13. Recursion

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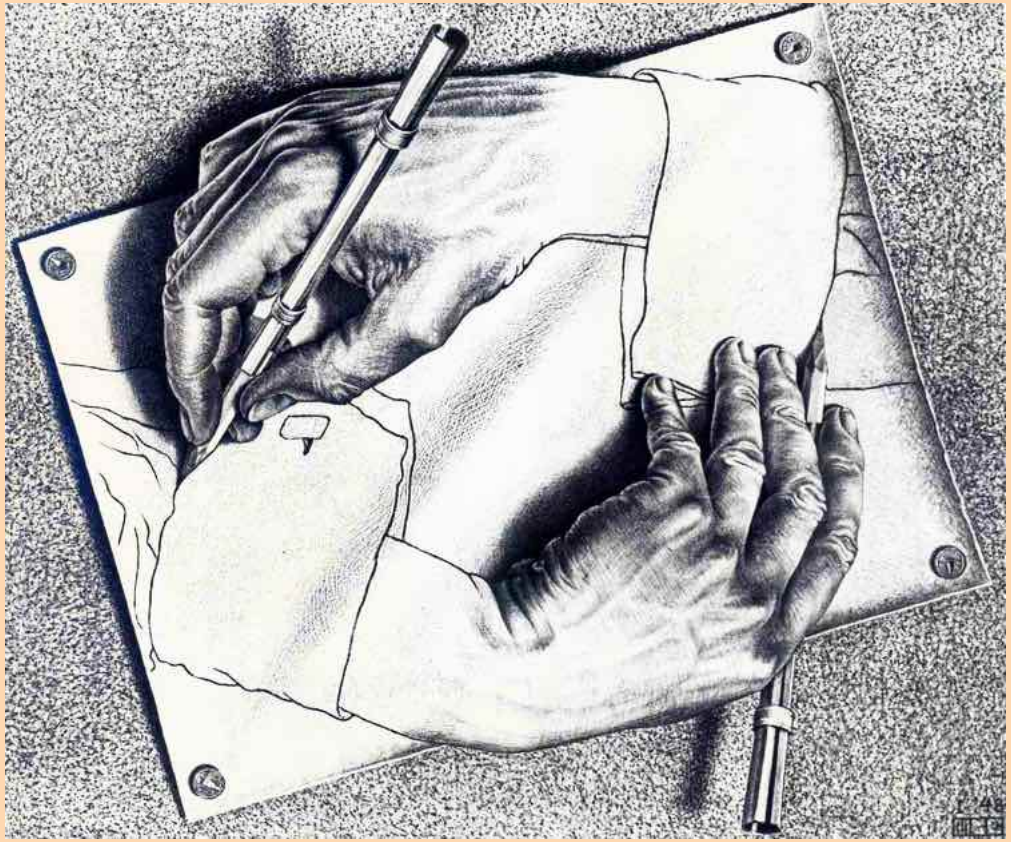
Recursive Functions (Recursion)



A function that calls itself (min-re.c).

