King and Four Sons

HackerRank

The King of Byteland wants to grow his territory by conquering K other countries. To prepare his 4 heirs for the future, he decides they must work together to capture each country.

The King has an army, A, of N battalions; the i^{th} battalion has A_i soldiers. For each battle, the heirs get a detachment of soldiers to share but will fight amongst themselves and lose the battle if they don't each command the same number of soldiers (i.e.: the detachment must be divisible by 4). If given a detachment of size 0, the heirs will fight alone without any help.

The battalions chosen for battle must be selected in the following way:

1. A subsequence of K battalions must be selected (from the N battalions in army A).
2. The j^{th} battle will have a squad of soldiers from the j^{th} selected battalion such that its size is divisible by 4.

The soldiers within a battalion have unique strengths. For a battalion of size 5, the detachment of soldiers $\{0, 1, 2, 3\}$ is *different* from the detachment of soldiers $\{0, 1, 2, 4\}$

The King tasks you with finding the number of ways of selecting K detachments of battalions to capture K countries using the criterion above. As this number may be quite large, print the answer modulo $10^9 + 7$.

Input Format

The first line contains two space-separated integers, N (the number of battalions in the King's army) and K (the number of countries to conquer), respectively.

The second line contains N space-separated integers describing the King's army, A, where the i^{th} integer denotes the number of soldiers in the i^{th} battalion (A_i).

Constraints

- $1 \leq N \leq 10^4$
- $1 \leq K \leq min(100, N)$
- $1 \leq A_i \leq 10^9$
- $1 \leq A_i \leq 10^3$ holds for test cases worth at least 30% of the problem's score.

Output Format

Print the number of ways of selecting the K detachments of battalions modulo $10^9 + 7$.

Sample Input

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3 2
3 4 5
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Sample Output

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20
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Explanation

First, we must find the ways of selecting 2 of the army's 3 battalions; then we must find all the ways of selecting detachments for each choice of battalion.

Battalions $\{A_0, A_1\}$*:*
A_0 has 3 soldiers, so the only option is an empty detachment ($\{\}$).
A_1 has 4 soldiers, giving us 2 detachment options ($\{\}$ and $\{0, 1, 2, 3\}$).
So for this subset of battalions, we get $1 \times 2 = 2$ possible detachments.

Battalions $\{A_0, A_2\}$*:*
A_0 has 3 soldiers, so the only option is an empty detachment ($\{\}$).
A_2 has 5 soldiers, giving us 6 detachment options ($\{\}$, $\{0, 1, 2, 3\}$, $\{0, 1, 2, 4\}$, $\{1, 2, 3, 4\}$, $\{0, 1, 3, 4\}$, $\{0, 2, 3, 4\}$). So for this subset of battalions, we get $1 \times 6 = 6$ possible detachments.

Battalions $\{A_1, A_2\}$*:*
A_1 has 4 soldiers, giving us 2 detachment options ($\{\}$ and $\{0, 1, 2, 3\}$).
A_2 has 5 soldiers, giving us 6 detachment options ($\{\}$, $\{0, 1, 2, 3\}$, $\{0, 1, 2, 4\}$, $\{1, 2, 3, 4\}$, $\{0, 1, 3, 4\}$, $\{0, 2, 3, 4\}$).
So for this subset of battalions, we get $2 \times 6 = 12$ possible detachments.

In total, we have $2 + 6 + 12 = 20$ ways to choose detachments, so we print $20 \ \% \ (10^9 + 7)$, which is 20.