Project 1

Project Overview

In this project, your task is to conduct a randomized experimental study involving the Islanders. Recall that in a randomized experimental study, you have a treatment group and a control group. That means you will need to split your sample into two groups first before starting your study. It may be possible to explore the same topic as project one, but from an experimental design perspective.

The following is an overview of what is expected from your group:

- Choosing a research topic and questions to explore
- Designing a study for your chosen topic

  - Collecting and recording data
  - Analyzing the data using both numerical summaries and visualizations

- Writing a report about your findings and conclusions
- Presenting your findings to the class

Research Topic and Questions

Your research topic is a short statement that describes the general area of interest. Ideally, your topic should be no longer than 15 words. It should be broad enough to allow for multiple research questions to be asked, but specific enough to give a clear idea of what you are interested in.

Study Design

Your group will design an experimental study to answer your research questions via hypothesis testing techniques learned in the course. You will need to decide on the following aspects of your study:

- **Population**: Who are you interested in studying? This could be a specific Island or a specific city within the Islands.
- **Sample**: How will you collect your data? What sample size and sampling strategy (simple random, stratified, cluster, etc.) will you use and why?
- **Variables**: What intervention/treatment will you be administering? What variables will you collect data on? What are the predictor variables and what are the response variables? How will you measure these variables? What are the units of measurement?
- **Data Collection**: How will you collect your data? How will you ensure that your data is reliable and valid? How will you minimize bias in your data collection?
- **Data Analysis**: What statistical methods will you use to analyze your data? What visualizations will you create? How will you link these analyses together to tell a coherent story?

The Report

The final report should be a polished document that clearly communicates your research topic, questions/hypotheses, data, analyses, and results. The report should be written in a clear, concise, and professional manner. It should be free of grammatical errors and typos. The report should also include a title page with the title of your project, the names of all team members, and the date. A sample completed report will be provided.

Project Timeline

The five milestones for this project are as follows:

1. Milestone 1 - Project proposal.
2. Milestone 2 - A first draft of your project write-up.
3. Milestone 3 - Peer review, on another team's first project.
4. Milestone 4 - A final completed project report.
5. Milestone 5 - Presentation with slides summarizing key points and findings of your study

Milestone 1 - Proposal

There are two main purposes of the project proposal:

- To help you think about the project early, so you can get a head start on finding data, reading relevant literature, thinking about the questions you wish to answer, etc.
- To ensure that the data you wish to analyze, methods you plan to use, and the scope of your analysis are feasible and will allow you to be successful for this project.

The project proposal will be due roughly three days after the project is assigned. Since the proposal is about a study not yet done, it should be written in **future tense**. It must contain the following details:

1. **Team members and their roles**: List the names of all team members and their roles in the project. Roles can include the following and multiple members can take on the same role: Data collection, Data analysis (performing the analyses in Tinker Plots), Report writing (e.g., abstract, introduction, literature review, findings, conclusion), Proof reading and typo/grammar checking, Team leader (e.g., setting up meetings, follow up, communicate with professor), etc.

2. **Research topic and Questions**: Refer the earlier note on what the topic and questions should look like. You should have at least two research questions for your research project.

3. **Design and Data**: Describe your study design and the data collection methods and techniques. Since this is an experimental design, be sure to revisit your study design notes from earlier in the semester to make sure you are doing everything right. You should provide a detailed description of your variables and how you plan to measure them. You should also describe your sampling strategies.

4. **Analysis plan**: Describe the analyses you plan to conduct. This should include an exploratory analysis part where your explore patterns and trends in your data using visualizations as well as numerical summaries. Focus should be on the variables of interest to your study. You should also have a hypothesis testing part detailing how you will run the tests in Tinker Plots.

Milestone 2 - First Draft

Your project draft is a completed project, that we will use to obtain feedback from the professor and peers in class. Since the report is about the study that is already done, you should write it in **past tense**. The draft should include the following sections:

1. **Abstract**: This section should provide a brief overview of the research topic, questions, data, and analyses you are conducting. It should also provide a brief overview of the findings. Think of the abstract as an executive summary of your work that someone can read and understand without reading the whole report. You should write the abstract *last*, after you have completed the rest of the report. Be sure to take a look at the sample abstract provided in the sample report.

