# Refining Computer Sales Strategy through Statistical Analysis Project - Part 1 & 2

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# Introduction:

This project focuses on leveraging data analysis to refine product strategies and enhance sales performance in the competitive computer market. By examining product specifications and pricing trends, the study aims to:

- **Align Offerings with Customer Demands:** Understand consumer preferences through specification-based analysis.
- **Strategic Pricing Decisions:** Assess price disparities between premium and non-premium computers to optimize pricing strategies.
- **Market Trend Insights:** Analyze price distribution to inform market positioning and effective advertising budget allocation.
- Through a structured approach, including data cleaning and analysis, the project seeks to deliver actionable insights for improved decision-making and resource optimization.

# Part1

## Business Objective 1
## Enhance Product Strategy and Sales Performance through Specification-Based Analysis.

**Task 1**
**a) Analyze Purchase Likelihood Based on Specifications**
**The company wants to understand the likelihood of customers purchasing specific computer configurations based on a combination of desired features (RAM size, processor speed, size of the computer screen).**
**What is the probability of a customer purchasing a computer with at least 8GB of RAM, computer screen size of 14 inch, and a processor speed exceeding 33 MHz?**

# Output:

- Number of computers with specified configurations: 1003
- Total computers: 6259
- Probability of purchase with specified configurations: 0.16

# Interpretation:

- **Key Insights:**
- **16% Probability:**Indicates that 16% of the total computers sold meet the specified configurations (8GB RAM, 14-inch screen, >33 MHz processor speed).
- **Actionable Recommendations:**
- **Inventory Management:**Ensure adequate stock for these configurations to meet demand.
- **Targeted Marketing:**Highlight the specifications in campaigns to attract more customers.
- **Pricing Strategy**:Assess if competitive pricing can further boost interest.

# Part1

**Business Objective 1**
**Enhance Product Strategy and Sales Performance through Specification-Based Analysis.**

**Task 1 (cont'd)**
**b) Probability of Selling Premium Computers**
**I. What is the probability of selling a premium computer?**
**II. Given that a computer is premium, what is the probability that it has a CD player?**

## Output:

- Probability of selling a premium computer: 0.90
- Probability of a premium computer having a CD player: 0.50

## Interpretation:

- **Premium Segment Dominance:**Premium computers account for the vast majority of sales, indicating a strong customer preference for high-end models.
- **CD Player Feature in Premium Models:**Only half of premium computers include a CD player, signaling a potential decline in the importance of this feature.
- **Recommendations:**
- Focus on innovation and differentiation in the premium segment to sustain high sales.
- Evaluate the relevance of CD players in premium models and consider offering alternatives (e.g., USB drives or cloud storage solutions) to align with evolving customer needs.

# Part1

## Business Objective 1
## Enhance Product Strategy and Sales Performance through Specification-Based Analysis.

**Task 1 (cont'd)**

**c) Predicting the Probability of Certain Specifications**

**What is the probability of a computer having a screen size greater than 15 inches and being premium?**

**Given that a computer is not premium, what is the probability that it has a screen size less than or equal to 14 inches?**

# Output:

- Probability of screen > 15 inches and being premium: 0.08
- Probability of screen ≤ 14 inches given not premium: 0.69

# Interpretation:

**Premium Computers:**

- A low probability (8%) of having screens larger than 15 inches suggests that this feature is not a dominant factor in premium models.
- Premium computers could benefit from introducing more large-screen options to cater to niche demand.

**Non-Premium Computers:**

- High probability (69%) of screens ≤ 14 inches indicates customer preference for smaller, compact screens in budget-friendly models.

**Recommendations:**

- Premium Segment: Consider expanding offerings of large-screen premium computers to tap into potential unmet demand.
- Non-Premium Segment: Focus on maintaining compact, affordable screen sizes while exploring mid-sized options for greater flexibility

# Part1

**Business Objective 1**
**Enhance Product Strategy and Sales Performance through Specification-Based Analysis.**

**Task 1 (cont'd)**
**d) Likelihood of computers having both a CD player and a multimedia kit**
**i What is the joint probability of computers having both a CD player and a multimedia kit?**
**ii. Given that a computer has a CD player, what is the probability that it also has a multimedia kit**

## Output:

- Joint probability of having both a CD player and a multimedia kit: 0.14
- Probability of having a multimedia kit given a CD player: 0.30

## Interpretation:

**Feature Pairing (CD Player & Multimedia Kit):**

- 14% Joint Probability: This shows that a minority of computers feature both the CD player and multimedia kit together.
- 30% Conditional Probability: While 30% of CD-equipped computers also have a multimedia kit, this indicates there's room for improvement in bundling these two features.

**Market Implication:**

- This suggests that while the combination of a CD player and multimedia kit exists, it is not as strong of a selling point. The company might want to explore other feature combinations or focus on promoting these paired features more aggressively.

