**Assignment 2**

Due: By midnight on Weds, Oct 2nd, via Canvas. Have one person from each group submit one Cohort\_Group#\_HW2.ipynb (e.g., BA1\_Group3\_HW2.ipynb) file to the Assignments area of Canvas, which provides the solutions to the below problems. Indicate the full names and student numbers of your team members at the top of the notebook.

1. **Flair Furniture with Quantity Discounts**

Consider the following version of the Flair Furniture problem. Assume all of the constraints of the original version remain. However, now the profit margins of tables and chairs depend on the quantity sold. Specifically, suppose the $7 profit margin per table holds until 150 tables are sold, but after that, Flair Furniture provides a discount, and the profit margin reduces to $3 per table for any tables sold above 150. Similarly, suppose the $5 profit margin per chair holds until 300 chairs are sold, but a discount is offered beyond this, reducing the profit margin to $4 per chair.

Formulate an LP to find the optimal number of tables and chairs to produce, along with the optimal profit. Provide the algebraic formulation, as well as the Gurobi-based solution. Explain to management how/why this solution differs from the baseline solution.

1. **Advertising goals**

An advertising company is considering three forms of advertising: television, radio, and newspaper. Each ad’s cost and potential customer reach is given in the following table:



The company has the following three goals:

Goal 1: Spend no more than $25,000 on advertising

Goal 2: Reach at least 30,000 new potential customers

Goal 3: Run at least 10 television ads

If the company goes over the $25,000 budget, it costs them $1 per dollar over the budget.

They estimate a cost of $5 for each potential customer they fall short of 30,000.

They estimate a cost of $100 for each TV ad they fall short of 10.

1. Formulate a linear programming model to help the company determine how many of each advertisement to run.
2. Use Gurobi to determine the optimal decisions and optimal objective function.
3. Discuss your solution.