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.

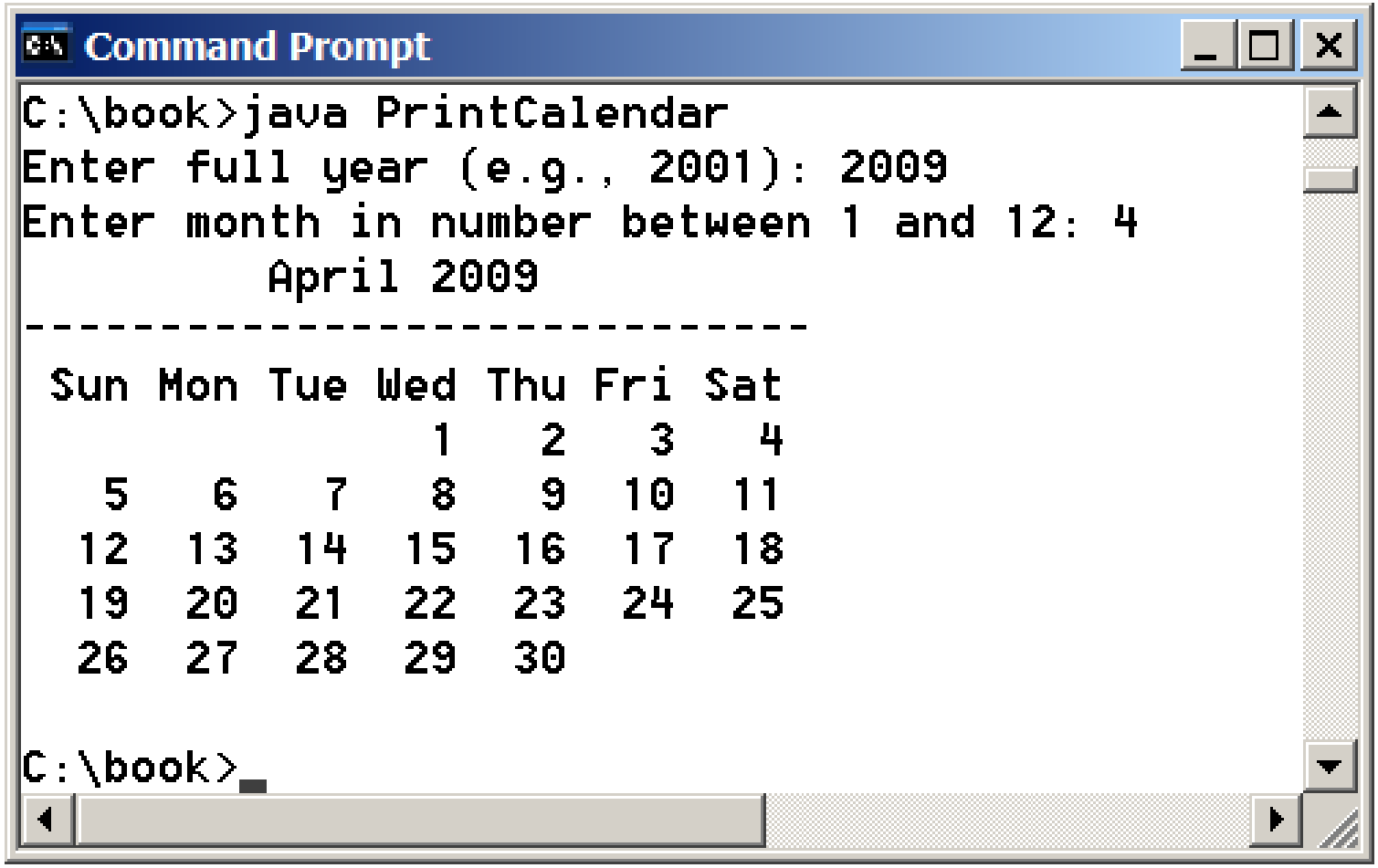
Implementation: Bottom-Up

- 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.

