6. Recursion

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Review

Functions

Function Definition

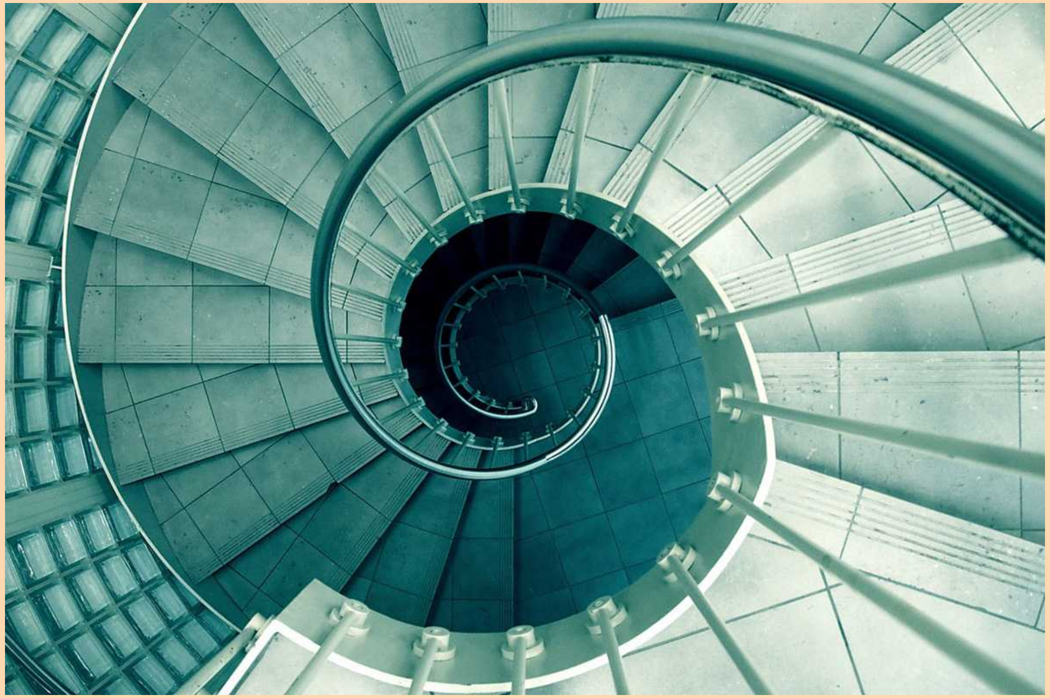
Function Declaration

Arrays as Parameters

Pass by Value

Overview

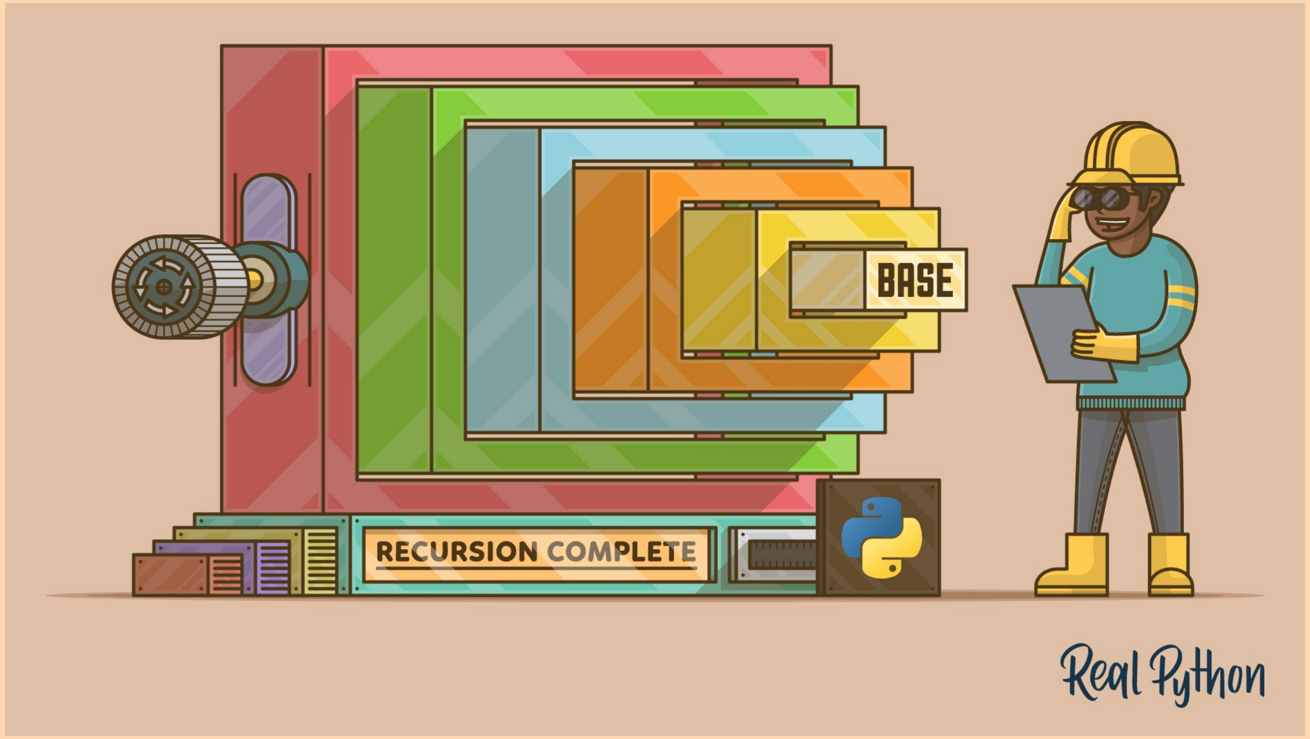
Recursive Functions (Recursion)



