

Q10. Dish Cooking Time (50 marks)

In a restaurant kitchen, there are various dishes that need to be prepared by a team of chefs. Each dish has a specific cooking time, and the kitchen can accommodate the cooking of up to K dishes concurrently.

However, when multiple dishes are being cooked at the same time, all the ongoing cooking processes must be finished before new dishes can be started. For example, if Dish A takes 10 minutes to cook and Dish B takes 15 minutes, the concurrent cooking of dishes A and B would require 15 minutes for the chefs to complete, and only then can they proceed to cook the next dish(es).

Given a list of dishes with their respective cooking times (in minutes) and the parameter K , representing the maximum number of dishes that can be cooked concurrently, your objective is to calculate the minimum time (in minutes) required for all the dishes to be fully prepared in the kitchen.

Note: The team of chefs can choose any sequence to cook the dishes.

Write a program to**Input, in sequence:**

- (1) a positive integer N , which indicates the number of dishes to be cooked, where $2 \leq N \leq 20$;
- (2) N positive integers, each not exceeding 20, representing the cooking times (in minutes) of the N dishes, respectively;
- (3) a positive integer K , which indicates the maximum number of dishes that can be cooked concurrently, where $1 \leq K \leq 5$.

Output:

The minimum time (in minutes) required for the kitchen to complete cooking all the dishes.

试题 10. 菜品烹饪时间 (50 分)

在一家餐厅的厨房里，有各种不同的菜品需要由一组厨师准备。每道菜品都有特定的烹饪时间，而厨房可以同时烹饪最多 K 道的菜品。

然而，当多个菜品同时被烹饪时，所有正在进行的烹饪过程必须完成，然后厨师们才能开始烹饪下一道（或下几道）菜品。例如，如果菜品 A 需要烹饪 10 分钟，而菜品 B 需要烹饪 15 分钟，在同时开始烹饪菜品 A 和 B 的情况下，厨师们需要 15 分钟来完成这两道菜品的烹饪，然后他们才能开始下一道（或下几道）菜品的烹饪。

给定一份菜品清单，其中包括每道菜品的烹饪时间（以分钟为单位）以及参数 K ，表示厨师们可以同时烹饪最多菜品的数量，您的目标是计算厨房完成所有菜品所需的最短时间（以分钟为单位）。

注意：厨师团队可以选择任何顺序来烹饪这些菜品。

试写一程式以**依序输入：**

- (1) 一个正整数 N ，表示要烹饪的菜品的数量，其中 $2 \leq N \leq 20$;
- (2) N 个不超过 20 的正整数，分别表示 N 个菜品的烹饪时间（以分钟为单位）；
- (3) 一个正整数 K ，表示厨房可以同时烹饪菜品最多的数量，其中 $1 \leq K \leq 5$ 。

输出：

厨房完成烹饪所有菜品所需的最短时间（以分钟为单位）。

Examples (例子)

Input (输入)	Output (输出)
10 9 11 14 8 13 7 6 12 10 5 3	38
3 10 15 12 2	25
12 15 19 20 9 10 13 14 19 10 9 10 10 3	55
15 11 9 6 13 8 14 5 12 7 10 15 5 13 6 10 4	42
19 1 10 18 7 4 13 6 19 2 16 8 11 3 17 14 9 5 12 20 5	47

Explanation and Test Cases for Q10: Dish Cooking Time:**Explanation:**

When multiple dishes are cooked simultaneously, the one with the longest cooking time takes precedence, and the others with the shorter cooking times are effectively ignored. The idea is to minimize the overall cooking time by maximizing the cooking times of dishes that can be ignored.

If the numbers are sorted, then it allows the largest cooking time to overshadow the next $K-1$ dishes, and then the $K+1$ largest to overshadow $2K-1$ largest, and so on.

Therefore, to solve this problem, the initial step is to sort the input integers in descending order.

Next, only the values at the positions of $j*K + 1$, are summed, where $j = 0, 1, 2, \dots$ and $j*K + 1 \leq N$.

Test Cases:

Input (输入)	Output (输出)
10 9 11 14 8 13 7 6 12 10 5 3	38
3 10 15 12 2	25
12 15 19 20 9 10 13 14 19 10 9 10 10 3	55
15 11 9 6 13 8 14 5 12 7 10 15 5 13 6 10 4	42
19 1 10 18 7 4 13 6 19 2 16 8 11 3 17 14 9 5 12 20 5	47
9 6 9 8 8 9 10 7 6 7 2	40
20 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 5	32
18 14 13 11 16 12 10 15 14 13 10 11 12 16 15 13 14 12 10 4	65