**Assignment 1 Findings**

**Q1 — Frailty Mini-Report**

I worked with a small table of height, weight, age, grip strength, and a yes/no frailty label. I converted height and weight to meters and kilograms, then calculated BMI. I also grouped ages into simple ranges and turned the frailty label into 0 or 1 so I could analyze it. When I checked the link between grip strength and frailty, I got a value of **−0.476**. In plain terms: people with stronger grips tend to be **less** frail in this tiny sample. This doesn’t prove cause and effect, it's just a pattern. With more data, I’d add a confidence interval or a quick resampling test to see how solid that number is.

**Q2 — Student Performance Visualizations**

**V1 — Math vs Reading by Gender (Boxplots)**

This chart compares math and reading scores for each gender. I start by checking the middle line (the median) to see which subject is higher within each group. Then I look at how tall the boxes and whiskers are**,** taller means scores are more spread out. If the two boxes (math and reading) overlap a lot, the difference is probably small; if they’re separated, the difference matters more. Any dots outside the whiskers are outliers worth a quick look. Also, if one group has fewer students, its box can look noisier. Overall, it’s a quick way to see where the scores sit and how much they vary for each gender.

**V2 — Mean Math Score by Test Preparation (Bar Chart)**

This chart compares average math scores for two groups: students who finished test prep and those who didn’t. If the “completed” bar is higher, it suggests prep might help**,** but it doesn’t prove it. Some students who sign up for prep may already be more motivated, which could raise their scores anyway. I also check how many students are in each group; tiny groups can make the averages jump around. In a deeper check, I’d add error bars and maybe a quick t-test to see how certain the difference is. Even a small bump can matter if the prep is cheap and easy to offer. Overall, it’s a clear side-by-side comparison that’s easy to explain.

**V3 — Mean Overall Average by Lunch Type (Bar Chart)**

This chart compares overall scores for students with standard lunch vs free/reduced lunch. Lunch type can hint at a student’s family resources, so differences here can point to possible equity gaps. If the standard-lunch group scores higher, that fits what we often see when students have more support and resources. How big the gap is matters: a small gap might mean support programs are helping; a big gap says we may need to do more. This is just a comparison, not proof that lunch type causes the scores. To be sure about the difference, I’d add error bars or a simple test. Watching this chart over time helps show whether our interventions are actually closing the gap.

**V4 — Correlation Heatmap (Math, Reading, Writing)**

This heatmap shows how closely each pair of subjects moves together. The number (Pearson r) runs from 0 to 1 here: numbers closer to 1 mean the two subjects tend to go up and down together; numbers near 0 mean there isn’t much of a link. It’s common to see a strong link between reading and writing since both rely on similar skills. A decent math**,** reading link can also show up because reading helps you understand word problems. When the numbers are high, it usually means students who do well in one subject also do well in the other. Just remember: this shows patterns, not causes. If one pair has a much lower number than the others, it’s a sign to look at the curriculum or tests to see why they might be less connected.

**V5 — Math vs Reading by Test Prep (Scatter with Trend Lines)**

This scatter plot compares reading (x) and math (y) and adds a best-fit line for each test-prep group. The upward trend means students who read better usually score higher in math, too. If the two lines have similar slopes but one sits higher, the prep group may just have an overall score boost. If the slopes differ, prep might be changing how reading relates to math, not just lifting scores. I also check the legend counts (n) so I don’t read too much into tiny groups. Outliers can pull the line around, so they’re worth a quick look. Along with the bar chart in V2, this helps tell whether prep changes just the average or the reading-to-math relationship itself.