

Guide to Doing Exercises

The Limits of Logic (PHIL 450)

Fall 2023

The only way to learn logic is by doing logic. The best way to understand an idea is to explain it to someone else.

The exercises are the most important part of this class. This is how you will develop core problem-solving skills, discover key ideas for yourself, and become a skilled communicator of technical ideas to others.

Doing the exercises will involve four parts.

1. Try to do all of the assigned exercises for yourself.
2. Sign up to present some of your solutions in class.
3. Discuss solutions in class.
4. Turn in written solutions to some of the exercises.

Solving exercises

You should make a serious attempt at all of the assigned exercises. Working on the exercises is the only way to practice core skills and come to understand key concepts. Ideas that come up later in the class will build on earlier exercises, so if you don't keep up with consistent practice, you will get lost later on.

Most of the exercises are **informal proofs**. Your job is to clearly justify a statement, in a way that convinces everyone that the statement is true, and also (ideally) illuminates *why* it's true. **I don't expect you to know how to do this already.** This is one of the core skills that you'll be learning in this class. I'll be teaching you tricks, tools, and strategies as we go.

(Your job for these problems is *not* to give a derivation in some formal system, like “natural deduction” or a “truth-tree,” like you might have learned in other logic classes. Similarly, your job is *not* to formalize statements in predicate logic. But those kinds of intro logic skills will come in handy. For example, it's important to be able to look at a complicated statement and figure out that it has “if ... then ...” structure.)

The problems vary a lot. Sometimes a single sentence will be an adequate answer. In other cases, a good solution might fill a whole blackboard. Hopefully everyone will get a chance to present a variety of different kinds of problems through the semester.

It's okay if you don't come up with good solutions to every problem, but it's important to give them all serious thought. As a rule of thumb, don't give up on a problem until

- (a) you've spent at least fifteen minutes on it, and
- (b) you've tried to apply some of the strategies from the textbook (which we'll also discuss in class).

After the first few weeks, if you're not finding that you're able to solve *most* of the assigned exercises, **come to office hours** to get more help with strategies.

Presentations

Roughly every other class meeting will be **problem days**, devoted to student presentations of solutions to exercises. When you present your solution to an exercise, **you are the teacher** for that part of the class. Your goal should be to help everyone in the class understand the main ideas involved in your problem.

1. Before each problem day, **sign up online** for a problem to present in class. (The link is on the class website.)

There is more than one sign-up slot for each problem. You can sign up in any of the slots. We will decide by random drawing in class which person actually gives the presentation, giving priority to people who have had fewer opportunities so far.

If you aren't selected to present, you will still get some presentation points, just for signing up. (But you can only get this credit once per problem day.)

- **4 points** (normally) for giving a clear and well-prepared presentation. Some especially long or difficult problems will be worth extra presentation points.
- **2 points** for signing up to present, if you are not selected

Generally speaking, you should aim to sign up for at least one problem for every problem day. But it's fine to skip a few through the semester.

2. Once you have signed up for a problem to present, **plan ahead** what things you'll write on the board, and what things you will say out loud.

If you are chosen to present:

3. Start your presentation by **explaining what the problem says, and what it means**. Is there anything about the problem that wasn't totally clear? You should also try to briefly explain how the problem fits with the rest of what we're doing, and why it might be important.
4. **Explain your solution to the problem, with a careful step-by-step justification.**

Pay particular attention to places where it wasn't obvious what to do. Did you use any special tricks? Did you try other strategies that didn't work? Think about what would help someone else figure out how to do similar problems.

You don't need to include *every* step of the justification, but if there are any gaps, think ahead about how you would answer questions about how to fill them in.

If you think you've said enough, don't feel like you have to pad it out. Short is good. (Sometimes a good solution might be just one sentence!)

Discussion

When someone presents a solution, **we'll discuss it together as a group**. Are there any parts of the reasoning that you don't understand? What steps or strategies did they use? Did you do it a different way? Are there any gaps in the reasoning that it would be helpful to fill in?

Very often in our discussion we'll find some mistakes. **It is okay to present a solution with mistakes**. Try not to be embarrassed by this—it's totally normal, even for professional logicians. **Your grade for problem presentations is not based on whether you get everything right**. It's based on whether

- (a) you have a plausible strategy for solving the problem,
- (b) you give a clear and organized explanation, and
- (c) you respond well to questions and feedback.

Write-ups

You should turn in written solutions for around ten exercises throughout the semester. For each problem day, I will mark which problems are eligible for write up points.

It is fine to type up your write-ups, and it is also fine to neatly write them by hand. If you do decide to type them up, I recommend using tools designed for technical writing like LaTeX or Pandoc Markdown (rather than Word).

You can turn in your write-up for an exercise **up to a week after** the exercise has been presented and discussed in class. For example, if a problem is presented on a Wednesday, you can turn in a write-up for that problem any time up to the next Wednesday.

The point of the write-up is not to convince me that you know how to do the problem, deep in your heart. Rather, the point is to *explain* how to do the problem, the way someone else would be able to follow. You should write this in good English prose, not in shorthand.

I will grade write-ups based on **correctness, clear communication, and style**.

- Remember that you are writing something for a human being to understand, not a computer.
- Write in full sentences, using English words, standard punctuation, etc.
- Use technical symbols when they are appropriate, but don't rely on abbreviations. Clear communication always comes first.

Collaboration

I encourage you to **work together** on exercises. I also encourage you to **come to my office hours** to get help with exercises.

But in either case, remember that you are individually responsible for understanding, explaining, and defending your ideas. It's easy to trick yourself into thinking you understand something better than you do. This doesn't help you. Here's a guideline if you work on a problem with others: set aside your notes from group sessions and write up your final solution on your own. That way you'll make sure you really understand it yourself.

(This does not apply to take-home exams: do those by yourself. You can always ask me questions, though.)