OTIS Syllabus

Year IX (2023-2024)

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§0 Prerequisites

OTIS assumes that you are able to read and write proofs. It is taught in English, and international students are welcome. Students from minorities and underrepresented groups are especially encouraged to apply (I promise I don't bite); financial aid is possible (see Section 1.3).

Since OTIS is focused on olympiads, it is recommended that you are reasonably confident in qualifying for your country's national olympiad.

Most important of all, you must be capable of independent self-study. OTIS is self-paced — no attempt is made to micromanage your progress or to nag inactive students.

§1 Overview

OTIS is a **guided self-study program** for math olympiads.

- The core of OTIS are so-called **units**. They consist of a short sequence of example problems followed by a problem set of about 15-25 olympiad problems, of which you solve a subset. More details in Section 2.

  Participants are given units "buffet-style"; you get access to as many units as you can complete. See Section 3 for details.

- There is an **OTIS Discord server** for discussion with staff and peers; see Section 4. Communication with Evan (via email) is welcome and encouraged (see Section 9.3).

- There are a small number of **practice exams** (see Section 5) and **other website features and minigames** (see Section 6).

§1.1 Calendar

There are two semesters; you may choose to do just one.

Fall semester September 1 to December 20.

Spring semester January 5 to April 30.

§1.2 Payment information and drop policy

- The payment is **$240 per semester**. There are **two semesters** each year.
- Payment is due on September 21 and January 21. There is a $60 late fee.

You may drop the program at no cost before the payment deadline. No promise after that, but if you have special situations or it's still pretty early, talk to me anyways. You can pay by credit card, Venmo, Paypal, Zelle, or mailed checks (more details later).

§1.3 Financial aid

OTIS is need-blind and meets full demonstrated need; see the application for details.

§2 What to expect from OTIS units

§2.1 Catalog of OTIS units

A *unit* refers to a handout on a particular topic. The page `http://web.evanchen.cc/static/otis-samples/synopsis.html` contains a snapshot of the catalog of units. There are **three tracks** of difficulties of units in OTIS. A topic can have multiple units of varying difficulties or versions.

B-level HM/bronze level at IMO. Example unit: Global.

D-level Bronze/silver level at IMO. Example unit: NT Construct.

Z-level Silver/gold level at IMO. Example unit: Weird Geo.

The choice of which units to cover each year is entirely up to you. Usually, it's a bit of an overwhelming task to try and pick from such a long list; when you join, there will be a long guide giving you hints on what units to select, and I sometimes provide recommendations as well.

§2.2 Most units contain lecture notes formatted as walkthroughs

The lecture notes for every unit includes some "walkthroughs": example problems together with a step-by-step tutorial. Example:

> **Problem** (IMO 2003/6)**.** Let p be a prime number. Prove that there exists a prime number q such that for every integer n, the number $n^p - p$ is not divisible by q.
>
> **Walkthrough.** **(a)** Show that if $q \not\equiv 1 \pmod p$ then this fails. So we will restrict our attention to $q = pk + 1$.
>
> **(b)** Prove that it's sufficient to have $p^k \not\equiv 1 \pmod q$, for the k in (a).
>
> *. . . and so on.*

The philosophy of walkthroughs is to emulate a lecture in text format (indeed they are based on past lectures from me). Full solutions to all the walkthroughs are provided in an appendix.

Some units also come with "reading" (often some excerpts from publicly available texts) that should be done first.

§2.3 Problems

The heart of each unit is a set of 15-25 olympiad problems. Each one is worth a number of [♣], and there is a total target goal. In addition, some problems are marked as "required"; these will have red color [♣].

Note that the [♣] values are **NOT a difficulty indicator**. They're meant to reflect how nice a problem is and how much you learn from solving it. This is well-correlated with difficulty (spending more time) but it's not exactly the same. Sometimes a hard problem is worth [3♣] because I don't think it's that cool, or sometimes an easier problem is worth [9♣] because I really like it.