# Part1

**Business Objective 2**
**Assessing Price Disparities Between Premium and Non- Premium Computers as compared to prices of both categories together.**

**a) What is the average price of computers in the population/whole data?**
**b) How does the average price of samples vary when data is sampled using different sampling techniques?**

## Output:

- Average price of computers in the dataset: $2219.58
- Simple Random Sampling Avg Price: $2223.37
- Stratified Sampling Avg Price: $2193.10
- Systematic Sampling Avg Price: $2220.65

## Interpretation:

**Population vs. Sampling Results:**

- The average price of all computers is $2219.58, providing a benchmark for comparison.
- Sampling methods produced similar results, demonstrating their reliability for estimating the population average.

**Key Observations from Sampling:**

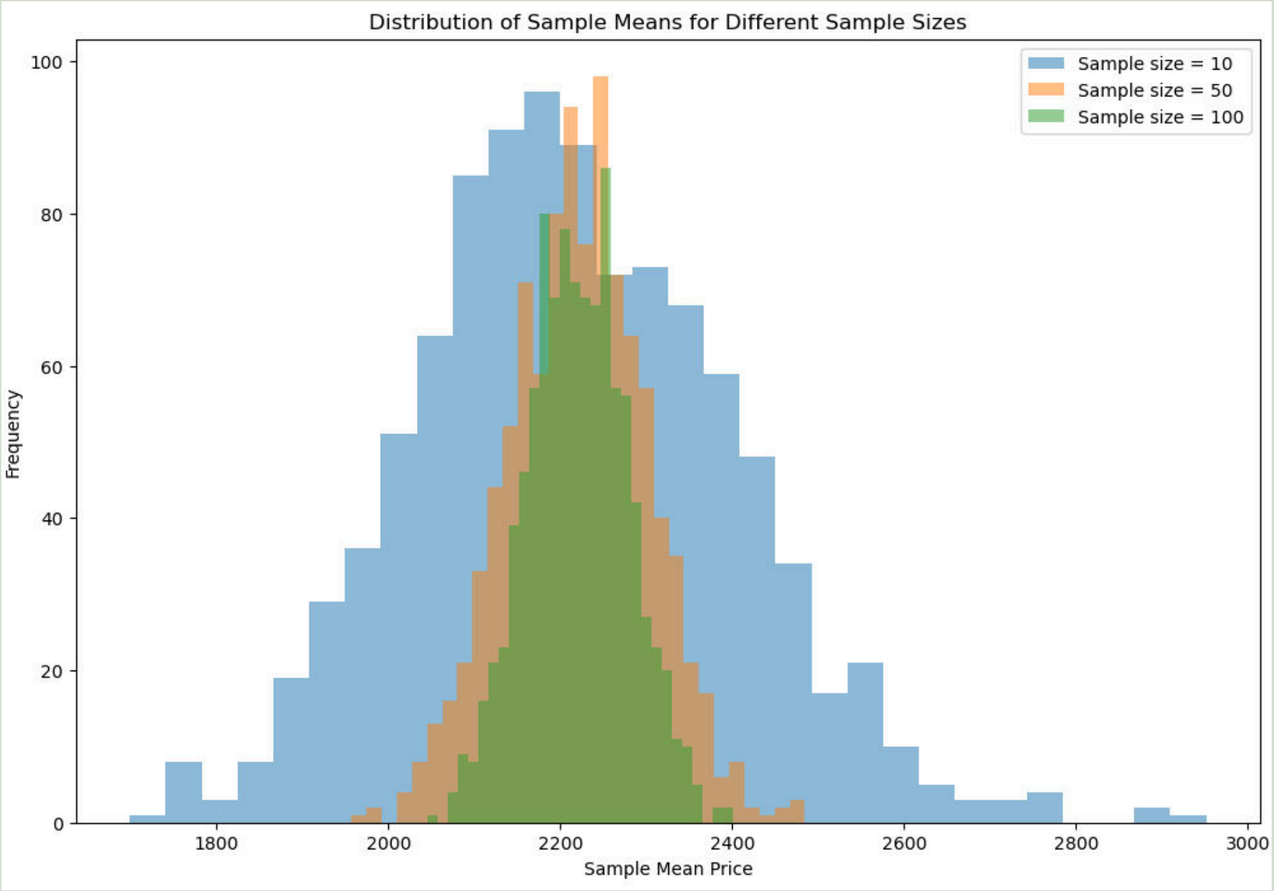
- **Simple Random Sampling:** Closely aligns with the population average ($2223.37), showing its effectiveness for general-purpose analysis.
- **Stratified Sampling:** Slightly lower average ($2193.10) reflects the proportional representation of premium and non-premium subgroups.
- **Systematic Sampling:** Nearly identical average ($2220.65) highlights its ability to capture the dataset's overall distribution accurately.

# Part1

## Business Objective 3
## Understanding Computer Price Trends Through Distribution Analysis

**Task 3**

**a) How does the distribution of sample means change for computer prices with different sample sizes?**
**b) Does the distribution of sample means approximate a normal distribution as sample size increases?**
**c) Check if properties of Central limit theorem for the samples is satisfied.**




# Interpretation:

**Based on the Shapiro-Wilk test results:**
**Test Statistic:** 0.9984093428521674
**Pvalue:** 0.4968329844518241 7

Since the p-value is greater than the significance level (usually 0.05), we fail to reject the null hypothesis. This means that we do not have 1 sufficient evidence to conclude that the 2 sample means are not normally distributed.

