



LIBYAN OLYMPIAD IN INFORMATICS · LOI

Training, Rating & IOI Team Selection Handbook

دليل نظام التدريب والتصنيف واختيار فريق IOI

Version 1.0 · October 2026 · Season 2026-27

This handbook describes the system as it will operate: rules, formulas, regulations and day-to-day operations. The full analysis of alternatives and the reasoning behind each decision is in the accompanying proposal. Numbers marked as initial are calibrated after the first contests of Season 1 and then frozen.

ORGANIZED BY · تنظيم



Libyan Academy for Telecom and Informatics
الأكاديمية الليبية للاتصالات والمعلوماتية · LATI

SPONSORS · الرعاية



القبضة
للاتصالات
LPTIC



Contents

Each part is written for a specific reader. Start with the one that is yours.

Part 0 · How to read this handbook

Who reads what

Part 1 · Overview

Goal, principles, architecture, glossary

Part 2 · Participant guide

Joining, levels, contests, the rating, the path to IOI

Part 3 · LOI Rating specification

Official formulas and parameters

Part 4 · IOI team selection regulation

17 formal articles

Part 5 · Curriculum

31 modules mapped to the IOI Syllabus

Part 6 · Contests and operations

Calendar, problems, editorials, contest day, proctoring

Part 7 · Coaching and mentoring

Roles, the Elite programme, safeguarding

Part 8 · Discord server

Channels, roles, permissions, the bot

Part 9 · Data

Tables, fields and privacy

Part 10 · Implementation roadmap

Phases, gates, first 30 days, KPIs

Part 11 · Scenarios

100 / 150 / 200 participants

Appendix A · The AOI study

What we took and what we did not

Appendix B · Evidence

Simulation results

Appendix C · Reference code

Python for the rating and selection

Appendix D · Forms

Problem proposal, registration, appeal

Appendix E · Sources**Appendix F · Unified visual identity**

Colors, type, logos, sponsors strip, Discord and website

Part 0 · How to read this handbook

The handbook is long because it is a complete reference. Nobody needs to read all of it.

You are	Read	Why
A participant (student)	Parts 1 and 2	How you progress, how your rating works, how you reach IOI
A parent	Part 2 (2.1, 2.8, 2.9), Part 4, Part 7.4	Eligibility, selection, student safeguarding
A coach or mentor	Parts 2, 5, 6 and 7	Curriculum, weekly rhythm, responsibilities
A setter or tester	Part 6 (6.3–6.6), Appendix D	Problem lifecycle and templates
The Scientific Committee and Selection Panel	Parts 3, 4, 5 and 6	The regulation and the formulas
A developer (bot, website)	Parts 3, 8, 9 and Appendix C	Specifications, data and code
The Organizing Committee	Parts 6, 8, 9 and 10	Calendar, proctoring, Discord, data
The Executive Director	Everything, starting with Parts 1 and 10	The full picture and the plan

Level naming

L1 is the entry level and L3 is the highest. Technical terms are kept in English, as students will see them at IOI.

Part 1 · Overview

What we are building, and why it is shaped this way.

1.1 The goal

Identify and develop the strongest programmers in Libya, not reward whoever has stayed in the programme the longest.

Every rule in this handbook is tested against that sentence. The system balances four things: consistency, current skill, competition performance and long-term development. It does so by separating two jobs: one system that measures and develops (training), and one that selects (IOI).

1.2 Six principles

1. **Current strength beats seniority.** A strong player who arrives late must reach their true place within two or three contests.
2. **Attendance builds confidence in your estimate; it does not raise the estimate.** More contests add accuracy, not points.
3. **Online is low-stakes; whatever decides is proctored.** In 2026, AI tools can solve many olympiad problems, so no unproctored contest decides who represents Libya.
4. **Every rule is published before the season and does not change during it.** Changes happen between seasons only.
5. **No problem without an official solution and explanation.** The editorial is written before the contest, not after.
6. **Data is structured from day one.** Every result is stored so it can move to the website later without re-entry.

1.3 The architecture: two numbers on one database

The **LOI Rating** runs training and moves after every contest. The **Selection Score** picks the IOI team and is computed only from 6 proctored, IOI-format contest days. The rating gets you into the room; the room decides.