(1) Thinking like a Computer Scientist

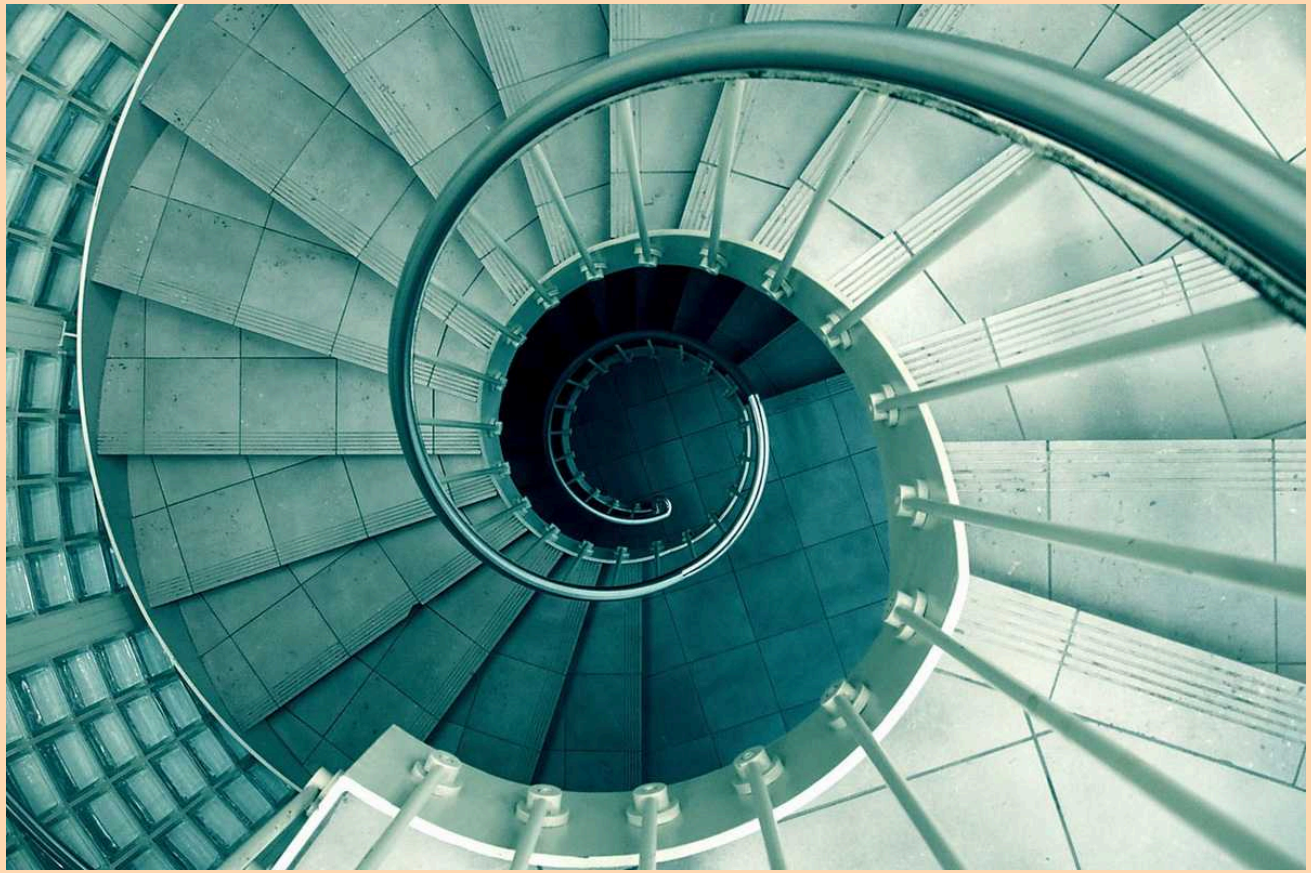
You have a problem and suppose you have the Mirror.

The Mirror can solve smaller sub-problems for you magically.

(1) Thinking like a Computer Scientist

- How to reduce the original problem into smaller sub-problems?
- How to solve the original problem given the solutions to the smaller sub-problems?

What are the smaller sub-problems? (★★★★★)

