Question 19.1

Retailer Case-Study

Hypotheses:

1. **More Shelf Space = More Sales - A/B testing varying space**
2. **More sales = more complementary products**
3. **Larger effect if complementary products are adjacent - Regression**

Constraints:

1. **Minimum and maximum shelf space for each product**
2. **Total amount of shelf space**

I. The retailer's overarching goal is to determine the amount of space to allocate for each product in order to maximize sales. This can be broken down into three parts:

A. Determine which products are complementary
B. Determine how much space to allocate to each product
C. Measure and Analyze the effects

II. Determine which products are complementary: the company would like to place products that are commonly sold together, next to each other in the store. However, there is a consideration about whether or not this would actually increase the sales for the products. In this scenario we will assume that placing complementary products near each other does increase the sales.

To predict which products are complementary the retailer must look at the previous purchase of their customers. Analyzing the receipts of each customer's visit can provide useful insights about this information. Items that are frequently purchased on the same visit may provide information about which products are complementary. A clustering model could be implemented to determine which products are purchased together the most often

Step 1:

Given: Previous customer receipts and habits
Use: Clustering algorithms
To: Determine which products are complementary

III. Determine how much space to allocate to each product: the company believes that spacing causes products to be purchased more and allocate space to products that benefit from more spacing. However, the maximum and minimum spacing for each product, as well as the overall store space are some constraints that will have to be noted.

To determine how much space to allocate to each product the retailer could look at past information about the sales of certain products and their shelf space over time. This would allow the retailer to see which products had sales rates that changed when the shelf spacing changed. If the retailer does not have this information then making the changes themselves and analyzing the results over time or looking at other stores may be a useful option. Once this data is collected an optimization algorithm could help to determine the ideal amount of space for each product.

Step 2:

Given: data about shelf spacing for each product
Use: Optimization or Greedy Multi Armed Bandit test
To: Determine which products benefit from most spacing

IV. Determine whether changes had an impact on the product sales: The retailer assumes that creating more shelf space for products and placing complementary products next to each other will lead to higher sales but this is not a guarantee. It would be beneficial to analyze the different scenarios to understand the effects.

To gain a better understanding of the effects of the changes that were previously made, it would make sense to analyze different scenarios. The shelf spacing for products could be altered to determine whether this has any effect on the sales for this product, Varied placements of objects that are deemed to be complementary could also provide insight into how the distance between complementary products affects sales. A/B testing would model these variations well and provide useful insight into which scenarios resulted in the most sales.

Step 3:

Given: Various Combinations of complementary products and shelf spacing
Use: A/B testing
To: Determine whether or not changes had an effect