Developing "Bigger" Programs

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Objectives

■ To design and implement methods using stepwise refinement (§6.10)

Writing Bigger Programs

- Several simple but effective techniques, thus far,
 - 1. Compile often and test often and thoroughly
 - 2. Trace the program
 - 3. Use debug messages
 - 4. Step-wise refinement using methods
 - Demonstrated a few times before, let's look at it again

Stepwise Refinement

- The concept of method abstraction can be applied to the process of developing programs.
- When writing a large program, you can use the "divide and conquer" strategy, also known as stepwise refinement, to decompose it into subproblems.
- The subproblems can be further decomposed into smaller, more manageable problems

Implementation: Top-Down

- Top-down approach is to implement one method in the structure chart at a time from the top to the bottom.
- Stubs can be used for the methods waiting to be implemented.
- A stub is a simple but incomplete version of a method.
- The use of stubs enables you to test invoking the method from a caller.
- Implement the main method first and then use a stub for a method.

Implementation: Bottom-Up

- Bottom-up approach is to implement one method in the structure chart at a time from the bottom to the top.
- For each method implemented, write a test program to test it.
- Both top-down and bottom-up methods are fine.
- Both approaches implement the methods incrementally and help to isolate programming errors and makes debugging easy.
- They can be used together.

Benefits of Stepwise Refinement

- Simpler Program
- Reusing Methods
- Easier Developing, Debugging, and Testing
- Better Facilitating Teamwork

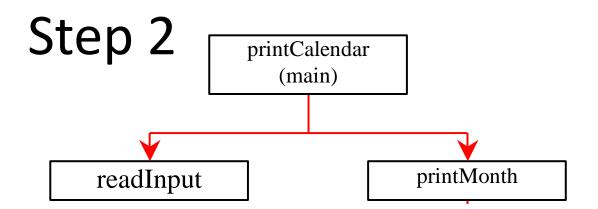
Problem. Generate and Print Calendar

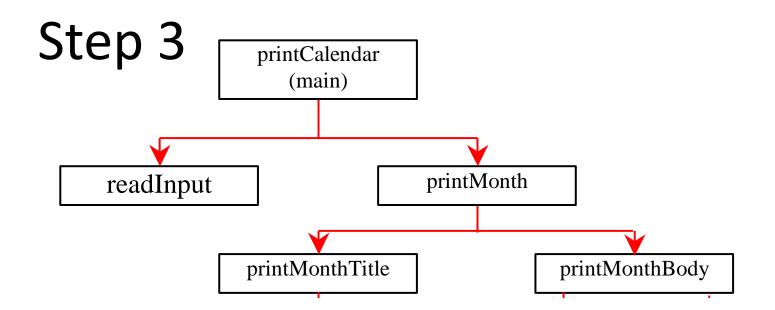
```
Command Prompt
C:\book>java PrintCalendar
Enter full year (e.g., 2001): 2009
Enter month in number between 1 and 12: 4
        April 2009
Sun Mon Tue Wed Thu Fri Sat
  5 6 7 8 9 10
 12 13 14 15 16 17 18
 19 20 21 22 23 24 25
 26 27 28 29 30
C:\book>_
```

