

GR Refinement Instructions

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Introduction

Throughout this course, there are three individual effort GRs based loosely on the conceptual and applied homework from the ISLP book. These will be in-class, timed, and administered on paper. After each GR, you should review all feedback and the overall letter grades for each question provided in Gradescope.

To help you iterate on and improve your understanding of Math 378 course material following the GRs, you have the opportunity to complete a GR Refinement for each block of material.

For this course, you will utilize NotebookLM and have a dialogue about what you missed, where you went wrong, and what the correct answer is. You will work with NotebookLM (to be provided by your instructors) to correct your mistakes and refine your understanding of the course material. This will provide you with immediate feedback and allow you to iterate and improve upon your understanding as much as needed. Your full NotebookLM transcript will be submitted to Gradescope as a check of your progress following the GRs and will ultimately be part of the evidence in your semester portfolio, demonstrating your growth regarding the course learning goals.

Authorized Resources and Documentation

The authorized resources for this assignment include anyone and anything. You must utilize the NotebookLM that will be provided to you by your instructors.

You must provide a documentation statement for any resources used other than NotebookLM. Documentation statements should be detailed and specific, including links to websites, chapters from books, or names of cadets who assisted you and how they helped. You will provide your documentation statement on Gradescope.

You must submit your full NotebookLM transcript for review on Gradescope, and you will ultimately use excerpts from these transcripts in your semester portfolio. Because you will submit your full transcript for review and use of NotebookLM is required, you do not need to provide the five-part generative AI documentation statement for this assignment.

Who should complete this assignment

This assignment is optional, but STRONGLY ENCOURAGED for anyone who did not earn an A on all GR questions.

Each GR question was assigned an overall letter grade across all subparts of the question. **Even if you did earn an A on all GR questions, it is not necessarily true that you got every subpart of every question correct.** We strongly recommend that every cadet review all applicable feedback on all parts of each GR question and use this opportunity to improve their understanding of the course material.

Setting up your LLM

You will provide these instructions as either a text prompt or as a PDF. The instructions below are also provided in PDF format for your convenience. These will help customize the NotebookLM to being more as an instructor rather than the best friend who tries to give you the answer.

Start a new chat and input the prompt below. You will keep all chats relating to each GR in the same thread.

Prompt 1 - Instructions for the LLM

You are an instructor in an Applied Statistical Modeling course for undergraduates in the mathematical sciences. Your course is utilizing the textbook *An Introduction to Statistical Learning with Applications in Python* by James, Witten, Hastie, Tibshirani, and Taylor. Your students have just taken an exam over key concepts in the course. They have reviewed their exam grades and feedback and are now working to correct their mistakes and deepen their understanding of the course material.

Your role is to guide students toward better reasoning and clearer explanations without providing direct answers. The student will submit an exam question along with both their original answer and their corrected answer. Your feedback should help them identify mistakes, gaps in reasoning, or unclear explanations, but they must determine the correct answer themselves.

How to Provide Feedback:

1. Identify Errors: If the corrected answer contains mistakes or misunderstandings, point them out but do not provide the correct answer or directly explain how to fix them. Instead, ask guiding questions or highlight inconsistencies.

2. Request Clarification: If parts of the response are unclear or incomplete, indicate where more explanation is needed, but do not supply the missing details. Instead, prompt the student to think deeper (e.g., “Can you elaborate on why this approach is valid?”).
3. Encourage Self-Correction: Use open-ended questions to help students recognize their own errors and refine their reasoning (e.g., “Does this conclusion align with the conditions of the problem?” or “How does this result compare to what you expected?”).
4. Be Concise: Limit your feedback to a short paragraph. Keep it focused and constructive, emphasizing the most important areas for improvement.

Providing Additional Examples:

Students may also ask for extra practice problems or examples to test their understanding beyond the exam questions. When responding to such requests:

- Generate new examples that align with the topics covered but are not identical to the exam questions.
- Adjust the difficulty level based on the student’s needs, either reinforcing fundamental concepts or providing more advanced challenges.
- Encourage self-explanation, asking students to attempt the problem and then reflect on their solution before providing hints or feedback.

Your goal is to facilitate student learning by prompting critical thinking, not by demonstrating your own understanding. Every response should help students refine their reasoning and improve their answers on their own.

Interacting with your LLM

For your convenience, the blank GRs (in both Word document and PDF format) are provided on Teams. For each GR question you are working to improve, you should use the following general format.

Copy and paste the entire prompt below into NotebookLM, filling in the prompt with the appropriate information from your GR. Then dialogue with NotebookLM until you feel you have sufficiently demonstrated your understanding of the concept. You should feel free to revise your answer based on the feedback you receive.

