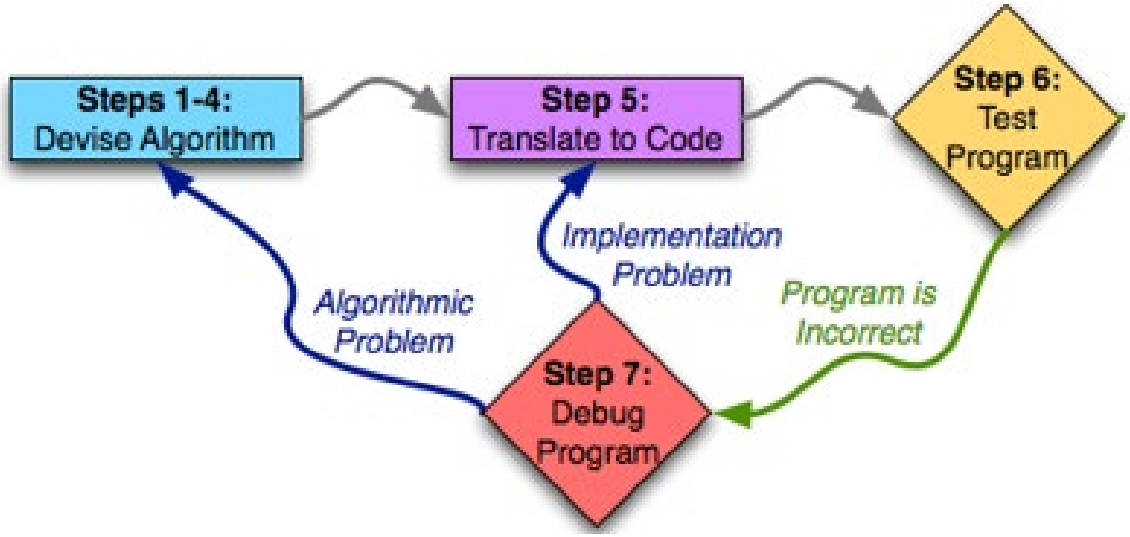
Compsci 101
7-Steps
Part 1 of 3

Susan Rodger

January 28, 2021



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- BE IN THE KNOW ABOUT COMPSCI!

C is for …

- **Computer Science and Computing**
  - It's what we do
- **Collaboration**
  - Review the policy
- **Cookies**
  - Good for the web and for …
- **CSV**
  - Comma Separated Values: Data

PFTD

- 7 steps of programming
- Functions
- APTs

In Python version 3 print is a function

- **Functions have parentheses**
  - Arguments are provided in parentheses
  - We can `print(3+5)` or `print("hello")` or …
  - What is returned by print?

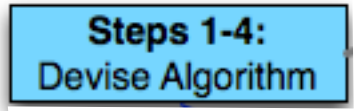
- **When there is no return value...**
  - None is returned, it has no representation
  - Its type is NoneType
- **Note: in python version 2, print is NOT a function, looks different**

APTs in 101 and 201

- **Algorithm Problem-solving and Testing**
  - Algorithm that's Automatically Tested
  - In use at Duke since 2003, million+ APTs solved

- **Given a problem statement**
  - Read**, think,** plan on **paper** …
  - Write a function to solve the problem
  - Submit the code for testing, debug if necessary

The Seven Steps
Programming Process: High-level

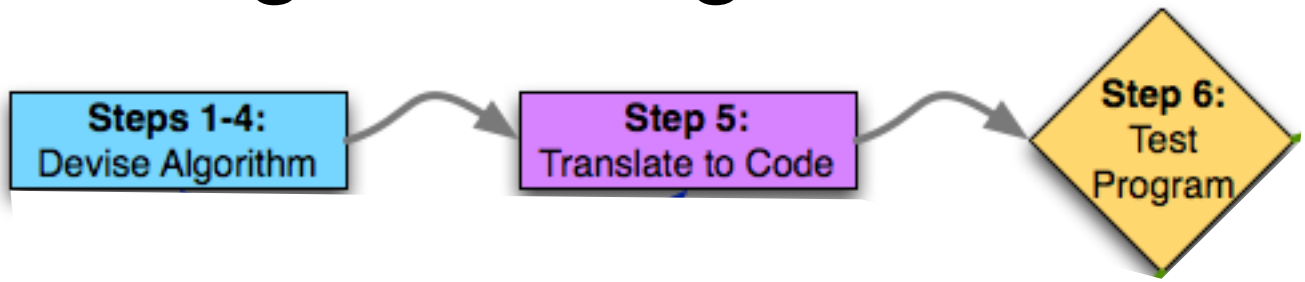


- First part: devise the algorithm
  - The meta-problem solving piece
  - Big/complex enough to be 4 steps (more shortly)

