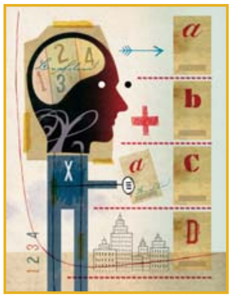

Moody's Mega Math Challenge

A contest for high school students

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Judging Perspective:
Approaches to Solutions Papers in Moody's Mega Math Challenge 2008

This year's Moody's Mega Challenge (M^3) required teams to analyze the replacement of a percentage of gasoline used in transportation with ethanol. Five specific questions were asked:

1. How much ethanol is needed to replace 10% of annual U.S. gasoline usage?
2. What effect will this fuel substitution have on carbon dioxide emissions?
3. Is corn-derived ethanol a cost-efficient way of producing fuel?
4. Estimate the effect of this policy on grain prices and developing nations over the next five years.
5. Are there better ways for the U.S. to attain national energy independence?

Since M^3 is a mathematical modeling contest, teams of contestants were expected not only to provide good arguments for their answers to the questions posed, but to develop mathematical models that support their arguments.

Given the open-ended nature of the questions, teams presented a wide variety of approaches to the solutions and answers. A common approach to begin the solution papers was to extrapolate information from current consumption data to estimate demand in future years. Some approaches began with a simple linear fit to the data. More sophisticated models took into account other factors, such as changes in efficiency, models for population growth, and the overall economy.

Many teams attempted complicated models to help analyze the economic effects of ethanol substitution. These included supply-demand models for the corn market and price-consumption models for the ethanol itself.

When looking at models for energy consumption using partial ethanol replacement, some teams looked carefully at the energy requirements for the production and distribution of ethanol. This became especially relevant when analyzing CO_2 production under different options.

When analyzing CO_2 production, some teams performed a very careful analysis of the chemistry of combustion of ethanol; others relied on published data but developed models for CO_2 production that took into account other variables.

This was not a problem that lent itself to a single model, but instead relied upon creative development and the use of a variety of models to analyze and answer a series of real-world questions. Clearly no team, especially a high school team with little or no warning on the subject of the problem, could be expected to develop a definitive solution to such a complex problem in such a short amount of time. However, the creative approaches taken by the top teams to develop models to answer these questions demonstrated their knowledge of the power of mathematical modeling to resolve complex questions that impinge on our daily lives.

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