

Concerned Citizen Commuters Association
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Independent Mathematical Contractors
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Anytown, Anystate 00000

Dear IMC:

My advocacy group is concerned with reducing carbon emissions via all possible methods. In the past we have focused on building new subway lines in New York City and increasing the ridership on those lines. We are now starting a campaign to increase the mileage in cars for people who have no choice but to drive their cars to work. Our research has focused on bettering the mileage in existing cars through a modification of the fuel blend being used. Our experience has been that 88.5 octane gasoline leads to better mileage.

Several different types of gasoline are available across the country. These gasolines are distinguished by their octane levels.

Name	Octane	Average Price on 3/3
Regular	87	\$3.049
Mid	89	\$3.180
Premium	91	\$3.363

The term “octane” has more than one definition, but the one used by the State of Minnesota is fairly useful:

Octane is a measure of a fuel’s tendency to knock or ping when it is mixed with air and burned in the cylinder of an engine. This octane rating is not based on the amount of chemical octane in the gasoline. The rating is called octane because the gasoline’s ability to prevent engine knock has been rated against the performance of pure hydrocarbon octane, which has a rating of 100. Gasoline, which is made from a blend of many other hydrocarbons, may have a higher or lower rating, depending on how its anti-knock performance compares to the performance of pure hydrocarbon octane.

You can think of this octane as a percentage of pure octane in the gasoline. In other words, 87 octane gas is 87% pure octane, 89 octane gas is 89% pure octane, ect. Across the country you may find slight differences in octane, but for the most part these fuel grades are reflective of what is available from refiners.

To make your decision, you’ll need to develop and solve a system of equations under some assumptions.

1. Instead of using the average prices on 3/3/08 above, use the octane levels and prices from your favorite gas station.

2. Assume that you are filling your own empty tank. If you do not own a car, you can assume a tank with a capacity of 16 gallons.

The question I would like you to answer is quite simple: By blending the three available grades of gas, how many gallons of each type of gasoline must be blended to obtain an 88.5 octane mixture that is as cheap as possible?

I assume that you will develop and solve a system of equations based on the information you find in your local gas station. You will need to create a system of two equations with three variables. One of these equations will insure that the total amount of gas will fill your tank. The other equation will insure that your gas mixture is 88.5 octane. Make sure you explain how you got your equations and the steps you followed to solve these equations.

Since I am not a mathematically inclined person (college algebra was over 10 years ago), I would like you to document your results in a technical memo. Your scientific expert (your instructor) has made resources available for you to help you produce this document.

I look forward to your technical memo on this matter. A scientific expert is available to answer any questions that you might have in the course of your investigations. This expert will not be available to assist on this project over the weekend before it is due. You should plan on consulting with this expert as soon as possible.

Sincerely yours,

Jack B. Green