

The classic Fermi problem, generally attributed to Fermi, is "*How many piano tuners are there in Chicago?*" A typical solution to this problem would involve multiplying together a series of estimates that would yield the correct answer if the estimates were correct. For example, we might make the following assumptions:

1. There are approximately 5,000,000 people living in Chicago.
2. On average, there are two persons in each household in Chicago.
3. Roughly one household in twenty has a piano that is tuned regularly.
4. Pianos that are tuned regularly are tuned on average about once per year.
5. It takes a piano tuner about two hours to tune a piano, including travel time.
6. Each piano tuner works eight hours in a day, five days in a week, and 50 weeks in a year.

From these assumptions we can compute that the number of piano tunings in a single year in Chicago is: $(5,000,000 \text{ persons in Chicago}) / (2 \text{ persons/household}) \times (1 \text{ piano}/20 \text{ households}) \times (1 \text{ piano tuning per piano per year}) = 125,000 \text{ piano tunings per year in Chicago.}$

And we can similarly calculate that the average piano tuner performs: $(50 \text{ weeks/year}) \times (5 \text{ days/week}) \times (8 \text{ hours/day}) \times (1 \text{ piano tuning per 2 hours per piano tuner}) = 1000 \text{ piano tunings per year per piano tuner.}$

Dividing gives: $(125,000 \text{ piano tuning per year in Chicago}) / (1000 \text{ piano tunings per year per piano tuner}) = 125 \text{ piano tuners in Chicago.}$

A famous example of a Fermi-problem-like estimate is the [Drake equation](#), which seeks to estimate the number of intelligent civilizations in the galaxy. The basic question of why, if there are a significant number of such civilizations, ours has never encountered any others is called the [Fermi paradox](#).