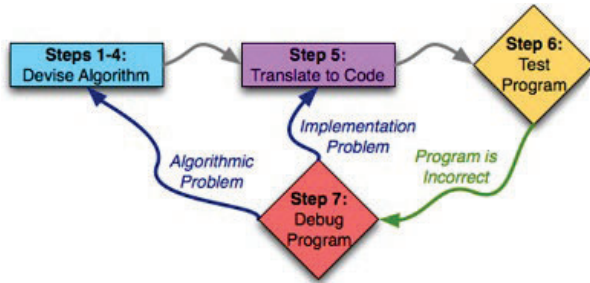


Compsci 101

7-Steps

Part 1 of 3

Susan Rodger
January 28, 2021



Join Duke Mailing lists compsci@duke.edu

- Mailing list about
 - Jobs, internships, research positions
 - Events related to computer science
- How to join:
 - Go to: lists.duke.edu
 - Be sure to authenticate
 - Add compsci@duke.edu
- 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

Steps 1-4:
Devise Algorithm

- 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

Steps 1-4:
Devise Algorithm



Step 5:
Translate to Code

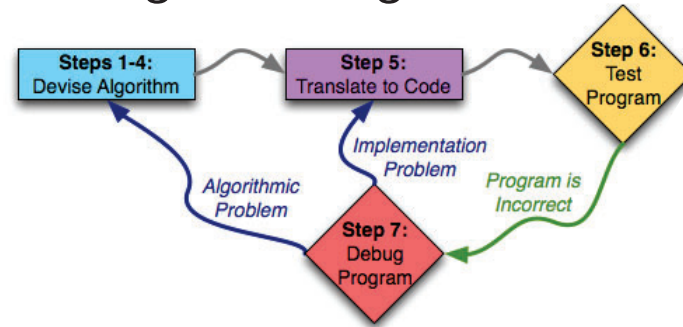
- After devising the algorithm, translate to code
 - Plan first, then code
 - Bridge analogy: blue prints, then construction
 - Essay analogy: outline, then prose

The Seven Steps Programming Process: High-level



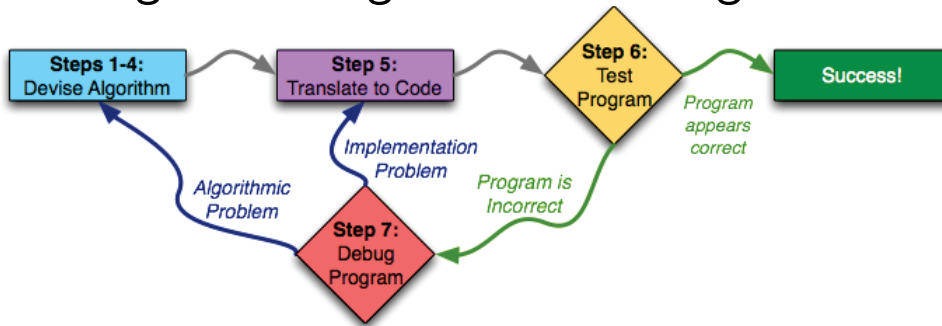
- Next test our program
- Testing important, often under-taught skill

The Seven Steps Programming Process: High-level



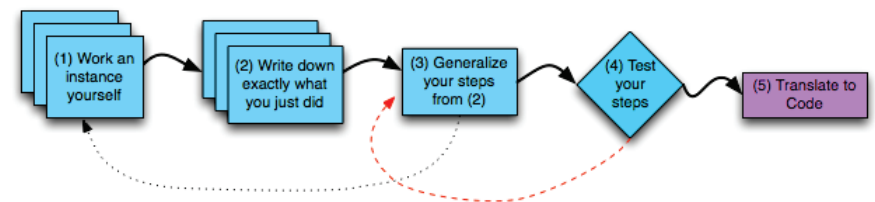
- Ideally would be correct first time; may need to debug
 - Identify problem (with science!)
 - Return to appropriate prior step to fix the problem

The Seven Steps Programming Process: High-level



- Work through cycle until program works

Steps 1—4: Devise Algorithm



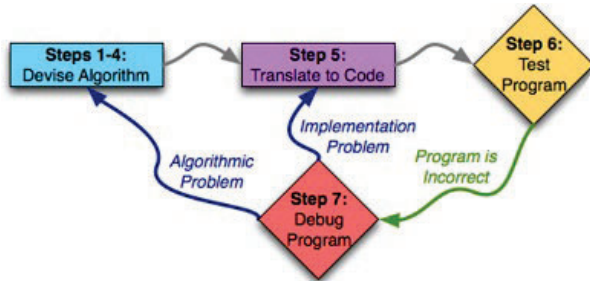
- Steps 1—4: devise the algorithm
 - Learn to do this well, be an excellent programmer
 - Language: does not matter