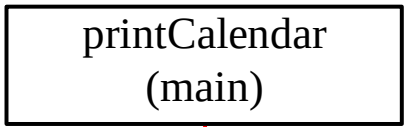
Benefits of Stepwise Refinement

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

Problem. Generate and Print Calendar

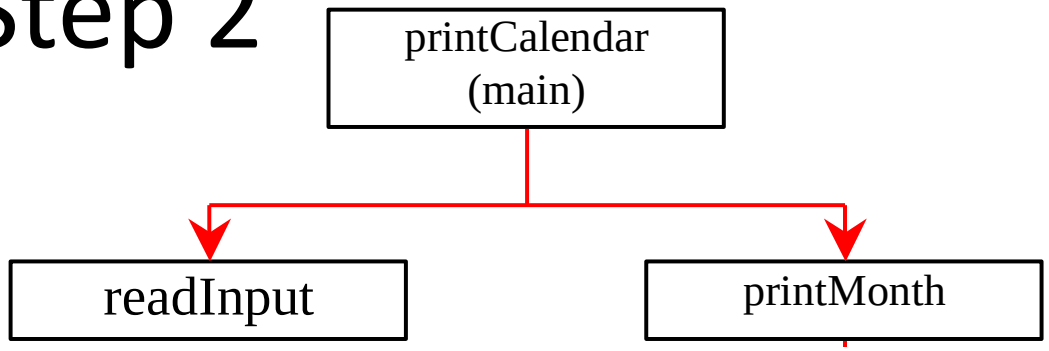


Step 1

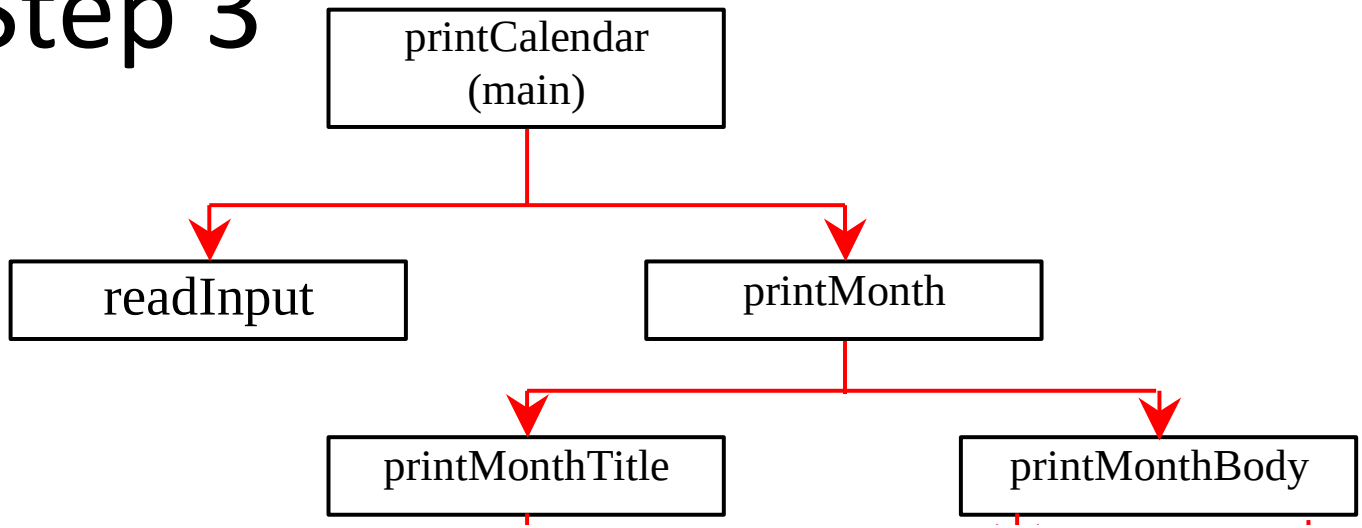


- Using stub methods as we go
- Implement one method at time from top to bottom; if unclear, use the bottom-up approach to understand possible solution

