**The Biggest Loser (At Math)**

By Ethan Segel

Yesterday, after a long day, my wife and I settled in for some time to chill out, and turned on the TV. Although I’d never watch it on my own, I know my wife is a fan of watching [The Biggest Loser](http://www.nbc.com/The_Biggest_Loser/), so I joined her for an episode last night. And to be completely fair, I think it’s a wonderful thing to help make people conscious about their bodies, their diet, their lifestyle, and how to have the life they want. The results of the people who succeed at this are truly spectacular.

[](http://scienceblogs.com/startswithabang/files/2009/04/erik-chopin-before-after.jpg)

They’re doing “couples” this season; there are mother-daughter teams, father-son, husband-wife, sisters, best friends, and cousins. Everyone started out — realistically — as morbidly obese, with no real direction as to how to improve themselves. But after 4 months or so of being at the compound (a.k.a. “We’re gonna train you to eat and exercise like a professional athlete”), people have lost anywhere from 95 to 145 pounds! Pretty impressive, no?

But they got towards the end of the episode, and my brain broke just a little bit. Here’s why: they have each person weigh-in, and they work the elimination criteria as follows:

1. Everyone takes their weight from the previous week and weighs in, getting their weight for this week.
2. They take the difference of those two numbers, and find the percentage of weight lost.
3. They then rank everyone by percentage of weight lost, and the lowest two are eligible for elimination.
4. The lowest two get voted on by the rest, and whomever is voted for by the majority goes home.

Pretty reasonable, except their method of measuring mass **broke me**, just a little. See if you can figure out why. The first four people weighed in, and here were their results (with weights in pounds):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Old Weight** | **New Weight** | **Weight Lost** | **% Lost** |
| Mike | 248 | 243 | 5 | 2.02% |
| Ron | 308 | 302 | 6 | 1.95% |
| Tara | 186 | 182 | 4 | 2.15% |
| Filipe | 252 | 247 | 5 | 1.98% |

1. Based on the data above, which two contestants are eligible to be voted out and sent home?

Explain.

Now, at this point, I’m jumping up and down and yelling at the television. **“Doesn’t anybody understand significant figures?!”** No, no they don’t, and here’s why. It looks like Tara lost the greatest percentage of weight; 2.15% is certainly more than 2.02%, 1.98%, and 1.95%, right? But *none of these numbers mean anything*; all we can say is that everyone lost 2% of their weight.

1. Using your knowledge of significant digits, explain why all of the “% Lost” values should be recorded as 2%.

Let’s say Tara didn’t lose 4.00 pounds. Let’s say she lost 3.55 pounds instead. 3.55 *rounds up* to 4 pounds, but what if we calculated those numbers for 3.55 pounds lost?

1. What % of weight did Tara lose if recorded to the correct number of significant digits?
2. What if Ron, the lowest person here (percentagewise), actually lost 6.45 pounds? What % of weight would he have lost if recorded to the correct number of significant digits?
3. Which of these two contestants, Tara or Ron, should actually be up for elimination?
4. But the person who has it toughest is Filipe. Because Filipe weighs *four more pounds* than Mike, how many pounds would he have to lose in order to beat Mike under the current system?
5. What changes does NBC need to make in order to ensure that the correct person is sent home each week based on the % of weight that is lost?

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