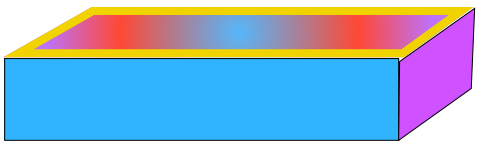
Montgomery Burns
Springfield
April 7, 2014

Math 104 Students
Wheaton College
Norton, MA 02766

Dear Calculus Students:

Your recent excellent recommendations have helped make the floating blue cerulean carbon fiber vases at the bi-level atrium at our company headquarters a tourist attraction of epic proportions for the greater Springfield metropolitan area. You have my deepest gratitude (which has no monetary value, just so we are clear with each other). In order to capitalize on the potential revenue stream that is provided by the hordes of tourists, Smithers has suggested selling snack cakes with a cerulean–magenta–gold decorative scheme similar to that used in the floating vases. When we realized that we needed help determining the optimal size of the baked goods, your enterprising and resourceful professor naturally referred me to you.

The cakes will be baked into a one-liter rectangular loaf shape, but what sets our tasty treats apart is the colors of the marzipan frosting that we will use on the top and sides of the cakes (the bottom is unfrosted). We will match the colors from the vases, using cerulean marzipan on the front and back, magenta marzipan on the two sides, and a special magenta–cerulean swirl on the top. In addition, we will outline the top edge of each cake with a thin gold icing to pull the entire confection together. I think you'll agree that these will be irresistibly delicious.



Since each cake has a volume of one-liter, we know that the ingredients for the cake itself will cost \$0.75, but because of the cost of the decorations, we are not certain of the optimal dimensions of the goodies that will minimize the total cost of ingredients. This is where we need your help.

We know that the magenta marzipan costs 0.10 cents per square centimeter, the cerulean marzipan costs 0.20 cents per square centimeter, the swirl marzipan costs 0.17 cents per square centimeter, and the gold icing costs 0.30 cents per centimeter. However, there is some uncertainty in the swirl marzipan markets of late, and our supplier has indicated that the swirl could increase to 0.25 cents per square centimeter or even as high as 0.35 cents per square centimeter. I need your expert opinion on the dimensions of the cakes that will minimize the cost of ingredients in each of the three cases.

Because you performed so admirably in the last assignment, I trust your judgement and am also interested in your opinion of a reasonable price to charge in each of the three cases and any thoughts you have on the aesthetics of the delicacies.

I realize that the rest of the semester is very busy for you, but in order to get the cakes on sale while the tourist crowds are still flocking to the atrium of the Springfield Nuclear Power Plant, I will need your report by the end of the day on Thursday, April 17.

Forever capitalistically yours,
Montgomery Burns
Owner, Springfield Nuclear Power Plant

A Few Comments From Your Enterprising and Resourceful Professor

- You should feel free to use Maple to help with some of the calculations and to generate graphs that you want to include in your paper.
- To get a feel for some of Maple's capabilities, try solving the problem using decimal values for the costs (e.g. 0.17) and try solving it again using fractions (e.g. $\frac{17}{100}$).