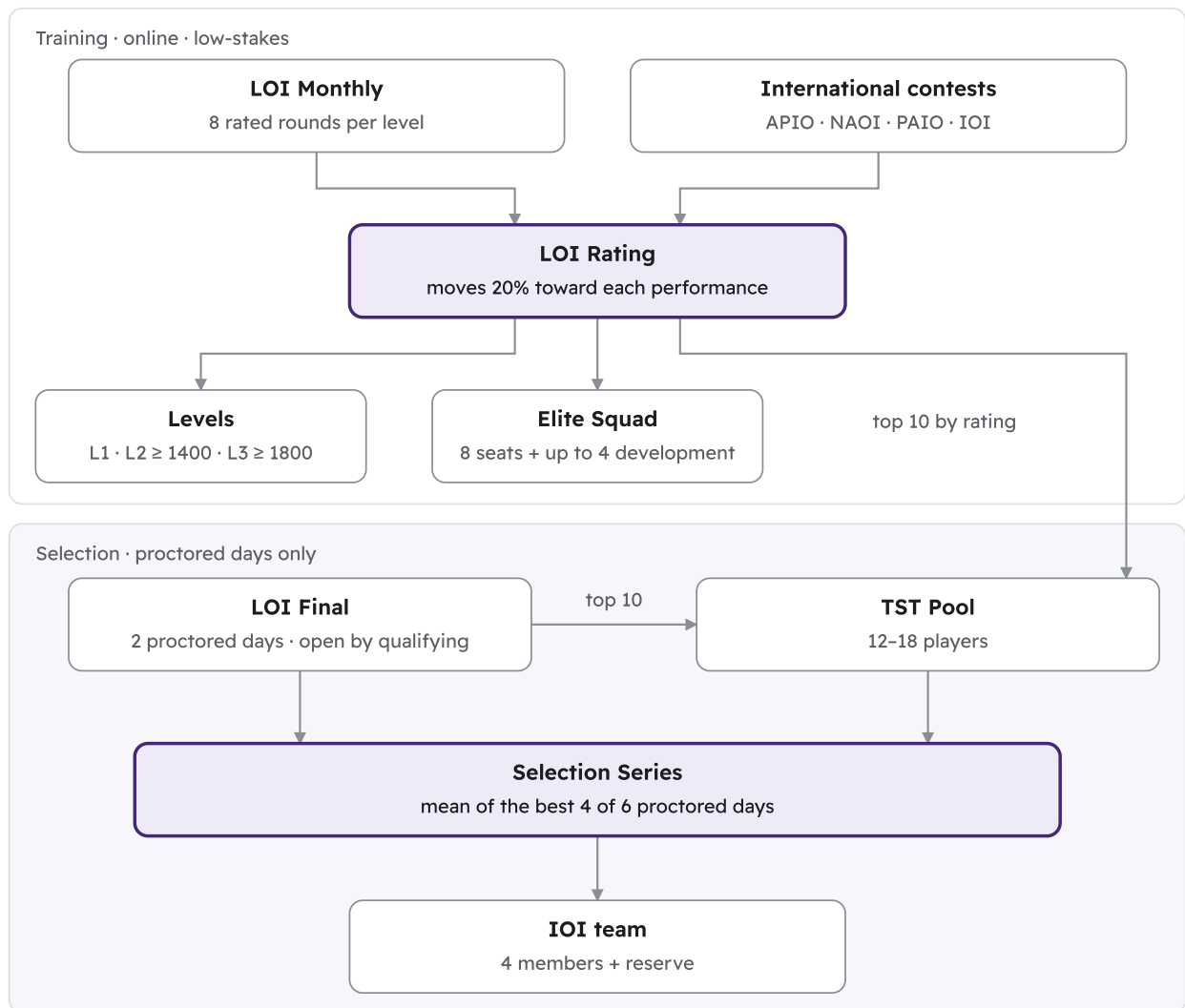


Figure 1 · Contests feed the LOI Rating; the final decision comes only from the proctored days in the shaded zone.

1.4 Components

Component	What it does	Details
3 levels (L1 / L2 / L3)	Groups students by skill for teaching and contests	2.2, 2.6
LOI Rating	Continuous estimate of each player's strength	2.5, Part 3
LOI Monthly	Monthly rated contest for each level	2.4, 6.2
Elite Squad	8–12 players working with international coaches	2.7, 7.2
LOI (Round 1 and Final)	The national olympiad, open to everyone through qualification	2.8, Part 4
Selection Series	6 proctored days that select the IOI team	Part 4
Curriculum	31 modules in prerequisite order	Part 5
Discord + LOI Bot	Day-to-day interface for training	Part 8

Component	What it does	Details
CMS	Contest system (the one IOI uses)	Part 6
Database	Single source of truth; moves to the website later	Part 9