2. **Introduction**: This section should introduce your research and the questions you are addressing. It should also provide a brief justification of the topic of choice. In other words, why should people care? Why is it important to explore your topic? It is helpful to cite a few sources to help support your case.

3. **Literature Review**: This section should provide a brief overview of the literature related to your research topic. You should cite at least 5 sources and synthesize their methods and findings in relation to your own research. Guidelines for writing an effective literature review can be found here.

4. **Methods**: This section should describe the data you are using and the analyses you plan to conduct. It should include the following subsections:

   - **Study Design**: How did you design your study? What was your treatment and control group? How did you randomize your sample? How long did the intervention last and why? What was the duration of the study? What were the inclusion/exclusion criteria ,if any, for your study?

   - **Participants**: How many participants did you use? What was your target population? Describe the demographic characteristics of the study participants (e.g., age, gender, etc). How many participants were in the treatment group and how many were in the control group? How did you select your sample? What sampling strategy did you use? Did you use any inclusion/exclusion criteria? If so, what were they?

   - **Data Collection Procedures**: You should also describe the data collection process, describe the variables of interest and specify predictor and response variables and how they were measured. You should also provide a detailed discussion of the sampling strategies used and justify your choices accordingly.

5. **Data Analysis and Results**: This is one of the most important and heavily weighted parts of your project. The analyses should be sound and their interpretations accurate. The analyses should demonstrate a thorough understanding of statistical concepts learned in this course (and beyond, if you like). As indicated earlier, your data analyses must include both exploratory and inferential analyses. ***Exploratory analyses*** includes summarizing data using various numerical and visual tools. Your ***inferential analysis*** will include hypothesis testing and parameter estimation via confidence intervals. Your interpretations of results should be as accurate as possible.

6. **Conclusion**: This section should summarize the research questions/hypotheses addressed in your study, the analyses conducted, and the findings. The findings of your study must be tied back to those reported in the literature review. For example, do your findings support previous studies or do they contradict them? It should also discuss the implications of your results and suggest directions for future research. Be sure to state any limitations of your study and what would be done differently if you were to do the study again.

7. **References**: This section should list all the sources you cited in your report. Use APA format for your references.

Milestone 3 - Peer review

Critically reviewing others' work is a crucial part of the scientific process, and MATH 155 is no exception. Each member of your team will be assigned at least one project from another team to review. Team members should read individually before meeting during which the team will come up with collective feedback for the other team. The peer review process will be double blinded, meaning that you will not know who is reviewing your project, and you will not know whose project you are reviewing. This feedback is intended to help you create a high quality final project, as well as give you experience reading and constructively critiquing the work of others.

Instructions and grading criteria for this milestone are outlined in Milestone 3: Peer review.

Milestone 4 - Final Write up

The final write-up is the culmination of your project. It should include all the sections of the first draft, but with revisions based on the feedback you received from your peers and the professor. The final write-up should be a polished document that clearly communicates your research topic, questions, data, analyses, and results. The final write-up should be written in a clear, concise, and professional manner. It should be free of grammatical errors and typos. The final write-up should also include a title page with the title of your project, the names of all team members, and the date.

Instructions and grading criteria for this milestone are outlined in Milestone 4: Writeup + presentation.

Milestone 5 - Presentation

The final milestone is a presentation of your project. The presentation should be about 10 minutes long and should include slides that summarize the key points and findings of your project. The presentation should be clear and concise. The presentation will be graded on

the clarity of the slides, the clarity of the presentation, and the ability to communicate your research topic, questions, data, analyses, and results to an audience. The presentation will be followed by a question and answer session with the professor and your peers.

