6. Recursion

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Review

Functions

Function Definition

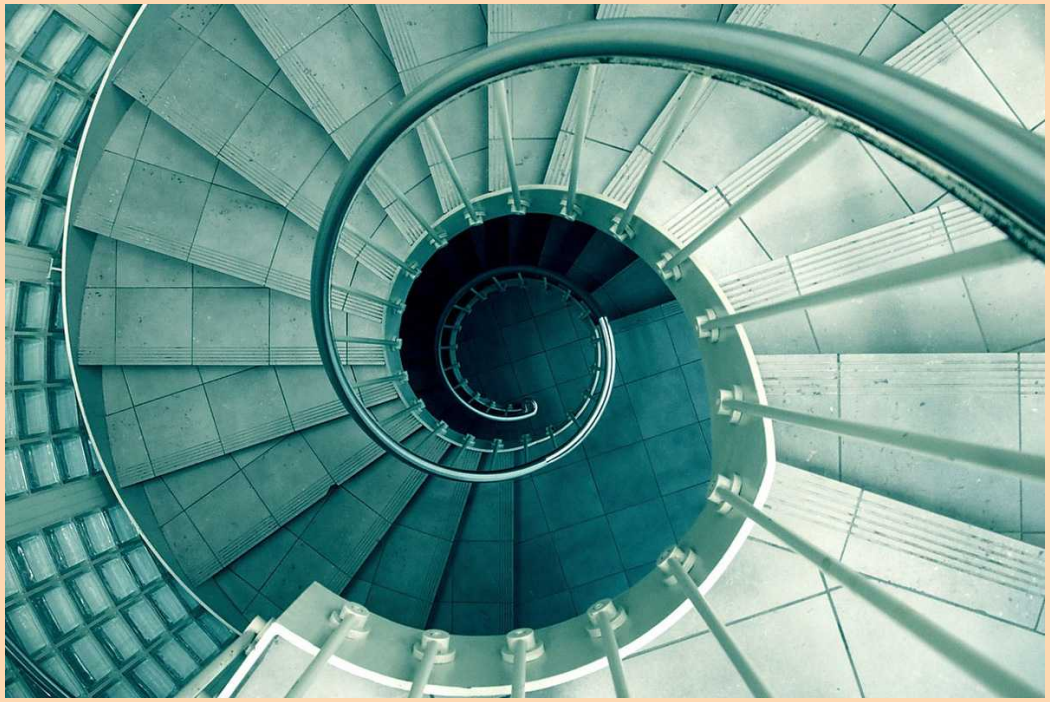
Function Declaration

Arrays as Parameters

Pass by Value

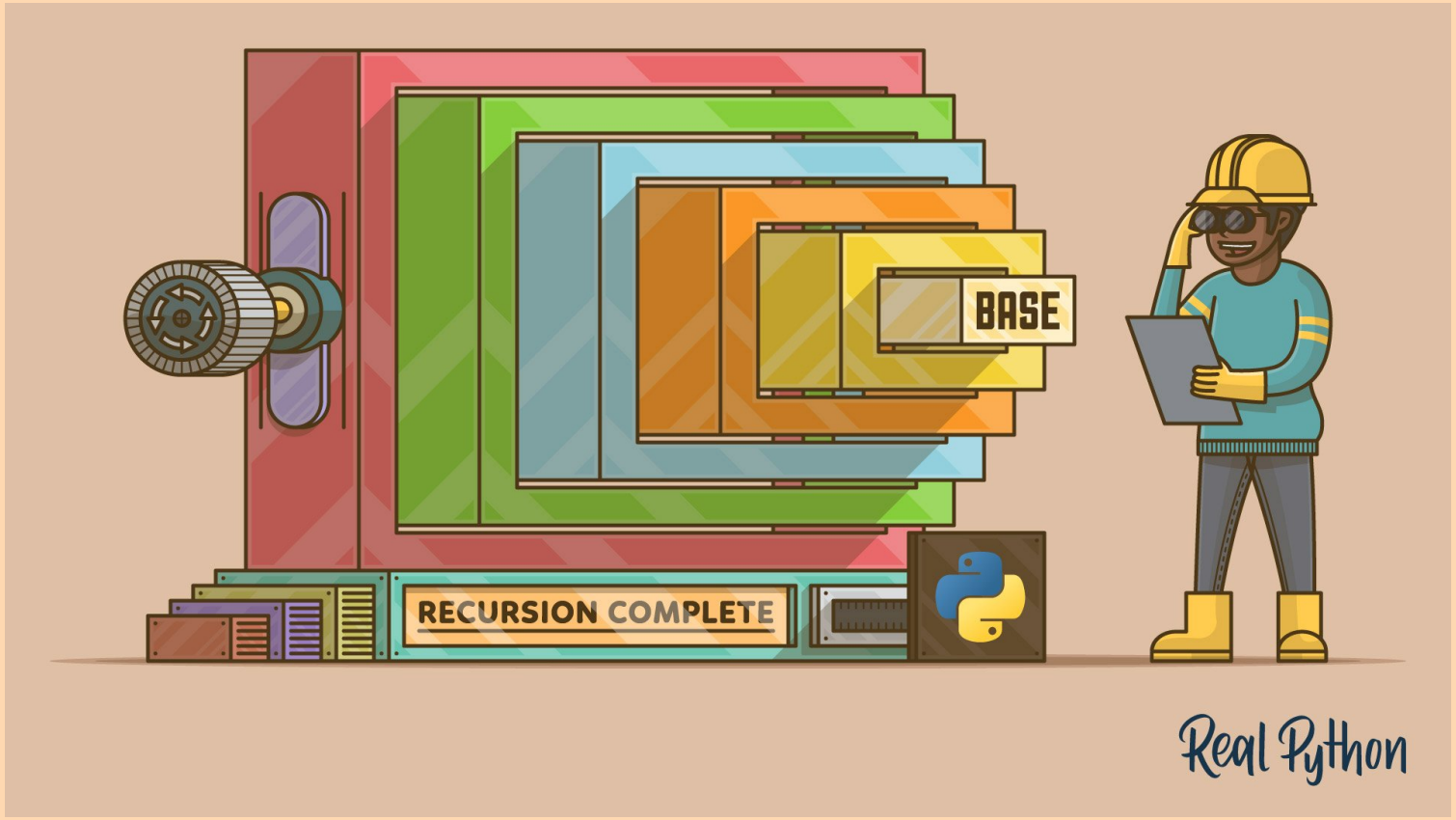
Overview

Recursive Functions (Recursion)



A function that calls itself.

Thinking Recursively



It is a loooong way to go to master recursion!!!