Compsci 101

7-Steps

Part 2 of 3

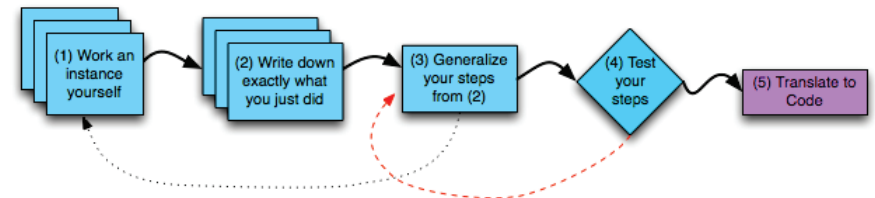
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Steps 1—4: Example: Calculate the average of two numbers

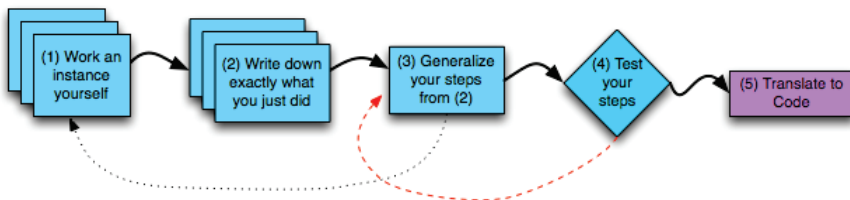


- Step 1: $2 + 5 = 7$, $7/2 = 3.5$
- Step 2:
 - Add $2 + 5$ and get 7
 - Divide 7 by 2 and the result is 3.5

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

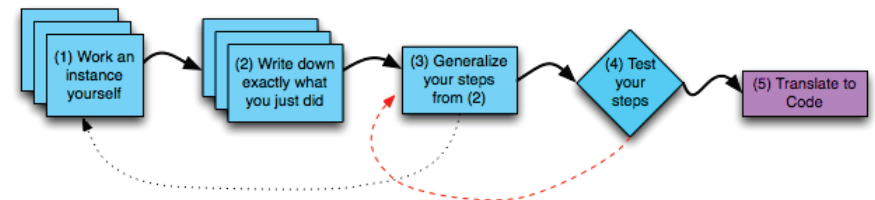


- Step 3:
 - Two variables num1 and num2
 - Add the two numbers together:
result is $\text{num1} + \text{num2}$
 - Divide the result by 2 and you have the answer
answer is $\text{result} / 2$

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



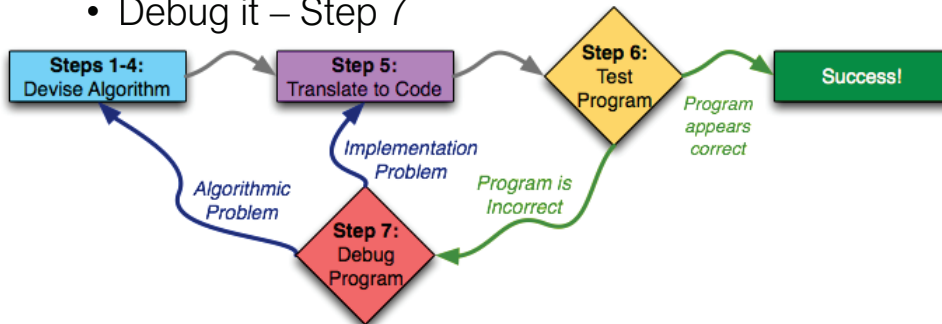
- Step 4: Try a different example
 - Use 8 and 6, num1 is 8, num2 is 6
 - Add the two numbers together:
result is $\text{num1} + \text{num2}$, is 14
 - Divide the result by 2 and you have the answer
– Answer is $\text{result}/2$, which is 7
- **IT WORKS!**

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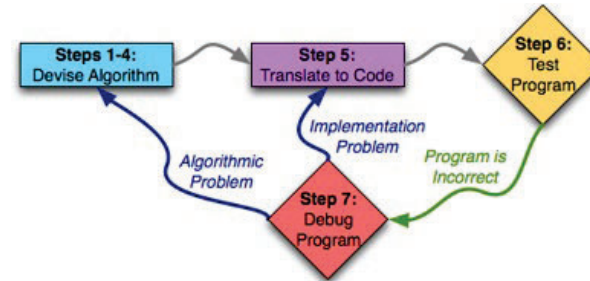
Step 5: let's convert it to code!

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



Compsci 101 7-Steps Part 3 of 3

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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?