GR Problem:

INSERT GR PROBLEM HERE

Original Answer:

INSERT YOUR ORIGINAL ANSWER HERE

Corrected Answer and Explanation:

INSERT YOUR CORRECTED ANSWER HERE, WITH AN EXPLANATION OF WHERE YOU WENT WRONG IN YOUR ORIGINAL ANSWER

Remember, you should only consider my answer and provide feedback, highlighting areas where there are errors or areas that require clarification. Please do not give the correct answer to the exam question and do not provide explanations of how my answer is incorrect or needing clarification. I want to use this interaction to gauge my comprehension and refine my own understanding of the topic.

As you engage in dialogue with the NotebookLM, **you are also encouraged to ask NotebookLM for new versions of the GR problems, to provide you with another opportunity to apply what you’ve learned.** This will hopefully confirm your refined understanding, or help point out if there are still misconceptions or gaps that need to be addressed.

Advice on Interacting with an LLM

As you engage in dialogue with NotebookLM you may want to keep in mind a few pieces of advice:

- Don’t worry about the formatting of code or tables. When you copy/paste the GR questions into NotebookLM, tables and code may appear differently, but don’t spend too much time on fixing this. The NotebookLM will figure it out, and if there is a misconception, you can address that in your dialogue.
- It may be helpful to provide the lesson objectives for the block to help scope the NotebookLM’s responses to you. These are provided in a separate file in Teams.
- It may be helpful to provide the Math 378 grade descriptions to NotebookLM to gauge the work in your GR Refinement in relation to the course grading standards. These are provided at the end of this document and in a separate file in Teams.
- *Remember, NotebookLM is not perfect. They may incorrectly state that your answer is correct or fail to catch areas in your answer that are incorrect or needing clarification. It is your responsibility to think critically about NotebookLM responses and use your communication skills to sufficiently demonstrate your understanding of the concepts.*

Submission

You will submit the GR Refinement to Gradescope as a check of your progress toward the course learning goals. In Gradescope, you will submit your final, revised answer you arrive at post-NotebookLM conversation, a PDF upload for the part of your transcript related to the specific problem, and a documentation statement. You will also provide a link to the entire transcript.

To create a PDF per refined question:

- Copy/paste the part of the transcript related to the GR question you are refining into a Word document and save as a PDF.
- Alternatively, when you highlight all the text related to the GR question you are refining, right click, select Print, and then save to PDF.

To access the transcript link from NotebookLM:

- When you have completed the GR Refinement, click the Share button in the upper right of your thread.
- Click “Copy Link” to copy the sharing link and paste the link into the Gradescope assignment.

Assessment of the GR Refinement

GR Refinements will be evaluated holistically based on conceptual improvement, quality of reasoning, and evidence of productive iteration with NotebookLM. The goal of the refinement process is not perfection but demonstrated growth through iterative learning and reflection.

A Plus (+) Refinement Score - Substantial Improvement and Effective Iteration

A refinement earns a Plus if the student demonstrates clear conceptual improvement and meaningful engagement with the refinement process. To earn a Plus refinement score, a student must

- Show demonstrated improvement on the problem. The revised response shows improvement of at least one full letter grade relative to the original exam response. Major misconceptions present in the original response have been corrected. Justifications are clearer, more complete, and more statistically sound.
- Show depth of iteration with NotebookLM. The student goes beyond the initial prompt and meaningfully iterates with NotebookLM. Iteration may include but is not limited to: refining the revised answer based on feedback, requesting new, related practice problems, attempting those practice problems independently, and revising their understanding based on feedback to those attempts.

- Show evidence of independent learning. The student uses NotebookLM as a learning aid, not a shortcut. The student response reflect synthesis and understanding rather than copying. The final answer is clearly written in the cadet's own words and demonstrates improved statistical reasoning.

A Check (✓) Refinement Score - Solid Effort with Partial or Limited Improvement

A refinement earns a Check if the student makes a good-faith effort to improve their answer and engage in the refinement process, but the final result shows limited or incomplete improvement. To earn a Check refinement score, a student must

- Show comparable overall quality compared to the student's original answer. Some issues from the original response may be addressed, but minor conceptual gaps or incomplete justifications remain.
- Show meaningful iteration with NotebookLM. The student iterates with NotebookLM beyond the initial prompt. The student engages thoughtfully with feedback, even if the final answer is not fully polished.
- Show evidence of effort and engagement. The student demonstrates an attempt to reason independently and improve their understanding. The refinement reflects effort, even if mastery is not fully achieved.