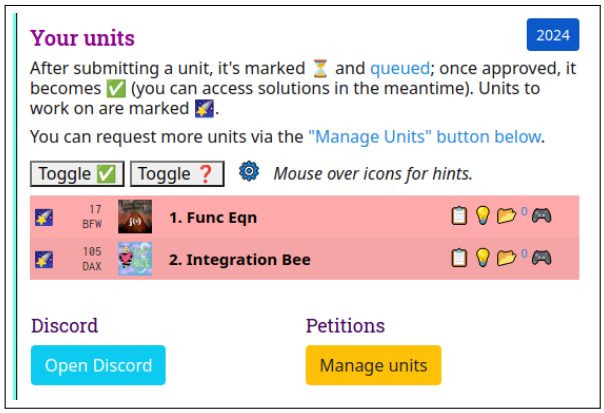
§2.4 Materials are internal use only

All materials are internal use only (but see Appendix D).

§3 Instructions for working on and submitting units

After initial setup, you'll see a table like the one at the right. This table shows what units you currently have unlocked, completed, or marked for later. There are big buttons for submitting units, and requesting changes to your selected units (see Appendix A.1).

You may work on units in any order. The order given on the website is just a weak recommendation.



§3.1 The unlock system (aka the heart of OTIS-WEB)

Since OTIS is self-paced, there are no submission deadlines.

Instead, **each time you complete a unit, you'll be asked what unit you want unlocked next**. You can think of this as **buffet-style** — this gives you an incentive to submit units (so that you can get more).[1]

It's possible and encouraged to **submit unit petitions** to change your set of units (see Appendix A.1). You do this using the "Manage Units" button. You are allowed up to 9 units unlocked at any point.[2]

§3.2 Write-ups and submission

- **You only need to submit outlines of solutions**, since full write-ups can be time-consuming. An "outline" is just a few sentences with the main ideas, e.g.:

  > **Example problem** (HMMT 2016 Guts #17): Compute the sum of all integers $1 \le a \le 10$ with the following property: there exist integers p and q such that p, q, $p^2 + a$ and $q^2 + a$ are all distinct prime numbers.
  >
  > **Example outline**: Odd a fail by parity and $a \equiv 2 \pmod 3$ fail mod 3. This leaves $a \in \{4, 6, 10\}$, for which we can take $(p, q) = (3, 5)$, $(5, 11)$, $(3, 7)$, respectively. Thus $4 + 6 + 10 = 20$.

  However, full solutions are welcome too if you have the time and patience. In general, **the amount of detail to include is mostly up to you**. The only constraint is that at minimum I should be able to see roughly what overall approach you are taking. Of course, the more detail you provide, the better feedback I can give; but most solutions I get are completely correct anyways, in which case I don't really have anything to say beyond "nice job".

- Upload a **single PDF** to OTIS-WEB, by clicking the green "submit unit" button.

  As I mentioned in the beginning, I suggest typesetting your problem sets in LaTeX.[3] On OTIS-WEB you can click 📋 to get a LaTeX template with all problem statements. Of course, using this template is optional; you can use your own style too.

  Scanned handwritten work is acceptable too, as long as legible. Please write darkly if you do choose to handwrite. There is a 10MB limit on the submitted PDF, so you may need to do some compression (see Appendix A.2)

- Please **include the name/source of the problem** when known (e.g. "IMO Shortlist 2016 G2"); this makes it much easier for me to read. You don't have to reproduce the entire statement (unless you want to).

- **Comments, questions, requests, etc. about problems are encouraged.** For example, if there is a step you are unsure about, you are encouraged to note this so I know to comment on it. Or, if you want to make jokes about an especially stupid problem, or call out a problem you really liked, that's encouraged too.

- Additionally, every unit has a "**mini-survey**" at the end worth [1♣], seeking thoughts about the unit overall. I'm always looking for feedback, so completing the mini-survey is appreciated and encouraged, even if you don't need the [1♣].