Thinking Recursively

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

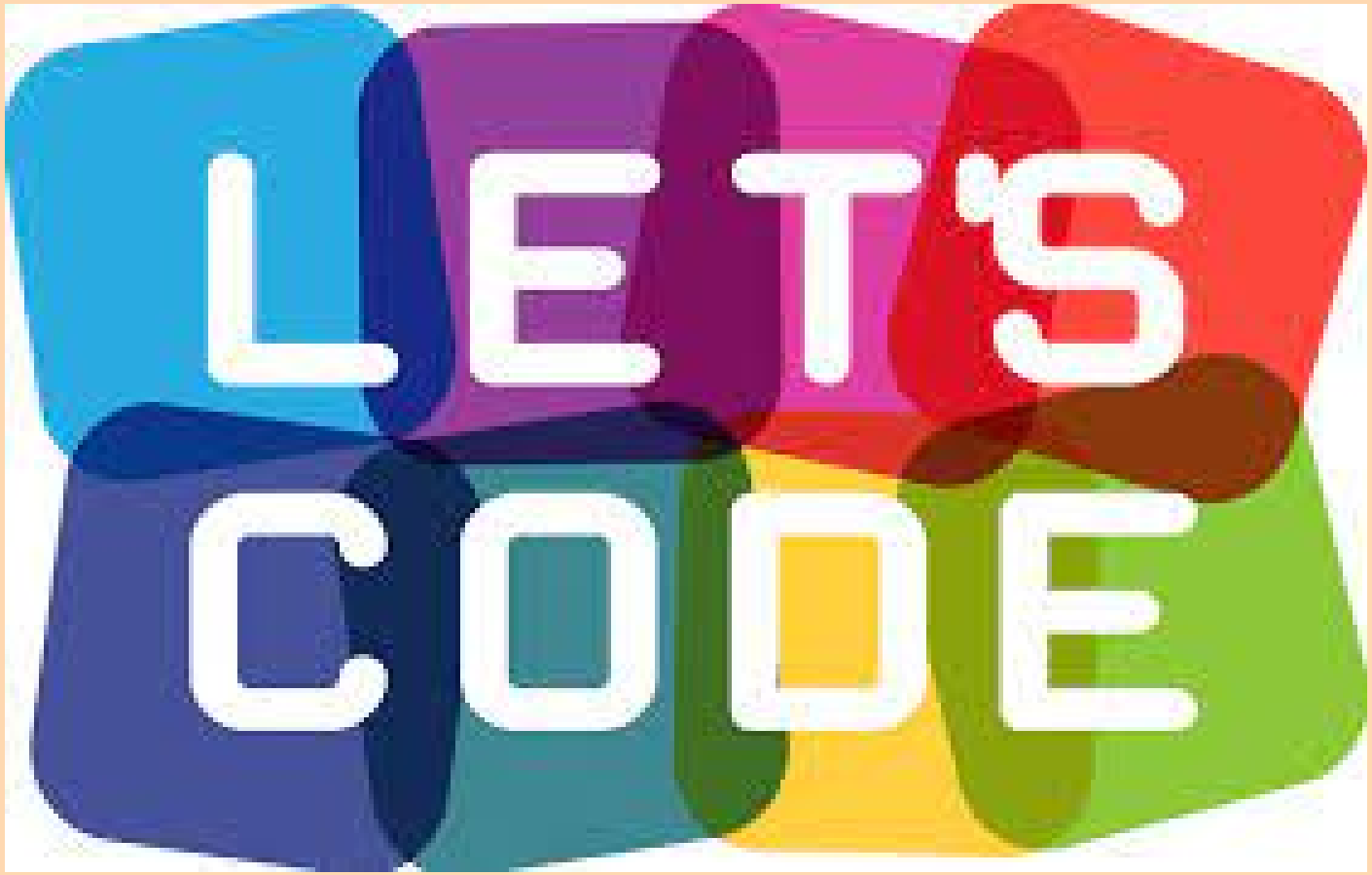
Ask the Mirror Right Questions

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)

$$
\begin{aligned}
\mathrm{Sum}(1,3,5,7) &= 7 + \mathrm{Sum}(1,3,5) \\
&= 7 + (5 + \mathrm{Sum}(1,3)) \\
&= 7 + (5 + (3 + \mathrm{Sum}(1))) \\
&= 7 + (5 + (3 + 1)) \\
&= 7 + (5 + 4) \\
&= 7 + 9 \\
&= 16
\end{aligned}
$$

Fibonacci Sequence (fib-re.c)