A function that calls itself.

Thinking Recursively

Solving a task by first solving its smaller subtasks



It will be a loooong way to go to master recursion!!!

Thinking Recursively

You want to solve a task and suppose you have the Mirror.

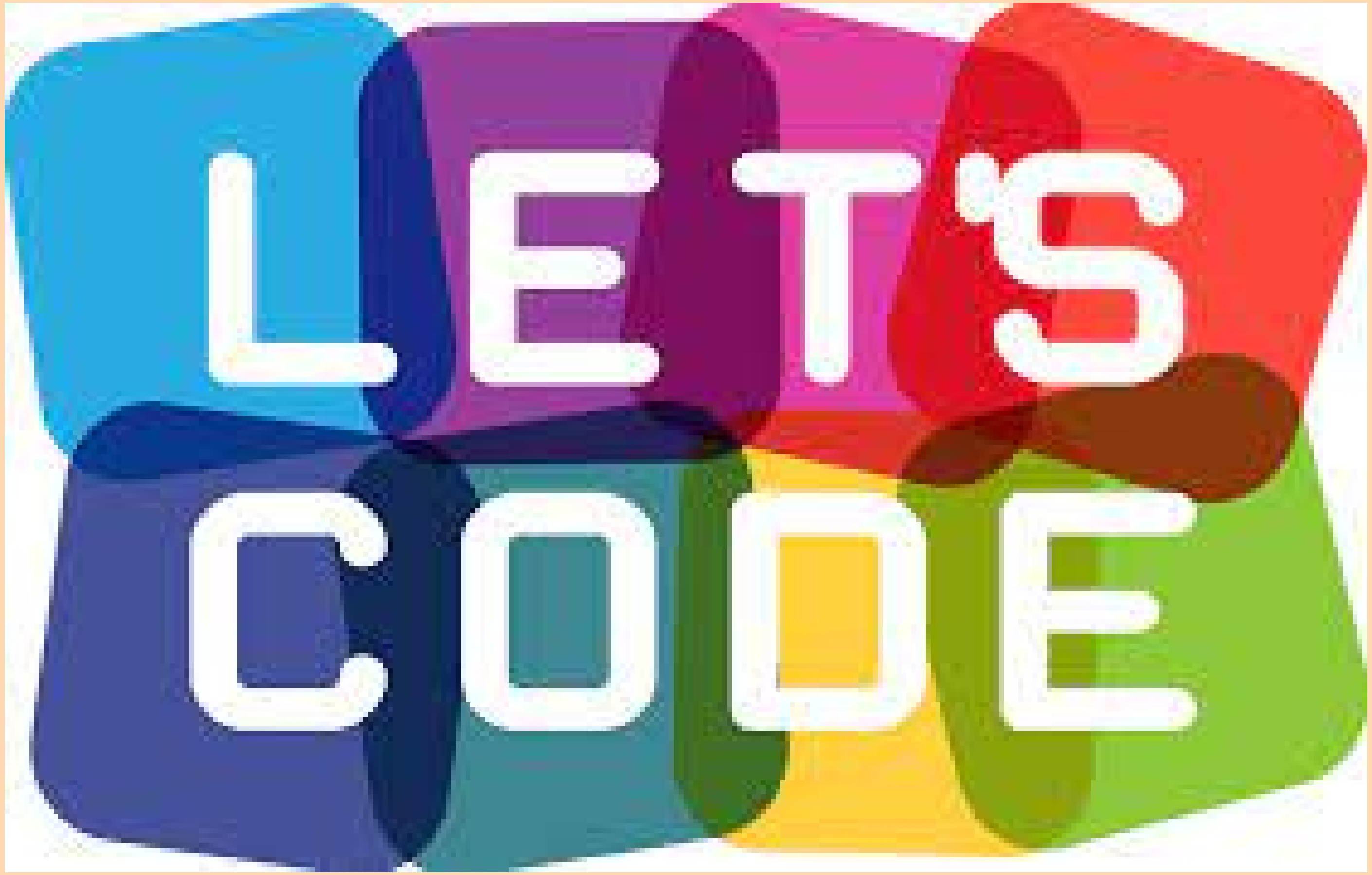
Ask the Mirror Right Questions

Thinking Recursively

- What is a smaller task? (⋆ ⋆ ⋆ ⋆ ⋆)
- How to solve the task given the solution to the smaller one? (⋆ ⋆ ⋆)
- What is the smallest task? (⋆)