[1] In the past when people had access to everything, there was a lot of complacency of the form "oh, I can always work on this later", and then never actually getting to work on it.

[2] I think realistically most people won't be able to juggle between nine different units at once, but I set the cap that high anyways because I also don't want to micromanage people too much.

[3] The output is pretty, you learn how to use LaTeX (useful later in life), and you now have digital copies of all your work. Given how much time you're spending, don't you want to have something to keep?

§3.3 Getting un-stuck on problems (I promise you will get stuck sometimes)

Being able to ask for help is an important part of the program. There are a few ways to ask for help (not mutually exclusive):

- Using the Discord server (see Section 4);
- Checking the ARCH system (see Section 6.1);
- Contacting Evan directly (see Section 9.3).

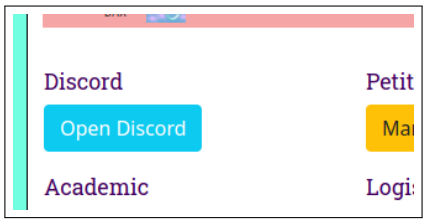
§3.4 Problem set submissions are NOT graded, but checked off

Regular problem set submissions are NOT graded.[4] Sorry, there are just too many.

Usually, I scroll through the solutions to sanity-check them and point any obvious issues I can see (wrong final answer, common pitfalls, etc.). But I will probably not notice typos or more subtle errors.

§4 Discord

OTIS has a Discord server with current/past OTIS participants, linked on the portal.



Registering on the OTIS Discord is strongly encouraged; there's a pretty big correlation between students who do well in OTIS and how active they are in the Discord. You're free to check it as frequently or infrequently as you choose, but the social space is an important part of the program.

On the OTIS Discord, you should feel welcome to ask for hints on OTIS problems (many alumni worked through the same problems[5]) or other math questions. Problem discussion, socializing (games, music, etc.) are also encouraged.

§5 Optional mock olympiads and quizzes

There will be 10 tests (mock olympiads) in the school year, which come in pairs. The short quizzes are short-answer practice, each with 5 much quicker short-answer problems. The dates for the practice exams are specified in Figure 1.

(There is no test due November 15 because of USEMO.)

Test Name	Released	Due
Tests 1 and 2	Sep 1	Oct 15
Quiz A, B, C	Oct 1	Nov 15
Tests 3 and 4	Nov 1	Dec 15
Quizzes D, E, F	Nov 1	Dec 15
Tests 5 and 6	Dec 1	Jan 15
Quizzes G and H	Dec 1	Jan 15
Tests 7 and 8	Jan 1	Feb 15
Tests 9 and 10	Feb 1	Mar 15

Figure 1: Schedule for OTIS practice exams

§5.1 Instructions for tests (mock olympiads)

Each test is three problems, 7 points per problem, 4.5 hours.

[4] This is part of why I only ask for outlines of solutions.

[5] Discord's search feature provides yet another option: if you want help on 2013 A4, you can try to search "2013 A4" in past Discord messages

- **Only the odd-numbered tests (i.e. tests 1, 3, 5, 7, 9) are graded**. The even-numbered tests (i.e. tests 2, 4, 6, 8, 10) can be taken for practice but should not be submitted for grading.
- You will submit through an external website, called **GradeScope**. The website will give you explicit instructions on how to register.
- There are three levels: JMO, USAMO, and TST. Pick one.
- Like a real olympiad, submit complete solutions on the given answer sheets. You can download the answer sheets from OTIS-WEB.

The solutions are available immediately, so you can read them right after taking the test, without waiting for grading.

§5.2 Instructions for quizzes (short answer)

These are intended to give you bit of short-answer practice during the school year, to help prepare you for AIME, HMMT, PUMaC, MP4G, et cetera.