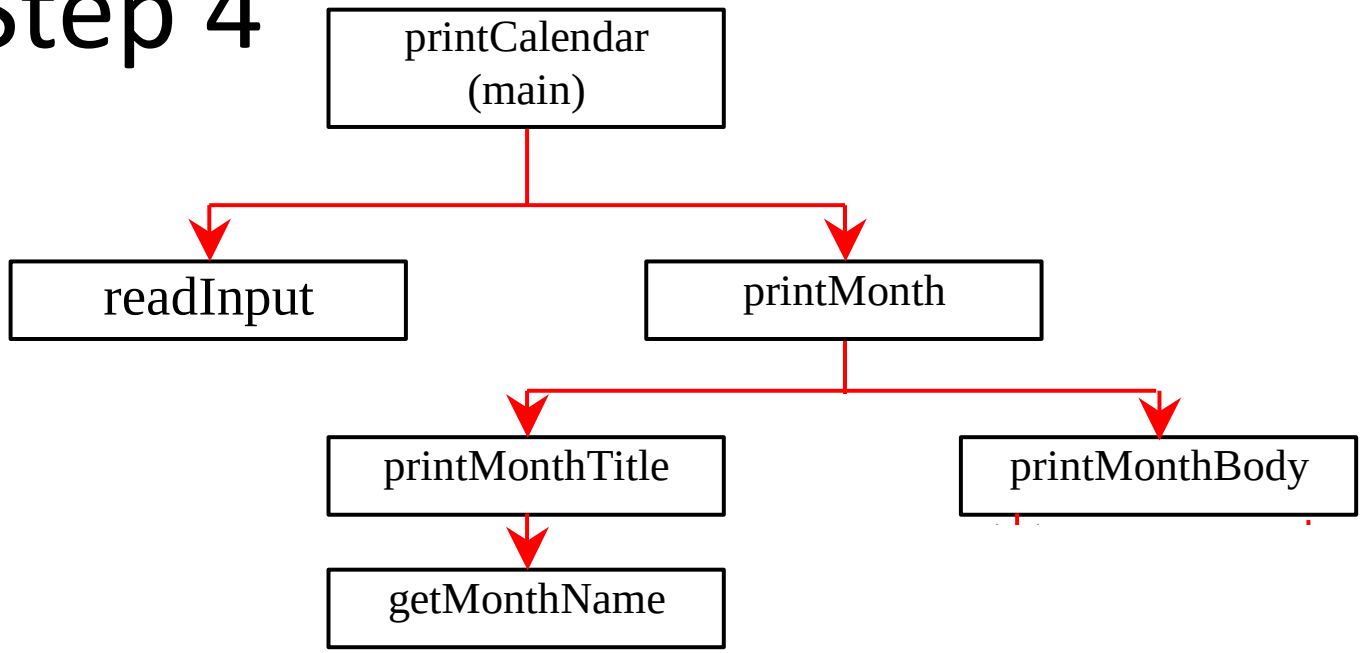
Step 2



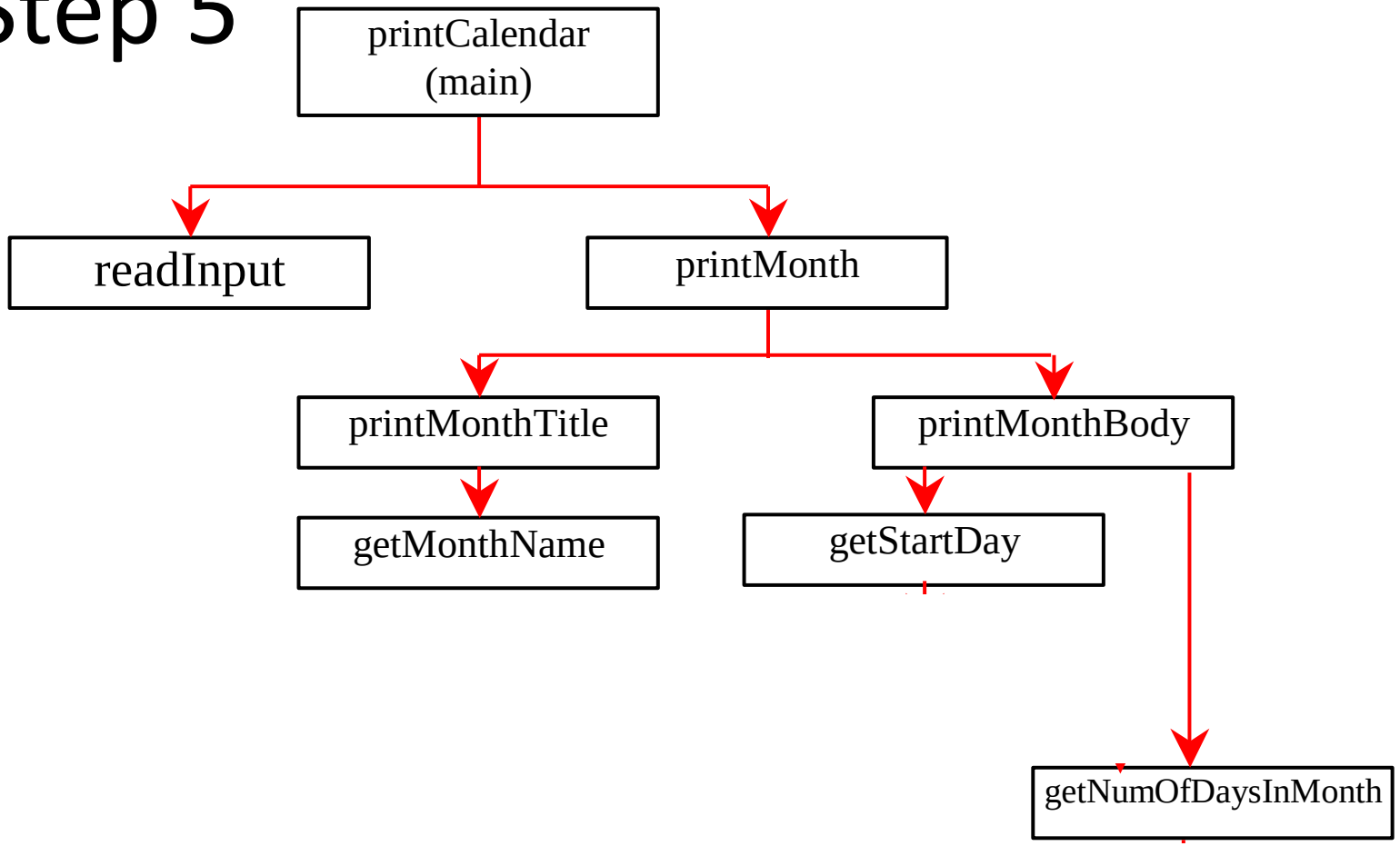
Step 3


printCalendar
(main)
readInput
printMonth
printMonthTitle
printMonthBody

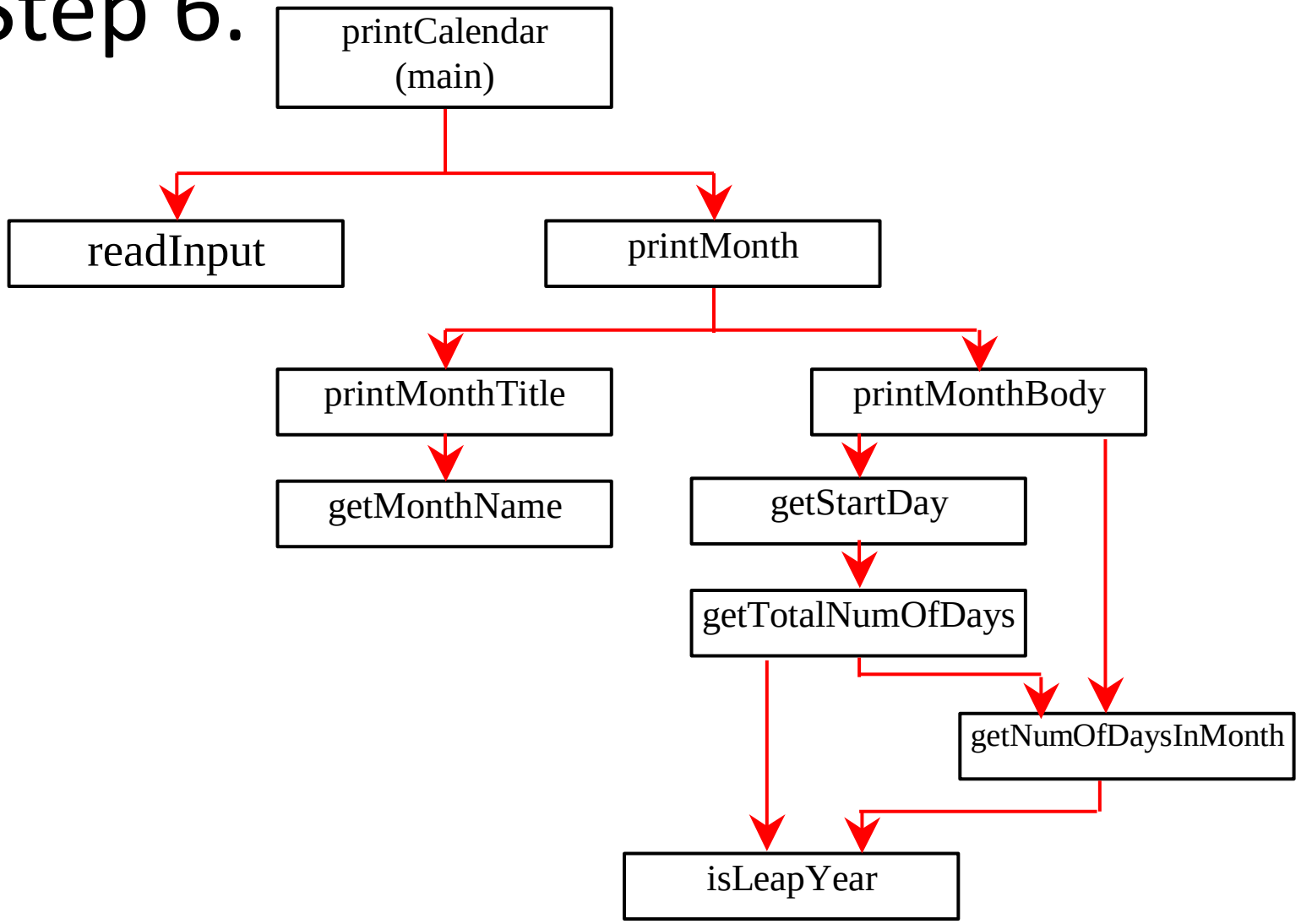
Step 4


printCalendar
(main)
readInput
printMonth
printMonthTitle
printMonthBody
getMonthName

Step 5


printCalendar
(main)
readInput
printMonth
printMonthTitle
printMonthBody
getMonthName
getStartDay
getNumOfDaysInMonth

Step 6.


printCalendar
(main)
readInput
printMonth
printMonthTitle
printMonthBody
getMonthName
getStartDay
getTotalNumOfDays
getNumOfDaysInMonth
isLeapYear

Questions