Fermi Project

What are Fermi questions?

An estimation using orders of magnitude of rough but quantitative answers to unexpected questions about many aspects of the natural world. These questions would be impossible or impractical to calculate through other methods. This 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.

What are some examples?

1) How many times the wipers had crossed the car windshield on the way to school.
2) How many grains of sand are on the local beach
3) What would it take to fill this room with popcorn?
4) How many people in the world are talking on their cell phones at this instant?
5) What is the volume of air that I breathe in one day?
6) How many bricks are in the exterior of our school building?
7) How many balloons would it take to fill the school gym?
8) How many times does a human heart beat in a lifetime?

Directions:

Pick a school appropriate Fermi question that can be completed using at least three calculations/order of magnitude estimations. Solve problem using the Fermi method to estimate the answer to the nearest order of magnitude. Present this information clearly and neatly on a poster titled "Did You Know"….. Include at least one design element such as color or a picture. The second half of the poster should say evidence and contain all the math to support your answer.

FERMI PROJECT RUBRIC
(Did You Know Posters)

FERMI PROJECT & PRESENTATION RUBRIC

	3	2	1	0
Mathematically Correct	Formulas or Operations used were used correctly, and there were no errors in computation	Computation was incorrect, but the mathematical process used was correct	Computation was reasonable, but operations or formulas used were incorrect	Computation, formulas, & operations used were completely incorrect
Process	Your process reflects the intention of a Fermi estimation by using powers of ten	Your process reflects some of the intention of a Fermi estimation by mentioning powers of ten	Your process does not reflect the intention of a Fermi estimation by using powers of ten but is mathematically sound	Your process does not reflect the intention of a Fermi estimation by using powers of ten and is not mathematically sound
Quality of work	Information was presented clearly, and easily read by the audience, this includes pictures, and graphical displays	Information was clearly legible, but layout was in disarray, and included no graphics	Audience has difficulty reading the information, and presentation layout was in disarray	There was zero organization, and the information given was difficult to be read by audience
Timeliness	Your project and presentation were ready on time	Your project or presentation were 1 day late	Your project and presentation were 1 day late	Your project and/or presentation were more than 1 day late

Project: _____/12

Comments:

Counting by powers of ten

"One, ten, hundred, thousand, ten thousand, hundred thousand, million, ten million, hundred million, billion, ..."

One	10^0	1.	*"ten to the **zero**"*
ten	10^1	10.	*"ten to the **one**"*
hundred	10^2	100.	*"ten to the **two**"*
thousand	10^3	1,**000**.	*"ten to the **three**"*
ten thousand	10^4	10,000.	*"ten to the **four**"*
hundred thousand	10^5	100,000.	*"ten to the **five**"*
million	10^6	1,**000,000**.	*"ten to the **six**"*
ten million	10^7	10,000,000.	*"ten to the **seven**"*
hundred million	10^8	100,000,000.	*"ten to the **eight**"*
billion	10^9	1,**000,000,000**.	*"ten to the **nine**"*
ten billion	10^{10}	10,000,000,000.	*"ten to the **ten**"*
hundred billion	10^{11}	100,000,000,000.	*"ten to the **eleven**"*
trillion	10^{12}	1,**000,000,000,000**.	*"ten to the **twelve**"*
ten trillion	10^{13}	10,000,000,000,000.	*"ten to the **thirteen**"*
hundred trillion	10^{14}	100,000,000,000,000.	*"ten to the **fourteen**"*