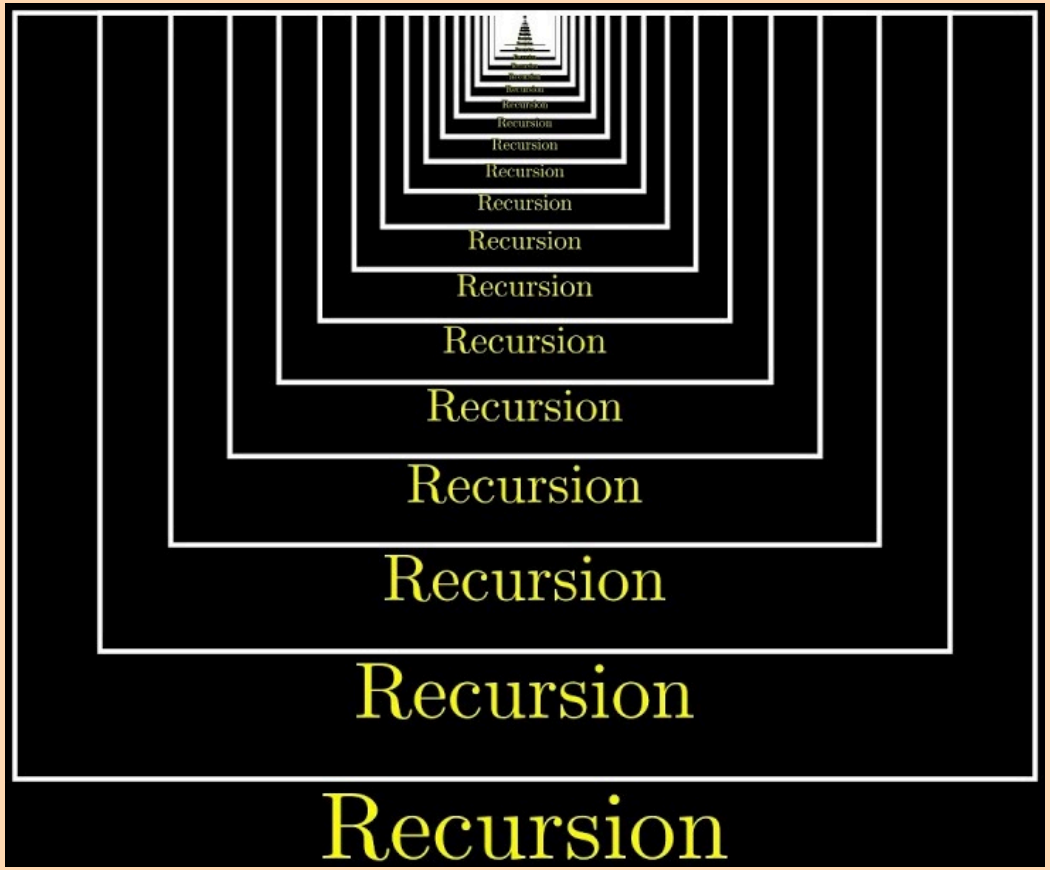


stairs.c

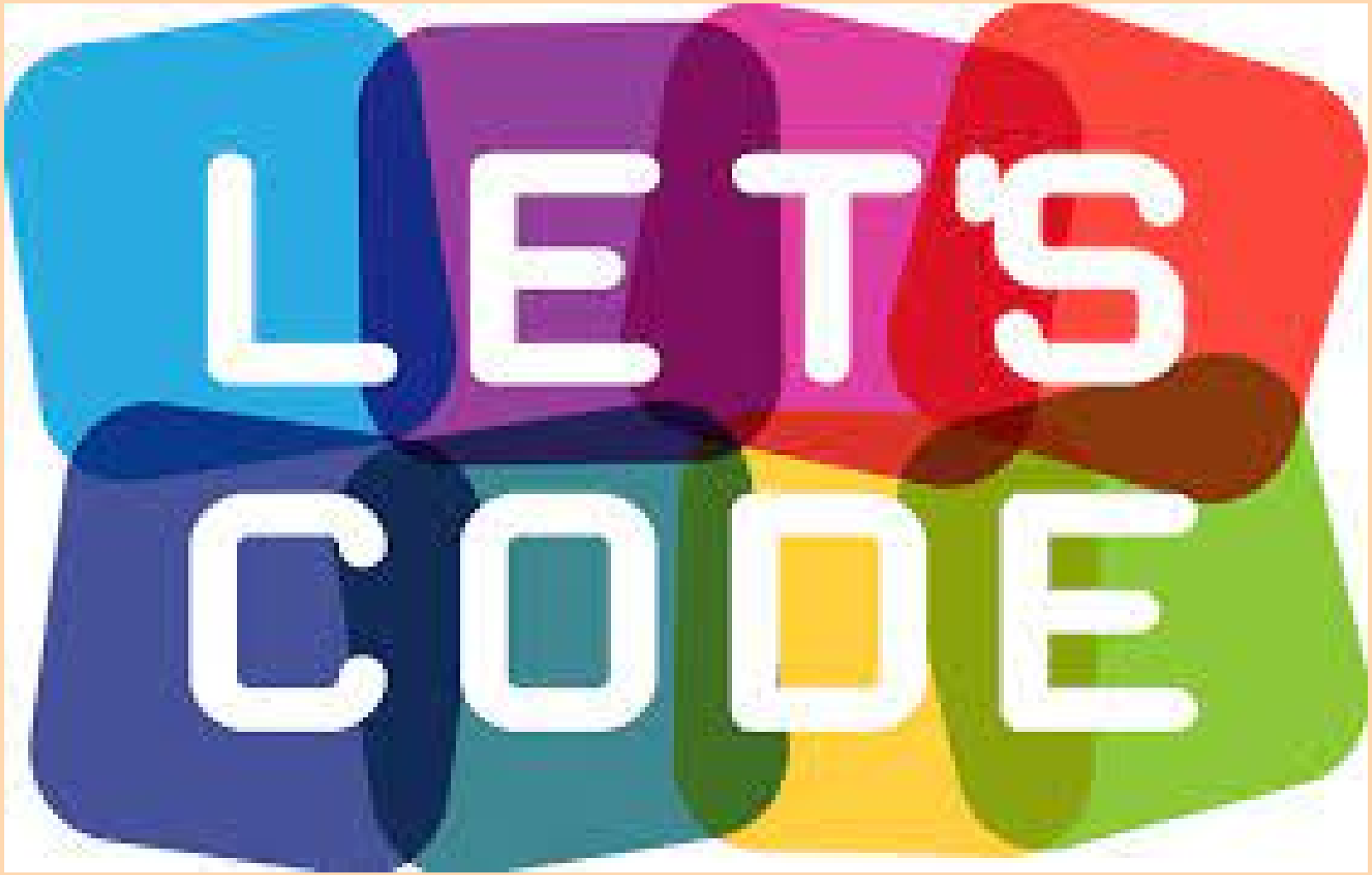
(2) Thinking like a Computer

How does the Mirror work? (stairs.c)