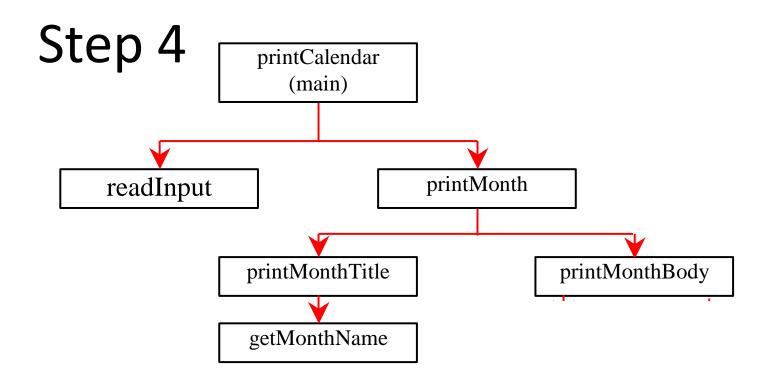
Step 1

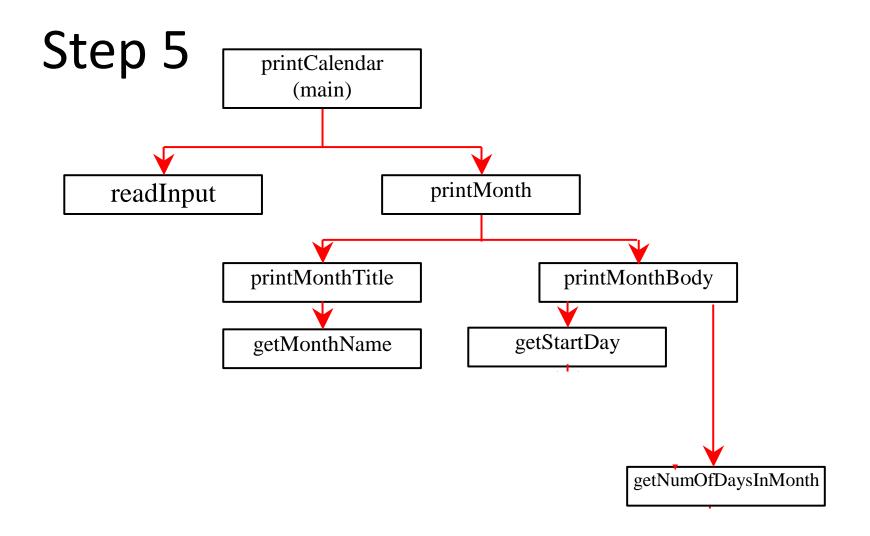
printCalendar (main)

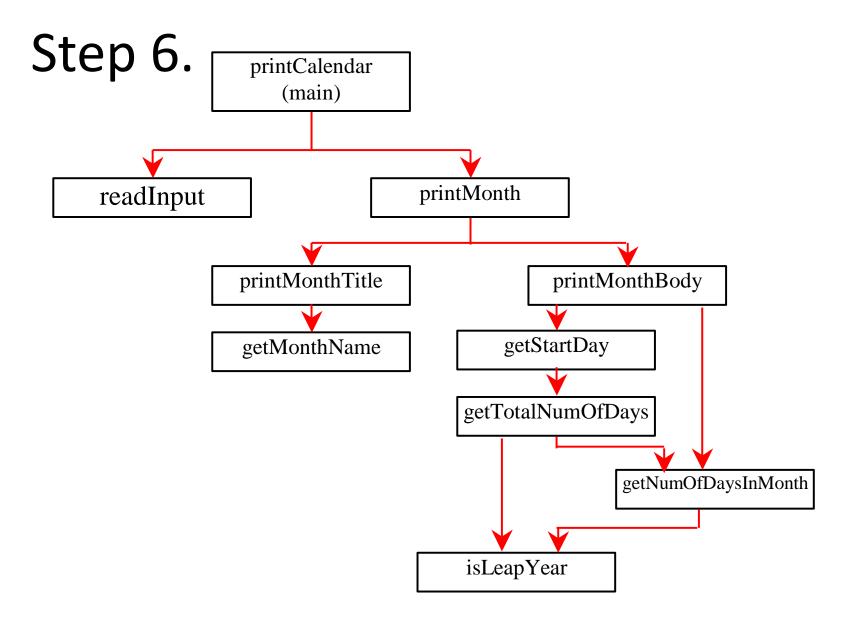
- Using stub methods as we go
- Implement one method at time from top to bottom; if unclear, use the bottom-up approach to understand possible solution











Questions