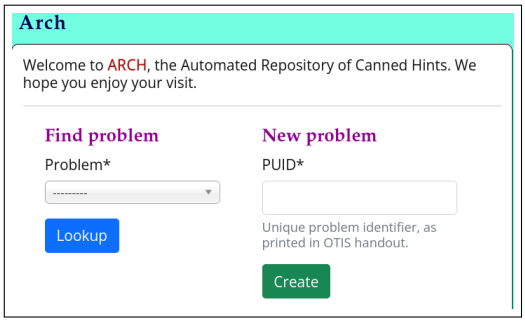
Each quiz is **45 minutes long**, and features **5 short answer problems**. (Think of it like $\frac{1}{3}$ of an AIME.) You submit quizzes directly on the website.

§6 Additional features of OTIS-WEB

§6.1 ARCH (🗼): Automated Repository of Canned Hints

OTIS-WEB contains a repository of hints for practice problems, known as the ARCH system. You can access ARCH directly on the website, or by **clicking the green problem identifier** on any OTIS handout to open a browser to directly access its ARCH link.

ARCH also contains **solutions** to many of the problems, in addition to user-contributed hints.



§6.2 Leveling up

OTIS-WEB has progress bars that lets you "level up" as you progress in OTIS. Your level is determined by four statistics:

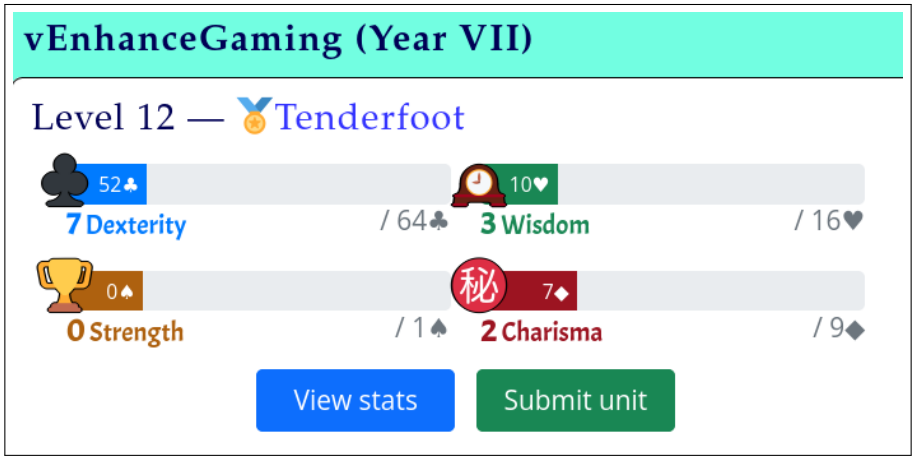
Dexterity This is the sum of the ♣ (clubs) points obtained across all units.

Wisdom Hearts are the total number of self-reported hours spent across all units.

Strength Spades are obtained through mock tests/quizzes, markets, and special quests.

Charisma Diamonds are obtained by finding an Easter-egg code. Each code is a 24-26 character hex string (so it'll look something like `50726f626c656d20442e3421`). Click (💎) on the website for more hints.

The **level** is the sum of $\sum_{i=1}^{4} \lfloor \sqrt{n_i} \rfloor$ where n_i is the i'th quantity defined above. An example of the level bars is shown below:



§6.3 Problem suggestions (💡) can be submitted through OTIS-WEB

If you have suggestions for problems from past contests to add to OTIS units, you can submit them through OTIS-WEB by clicking the light bulb 💡. Approved suggestions get added to the unit immediately, with credit to you (unless you request anonymity).

You need to write up a solution to the suggested problem. By submitting, you agree to let Evan use, edit, or adapt it for OTIS or any other math-olympiad-related purposes. On the other hand, you retain copyright/ownership of your writing, so you can also use it for whatever you want elsewhere.

For problems from famous contests, you may want to double check whether I already have the problem in my database and am using it in a different unit before taking the time to write it up.

