Studying for Olympiads

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Here I will list some tips on preparing for Physics Olympiads. This will be quite brief, because there really isn't some grand mystery to it. You do need talent, but the threshold is surprisingly low, and chances are you're on the right side of it. From then on, it's mostly a matter of working hard enough.

Study Plan

This is how I would have put in the hours if I could do it again from scratch.

- Read through Kevin Zhou's advice file. While it addresses things from an American perspective, it will probably still answer any questions that you may have about Olympiad physics. There you will also find some great insights about education in general, and it's worth paying attention to those as well.

- Work through Halliday, Resnick, Krane, both volumes. Initially I didn't buy into the hype around this book, but it really is masterfully written. Whenever I'm confused about the subtler points of some physical law, this book almost always has the answers.

  This is a long textbook, but I've found that page counts don't really mean anything[1]. There are way too many problems in there though. As for how many of those you should solve, it's up to you. Once they stop being a challenge and you feel like you're not learning anything new, you should probably move on to the next chapter. Keep in mind that it's completely natural to forget the material on your first pass. Simply come back to it until it's committed to long-term memory.

- You'd now be in a good position to tackle some Olympiad problems. I think that directly proceeding to Kevin Zhou's handouts is too much of a difficulty spike for most students (let alone Kalda's handouts, which I think are harsher on the reader). When it comes to bridging the gap, I really like the Online Physics Brawls. This competition has lots of problems ordered by difficulty – the first few are trivial, while the final problems are often brutal, requiring coding, vector calculus, and linear algebra. However, there are detailed solutions all across, and there's a good balance between standard problems and trickier Russian-style stuff.

  My advice is to pick any year's exam[2], start from the beginning, and whenever you hit a wall, look up the relevant concepts – in textbooks, not on Wikipedia! Repeat until you've done a couple hundred problems. If you don't like the Physics Brawls, you could also do old (pre-2013) USAPhO Problems, or maybe some Bulgarian problems that I wrote solutions for.

- By this point you are probably ready to go through Kevin Zhou's handouts. For reference, my pace varied between one handout in two days (**M4**, **E4**, **X2**...) and one handout a week (**M8**, **E8**...). This adds up to a lot of time, but if you enjoy physics, you'll find it very fun.

- After you're done with this, you're likely set for IPhO gold, maybe silver. There are diminishing returns from delving even deeper into Olympiad physics, but if you want to continue down that path, there are even harder problems out there if you know where to look. I particularly like the Russian team selection tests, because they teach you interesting advanced physics without being excessively cruel with the algebra (unlike recent APhOs and Chinese Olympiads). Everything on their website is in Russian, but you can trust machine translation nowadays.

General Study Tips

- Physics Olympiads come in all shapes and sizes. Any two Olympiads will differ in their syllabus, in the time pressure, and in the types of tricks you need to be familiar with. This is why it matters what particular exam you're studying for. If you're training for the US Olympiad using

[1] Book A might be four times shorter than Book B, and yet take you twice as long to read.

[2] As a general rule of Olympiads, more recent exams tend to be harder.

Russian problems only, you will be in for a disaster – you'll never see compass-and-straightedge lens problems at USAPhO, and you surely won't be prepared for the special relativity. So, by far the best way to study for a competition is to go through its past papers. Be sure to have cleared those in addition to your general prep. After all, being able to ace IPhO is pointless if you stumble on your National Olympiad.

- Similarly, to get a good feel for the particularities of each exam, you should do at least a few past papers in real exam conditions, i.e. timed, no breaks. Students are often taken aback at the time pressure on the day of the exam if they haven't trained to cope with it beforehand. It might even be a good idea to do papers which are known to be full of errors – because this is a situation you might well have to face in real life.

- Find a community. With physics, you're playing a long game, and your interest will inevitably falter if you keep at it alone. People simply do better when they collaborate. If you live in the right place, there will be extracurricular physics classes available to you. Do attend those just for the chat, even if you're think they're below your level. It's in your favour to be proactive in approaching friends and teachers to discuss problems with.

  The physics training camps that most countries have are extremely helpful precisely because they connect like-minded students. The actual physics that you learn there is secondary, because there's only so much that you can take in within two weeks. You might be unfortunate in that your country doesn't have strong traditions in Olympiad physics. In that case, try the Physics Olympiads Discord Server, or maybe look into the physics classes at your local university,

- On the more practical side, my only suggestion is to write a lot. Sure, everyone learns their own way, but what you do in exams is write. Even if you think you can remember everything you're taught without writing it down, it wouldn't hurt to get better at laying out clear answers on paper. I've worked with many self-described visual learners, and their exam papers are always a mess. I think making your own cheat sheets when revising is a great help in that regard.

For what to do right before the exam, see my other advice file.

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