$$F_0 = 1$$

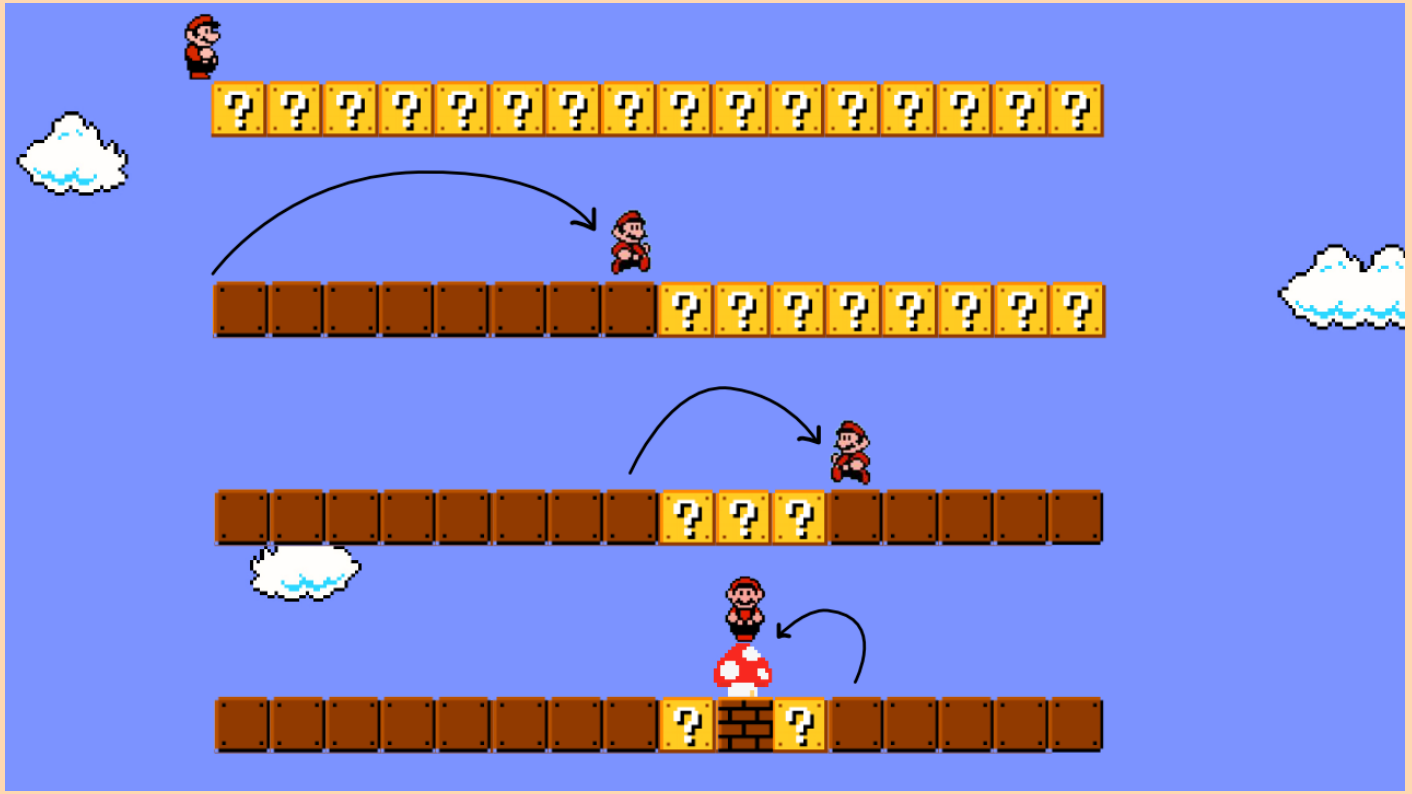
$$F_1 = 1$$

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