§6.4 Markets (📈)

For entertainment, estimation markets are hosted throughout the year, where you try to estimate some unknown quantities, and gain ♠ for doing so. Markets generally open Fridays at midnight Eastern time and run for 78 hours.

§6.5 Wiki (🎮)

There is a fandom-style Wiki with advice and description for each unit, as well as a few other fun pages.

§6.6 Hanabi (🎆)

The website helps to organize Hanabi games which offer spades for scoring well. See https://tinyurl.com/hanabi-evan-intro for more about the game.

§7 Miscellaneous

§7.1 T-shirt ordering around March each year

Assuming sufficient demand, participants can order OTIS T-shirts around March of each year. The cost of the T-shirt is usually subsidized by about 50%, not including shipping.

§7.2 Major surveys

Throughout the year, I send three large OTIS surveys by email.

- The first (longest) survey[6] is sent around the fifth week or so.
- The second survey will be sent around the end of the fall semester.
- The third (shortest) survey will be sent at the end of the year.

§7.3 Twitch stream

On some Fridays at 8pm ET, I run a public stream on `twitch.tv/vEnhance`. During this time I will solve math problems I haven't seen before, together with discussion and suggestions from my viewers. So, if you want to see what the process of solving a math olympiad problem looks like for me, tune in!

You can find more details about the stream at:

`https://web.evanchen.cc/videos.html`.

§8 Summer availability

OTIS does not run during the summer. However, the Discord server will obviously remain active, and parts of the website will still function nonetheless.

- Unit petitions, submissions, and check-offs are disabled.
- Practice exams are hidden during the summer (they go through some edits after each year). You should download the practice exams if you want to keep them.
- Any units that you have already unlocked or finish remain online. Solutions for these units will become automatically available for download as well (even if you did not submit). ARCH also remains online.

  It's common for students to **request several units just before the spring semester ends** with the intention to work on these units during the summer. As always, the maximum number of unlocked units at once is 9.

  If you re-join OTIS in the subsequent fall semester, it's permissible to submit all these units at once at the start of the fall.
- RPG minigames vary in functionality:
  - New markets are generally not created during the summer.
  - Hanabi competitions could continue, depending on interest.
  - Diamond redemption is still available.
- The social Discord server remains fully active, so you can continue to discuss math problems or hang out, etc.

[6]The nice thing about having a start-of-year survey (rather than an end-of-year survey like the rest of the world) is that your feedback will actually be used right away this year, rather than just helping future instances of OTIS.

§9 Contact

§9.1 Please just call me Evan and not Mr. Whatever

I hate it when people call me Mr. Chen.[7]

Honorifics are for boring old people (e.g. high school teachers). They're for people who are not your friend. They're for people who insist on you explicitly signalling respect and treating them as an authority figure rather than a human.

I don't work that way. I don't expect students to respect me solely because I happened to be born in 1996 and not 2006. I *earned* my student's respect.

Some teachers prefer the psychological barrier that honorifics put up, but I'm not one of them. I hate formality. I insert sarcastic jokes everywhere. I use Discord emojis with reckless abandon. I openly make fun of problems like IMO 2020/2. I want my students to feel it's okay to be honest and have fun around me, and the same way I refuse to wear ties, I'm not going to demand fake politeness.

So just call me Evan.

§9.2 Contact methods

The best way to reach me is email; response times are 1-2 days. Use:

evan@evanchen.cc

You are also welcome to ask questions on Discord and mention me. The advantage of this is that another student or alum may give an earlier answer, since there is one Evan and about 600 not-Evan's[8] in the server.

However, **Discord direct messages are discouraged**; they're slower than either email or the OTIS server, and make it harder for me to keep track of what I've replied to.

§9.3 Talk to me, I don't bite (on asking questions)

I want to really stress the importance of keeping in contact with me, and in particular the importance of asking for pointers when stuck.[9] The problem sets are meant for practice, not measurement. A problem will usually teach you a lot more in the first one or two hours than in the six hours after that. So it's much better to ask for feedback on your approaches once you've hit a barrier, rather than being stuck for hours on problem 5 and then not reading problems 6-10.