What are the smallest sub-problems?



Solve them without recursion!



min-re.c gcd-re.c bsearch-re.c mergesort.c

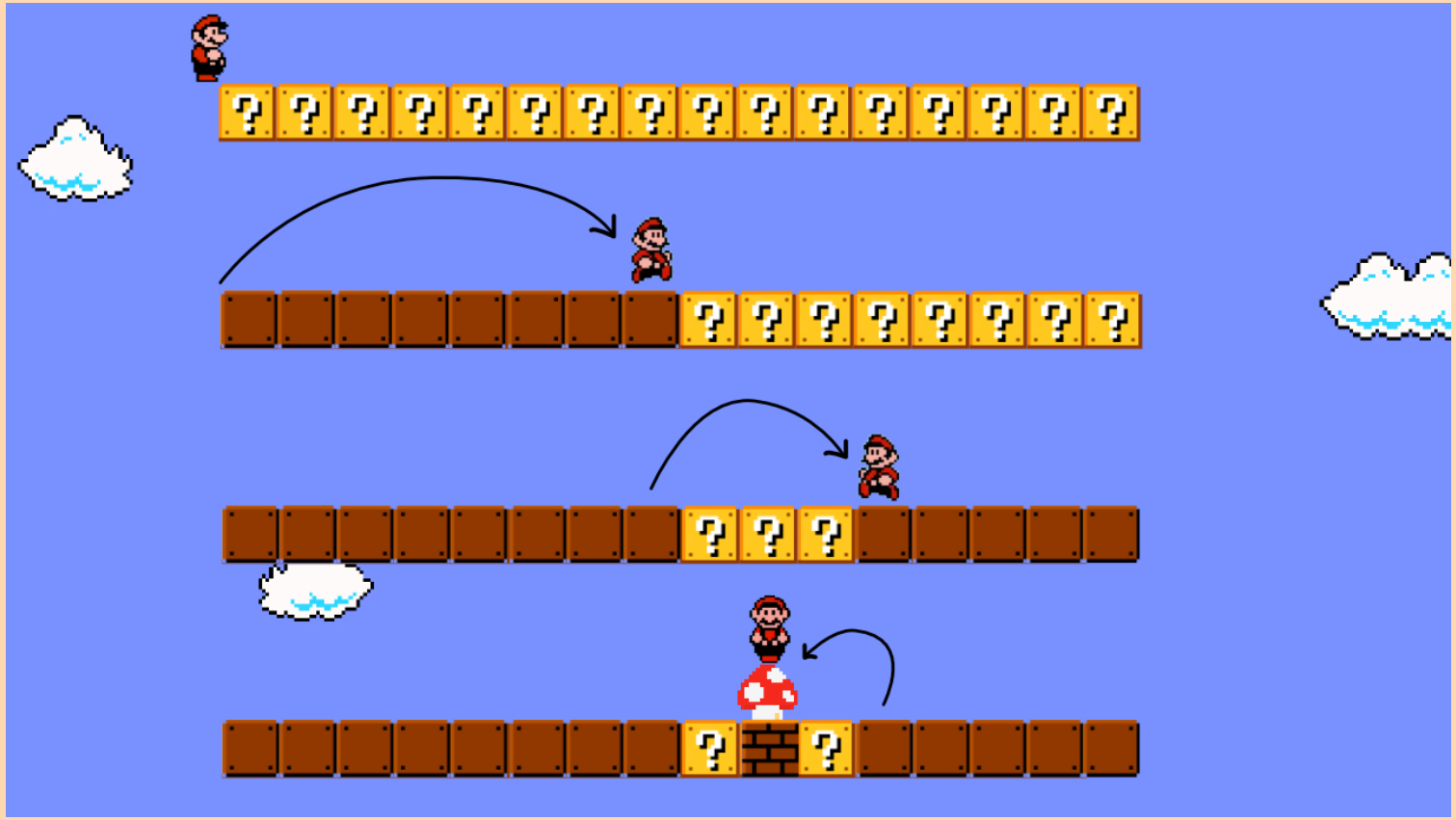
Min (min-re.c)