The Seven Steps
Programming Process: High-level

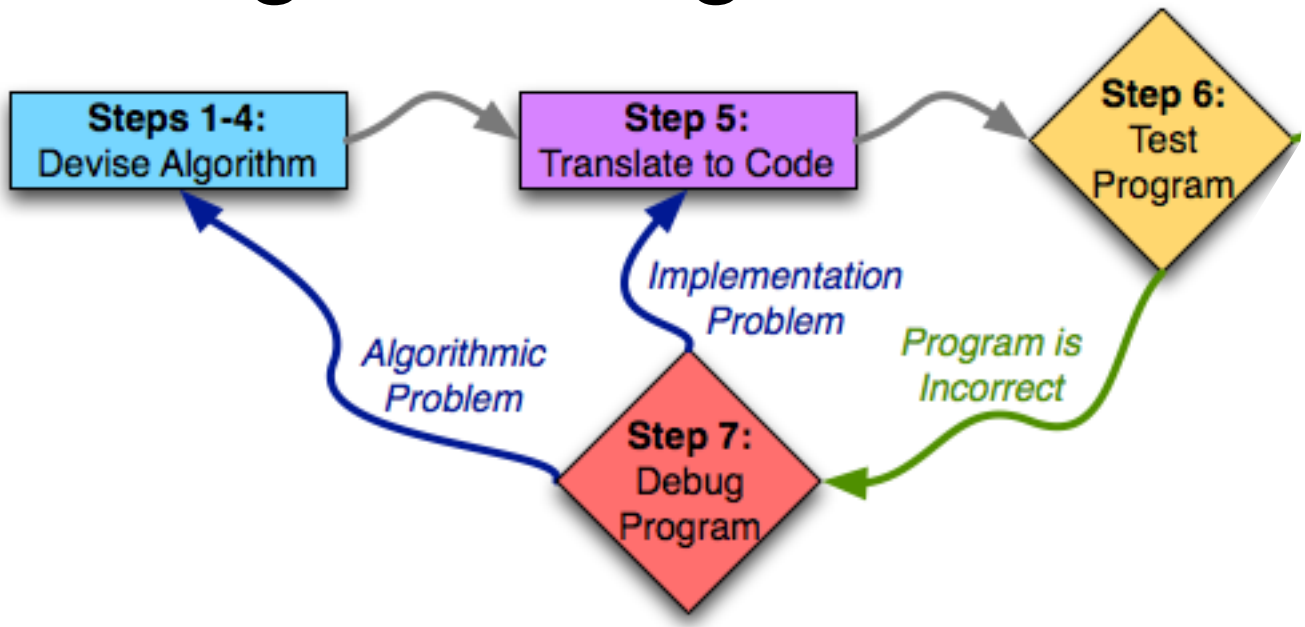
- After devising the algorithm, translate to code
  - Plan first, then code
  - Bridge analogy: blue prints, then construction
  - Essay analogy: outline, then prose

