

Dimensional Analysis

Worked Examples

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First, we need to look up the conversion between grams and ounces – one ounce is about 28.35 grams.

Then we can let the units tell us what to do.

We want dollars per gram. We'll set it up without the numbers in place first to be sure that the units come out right, then put in the pieces.

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$$\frac{2.99 \textit{ dollars}}{14 \textit{ ounces}} \cdot \frac{1 \textit{ ounces}}{28.35 \textit{ gram}} \cong 0.0075 \frac{\textit{dollars}}{\textit{gram}}$$

It cost about 3/4 of a cent per gram.

Does that make sense? Yes, there are about $14 \cdot 28.35 \approx 400$ grams in the box of cereal, and it did cost about 3/4 of 400 cents.

My iTunes music library has about 9119 songs, for a total of 32.42 GB.

About how many GB is each of my songs?

I want GB per song, so the units tell me to divide 32.42 by 9119.

I get about 0.0036 GB per song.

(This would be more commonly reported as about 3.6 MB per song.)

My brand of laundry detergent comes in a 128-ounce package. On the label, it says it contains enough detergent for 88 loads. Unfortunately, I have lost the little cup that I'm supposed to use to measure the detergent, and I'll have to use an ordinary measuring cup.

How much laundry detergent should I use per load?

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There are 8 ounces in a cup (8 ounces per cup). Let the units tell you what to do. I have ounces, and I want to end up with cups, so I need to multiply my ounces by cups per ounce:

$$\frac{16}{11} \text{ ounces} \cdot \frac{1 \text{ cup}}{8 \text{ ounces}} = \frac{2}{11} \text{ cups}$$

I'll need $\frac{2}{11}$ cups of detergent per load.

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Second reality check: My measuring cup doesn't show 11ths of a cup. It shows $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, and so on. What should I really do?

How do I measure about $\frac{2}{11}$ cup?

I won't be able to measure $\frac{2}{11}$ cup exactly, but I can approximate. This is where the calculator approximation can come in handy.

My calculator says that I need about 0.181818 cups.

The smallest mark on my measuring cup is $\frac{1}{4}$ cup, which is 0.25 cups.

So I will just fill my measuring cup to a little less than the $\frac{1}{4}$ cup mark, and hope that's good enough.

And next time, I'll make sure not to lose the little cup that comes with the detergent.