Can you steal fractions of an item?

Suppose you're a thief in a grocery store. You can steal bags of lentils and rice. If a whole bag doesn't fit, you can open it and take as much as you can carry. So now it's not all or nothing—you can take a fraction of an item. How do you handle this using dynamic programming?

Answer: You can't. With the dynamic-programming solution, you either take the item or not. There's no way for it to figure out that you should take half an item.

But this case is also easily solved using a greedy algorithm! First, take as much as you can of the most valuable item. When that runs out, take as much as you can of the next most valuable item, and so on.

For example, suppose you have these items to choose from.

Quinoa is more expensive per pound than anything else. So, take all the quinoa you can carry! If that fills your knapsack, that's the best you can do.

If the quinoa runs out and you still have space in your knapsack, take the next most valuable item, and so on.

Optimizing your travel itinerary

Suppose you're going to London for a nice vacation. You have two days there and a lot of things you want to do. You can't do everything, so you make a list.

ATTRACTION	TIME	RATING
WESTMINSTER ABBEY	½ DAY	7
GLOBE THEATER	½ DAY	6
NATIONAL GALLERY	1 DAY	9
BRITISH MUSEUM	2 DAYS	9
ST. PAUL'S CATHEDRAL	½ DAY	8