The Seven Steps
Programming Process: High-level



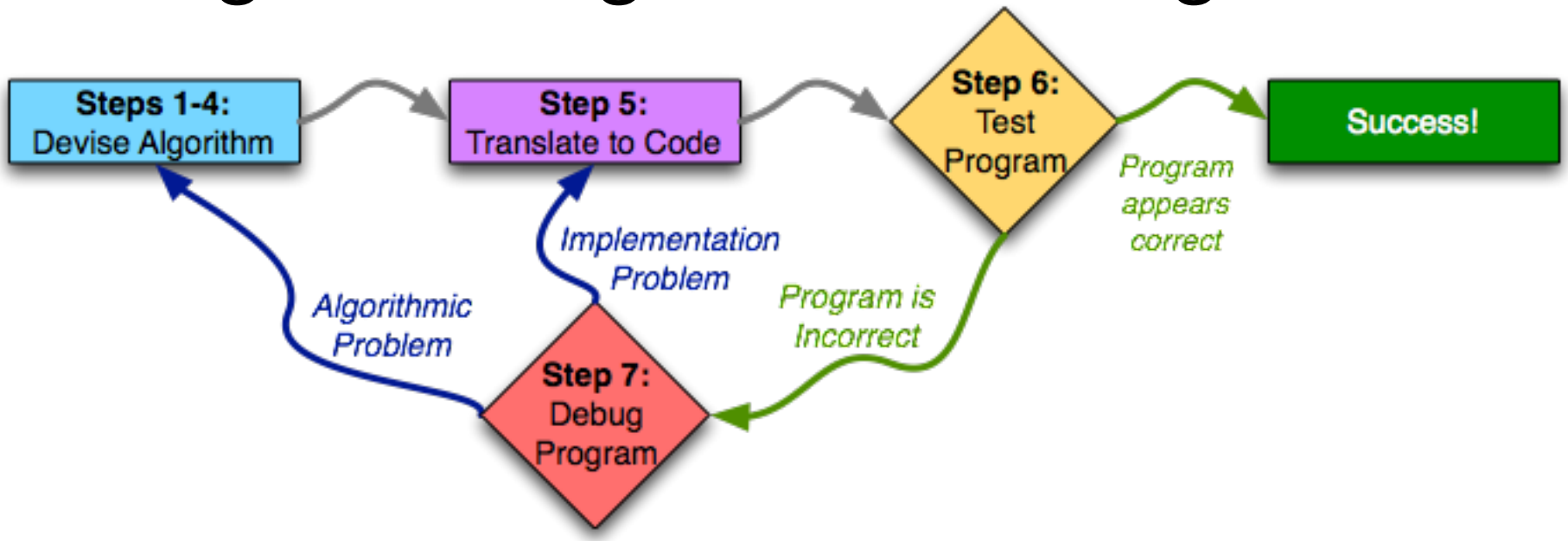
- Next test our program
  - Testing important, often under-taught skill

The Seven Steps
Programming Process: High-level



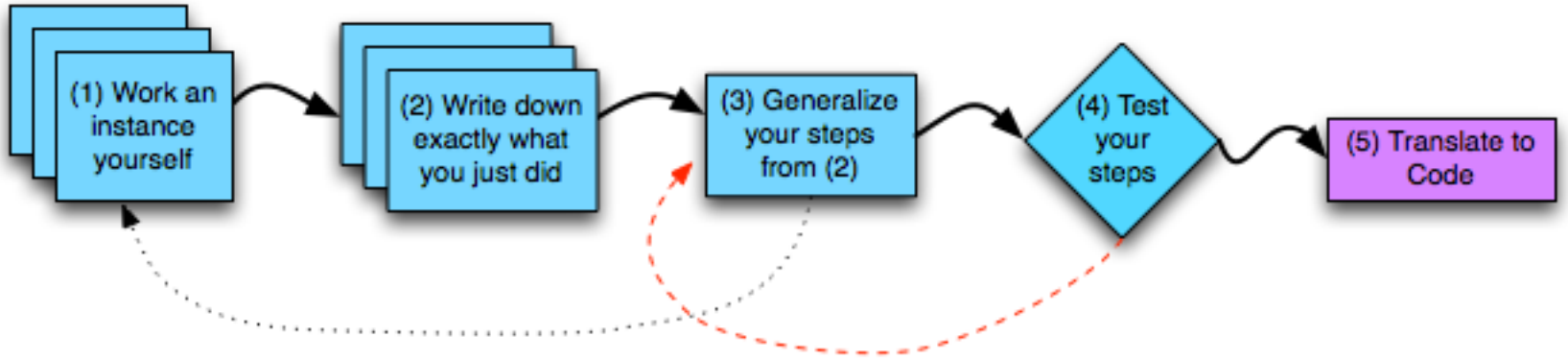
- Ideally would be correct first time; may need to debug
  - Identify problem (with science!)
  - Return to appropriate prior step to fix the problem

The Seven Steps
Programming Process: High-level



- Work through cycle until program works

Steps 1—4: Devise Algorithm



- **Steps 1—4: devise the algorithm**
  - Learn to do this well, be an excellent programmer
  - Language: does not matter

