Computational problem:
A computational problem is a specification of the desired input-output relationship

Instance:
A problem instance is any valid input to the problem

Algorithm:
An algorithm is a well defined computational procedure that transforms inputs into outputs, achieving the desired input-output relationship

Analyzing Algorithms:
    Predict resources utilization
        Memory (space complexity)
        Running time (time complexity)
            Depends on the speed of the computer
            Depends on the implementation details
            Depends on the input, especially on the size of the input
A way of measuring running times that is mathematically elegant and machine-independent

Measure the running time as the number of primitive operations, (addition, multiplication, comparisons) used by an algorithm
Measure the running time as a function of the input size

Θ-notation
    Drop low-order terms, ignore leading constant

Merge Sort
Mergesort(A, left, right):
    if left < right, then
        center ← (left + right) / 2
        Mergesort(A, left, center)   #   T(n/2)
        Mergesort(A, center + 1, right)   #   T(n/2)
        Merge the two sorted arrays   #   Θ(n)
        # key subroutine: "merge"
    end

$$T(n) = \begin{cases} 2T\left(\dfrac{n}{2}\right) + \Theta(n), & if\ n > 1 \\ \Theta(1), & if\ n = 1 \end{cases}$$

T(n) = Θ(nlogn)