A guide to choosing units

For new students

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UNIT-GUIDE

This guide helps new students with picking what initial set of units they want to work on.[1] Don't sweat it too much; you can request changes later.

§1 The wiki, and other sources of advice

Every unit has a page on the wiki:

https://otis.evanchen.cc/wiki/units/

some of which are more developed than others. The good pages will at least have a description of what you're signing up for and some examples of problems that appear on the unit. You can use this to inform your choices about what units might be good picks.

If you're still not sure what you want to choose or want any sort of advice, you should ask Evan or other students, rather than just guessing.

§2 This is a buffet — the unlock system

An "average" pace is to complete one unit every two weeks, so a good goal is to try and complete 6-8 units every semester. However, some students have more time to devote to OTIS than others, so you can vary this pace accordingly.

You can add as many units as you desire. The catch is that **new units only unlock as you complete previous ones**. At any one point, you will only have a few units available. I find that this is a good source of motivation — the more units you complete, the more you get access to (sort of like a video game).

My recommendation is to **begin by choosing 15-20 of the units** you are most interested in to begin with (assuming you are a full-year student). You can always drop units later if you don't want to work on them, and you can also ask for more units to get added later.

[1] Historically, I used to just pick the units for each student. However, I want to continue experimenting with giving students more and more autonomy, which led to the creation of this unit guide.

§3 About the codes

You will quickly notice that every unit has a three-letter code. Here is an explanation of what the code means.

- The first letter is a *difficulty indicator*. There are three possible letters B, D, Z. Guidelines:

  B-Level For students planning to take JMO, or hoping to solve the earlier problems on USAMO. Students in this category might aim for HM/bronze at the IMO.

  D-Level For students aiming to score well on USAMO, e.g. solving 3 or more problems. Students in this category should get at least bronze at most IMO's, and be aiming for silver or gold.

  Z-Level For advanced students, e.g. those aiming to win or HM on USAMO, qualify for USA IMO team, or earn a gold medal at IMO.

  Obviously there's a bit of variance, but those are guidelines. Naturally, you can mix difficulty levels. For example if you consider yourself strong at geometry, you might choose to work on harder geometry units compared to the other subjects.

- The second letter is a *subject indicator*. They are
  - A for algebra, F for functional equations (rows colored red)
  - C for combinatorics (rows colored blue)
  - G for geometry (rows colored green),
  - N for number theory (rows colored grey)
  - M for miscellaneous (rows colored yellow).

- The third letter is a *version indicator*; it could be either W, X, or Y. Some units have multiple versions of the same level; the intention is that you can do a unit more than once. When there are multiple versions, you should pick one at random. They have different problems but are intended to cover the same content.

§4 Recommended units (for first-timers)

I want to single out some units in particular that I think most students should do.

§4.1 Algebra / FE

I suggest that most students work on at least one unit in functional equations.

If you just want general practice, the **Func Eqn** unit is the usual choice; in particular, if you are working on mostly B-level units, the obvious choice is the BFW functional equations unit.

There are two variants. The **Monster FE** unit covers functional equations which have pathological solutions, while the **Wrapped FE** unit covers functional equations of a particular flavor.

The **Sums** and **Analysis** units are also fairly core to the algebra curriculum.

I leave it up to you whether you want to work on inequalities or not. There are units for these in each of the three levels.

§4.2 Combinatorics

The **Equality** unit is basically mandatory. Every first-year student should do this unit unless they have some good reason not to.

If you consider yourself a beginner in combinatorics, I suggest adding **Entry Combo**.

I usually suggest adding some unit with **Global** in its name (for Z-level students, this is "Global and Local"). If you are working on mostly B-level units, you might want to add **Expected Value** before that; it helps serve as a ramp-on.

If you are mostly working on D-level units and want to focus on combinatorics in particular, I suggest adding **Local** in addition to Global.

If you are working on mostly D-level units, usually adding **Rigid** and/or **Free** is a solid choice.

§4.3 Geometry

I generally suggest **Complex Numbers** for everyone unless you are morally opposed to bashing. In my experience, very few students know Complex Numbers well, even after completing the relevant chapter of EGMO.

The **Harmonic** unit is fun and I find it a good way to start the year. The DGW Harmonic is often accessible to everyone. If you are more technically inclined or just like projective geometry, you might consider doing **Homography** instead.

If you have finished the EGMO textbook, the unit **Art School** is challenging but rewarding.

§4.4 Number theory

There are certain "core" units for number theory depending on the level. If this is your first year I suggest doing at least one of them.

- B-level: AIME Mods, Orders
- D-level: Exp NT, Heavy NT
- Z-level: Super NT.

The rest of the NT handouts tend to be focused on certain more specialized topics, like integer polynomials or constructions, etc. I think these "topics" NT handouts are quite fun and it's good to pick one or two of these that look most interesting.

§4.5 Summary

Reading is hard so here's the summary. The row in the chart corresponds to the average difficulty level of your units. So if you plan to get mostly B-level units, then the suggested units are those in the first row.

	Alg	Combo	Geom	NT
B-level	FE, Sums	Entry Combo, Equality	Complex Num, Elem Geo	AIME Mods *or* Orders
D-level	Any FE unit, Sums, Analysis	Equality, Global, Rigid	Complex Num, Harmonic *or* Homography, Art School	Exp NT *or* Heavy NT
Z-level	Any FE unit, Sums, Analysis	Equality, Global+Local, Rigid *or* Free	Complex Num, Harmonic *or* Homography	Super NT

§5 The sorting

In the selection form you may notice the units appear in a seemingly arbitrary order. In fact, this order has some thought hidden behind it; it group similar units near to each other, and it also handles some dependency chains (i.e. units that I think should come before others are rigged that way).

§6 Sample unit-sets

The following is a choice of units that I think would be quite normal for a student in each of the three tiers B, D, Z. Obviously, you should adjust it according to taste. I think it's a good starting point though.

§6.1 Sample choice with mostly B-level units

1. DGW Harmonic
2. BAY Cyclotomic
3. BCY Entry Combo
4. BCW Expected Value
5. BFW Func Eqn
6. BCY Induct
7. BCW Equality
8. BNW Prime Exponents
9. DGW Complex
10. BGW Bary
11. BNW AIME Mods
12. BNW Orders
13. BCY Rigid
14. BGY Elementary Geo

15. BGX AIME Geo
16. BAW Ineq Func

§6.2 Sample choice with mostly D-level units

1. DGW Harmonic
2. DCX Global
3. DCX Local
4. DFW Func Eqn
5. DCW Equality
6. DGW Complex
7. DGW Bary
8. DNW Exp NT
9. DNW Heavy NT
10. DCX Rigid
11. DCX Free
12. DGX Weird Geo
13. DMY Grinding
14. DNY NT Construct
15. DMW Courage
16. DCW Arrows

§6.3 Sample choice with mostly Z-level units

1. ZGY Homography
2. ZCX Global and Local
3. ZFW Monster FE
4. ZCW Equality
5. ZGX Super Complex
6. ZGX Super Bary
7. DAY Analysis
8. ZCY Linear Algebra
9. ZNX Super NT
10. ZCW Rigid

11. ZCX Free
12. ZCY Process
13. ZNY Int Polynom
14. DMY Anti Probs
15. ZGY Inversion and Spiral
16. ZAW Formulas

§7 The petition system

After you have finalized your choices for units, you can still request additional changes, (though these may be subject to approval). On the website, find the link that says "Request Units", and fill out the forms there to request changes.