Some pointers on asking questions:

- *Do it*. Really.
- It's more convenient for me if you refer to problems by source e.g. "USAMO 2010/6" (instead of "problem 10", say). I have a lot of the contest years memorized by now.
- Describing what you've tried so far (even things that didn't work) is helpful, so I can give more refined suggestions.
- Don't be afraid to ask for further directions if the first answer I give isn't sufficient!

[7] Even worse is "Dr. Chen" or "Professor Chen". Neither of those titles is even correct.

[8] As of 5 November 2022.

[9] Here's another long digression: people often call this "asking for hints", but I don't like this phrasing and try to avoid it when possible. The reason is that hints are seen as things that you only take if you can't do something yourself. This is only true during the "big game" when you're being scored. Training is not like that: long delays in feedback actually make learning slower.

Appendix

§A Some advice and words of encouragement

§A.1 Flexibility of units

I want to stress that the curriculum is malleable. You can and should **request changes or additions to your chosen units**. The only condition I should mention is that you should plan to do units that you request to unlock.

Here is a list of examples of good reasons (not exhaustive) that you should request changes to curriculum:

(a) Your preferences have changed since last June, and now you want to work on less geometry and more combinatorics.

(b) A little bird told you that the Anti-Problems unit is *hilarious*.

(c) That Z-level Analysis or Extreme Graph unit just isn't clicking. You want to downgrade the difficulty, or skip it altogether.

(d) You find a D-level of a unit too easy and want to do the Z-level one instead.

(e) You saw Evan nuke a problem with homography, and are now curious.

(f) You've realize you've seen most of the problems on the Linear Algebra unit already so you'd rather work on something else.

In short: this is an **all-you-can-eat buffet** with 100% satisfaction guarantee™. The "one unit per two weeks" is meant as a baseline and shouldn't be taken too seriously.

§A.2 Hints on scanning files

If you have a iPhone/Android/whatever, there are quite a few apps that will let you take pictures with your phone, and then automatically apply the correct linear transformation to get a scan of the page. For many of you this will be more convenient.

On recent iPhones, the native "Notes" app actually has this built-in. I've seen "Tiny Scanner" and "Cam Scanner" as well.

§B The OTIS-WEB GitHub (🖥️)

The OTIS-WEB source is public at `https://github.com/vEnhance/otis-web`, and so is the issue tracker for the website. This means a few things.

§B.1 Bug reports and feature requests

If you see a bug in OTIS-WEB, or you have a feature request for the website, you should **open an issue** on the GitHub repository. Create a free GitHub account and then go to

`https://github.com/vEnhance/otis-web/issues`

Issues opened this way get tracked automatically and synchronized to Evan's to-do list.

§B.2 Pull requests

> Ask not what OTIS-WEB can do for you, but what you can do for OTIS-WEB.
>
> OTIS propaganda, §B.2

If you are able to code, you can also submit your own code by creating a **pull request**. This means that if you have a feature you really want, you don't have to wait for Evan to implement it — you *could* write it yourself. (That's how a lot of open-source works: whoever actually writes the code gets to decide what order things get created).

If you don't know how to code, then you should learn it. 😉

https://youtu.be/W27XcqeXp20

It's admittedly a lot take in all at once, so to the right is a video tutorial showing this process from start to finish:

§B.3 White-hat hacking

Reasonable *white-hat hacking* is permitted if, and only if:

1. The hacks do not target other student's personal data or disrupt their service;
2. Only past or current OTIS students are participating; and
3. Any discovered vulnerabilities are disclosed privately to Evan.