Grading

Overall grading

The overall grade breakdown by milestone (M_i) is as follows:

Total	100 pts
M1: Project Proposal	10 pts
M2: First Draft	20 pts
M3: Peer Review	10 pts
M4: Final Write up	40 pts
M5: Slides + Presentation	10 pts
Collaboration & Teamwork	10 pts

Grading Milestone details

M_1 - **Project Proposal**

- *Completion (0-2pts)* - Did the team complete ***all parts*** of the proposal as required?
- *Content (0-2pts)* - What is the quality of research and/or question and relevancy of data to those questions?
- *Correctness (0-2pts)* - Are the proposed statistical procedures sound/reasonable for the stated questions?
- *Communication & Writing (0-2pts)* - What is the quality of the statistical presentation, writing, and explanations?
- *Creativity and Critical Thought (0-2pts)* - Is the project carefully thought out? Does it appear that time and effort went into the planning of the project?

M_2 - **First Draft**

- *Abstract (0-2 pts)* - Does the abstract provide a brief overview of the research topic, questions, data, analyses, and findings?
- *Introduction (0-2 pts)* - Does the introduction articulate the research topic and questions being addressed? Does it provide a brief overview of the data and a justification of the importance of the study? Does it provide some citations to support the case?

- **Literature Review (0-3 pts)** - Does the literature review provide relevant in-text citations? Does it examine and synthesize the sources in context of the current study? Does it include at least 5 sources?
- **Methods (0-3 pts)** - Does the methods section address the study design, sample (participants), the data, and the analysis methods? Does it justify the choice of analysis methods?
- **Data Analysis and Results (0-6 pts)** - Are the analyses implemented correctly? Are the interpretations for **both research questions** done correctly and in context of the study? Does the paper provide both exploratory and inferential analyses using Tinker Plots? Do the analyses demonstrate a thorough understanding of statistical concepts learned in the course?
- **Conclusion (0-2 pts)** - Does the conclusion summarize the research questions you addressed, the data you used, the analyses you conducted, and the results you obtained? Does it discuss the implications of the results and suggest directions for future research?
- **References (0-2 pts)** - Are all the sources you cited in your report listed in the references section? Are they in APA format?

M_3 - Peer Review

Peer reviews will be graded on the extent to which it **comprehensively and constructively** addresses the components of the reviewee's team's report.

Only the team members participating in the review process are eligible for points for the peer review. Teams may choose to meet in-person or virtually. The team should submit a single review document that includes the following:

- **Quality of feedback (0-3pts)** - Did the team provide **constructive and actionable** feedback? Please note that actionable does not mean telling the reviewee team what to do, but rather providing feedback that the team can use to improve their work.
- **Correctness (0-2pts)** - Are the critiques provided sound and reasonable?
- **Communication & Writing (0-2pts)** - Is the feedback report understandable and free from grammatical errors and typos?
- **Completion (0-2pts)** - Did the team provide feedback for **all sections** of the report?

M_4 - Final Writeup

The grading of the final write up follows the same grading criteria as Milestone 2 but gets additional points. To get maximum points on milestone 4, you should address the feedback given to you on your project draft by your peers and/or professor. If there is any feedback that you think does not need to be addressed, please provide a justification for why you think so.

- *Abstract (0-4 pts)*
- *Introduction (0-4 pts)*
- *Literature Review (0-6 pts)*
- *Methods (0-6 pts)*
- *Data Analysis and Results (0-14 pts)*
- *Conclusion (0-4 pts)*
- *References (0-2 pts)*

M_5 - **Presentation**

- ***Slides (3 pts)*** - Are the slides clear, well-organized, and concise? Do they summarize the key points and findings of the project?
- ***Presentation (4 pts)*** - Is the presentation clear and does it show a thorough understanding of the material learned? Are speakers audible enough and facing the audience? Are they engaging and do they maintain eye contact with the audience?
- ***Question and Answer (Q&A) (3 pts)*** - How well does the team answer questions about their project? Are they able to communicate their research topic, questions, data, analyses, and results to an audience?

Submission

Submissions for all milestones should be made through Canvas. You will see the assignments created in Canvas for each milestone with more detailed instructions.