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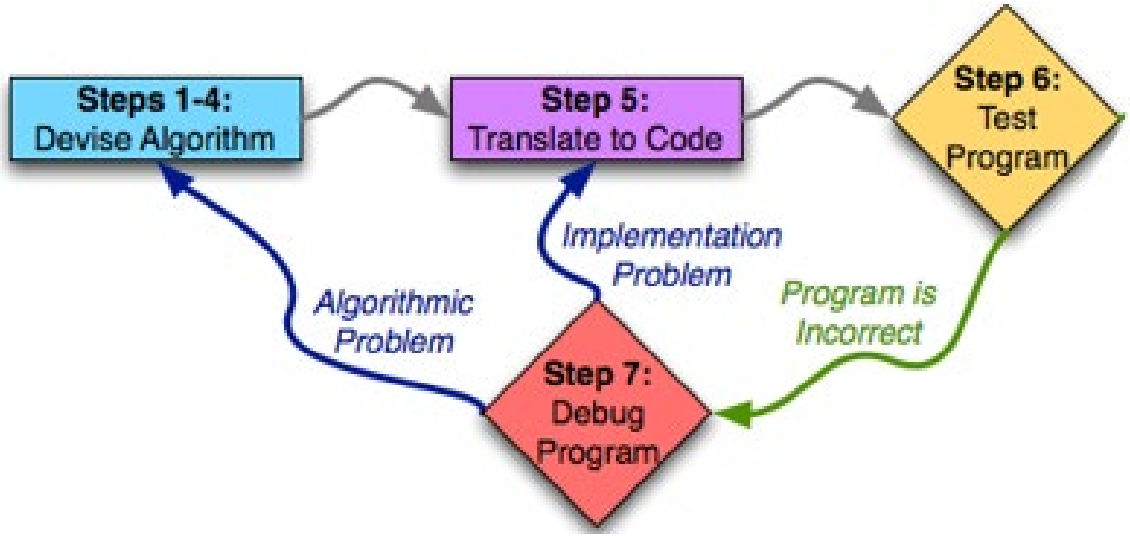
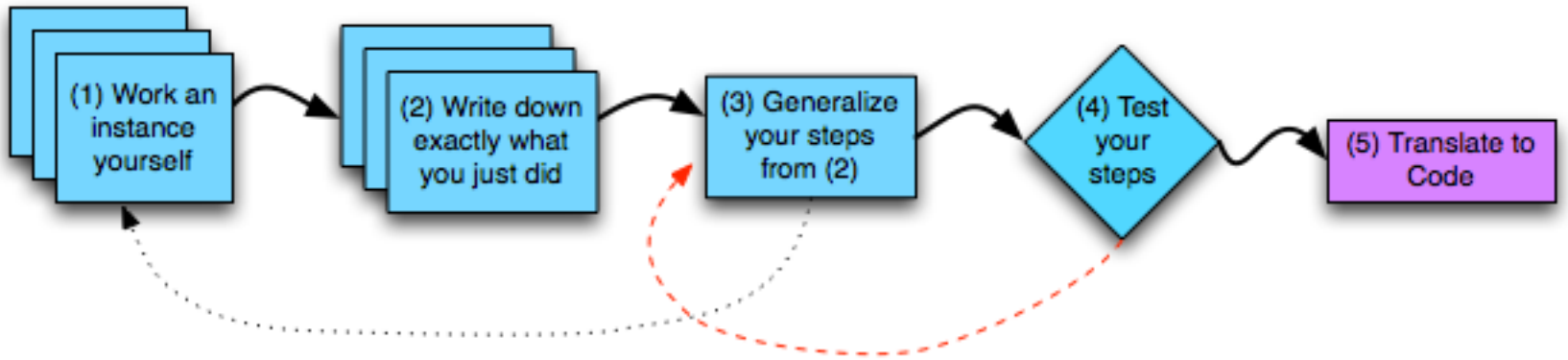
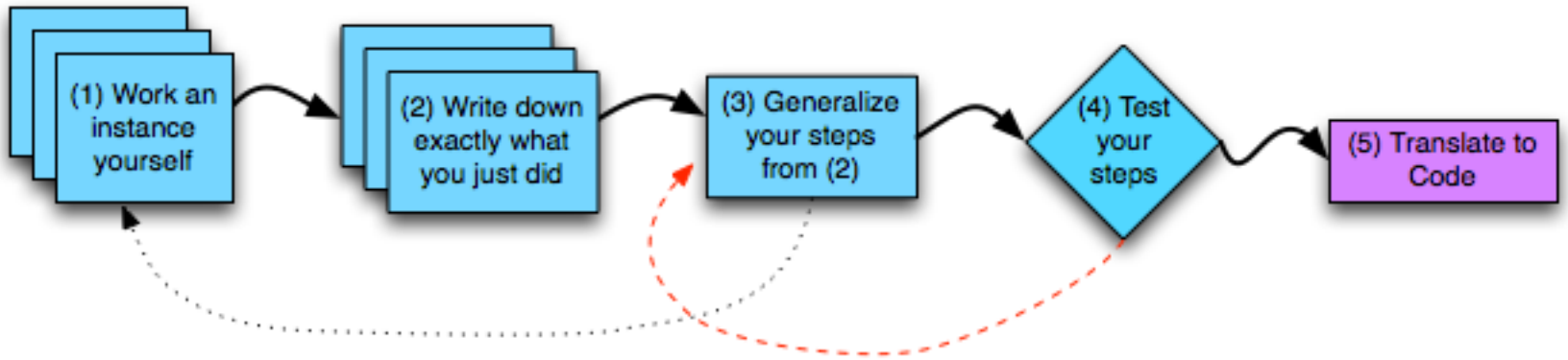


