ALY-6050 Module Five Project

Project: Using Linear Programming Models to maximize profits

The submission of each weekly project will consist of an Excel workbook (or an R script file if R has been used) and a Word document– a minimum of two submissions that have been submitted as attachments. For each weekly project, students should complete their analytic work in an Excel workbook, and write a minimum of 1500 words in a Word document describing their findings. The Word document should be according to the APA standards, i.e., it consists of a title page (including student's name, assignment title, course number and title, the current academic term, instructor's name, and the assignment completion date), and a reference page. The Word submission of each project will consist of three sections:

(i)   Introduction
(ii)   Analysis
(iii)   Conclusion

Project:

A northern hardware company is studying a plan to open a new distribution center in southeast. The company plans to rent a warehouse and an adjacent office and distribute its main products to the local dealers. The company has decided to initially start with four of its main products: Pressure washers, Go karts, Generators, and Water pumps. The table below describes how much each of the products will cost the company (including transportation costs):

Item	Cost (in Dollars)
Pressure washer	330
Go-kart	370
Generator	410
(Case of 5 Water Pumps)	635

Table 1: Costs of products in dollars

The company has set aside a purchasing monthly budget of $170,000 for the new location. The selling prices (per unit) for each item are given in the table below:

Item	Selling Price (in Dollars)
Pressure washer	499.99
Go-kart	729.99
Generator	700.99
Water pump	269.99

Table 2: Revenues of products in dollars

Other than the budget, another of the company's concern is the available space in the warehouse. The warehouse has 82 shelves, and each shelf is 30 ft long and 5 ft wide. Pressure washers and generators each are stored on 5 ft by 5 ft pallets whereas each Go Kart is stored on an 8 ft by 5 ft pallet. Furthermore, a 5 ft by 5 ft pallet is used to store four cases of water pumps

For promoting its brand products, the company's marketing department has decided to allocate at least 30% of its inventory to pressure washers and Go Karts and sell at least twice as many generators as water pumps.

Perform a monthly analysis using a linear programming model to maximize the company's net profit.

Complete the following in a Word document and in an Excel workbook (or R). Submit both the Word document and the Excel workbook (or R script file) as attachments.

1. In a Word document, write the mathematical formulation of the problem.
2. Set up the linear programming formulation in an Excel workbook or R.
3. Use the Excel Solver or R to solve the problem, and generate a sensitivity report.
4. Describe the optimal solutions obtained in the Word document. These will consist of the inventory level for all four products and the optimal monthly profit.
5. One of the decision variables has an optimal value of zero. Use the Solver sensitivity report to determine the smallest selling price for that item so that this optimal zero solution value changes to a non-zero value.
6. In the word document explain whether, in addition to the $170,000 allocated to the purchasing budget during the first month, the company should allocate additional money. If yes, how much additional investment do you recommend, and how much should the company expect its net monthly profit to increase as a consequence of this increase?
7. In the word document, explain whether you recommend that the company should rent a smaller or a larger warehouse. In any case, indicate the ideal size of your recommended warehouse in square feet, and indicate how much this change in the size of the warehouse will contribute to the monthly profit.

Rubric ALY 6050 Project 5

Category Score	Characteristics
A Range *Excellent* **90–100 points**	• **R/Excel** Accurate completion of 90%–100% of all R/Excel requirements. Code and/or excel is well formatted and easily readable. • **Report (Content)** Complete presentation and analysis of key results. Contains all required tables, and visualizations. Provides a precise description of the analytical concepts and theories used in the analysis. • **Report (Style and Submission)** Title page, introduction and conclusion/recommendation included; accurate APA citations; minor grammar or spelling errors; page numbers.
B Range *Good* **80–90 points**	• **R/Excel.** Accurate completion two parts of project. Code and/or Excel is poorly formatted or difficult to read. • **Report (Content)** At most one major required component missing. Report shows gaps in reasoning or conclusions not supported by the data. • **Report (Style and Submission)** Missing one of the required elements (introduction, conclusion, etc.); incomplete or incorrect citations; occasional grammar or spelling errors. Imprecise.
C Range *Satisfactory* **70–80 points**	• **R/Excel.** Completion of only a single part of the project. Major deficiencies in readability. • **Report (Content)** Report missing major required elements; evidence for recommendations is unclear or inaccurate; lack of organization. • **Report (Style and Submission)** Missing more than one of the required elements; few or no citations; frequent grammatical and spelling mistakes.
F Range *Unsatisfactory* **0–70 points**	• **R/Excel.** Accurate completion of fewer than 70% of all requirements. Disorganized and incomplete code. • **Report (Content)** Mostly missing. • **Report (Style and Submission)** Missing most required elements; major formatting or grammatical errors.

Table 1 Project 1 Rubric