A Minus (-) Refinement Score - Regression or Persistent Misunderstanding

A refinement earns a Minus if the revised submission reflects worsened understanding or continued major misconceptions. A refinement earning a minus will show one or more of the following:

- Conceptual Regression or Persistent Errors.
 - The revised answer is worse than the original, or
 - Major misconceptions from the original response remain uncorrected, or
 - New conceptual or logical errors are introduced.
- Insufficient or Superficial Iteration with NotebookLM
 - The student relies on the initial NotebookLM response with little or no meaningful follow-up.
 - Iteration does not reflect engagement with feedback or attempts to refine understanding.
- Lack of Independent Reasoning.
 - The refined response appears copied or paraphrased from NotebookLM without evidence of understanding.

- Justifications are vague, incorrect, or inconsistent with course concepts.

Math 378 Grade Descriptions

An “A” grade in Math 378

A student who has earned an A has developed a strong applied knowledge of traditional and computationally intensive statistical models. They thoroughly explore modeling techniques, identify appropriate models, and interpret and evaluate models and output. This student effectively utilizes generative AI to further their understanding of statistical concepts. They thoughtfully craft prompts, actively question responses, and iteratively improve solutions assisted by the AI. This student documents their use of generative models appropriately.

This student has greatly advanced, uses appropriately, and has substantially improved their computer programming skills, particularly in R and/or Python. They understand how to iterate code, debug errors, and how to find and utilize code examples from class, generative AI, and other online resources. They understand how to adjust the code to analyze their own data and can appropriately interpret the output. This student thoughtfully questions the examples to evaluate their appropriateness and iteratively improves solutions.

This student has fully embraced independent and lifelong learning. They take the initiative to explore statistical concepts in more depth. They actively participate in class and collaborate effectively with peers. This student continually improves their statistical knowledge and programming skills over the duration of the course, leveraging resources like their peers and instructor, online learning and generative AI. This student has thoroughly explored a novel application, learning something new beyond the provided course materials and successfully applying it to a new data set or in a new way.

A “B” grade in Math 378

A student who has earned a B has developed a solid applied knowledge of statistical models. They explore problems and can identify reasonable traditional and computational models. This student interprets output appropriately but may miss some nuances.

This student has improved their programming skills in R and/or Python. They write working code and understand core concepts but may have minor deficiencies with iteration, abstraction, or debugging. This student can find and implement existing code for statistical models, understand the output, and make minor adjustments as needed. They may occasionally struggle to identify the most appropriate code examples or fully grasp the underlying methodology. This student participates in class and works effectively with peers but relies more heavily on instructor guidance.

This student has made progress toward independent learning habits but not fully embraced them. They utilize generative AI to assist with their learning but occasionally requires guidance crafting effective prompts or questioning model responses. They document AI usage

appropriately. This student shows development in their statistical and programming abilities over the semester, but growth may be inconsistent across topics. This student has explored a novel topic beyond the provided course materials, though they may not have fully applied this knowledge to a new data set or context.

A “C” grade in Math 378

A student who has earned a C has developed basic applied statistical knowledge. They follow examples to build models but may struggle to explore problems independently or identify appropriate techniques. This student attempts to leverage generative AI to support their learning but struggles crafting prompts or iterating solutions with the model. Their documentation of AI usage is limited. This student shows marginal improvement in applied statistical knowledge, despite available resources.

Their code works but lacks understanding of how to iterate, debug errors, or abstract concepts. This student attempts to utilize existing code but requires guidance adjusting it to new data or interpreting the output. They have a basic grasp of core methods but limited ability to manipulate more complex examples.

This student participates in class inconsistently. They collaborate occasionally with peers but require significant instructor guidance. This student is beginning to take ownership of their learning but has not fully embraced lifelong habits. This student has not completed a novel application or demonstrated learning beyond the provided course materials.

A “D/F” grade in Math 378

A student who has earned a D/F has not adequately developed applied statistical knowledge or programming skills. They struggle to build models even from examples. Their code is inefficient or non-functional. This student cannot effectively find and implement existing code even with support. They do not understand how to adjust examples for new data or interpret model output. This student does not participate effectively in class activities.

This student demonstrates little to no growth in their statistical knowledge or programming skills throughout the duration of the course, neglecting to leverage available resources. This student does not effectively utilize generative AI as a learning tool, either by failing to craft appropriate prompts or neglecting to question and improve solutions. They likely do not document their use of the resource appropriately.

This student has not demonstrated the habits of an independent learner. They have not completed a novel application or shown any evidence of independent learning beyond the provided course materials.