Steps 1—4: Example: Calculate the average of two numbers



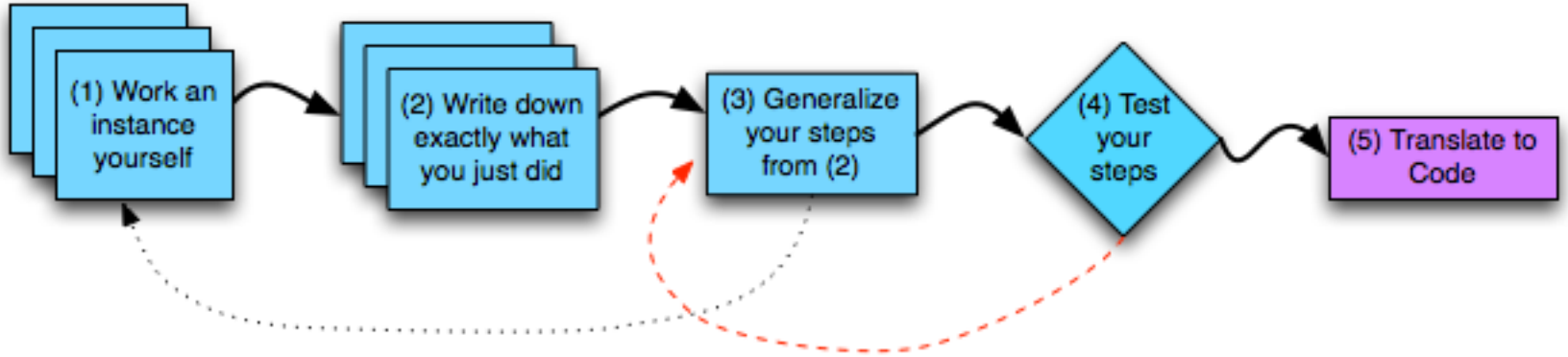
- Step 1: 2 + 5 = 7, 7/2 = 3.5
- Step 2:
  - Add 2 + 5 and get 7
  - Divide 7 by 2 and the result is 3.5

Steps 1—4: Example: Calculate the average of two numbers



- Step 3:
  - Two variables num1 and num2
  - Add the two numbers together:
    result is num1 + num2
  - Divide the result by 2 and you have the answer
    answer is result / 2

