Weight of Potatoes

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The following is another puzzle from the Irishman Owen O'Shea ([1]).

Suppose you buy 100 pounds of potatoes and you are told that 99 percent of the potatoes consist of water.

You bring the potatoes home and leave them outside to dehydrate until the amount of water in the potates is 98 percent. What is the weight of the potatoes now?

This problem takes a little concentration to get right and the solution is a bit surprising at first.

My Solution

As with all such percentage problems you need to concentrate on the absolute amounts and also what does not change. The constant in this case is the amount of non-water material in the potatoes. Since that was 100 – 99 = 1% of 100 pounds of potatoes, it is 1 pound of material. And that remains even after some water has evaporated.

So let w be the amount of water in pounds after the evaporation. Then

$$w = .98(w + 1)$$

where $w + 1$ is the weight of the potatoes after the evaporation. Then the weight of the water after evaporation is $w = .98 / .02 = 49$ pounds. So the total weight of the dehydrated potatoes is $w + 1 = 50$ pounds.

O'Shea Solution

His solution is basically the same as mine only with words rather than explicit algebra.

The surprising answer is that the potatoes now weigh only 50 pounds.

Many people find this solution incredible.

But look at it this way. When you bought the 100 pounds of potatoes, 1 percent of them, or 1 pound in weight, is nonwater. Thus, 1 percent of the potatoes, which are solids, weighs 1 pound. When the potatoes dehydrated so that 98 percent of the potatoes were water, the other 2 percent in the potatoes must consist of the nonwater component. This 2 percent nonwater component weighs 1 pound. If 2 percent of the nonwater solids weighs 1 pound, then 100 percent must weigh 50 pounds.

Thus, the potatoes weigh 50 pounds.

Source: "The Potato Paradox," http://www.puzzlefry.com/puzzles/the-potato-paradox, 31 July 2015

Futility Closet Solution

Apparently this has been around for a while. Futility Closet had a nice catch regarding the puzzle,[1] which I came across later.

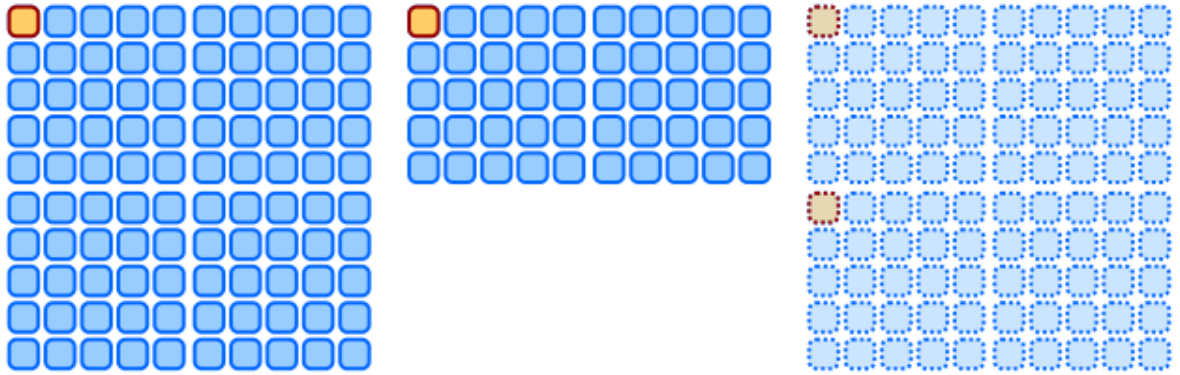[1] "Spuds Illustrated" 31 March 2024 (https://www.futilitycloset.com/2024/03/31/spuds-illustrated/)

I just found this visual explication of the potato paradox[3] — if potatoes are 99 percent water by weight, and you start with 100 pounds of potatoes and let them dehydrate until they're 98 percent water, what's their new weight?

The surprising answer is 50 pounds. Blue boxes represent water, orange non-water. So to double the share of the non-water portion we have to halve the amount of water.

(I had thought it was the setting that made this so confusing, but it turns out real potatoes are 80 percent water! So it's not as outlandish as I'd thought.)

References

[1] O'Shea, Owen, *Mathematical Brainteasers with Surprising Solutions*, Prometheus Books, Guilford, Connecticut, 2020

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2 https://commons.wikimedia.org/wiki/File:Potato_paradox.svg
3 https://www.futilitycloset.com/2010/08/10/the-potato-paradox/