



# Moody's Mega Math Challenge® 2014

A contest for high school students

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## Lunch Crunch: Can nutritious be affordable and delicious?

First Lady Michelle Obama spearheaded an initiative on good nutrition that led to passage of the Healthy, Hunger-Free Kids Act of 2010. Implementation of the act, however, revealed the competing preferences of the school lunch program's three major stakeholders. **Students** care most about taste and quantity; **school districts** are concerned about affordability; and the **federal government**, which provides financial support, wants to promote lifelong healthy eating habits.

Schools have seen the cost of offering lunch go up (since healthier foods are often more expensive), while participation goes down (students are less satisfied with school lunch, either because it doesn't taste as good or it isn't filling enough), causing a fiscal crisis for some school districts<sup>1</sup>.

The USDA has asked your consulting firm to provide a report with mathematically founded insights into the problem; you should address at minimum the following three concerns.

1. **You are what you eat?** Students' caloric needs at lunch depend on how active they are, whether they eat breakfast, and a host of other factors. Develop a mathematical model that takes as input a student's individual attributes, and outputs the number of calories that a student with those attributes should eat at lunch.
2. **One size doesn't necessarily fit all.** The guidelines dictated by the Healthy, Hunger-Free Kids Act of 2010 are based on meeting the needs of an "average student"<sup>2</sup>. However, meeting the average need may not necessarily be the right amount for many students. Now that you've identified attributes that affect caloric needs at lunch, create a model to determine the distribution of U.S. high school students among each of these categories. If every student eats the standard school lunch, what percentage of students will have their caloric needs met at lunch?
3. **There's no such thing as a free lunch.** A sample school district has a weekly budget of \$7 per student for the purchase of food only. Leverage math modeling to develop a lunch plan (using food categories) that stays within the budget, meets the nutritional standards and appeals to students. What changes would you make if your budget was decreased by \$1?

You may want to take into account how your model could be applied across different geographic and/or socio-economic regions. Your report to the USDA should include a one-page summary of your findings.

You may find the following websites helpful:

[http://www.globalrph.com/estimated\\_energy\\_requirement.htm](http://www.globalrph.com/estimated_energy_requirement.htm)

<http://www.cdc.gov/mmwr/pdf/ss/ss5905.pdf>

<http://www.cdc.gov/growthcharts/charts.htm#Set3>

<http://www.amstat.org/censusatschool/about.cfm>

1. <http://healthland.time.com/2013/08/29/why-some-schools-are-saying-no-thanks-to-the-school-lunch-program/>

2. <http://cspinet.org/new/pdf/new-school-meals-faq.pdf>