Greatest Common Divisor (gcd-re.c)

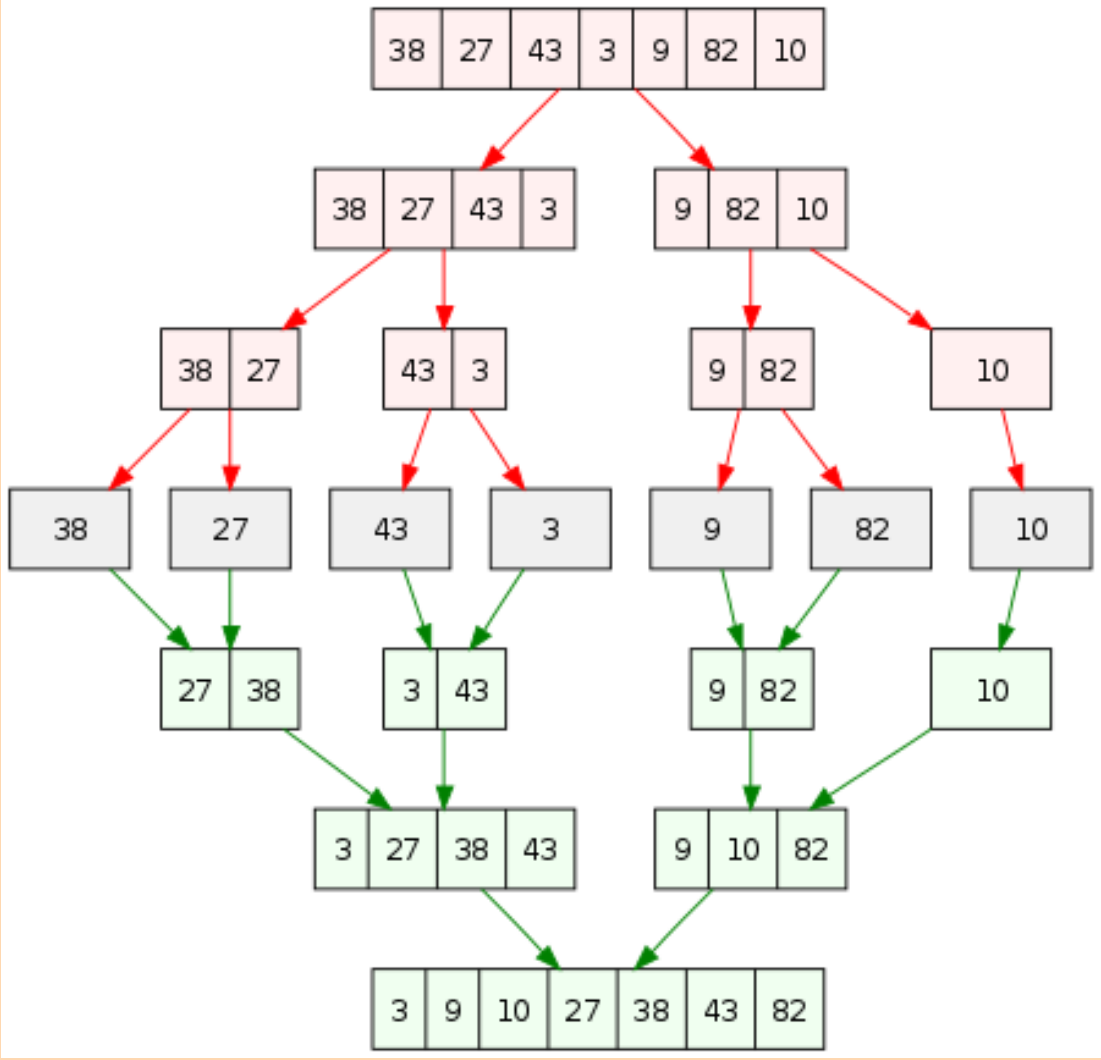
$$\gcd(a, b) = \gcd(b, a \,\%\, b)$$

Binary Search (bsearch-re.c)

