

From: A. Richmond Birnan
 Springfield, USA
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To: Math 1110 Students
 Appalachian State University

Dear Calculus Students:

We have decided that the time is ripe to diversify our business. With the shortage of flu vaccines last fall and rising deductibles on prescriptions, the market seems perfectly situated to introduce the *Cough and Sniffle* brand over-the-counter flu remedy. When we went looking for help in determining how much to produce, your enterprising and resourceful professor naturally referred us to you.

We have some approximations for the potential costs and revenues. There will be a small initial fixed cost of approximately \$10,000 to convert a portion of our facility from handling Illudium Q-36 explosive space modulator waste to producing the flu remedy.

The plan is to distribute the remedy to retailers in cases containing 1,000 doses each. Upon the advice of your enterprising and resourceful professor, my top-notch R&D department has also determined, through extensive research, the materials costs, the labor costs, and the price the market will bear for several different levels of production.

No of Cases Produced	100	600	1100	2100	3100	4100
Materials cost per case (\$)	167	72	17	34	217	568
Labor cost per case (\$)	300	175	87	7	60	247
Selling price per case (\$)	69	71	72	67	62	34

There are several vital pieces of information we need to know in order to plan our production. Specifically, we would like to know

- the number of cases we should manufacture to maximize total profit
- the number to produce to maximize the profit per unit sold
- the break even point

In addition, we would also like to know the number of cases that

- minimizes the average cost per case
- minimizes the total cost.

I will need your report by Tuesday, October 30, in order to prepare for production.

A Few Comments From Your Enterprising and Resourceful Professor

The information requested will certainly not occur at one of the given data points, so I would suggest that you try to find a function that models the materials cost, a function that models the labor cost, and one that models the selling price reasonably well. Plotting these points should give you an idea of the types of functions that will be likely candidates. Once you have these functions, you should be able to determine the requested information without difficulty.

Write your report to Mr Birnan — don't assume that he knows all of calculus; explain carefully what you have done and why.