Yes, the distribution of sample means approximates a normal distribution as the sample size increases.
This is a fundamental principle in statistics, known as the Central Limit Theorem (CLT).

# Part2

## Business Objective 4

## Analyzing Advertising Budget for Premium Computers by Identifying Budget Allocation.

**Task 1**

**The advertising budget spent on promoting premium computers in 2023 is increased as compared to 2022. The mean advertising budget was 221.3 billion dollars in 2022 and was 222.2 billion dollars in 2023 A promoter in this company believes that the average advertising budget is higher than that of 2022. Priya, a data analyst, randomly selected 40 premium computers to check this notion.**
**Use a 5% level of significance to test Maya's hypothesis. Consider normally distribution in the population and standard deviation is 74.83.**

# Output:

- Z-Test Statistic: 0.0761
- Critical Z-Value: 1.6449
- Decision: Fail to reject H0H0

# Interpretation:

**Key Findings:**

- The Z-statistic (0.0761) is far below the critical value (1.6449) at a 5% significance level.
- This indicates that the observed difference in the average advertising budget is likely due to random variation.

**Business Implication:**

- The claim that the 2023 advertising budget significantly increased cannot be statistically supported.
- The company might consider revisiting its allocation strategies or further investigating factors affecting budget effectiveness.

# Part2

**Business Objective 5**
**Evaluate the Price Difference between Computers with and without CD Players**

**Task 2**
**Is there a statistically significant difference in the average price of computers with CD players and computers without CD players? Use 5% of the significance level for the test**

## Output:

- T-Test Statistic: 16.07486310306849
- P-Value: 5.2424656650780 34e-57
- Reject the null hypothesis: There is a statistically significant difference in the average prices.

## Interpretation:

**Key Finding:**

- The t-test shows a statistically significant difference in average prices between computers with and without CD players.

**Statistical Evidence:**

- T-Test Statistic: 16.07
- P-Value: 5.24×10−575.24×10−57 (far below 0.05 significance level).

Computers with CD players are priced significantly differently, indicating that the presence of a CD player is a notable factor in pricing.

# Part2

## Business Objective 6
## Analyze Premium Computer Pricing Strategy

**Task 3**

**a) Identify Price Discrepancy for Premium Computers**

**Determine if the mean price of premium computers differs significantly from $2200?**

**To examine this, select 25 samples of premium computers randomly from the data. Assume the data is normally distributed in the population. Use a 5% significance level to test this hypothesis**

# Output:

- T-Test Statistic: 0.5388085552024006
- P-Value: 0.5949820708830511
- Fail to reject the null hypothesis: The mean price of premium computers does not differ significantly from $2200.

# Interpretation:

**Key Finding:**

- The one-sample t-test results show that the mean price of premium computers does not differ significantly from $2200.

**Statistical Evidence:**

- T-Test Statistic: 0.54
- P-Value: 0.59 (greater than 0.05 significance level).

Based on the test, there is no statistically significant difference between the sample mean price of premium computers and $2200.

# Part2

## Business Objective 6
## Analyze Premium Computer Pricing Strategy

**Task 3 (cont'd)**

**b) Analyze price disparity between premium and non-premium computers Is there a significant difference in the mean prices of premium and non-premium computers?**

**Assume that the prices are normally distributed and that the population variances are approximately equal. Use a 5% significance level to test this hypothesis.**

# Output:

- T-Test Statistic: -6.404063996063658
- P-Value: 1.622883063853707e-10
- Reject the null hypothesis: There is a significant difference in the mean prices of premium and non-premium computers.

# Interpretation:

**Key Finding:**

- The independent two-sample t-test reveals a significant difference in the mean prices of premium and non-premium computers.

**Statistical Evidence:**

- T-Test Statistic: -6.40
- P-Value: 1.62×10−101.62×10−10 (far below the 0.05 significance level).

The mean prices of premium and non-premium computers are significantly different, indicating a distinct price gap between the two categories.

# Conclusion:

**Customer Purchase Likelihood:**

- 16% probability of purchasing computers with specific configurations (8GB RAM, 14-inch screen, and >33 MHz processor).

**Premium Computers Insights:**

- 90% probability of selling a premium computer.
- 50% chance that premium computers have a CD player.
- Significant price difference between premium and non-premium computers.

**Price Disparities:**

- Significant price difference between premium and non-premium computers.
- Average price of all computers: $2219.58

**Advertising Budget:**

- No significant increase in advertising budget for premium computers in 2023 compared to 2022.

**Business Implications:**

- Focus on promoting premium computers and configurations with higher interest.
- Optimize pricing strategy, as premium computers are priced significantly higher.
- Reevaluate advertising budget allocation for better returns.

# Thank YOU