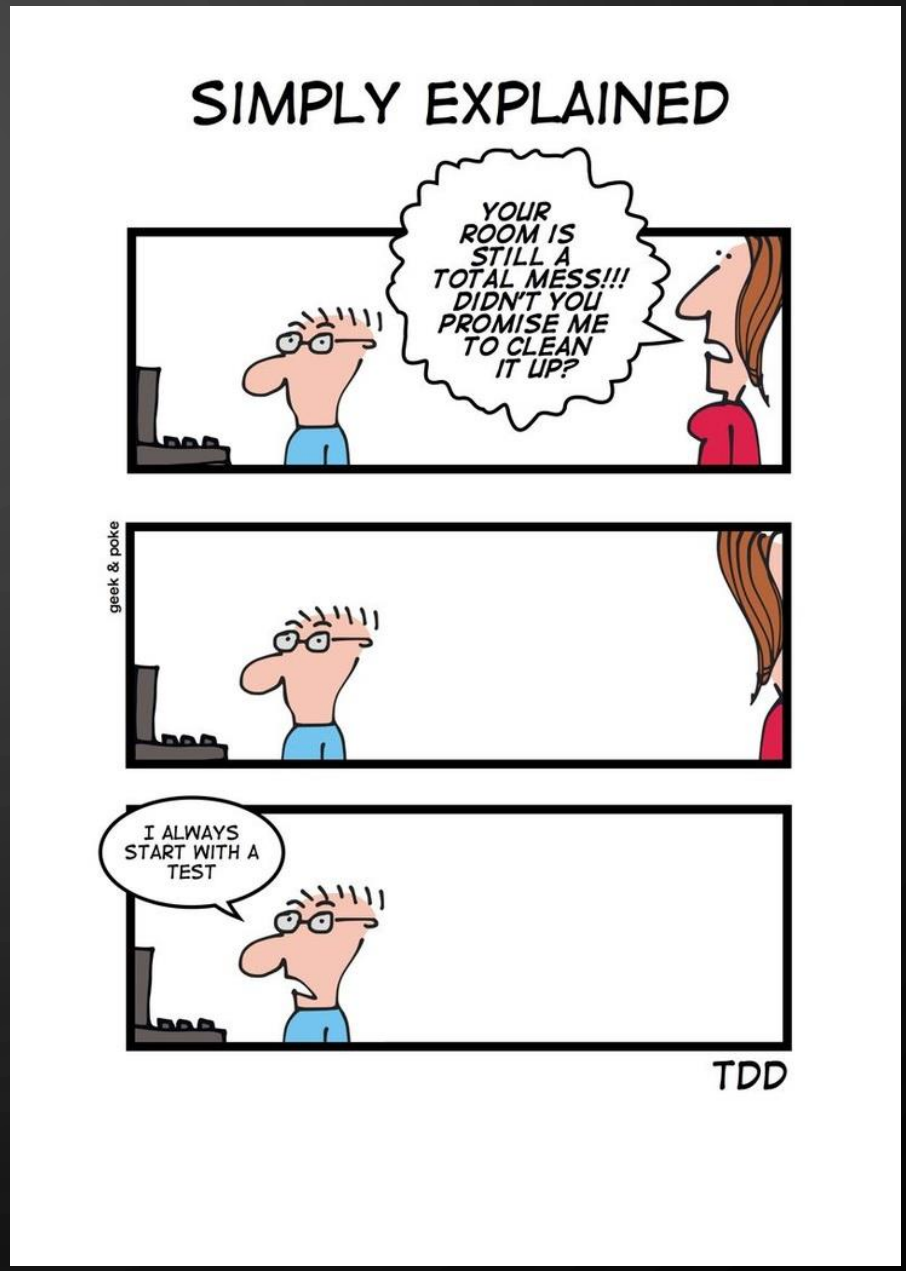
PRACTICAL EXAMPLE

- Now the code – and then run the test!

```
public static double sum(double[] arr) {
   double s = 0;
   for(double x : arr)
      s += x;
   return s;
}
```

THINGS TO REMEMBER

- Always have code that compiles
- Test writing is an art that takes practice (and more learning!)
- Compile and test often!



TESTING FRAMEWORKS

- Many frameworks exist CppUnit, JUnit, etc.
- We will be using a much more simple unit testing framework developed by me
  - A unit test is a check of one behavior of one "unit" (e.g., function) of your code
  - If you have downloaded the lab zip for today open it and look there
  - Follows **SETT** – unit testing paradigm
    - **Setup** – create data for input and predetermine the output
    - **Execute** – call the function in question
    - **Test** – analyze correctness and determine true/false for test
    - **Teardown** – cleanup any data, close buffers, etc

UNIT TEST EXAMPLE

```
public static boolean testSum() {
  //setup
  double[] arr = {0, 1, 1, 2, 3, 5, 8};
  double ans = 20;

  //execute
  double s = sum(arr);

  //test
  return s == ans;

  //teardown - here is empty
}
```

TDD - EXERCISE

- Write a Java function to find the median of an array of integers
  - Do test driven development, starting with a good unit test(s)
  - After test is created and checked, code the function
- Pair program
- Once completed, you should use the extra time to work on Programming Assignment 5