**Mathematics of Industry and Government**

# Linear Programming Project

Objective:

* You are trying to obtain a loan from a bank (AKA me) to start a company that produces more than one product.
  + Each product must have a cost and a profit associated with it.
* The products that your company produces must have some **constraints**.
  + Examples might include:
    - Limit on the amount of money you can spend on raw materials
    - Limit on the amount of raw materials you can obtain
    - Limit on the amount of time you can spend producing
    - Demand for your product
* **WARNING: THE CONSTRAINTS YOU MAKE UP MAY NOT WORK. VISIT DESMOS.COM/calculator TO GRAPH YOUR CONSTRAINTS AND MAKE SURE THEY OVERLAP!**
* You will then use linear programming to develop the amount you need to produce of each of your products to maximize your profit.
  + Must develop the following:
    - an objective function
    - a list of constraints

Requirements:

At minimum, your presentation should include:

1. Your group:
   * You may have up to two persons per group.
   * Any group member that is absent more than 2 days will be removed from the group and given the test and will be required to complete all of the reviews for the test.
   * Additionally, any group that is addressed for conduct three times will be split up and possibly given the test.
2. Your products:
   * Make them up and show them off. This can be included as a picture in the prezi/ppt/video.
3. A screen shot of your Excel file. Make sure your file has all the correct context for your products with the Decision Variables, Objective Function, Constraints and Titles.
4. Your cost analysis
   * Using your answers from Excel, indicate how much you need to produce of each product to maximize your profit.

Grading:

This project will count as a test grade. And will be broken down by the following:

80% - By the “Bank” aka the teacher

20% - By your partners

Follow the guidelines on the rubrics on the next page for more specific grading information. Notice that appearance, creativity, and other extras affect your grade!

Alternative Assignment:

A test consisting of:

* Vocabulary section
* Writing LP problems as equations and inequalities
* Solving LP problems with the computer
* Solving word problems using the computer.
* Essay portion dealing with how to solve LP problems in the general case.

**Grading Rubric:**

**BANKER/TEACHER – 80% of the total grade**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number of Constraints**  (10 points) | There are 4 or more constraints included.  (10) | There are 3 constraints included.  (7) | There are 1 or 2 constraints included.  (4) | What are Constraints?  (0) |
| **Realism**  (15 points) | All constraints make sense  (15) | 1 or 2 constraints have slight issues  (10) | 1 or 2 constraints DO NOT make sense  (5) | NONE of the constraints make sense  (0) |
| **Objective Function**  (10 points) | Company makes 3 or more products  (10) | Company makes 2 products  (7) | Company makes 2 products but the objective function is incorrect.  (4) | Objective function isn’t included.  (0) |
| **Answers to the Problems**  (15 points) | Optimal Solution and Maximum are correct AND in context  (15) | Optimal Solution and Maximum are correct OR in context  (10) | BOTH Optimal Solution and Maximum are INCORRECT by simple mistake AND NOT in context  (5) | Both problems are wrong, reason is unknown  (0) |
| **Prezi**  (10 points) | Students took full advantage of Prezi OR developed their own video to WOW the “banker”  (10) | Students used Prezi OR made their own video but lacked that “WOW”  (7) | Students used Prezi OR Power Point but showed they did the bare minimum  (4) | You should be ashamed  (0) |
| **Screen Shot of Excel**  (10 points) | The excel file has ALL the correct contexts for the objective function, the decision variables and the constraints  (10) | The excel file has SOME of the correct contexts for the objective function, the decision variables and the constraints  (7) | The excel file has NONE of the correct contexts for the objective function, the decision variables and the constraints  (4) | What’s a screen shot?  (0) |
| **Creativity**  (10 points) | Looks totally original  (10) | Think I’ve seen this problem before but they’ve gone a different direction with it.  (7) | I know I’ve seen this project before.  (4) | Thanks for practically copying my problem!  (0) |

**PARTNER’S EVALUATION – 20% of the total grade**

|  |  |  |  |
| --- | --- | --- | --- |
|  | He/She did this very well.  (4) | This was okay.  (2) | My partner let me down.  (0) |
| My partner made a lot of good suggestion. |  |  |  |
| My partner was on task for the majority of the time we worked together. |  |  |  |
| My partner was open to my suggestions. |  |  |  |
| My partner knew what was expected of him/her. |  |  |  |
| I was able to complete the project effectively as a result of working with my partner. |  |  |  |