Targeting Evan's personal information stored on OTIS-WEB is allowed. To give some examples, the following are permitted:

- Reading or cloning the source code of OTIS-WEB to find vulnerabilities.
- Trying to manipulate URL's to load pages that should be off-limits.
- Attempting to download units or solution files that are locked.
- HTML inspect element or manipulation of form data submission.
- Attempting to gain access to the MySQL database.
- Trying to obtain `INVOICE_HASH_KEY`, etc.
- Attempting to hack the level system, e.g. trying to obtain a higher level than one should have.
- Attempting to hack the practice quiz system, e.g. trying to obtain the answers to quiz problems before submitting the quiz.

But the following are *not* permitted:

- Stealing the passwords of other students.
- Attempting to download work of other students.
- `Robert'); DROP TABLE Students; --`
- Denial of service attacks or automated brute-force password guessing.

If in doubt, ask first, of course.

§C Mission statement (not meant to be read)

I want to have an official mission statement here, but it's more for completeness and my own reference. You do not need to read it unless you really really want to.

OTIS is built with **four goals**. These are the metrics which I use to measure my "success" each year, and guide all my design decisions. For each goal, I give a brief description and my plans to achieve it.

- *Systematic hard work.* Most importantly, I want students to learn work ethic. The focus is squarely placed on problem sets, with lectures minimal or nonexistent. You will do a large number of problems: there is no way around this.

  The program's structure is set in a fairly explicit way, with individual units and concrete deliverables. Thus students work in a systematic and organized fashion. I like to think that the careful planning and design of OTIS (and even the sheer amount of material) helps set a good example as well.

- *Learning how to learn.* OTIS is my attempted answer to "how should people learn?", in the context of math olympiads. Yes, you have to spend a lot of time, but there's more to it than that.[10] How do you know you really understand something? What should you be thinking about after you've done each problem? How do you prioritize approaches? Why are philosophy and intuition so important? And so on.

  During OTIS, these ideas are addressed indirectly through examples and explicitly through discussion. I don't claim my answers are the best or only ones. But I hope it's one helpful viewpoint. My intention is that seeing olympiad math from the OTIS perspective gives insight into these nuances.

- *Enjoyable and worthwhile experience.* In the short-term, I want OTIS to be fun. In the long-term, I want students to be able say, "*hey, I really enjoyed OTIS and learned a lot from it, and I'm glad that I joined*", even if they didn't do as well on USAMO as they hoped. I think this kind of maturity and appreciation is important later on in life (for example in trying new things without excessive fear of failure).

  This is where the human face of OTIS comes in. Part of it is in design: point-based problem sets, picking fun problems, keeping a human voice in writing.

  The other part is just being available. During the school year, I see a lot of students who are left to float around and fend for themselves. My hope is that I can be a good mentor for students: being there to answer questions, giving guidance and encouragement, just being enthusiastic, etc. It's hard to learn math in a vacuum; I hope to fix that.

- *Olympiad math itself*: after completing OTIS, students should have learned a lot of olympiad math. The mechanism for this should be self-explanatory!

Optimizing all four metrics simultaneously is hard enough. And so, to take a page from Ravi Vakil's algebraic geometry notes: **there are no other goals**.

[10] To quote Palmer Mebane: "It's always discouraging to see people say that they're planning to do every problem in PSS or every IMO SL, because it sounds like they're more intent on being able to say they've done that than actually doing the problems as thoroughly as they should."

§C.1 Non-goals of OTIS

In particular, the following are explicitly *not* goals of OTIS, though they often occur only incidentally (e.g. even though there is little to no attempt to help students prepare for the AIME, they will probably get better at it anyways).

- Training for short-answer contests like AIME,
- Introducing students to higher math or undergraduate math, or even encouraging students to study these,
- Discussing applications of math to other fields,
- Trying to encourage students to think about the world,
- Helping students with admissions to top colleges,
- ...

I want to stress that by listing these as non-goals, I do *not* mean to say they are unimportant or undesirable; indeed, they are positive and often occur as side effects. Instead, it means the program structure is *not optimized* for these. I follow the Unix philosophy here: "write programs that do one thing and do it well". I guess in this case I am doing four things.

