Assignment Instructions: Assignment 1

Purpose

The purpose of this assignment is to set up and use the tools for this course. You will also learn to formulate a linear programming problem.

Directions

1. In this assignment, you will accomplish the following:
   1) Setup R
   2) Setup RStudio
   3) Setup a GitHub account

   Once you have done the above, you will create an R script. You may choose what the script does, but at the minimum should demonstrate the following:

   1) Read a file for data
   2) Produce summary statistics of the data
   3) Produce a graph, and
   4) That it works.

   Upload the script to your GitHub account. On Blackboard, you will submit the address (the first link) of the GitHub project to this script.

   You should create a word or PDF copy for the following problem and upload the file to the same GitHub account. On Blackboard, you should then submit the address (the second link) to this file.

2. Back Savers is a company that produces backpacks primarily for students. They are considering offering some combination of two different models—the Collegiate and the Mini. Both are made out of the same rip-resistant nylon fabric. Back Savers has a long-term contract with a supplier of the nylon and receives a 5000 square-foot shipment of the material each week. Each Collegiate requires 3 square feet while each Mini requires 2 square feet. The sales forecasts indicate that at most 1000 Collegiates and 1200 Minis can be sold per week. Each Collegiate requires 45 minutes of labor to produce and generates a unit profit of $32. Each Mini requires 40 minutes of labor and generates a unit profit of $24. Back Savers has 35 laborers that each provides 40 hours of labor per week. Management wishes to know what quantity of each type of backpack to produce per week.
   1. Clearly define the decision variables
      i. The decision variables include the number of products to produce at their respective unit profits for both Minis and Collegiates per week.
   2. What is the objective function?
      i. The objective function is a maximization function which can be viewed below:

ii. Max Z = $32X_1 + 24X_2$

3. What are the constraints?
    i. The constraints are the time able to be spent on production of minis and collegiate and the amount of square feet able to be used for said production.
4. Write down the full mathematical formulation for this LP problem.

Solution:

X_i = the number of products to be produced and sold where i = 1, 2 where 1 denotes Collegiates and 2 denotes Minis

Max Z = $32X_1 + 24X_2$

St:

$X_1 \leq 1000$

$X_2 \leq 1200$

$3X_1 + 2X_2 \leq 5000$

$45X_1 + 40X_2 \leq 84000$

$X_i \geq 0$

Learning Outcomes

The assignment will help you with the following course outcomes:

1. Familiarize yourself with R/Rstudio, and GitHub
2. Formulate an LP model

Requirements

All assignments are due before the next class.

General Submission Instructions

All work must be your own. Copying other people's work or from the Internet is a form of plagiarism and will be prosecuted as such.

- Upload your R document to your git repository. Name your file Username_#.ext, where Username is your Kent State User ID (the part before @), and # is the Assignment number. In this case, 1. ext is the file extension. For R, either .R, or .Rmd, if using an R markdown document.

Provide the link to your git repository in Blackboard Learn for the assignment.