Thinking like a Computer

min.c



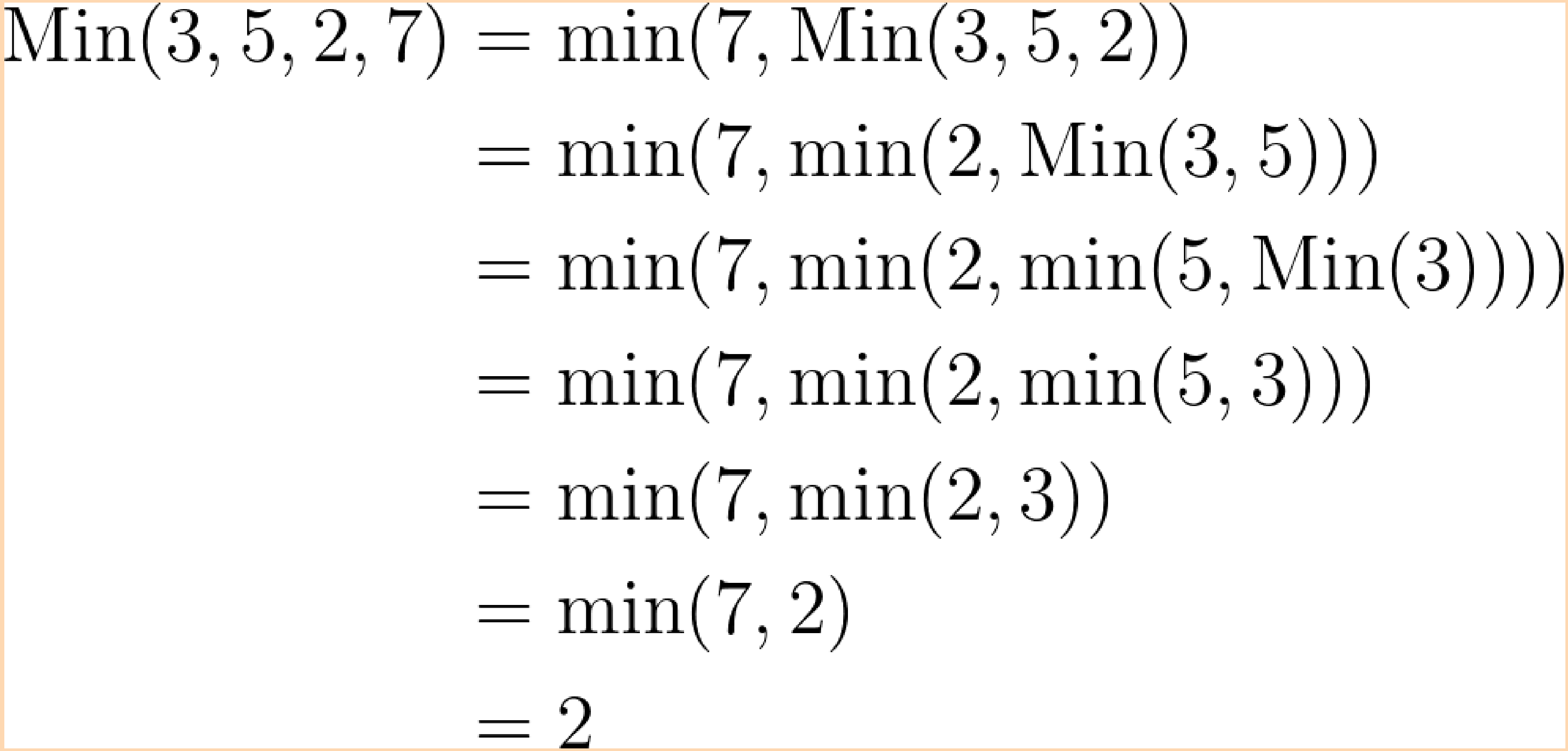
min-re.c sum-re.c fib-re.c gcd-re.c

bsearch-re.c ~~mergesort.c~~

Min (min-re.c)

Ask the Mirror Right Questions

Min (min-re.c)



$$\begin{aligned}\mathrm{Min}(3,5,2,7) &= \min(7, \mathrm{Min}(3,5,2))\\ &= \min(7, \min(2, \mathrm{Min}(3,5)))\\ &= \min(7, \min(2, \min(5, \mathrm{Min}(3))))\\ &= \min(7, \min(2, \min(5, 3)))\\ &= \min(7, \min(2, 3))\\ &= \min(7, 2)\\ &= 2\end{aligned}$$

Sum (sum-re.c)

Ask the Mirror Right Questions

Sum (sum-re.c)

Fibonacci Sequence (fib-re.c)