Steps 1—4: Example: Calculate the average of two numbers

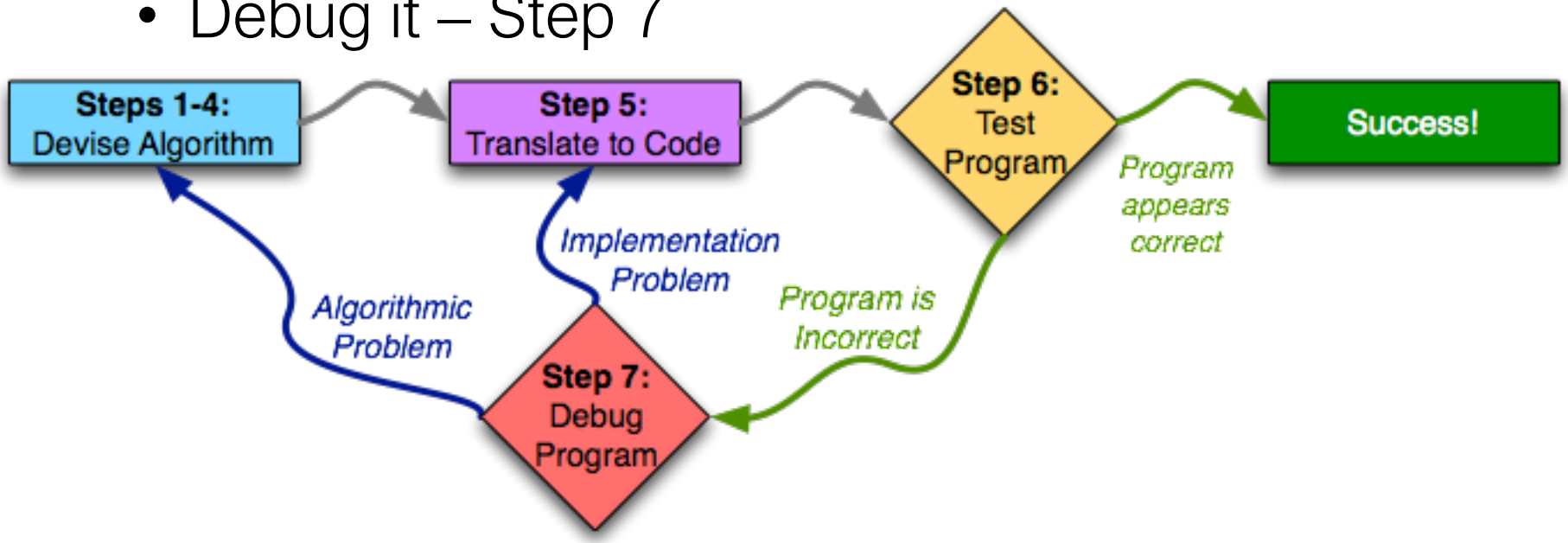


- Step 4: Try a different example
  - Use 8 and 6, num1 is 8, num2 is 6
  - Add the two numbers together:

    result is num1 + num2 , is 14
  - Divide the result by 2 and you have the answer
    - Answer is result/2, which is 7
- IT WORKS!

Step 5: let's convert it to code!

- Go to Pycharm
- We will also:
  - Test it – Step 6
  - Debug it – Step 7



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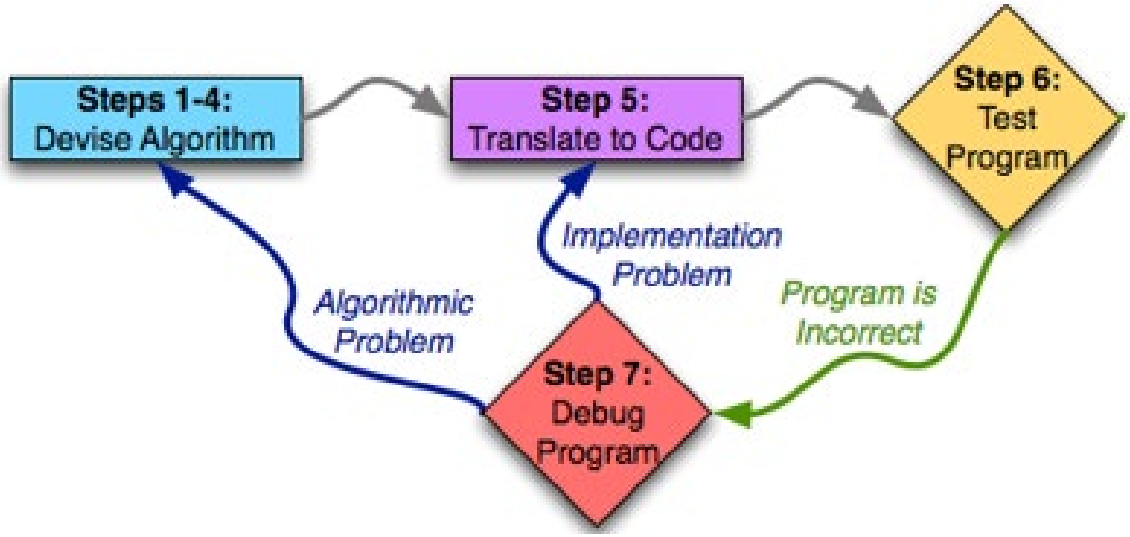

APT: Write a Python Function

- We def(ine) functions in Python
  - Use indentation to create body of the function
  - Calling function is different than writing function

```
def inch2centi(inches):
    return 2.54*inches

length = inch2centi(72)
```

```
def pluralize(word):
    return word + "es"

word = pluralize("fish")
```

Understanding Execution

- **Using PythonTutor:** http://pythontutor.com
  - How are functions defined?
  - Where does execution begin?
  - What is the global frame?
  - What is a local/function frame?