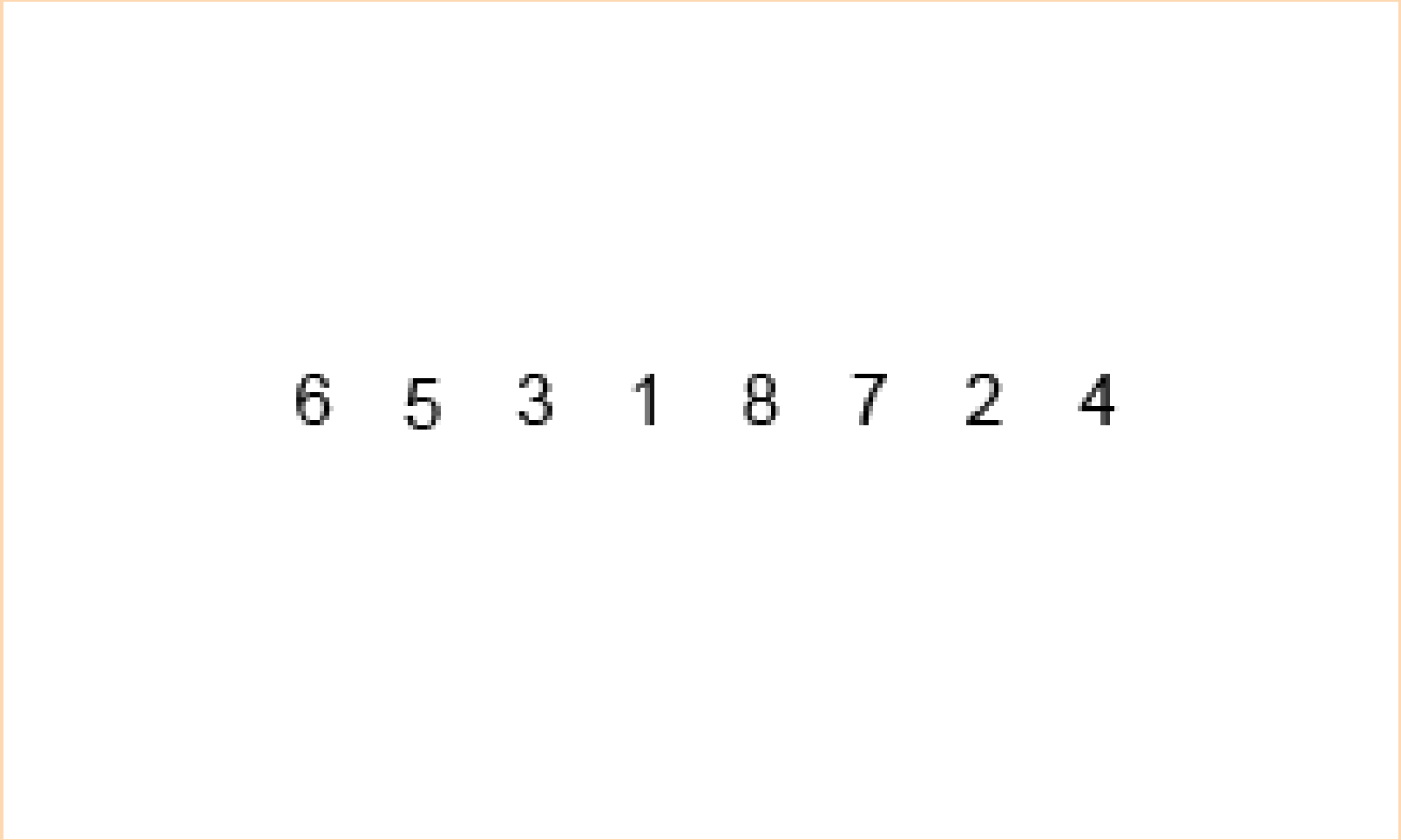


You should do sth. first to obtain the smaller task.

MergeSort (mergesort.c)



MergeSort (mergesort.c)




SEE
YOU
NEXT
WEEK