$$F_0 = 1$$

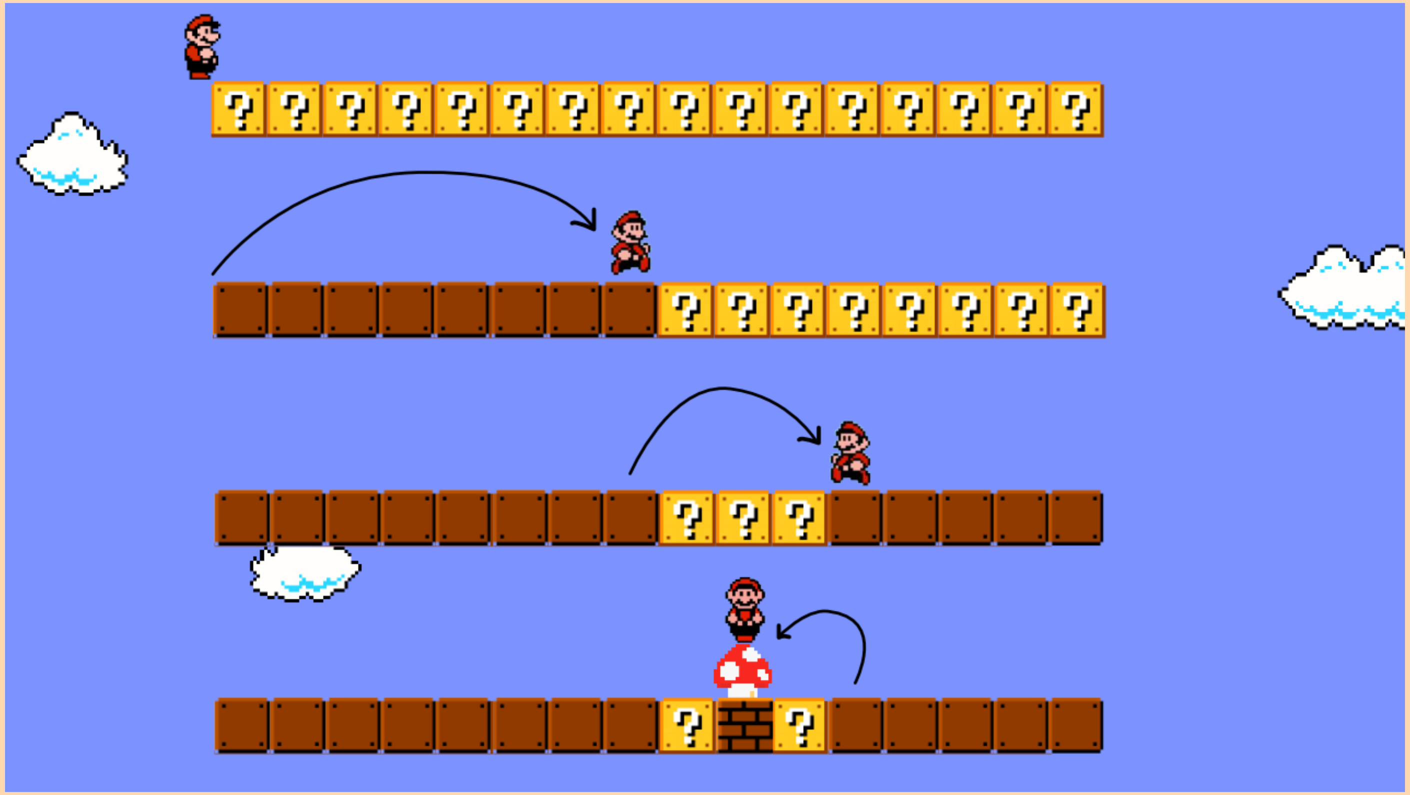
$$F_1 = 1$$

$$F_n = F_{n-1} + F_{n-2} \quad (n > 1)$$

