How to develop a program

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Program development methodology: English first, then Python

1. Define the problem
2. Decide upon an algorithm
3. Translate it into code

Try to do these steps in order
Program development methodology: English first, then Python

1. Define the problem
   1. Write an English description of the input and output
   2. Do not give details about how you will compute the input and output
   3. Create test cases
      - Input and expected output

2. Decide upon an algorithm

3. Translate it into code

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Program development methodology:
English first, then Python

1. Define the problem

2. Decide upon an algorithm
   1. Implement it in English
      • Write the recipe or step-by-step instructions
   2. Test it using paper and pencil
      • Use small but not trivial test cases
      • Play computer, animating the algorithm
      • Be introspective
         – Notice what you really do
         – May be more or less than what you wrote down
         – Make the algorithm more precise

3. Translate it into code

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3. Translate it into code
   1. Implement it in Python
      • Decompose it into logical units (functions)
      • For each function:
         – Name it (important and difficult!)
         – Write its documentation string
         – Write its code
   2. Test it

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– It’s OK (even common) to back up to a previous step when you notice a problem
– You are incrementally learning about the problem, the algorithm, and the code
– “Iterative development”
The *Wishful Thinking* approach to implementing a function

- If you are not sure how to implement one part of your function, define a **helper function** that does that task
  - “I wish I knew how to do task X”
  - Give it a name and assume that it works
  - Complete the implementation of your function
  - Later, implement the helper function
  - The helper function should have a *simpler/smaller task*

- Can you test the original function?
  - Yes, by using a **stub** for the helper function
  - Often a lookup table: works for only 5 inputs, crashes otherwise