

# Pandas Data Wrangling Project – Phase 4

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## Introduction

Bruno is impressed with how well the customer dataset has been cleaned and enriched. Now he's eager to extract meaningful business insights from the data. He has several specific questions about customer behavior patterns, revenue trends, and churn metrics that will help inform Keiko Corp's strategic decisions.

Let's leverage Pandas aggregation techniques to generate summaries that answer Bruno's questions!

*(Once again, feel free to continue building on your notebook from the previous phase of the project, OR export the end-state DataFrame from that phase as a CSV file and use it as a starting point here.)*

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## Task 1: Analyze Revenue by Contract Type

Bruno's first question is: "How many of our customers are signed up under each contract type, and how does average and total revenue vary among those contract types? I want to understand our revenue profile across different customer commitments."

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## Task 2: Analyze Churn by Service and Contract Type

Bruno's second question: "I'd like to see the churn rate – and maybe customer count and average tenure as well – broken down by *both* internet service type AND contract type. Are there specific combinations that are particularly problematic?"

*HINT: To calculate churn rate, you'll first need to create a numeric version of the churn column where 'Yes' = 1 and 'No' = 0. Then the mean of this column gives you the churn rate. A fast way to do this is to compare the **churn** column to the string '**Yes**'. That comparison returns a Boolean Series, which can then easily be converted to a numeric data type.*

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## Task 3: Create a Pivot Table of Churn Rates

Bruno's third question: "Can you give me a cleaner, cross-tabulated view of the churn rates? I want to see internet service types as rows and contract types as columns."

*HINT: A pivot table is perfect for creating this kind of cross-tabulated summary!*

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## Task 4: Compare Customer Charges to Contract Average

Bruno's fourth question: "I'd like to know how each customer's monthly charges compare to the average for their contract type. Can you add a column to the main dataset showing the difference from their group average?"

*HINT: The `transform` method is useful here because it returns a Series with the same index as the original DataFrame, allowing you to add the result as a new column.*

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## Task 5: Analyze Monthly Signup Trends

Bruno's fifth question: "I want to understand our customer acquisition trends over time. Can you show me the number of new signups per month, along with a 3-month rolling average to smooth out the fluctuations?"

*HINT: You'll need to extract year and month from the signup date, count signups per month, then apply the `rolling` method to calculate the moving average.*