Greatest Common Divisor (gcd-re.c)

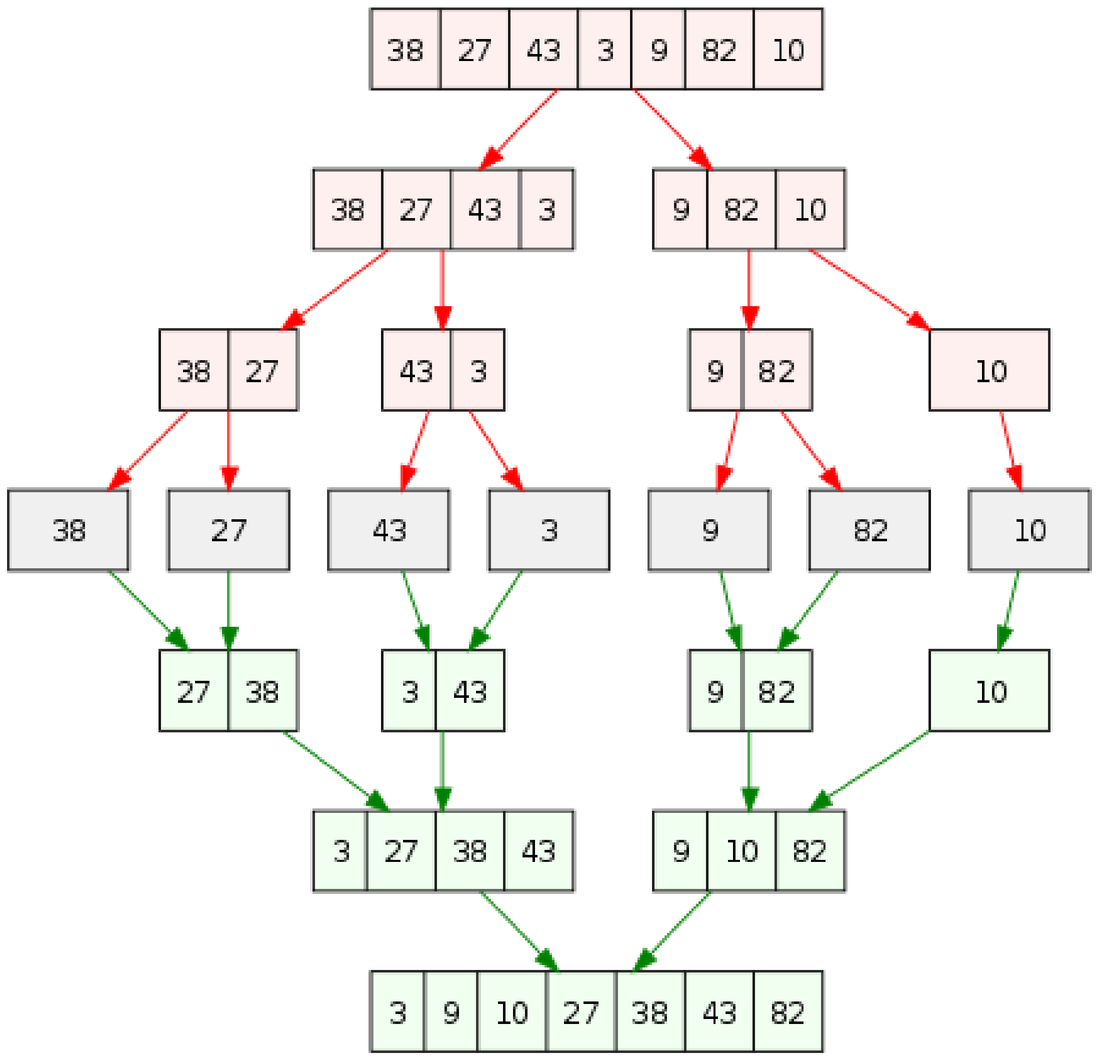
$$\mathrm{gcd}(a, b) = \mathrm{gcd}(b, a \,\%\, b)$$

