**IE 5340/3340 - Template required to plan the models before entering them in AMPL**

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Notes:

* AMPL entails the creation of two-three files:
  1. a .mod file with the model and
  2. a .dat file with the data
  3. a .run file with the instructions to execute the model. This file is optional since you can type the commands in the AMPL console to execute the model. However, the run file is convenient if other people are users of your model.
* Feel free to enlarge/shrink spaces in some sections of this format as needed.

1. **Particular Model**

**This is the model that gives particular numbers to the parameters**

1. Definition of decision variables:
2. Objective function: (clearly indicate if max or min)
3. Constraints:
4. Sign Constraints:

**2. General Model**

**In this model, the parameters do not take particular numbers. Parameters are represented with words. Also, the model uses mathematical notation such as sum** **for all  and belong ∈symbols**

a. Definition of decision variables:

b. Objective function: (clearly indicate if max or min)

c. Constraints:

d. Sign Constraints:

Elements of an AMPL model:

• Sets: They are collections of concrete or abstract items. Sets are useful to run indexes on summations and to represent the sizes of arrays and matrices

• Parameters: They are given single values, arrays or matrices

• Variables: They are the unknown decision variables

• Objective function

• Constraints

3. Which SETS do you need to define? List the name of each set and its elements

|  |  |
| --- | --- |
| Set name | Elements |
|  |  |
|  |  |
|  |  |
|  |  |

4a. List all Arrays or Matrices that you need to use to define your PARAMETERS

Complete the table below. The numeric values will be useful in the AMPL .dat file

|  |  |  |
| --- | --- | --- |
| Array or matrix  name | Size (usually in terms of a SET name; in braces) | Numeric values |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

4b. Write the name of any **single** PARAMETERS do you need to use

|  |  |
| --- | --- |
| Single parameter name | Numeric value (you don’t need braces here) |
|  |  |
|  |  |

5. Write the names for your Decision VARIABLES and if they are arrays or matrices provide the size of them. If they are “single-variables” size column is irrelevant.

|  |  |
| --- | --- |
| Decision variable  name | Size (in terms of a SET name if it is array or matrix) |
|  |  |
|  |  |
|  |  |
|  |  |

6. **Model file for AMPL**

* Write the **general model** using the **meaningful names** you gave to SETS, PARAMETERS and VARIABLES in steps 3-5.
* This general model will be the one you will type in the AMPL.mod file

**7. Data file for AMPL.** These are the instructions that you will type in the .dat file

**8. Compiling and running the AMPL files**

**Way 1:**

The following 5 commands can be typed in the AMPL console screen:

1. model **name of your model file with extension**;
   * I like to give to this file the extension .mod
   * If no sintax errors appear proceed to type the next instruction otherwise correct sintax errors, save the files, type in the console the command **reset;** and start to type the commands from 1-4 again
2. data **name of your data file with extension**;
   * I lie to give to this file the extension .dat
   * If no sintax errors appear proceed to type the next instruction otherwise correct sintax errors
3. option solver cplexamp;
   * If you are in your own PC and you don’t have the IBM optimization studio program installed type option solver cplex;
   * You can use other linear solvers such as **xpress** and **gurobi** by changing the word cplexamp in the previous command to any of the bolded names of these other solvers
4. solve;

Notes:

* + - Type **reset;** after the sequence of instructions is interrupted to correct sintax errors or for any other reason.
    - If the 4 commands above are successful you will see the objective function value appearing.

1. To display the value of the decision variables, type:

display name of the decision variable you want to display;

**Way 2:**

1. Write the commands listed on Way 1 on a file and save it with extension .run or .txt. The file will be called a run file.
2. Type the following instruction in the AMPL console screen to run the file

model **name of the run file with extension;**

* I will show a run file in class.
  + It will have instructions to save some of the results of running the model into a file named **results…..txt**
  + Once you run the run file click on the **refresh icon** (arrows icon on the top left AMPL screen; as depicted on the picture below).
    - You will see the new results file under the list of files (left screen).
    - Open the results file and if the run was successful you will see the correct solution!



AMPL is fun and powerful for solving IE problems!