**Mathematics of Industry and Government**

# Integer Programming Project

Objective:

* To develop TWO integer programming problems that require the integer constraint and develop these into TWO word problems of your choice. Think of situations where the decision variables need to be whole numbers.

The Process:

* + Create an excel file saved under the title: ***Unit5\_Project3.xlsx***
  + Develop two problems (max and min) that require the integer constraint.
  + Apply the Solver to determine the Optimal Solutions and the Minimum/Maximum Values
  + Create an Answer Report for each of your problems
  + Create TWO real world problems that could connect to your chosen two problems.
  + Create ONE or TWO Prezi(s) that puts all of this information together.

Requirements:

* + You may have only one partner per group. However, any group member that is absent more than 2 days will be removed from the group and given the test.
  + Additionally, any group that is addressed for conduct three times will be split up and possibly given the test. You will be responsible for all the test prep work if given the test. This includes disturbing students that are preparing for the test.
  + Make sure you share your Prezi login with your partners in the event that one is absent. Additionally, save the Excel file to both of your student numbers at the end of each day.

Your Prezi must include:

1. *A screen shot* 
   * of the Excel file and answer document FOR BOTH PROBLEMS solved as an Integer Programming problem.
2. *Your real world connection*

* A word problem that corresponds with your problem as an Integer Programming problem.
* MUST HAVE A SLIDE LISTING YOUR OBJECTIVE FUNCTION AND ALL CONSTRAINTS (WITH NAMES) FOR YOUR MIN AND MAX PROBLEM. Don’t forget the integer constraint.

1. *Your answer report explanation.* 
   * Using the answer report, you must
     + define your decision variables
     + determine the binding constraints and explain why they are binding WITH CONTEXT!!!!
     + determine the slack on the non-binding constraints and explain what this means in terms of your real world connection. In other words…. WITH CONTEXT!!!!
     + a sentence indicating the optimal solution and min /max value WITH CONTEXT!!!!.
2. *Integer programming explanation*
   * A reason given why your situation must be an Integer programming problem vs a Linear Programming problem. In other words, why your optimum solution can’t be decimal answers. WITH CONTEXT!!!!

Grading:

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

80% - By 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 IP problems as equations and inequalities
* Solving IP problems with the computer
* Solving word problems using the computer.

**Grading Rubric:**

**TEACHER – 80% of the total grade**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number of Constraints**  (10 points) | There are 4 or more constraints included for BOTH problems  (10) | There are 4 or more constraints included for ONLY ONE of the problems  (7) | There are 2 or 3 constraints included for BOTH problems    (4) | There is 1 constraint included for EITHER problems  (0) |
| **Realism**  (15 points) | All constraints make sense for BOTH word problems  (15) | 1 or 2 constraints DO NOT make sense for EITHER word problems  (10) | 1 or 2 constraints DO NOT make sense for BOTH word problems  (5) | NONE of the constraints make sense for BOTH word problems  (0) |
| **Answers to the Problems**  (20 points) | Max and Min answers are correct with no errors  (20) | EITHER the Max or Min answers are wrong, by simple mistake  (14) | BOTH problems are wrong, by simple mistake  (7) | Both problems are wrong, reason is unknown  (0) |
| **Answer Report**  (15 points) | Answer Report is included with a FULL explanation of slack/binding with CONTEXT for both problems  (15) | Answer Report is included but with SOME or INCORRECT explanation of slack/binding or WITHOUT CONTEXT for either problems  (10) | Answer Report is included with NO explanation of slack/binding or WITHOUT CONTEXT for either problems  (5) | Answer Report is not included for either problem.    (0) |
| **Integer Programming Explanation**  (10 points) | Both explanations make sense and are in CONTEXT of the word problems  (10) | Either explanation makes sense but ONE is NOT in CONTEXT of the word problems  (7) | Both explanations make sense but BOTH are NOT in CONTEXT of the word problems  (4) | No discussion of why the problems need Integer Programming  (0) |
| **Creativity**  (10 points) | Both problems look totally original  (10) | Think I’ve seen either of these problems before but they’ve gone a different direction with it.  (7) | I know I’ve seen either of these problems before.  (4) | Thanks for practically copying my problems!  (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. |  |  |  |