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

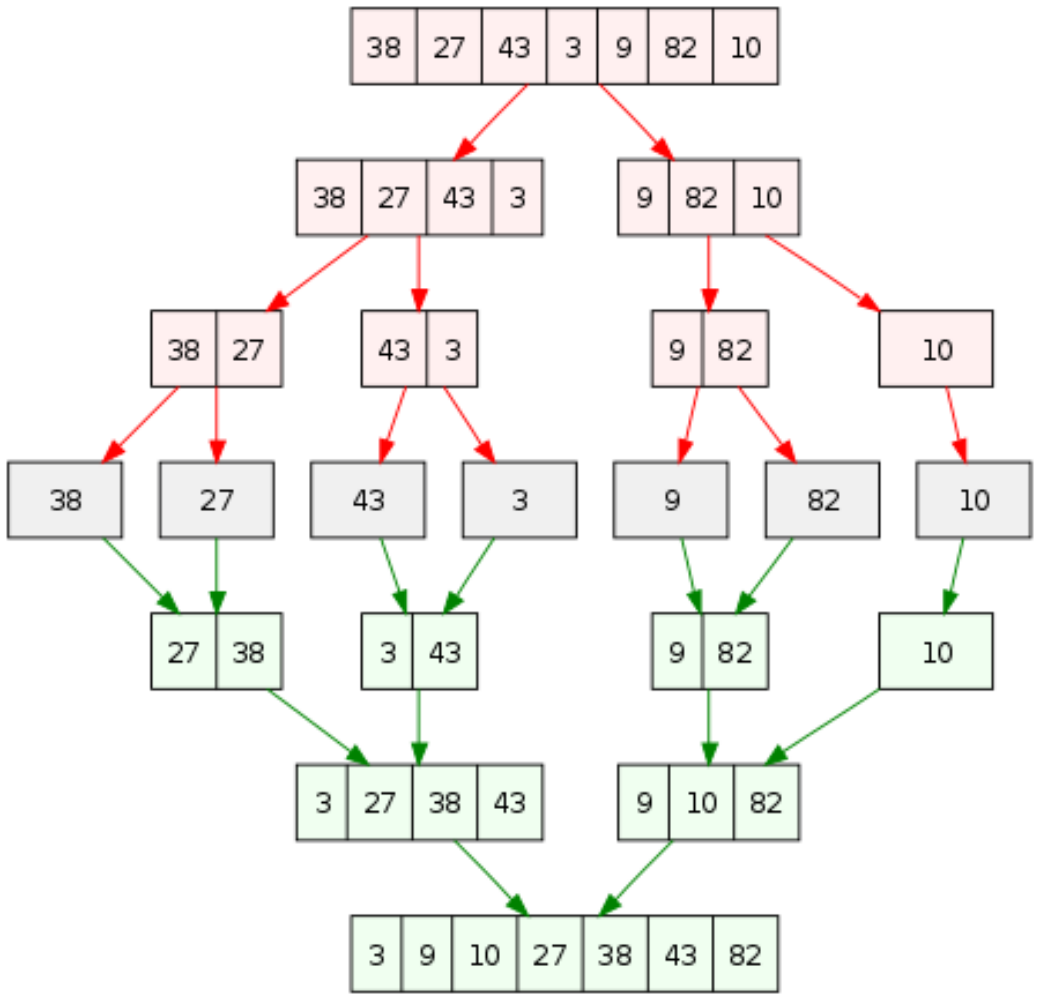
Greatest Common Divisor (gcd-re.c)

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

Binary Search (bsearch-re.c)



MergeSort (mergesort.c)



4 2 8 6 0
5 1 7 3 9

Happy End
of Semester

啊，朋友再见！

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