§D Fair use of OTIS materials

As mentioned before, OTIS materials are internal use only. The purpose of this section is to clarify exactly what that means.

Within OTIS, "exchanging handouts" is discouraged because it undermines the unlock system. You should file unit petitions instead as those are accepted quite generously.

Outside of OTIS, for personal or noncommercial educational use, all of the following are **okay without even asking permission**:

- **Sharing individual problems is not only permitted but encouraged.** I do not "own" most problems and it is wonderful thing to share beautiful problems with others[11]. For example, if you see a problem you really like, you can post about it on your blog, talk about it at your country's math camp, etc.

  The only caveat is problems on Waltz and Foxtrot practice exams, since for practice exams it's important people don't recognize those problems. In that case I prefer you ask, so I can at least replace the exam problem.

- **Quoting small passages** is permitted. This includes solutions to individual problems; e.g. if your friend is asking how to do Shortlist 2021 G4, it's fine to screenshot the relevant solution from the OTIS packet.

- **Any ideas, methods, philosophy, etc.** can be shared freely with no restrictions.[12] If people ask what "rigid" or "remainder bounding" means, you may certainly explain in your own words or link relevant example problems.

If you wish to share a substantial portion of a handout, or really for any reasonable request, **just ask nicely**. As of November 2022, I have never declined a request.

That said, please do not upload OTIS materials to `coursehero.com` or similar websites.

[11] Bonus points if it's an Evan problem.

[12] Legally, you cannot copyright ideas, only the expression of ideas. In any case, it would be idiotic for me to try and have OTIS secret weapons or something.

§E Math conventions

Here are some conventions and notation that OTIS will use. (For example, they may appear on OTIS practice exams with no further clarification.)

- We let $\mathbb{N} = \mathbb{Z}_{>0} = \{1, 2, \dots\}$ denotes the set of *positive* integers (i.e. 0 is not a natural number). We use $\mathbb{Z}_{\geq 0}$ for nonnegative integers.
- The functions $\lfloor \bullet \rfloor$ and $\lceil \bullet \rceil$ are the floor and ceiling functions.
- The graph-theory terms "graph", "vertex", "edge", "degree", "directed graph", "tournament" will be used freely. Graphs are *simple* graphs unless otherwise specified.
- The function log actually denotes the *natural* logarithm (not the base-10 logarithm).
- We say 0 divides itself, but not any other integer.
- Some problems may refer to chess pieces or games. We take https://en.wikipedia.org/wiki/Rules_of_chess as the agreed-upon rules for the games of chess.
- Empty sums are equal to 0 and empty products are equal to 1.

§F Side meetings with instructors (rare)

There are a number of instructors listed in https://web.evanchen.cc/otis.html#staff. These instructors are competition enthusiasts, often past OTIS participants, who have offered to take a number of students for 1:1 meetings on the side.

I need to start by warning you that these meetings are hard to get, because the supply lags significantly behind the demand (usually by a factor of 5 to 20, depending on the year). You should consider this as an optional addon to the main OTIS program, with severely limited availability.

Instructors generally have full latitude over how they wish to run their meetings. So they get to decide, for example,

- how many and which students they want to invite to work with them;
- how often they want to meet with these students;
- how much they wish to charge for these meetings, and whether they wish to be need-blind or offer financial aid for this;
- how they wish to format and structure the meetings. However, in practice, because the meetings are 1:1, most instructors are really liberal with allowing you to spend the time however is most useful to you, so it's really mostly up to you.

  For example, back when I did meetings, walking through problems was common, but so was going through theory or asking for generic advice. On another extreme I once had a 1:1 meeting where the student just asked me to explain how puzzle hunts worked (which had nothing to do with OTIS, but I was happy to anyway).

When you apply to OTIS each year, you can indicate you'd be interested in being paired with an instructor (or not). I pass on the list of these students to the instructors and ask them to contact anyone who they think would be a good fit. This invitation process is ad-hoc since the number of people is so small.