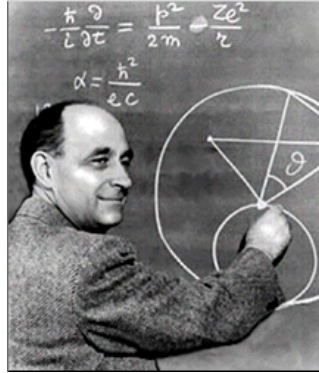


Enrico Fermi Problems



Enrico Fermi, Physicist 1901 - 1954

“There are two possible outcomes: If the result confirms the hypothesis, then you've made a measurement. If the result is contrary to the hypothesis, then you've made a discovery.”

—Enrico Fermi

Rough quantitative estimates

"... the estimation of rough but quantitative answers to unexpected questions about many aspects of the natural world. The method was the common and frequently amusing practice of Enrico Fermi, perhaps the most widely creative physicist of our times. Fermi delighted to think up and at once to discuss and to answer questions which drew upon deep understanding of the world, upon everyday experience, and upon the ability to make rough approximations, inspired guesses, and statistical estimates from very little data."

Philip Morrison, Letters to the Editor, Am. J. Phys., August 1963, v31n8 p626-627.

A Fermi game: Pinocchio *Is Pinocchio lying?*

How to play

1. The Pinocchio player makes up a statement. It may be true, or a lie.
Example: *"The average life span in the US is two billion seconds."*
2. The other players estimate whether the statement is accurate ... ***within a factor of 10.***

3 Pinocchios

1. Pinocchio says, "There are 2.27×10^9 seconds in the ancients' Harmonious Man's life of 72 years."
2. Pinocchio says, "There are about 66 billion cubits around the Earth."
Given:
 - a cubit is the length from your elbow to your fingertip
 - the circumference of the Earth is about 25,000 miles
3. Pinocchio says, "I am knitting a scarf for the Milky Way. Since the Milky Way is so special, I'm weaving it out of my own hair. I had to cut 1.42×10^{17} hairs to complete the scarf."
Given:
 - the Milky Way is 7.6×10^{20} meters wide (the scarf should be twice that length so it can wrap around)
 - human hair is 10^{-4} meters thick