Binary Search (bsearch-re.c)

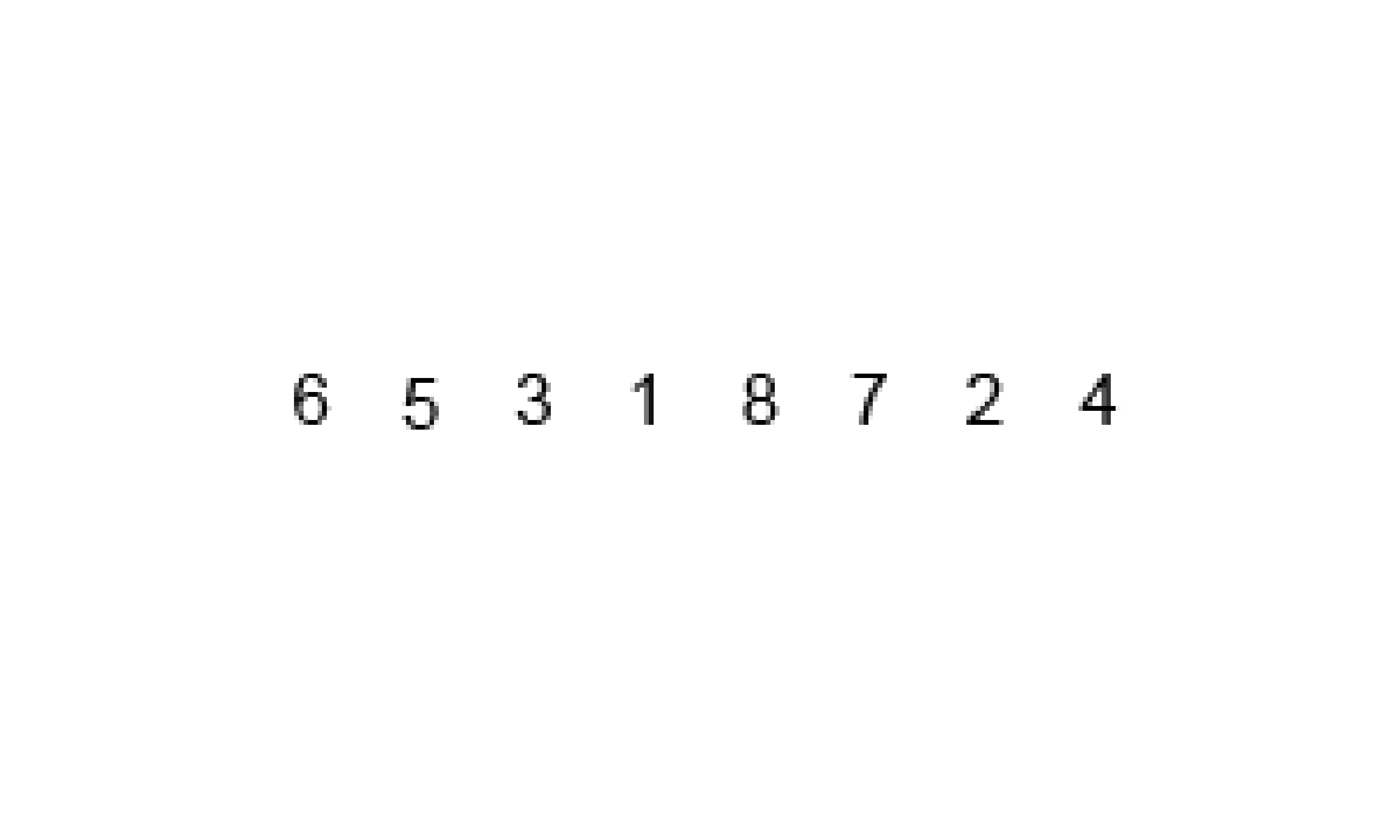


You should do sth. first to obtain the smaller task.

MergeSort (mergesort.c)



MergeSort (mergesort.c)



SEE
YOU
NEXT
WEEK