2403. Minimum Time to Kill All Monsters

Hard Topics Companies Hint

You are given an integer array `power` where `power[i]` is the power of the ith monster.

You start with `0` mana points, and each day you increase your mana points by `gain` where `gain` initially is equal to `1`.

Each day, after gaining `gain` mana, you can defeat a monster if your mana points are greater than or equal to the power of that monster. When you defeat a monster:

- your mana points will be reset to `0`, and
- the value of `gain` increases by `1`.

Return the **minimum** number of days needed to defeat all the monsters.

Example 1:

```
Input: power = [3,1,4]
Output: 4
Explanation: The optimal way to beat all the monsters is to:
- Day 1: Gain 1 mana point to get a total of 1 mana point. Spend all mana points to kill the 2nd monster.
- Day 2: Gain 2 mana points to get a total of 2 mana points. Spend all mana points to kill the 3rd monster.
- Day 3: Gain 2 mana points to get a total of 4 mana points. Spend all mana points to kill the 3rd monster.
- Day 4: Gain 3 mana points to get a total of 3 mana points. Spend all mana points to kill the 1st monster.
It can be proven that 4 is the minimum number of days needed.
```

Example 2:

```
Input: power = [1,1,4]
Output: 4
Explanation: The optimal way to beat all the monsters is to:
- Day 1: Gain 1 mana point to get a total of 1 mana point. Spend all mana points to kill the 1st monster.
- Day 2: Gain 2 mana points to get a total of 2 mana points. Spend all mana points to kill the 2nd monster.
- Day 3: Gain 3 mana points to get a total of 3 mana points.
- Day 4: Gain 3 mana points to get a total of 6 mana points. Spend all mana points to kill the 3rd monster.
It can be proven that 4 is the minimum number of days needed.
```

Example 3:

```
Input: power = [1,2,4,9]
Output: 6
Explanation: The optimal way to beat all the monsters is to:
- Day 1: Gain 1 mana point to get a total of 1 mana point. Spend all mana points to kill the 1st monster.
- Day 2: Gain 2 mana points to get a total of 2 mana points. Spend all mana points to kill the 2nd monster.
- Day 3: Gain 3 mana points to get a total of 3 mana points.
- Day 4: Gain 3 mana points to get a total of 6 mana points.
- Day 5: Gain 3 mana points to get a total of 9 mana points. Spend all mana points to kill the 4th monster.
- Day 6: Gain 4 mana points to get a total of 4 mana points. Spend all mana points to kill the 3rd monster.
It can be proven that 6 is the minimum number of days needed.
```

Constraints:

- `1 <= power.length <= 17`
- `1 <= power[i] <= 10^9`

Seen this question in a real interview before?   1/5

Yes   No

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Hint 1

Each monster can only have two states. They are either alive or dead.

Hint 2

We can use bitmasks to represent every possible combination of alive and dead monsters.

Hint 3

Let dp[mask] represent the minimum number of days needed to reach the state mask.

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