1.5 Glossary

Term	Meaning
LOI Rating	A number representing our estimate of your current strength. Starts at 1200.
Performance	The rating someone would need to achieve your exact placing against the same opponents in one contest.
Provisional	A player with fewer than 3 rated contests. Their rating moves faster and is not used as a reference for others.
Established	A player with 3 or more rated contests.
Inactive	Missed 3 consecutive LOI Monthly rounds. Hidden from the leaderboard; rating frozen.
Subtask	Part of a problem with easier constraints and its own points, as at IOI.
Editorial	Official explanation of the solution in the standard template, with code and common mistakes.
Upsolving	Solving a contest's problems after it ends, to learn.
Proctored	A contest with an invigilator present, or camera plus screen-share supervision.
TST	Team Selection Test: the team selection days.
TST Pool	12–18 players eligible to compete for the IOI team.
Selection Score (SEL)	Mean of the best 4 normalized day scores out of 6 selection days.
CMS	Contest Management System, the system used at IOI.
Placement Contest	A level-placement contest for newcomers.

Part 2 · Participant guide

Everything a student needs: how to join, what to learn, how you are rated, and how to reach IOI.

2.1 How to join

1. Join the LOI Discord server and answer the onboarding questions: your secondary-school graduation year, your city and your prior experience.
2. Fill in the official registration form. If you are under 18, a parent or guardian must sign the consent.
3. You receive an **LOI ID** (for example LY-2026-0137). This is your permanent number in all LOI records.
4. Type `/link` in Discord to connect your account to your ID, then activate your CMS account.
5. Take the **Placement Contest** (2.5 hours, 6 problems from easy to hard), or start directly with the next LOI Monthly in L1.
6. The resulting rating sets your level. A very strong performance can place you straight into L2 or L3.

2.2 The three levels

Level	For	What you learn	Your monthly contest
L1 · Foundations	Every newcomer, or rating below 1400	C++, algorithmic thinking, sorting, searching, prefix sums, recursion, first DP and graphs	3 hours, 5 problems
L2 · Algorithms	Rating from 1400	DP, graphs, shortest paths, DSU, trees, segment trees, IOI task formats	4 hours, 4 problems
L3 · Olympiad	Rating from 1800	Advanced IOI topics, mixed problems, five-hour strategy	5 hours, 3 problems (as at IOI)

All lessons and editorials are readable by every level. Your level decides which contest you enter and which interactive sessions you attend.

2.3 Your week at LOI

Activity	L1	L2	L3
Live lesson (also recorded)	90 min weekly	90 min weekly	2 hours every two weeks
Problem set	10 problems	8 problems	6 hard problems
Mentor office hours	Twice	Once	On request

Activity	L1	L2	L3
Practice Set (unrated)	Every two weeks	Every two weeks	Virtual IOI every two weeks
LOI Monthly (rated)	Once a month, on a Saturday		

Practical tip

If you are stuck on a problem for more than 45 minutes, read the first hint in the editorial and try again. If you are still stuck, ask in your level's help forum. A mentor replies within 24 hours.

2.4 The monthly contest: rules

- **When:** a Saturday. All levels end at 18:00 Libya time: L3 starts 13:00, L2 starts 14:00, L1 starts 15:00.
- **Scoring:** IOI style. Each problem is worth 100 points split into subtasks. Your best score on each subtask across all submissions counts. No time penalty and no penalty for wrong submissions.
- **Allowed:** cppreference.com, and machine translation of the problem statement only.
- **Not allowed:** any AI tool, help from anyone, and pre-written code (templates), as at IOI.
- **Questions during the contest** go through CMS clarifications only, not Discord.
- **After the contest:** discussion opens at 18:00, problems are open for upsolving immediately, and the editorial is published within 72 hours.
- **If you miss it:** no penalty. Your rating simply stays where it is.

2.5 How the rating works, in plain words

Your rating is our best guess of your strength right now. After each contest we ask: "How strong would someone have to be to finish where you finished, against these exact opponents?" That is your **performance**. Then we move your rating 20% of the way toward it.

Three important consequences:

- **Third place among strong players beats first place among beginners.** Performance depends on whom you beat, not only on raw points.
- **Showing up does not raise your rating by itself.** If you perform as expected, your rating stays the same. Improvement is what raises it.
- **One bad day cannot undo months.** The change in a monthly contest is capped at 150 points up or down.

If you are new

In your first 3 contests your rating moves faster: 60%, then 45%, then 35% of the distance. A strong newcomer therefore reaches their true place quickly. In our simulation, a strong player who joined late was

4th after one contest and 1st after two. Under a cumulative points system they would still have been 29th after six contests.

Examples

Situation	Rating before	Performance	Move	After
Strong result for a regular player (3rd of 40)	1650	2108	20% of 458 = +92	1742
Strong newcomer, first contest (3rd of 40)	1200	2108	60% of 908 = +545	1745
Surprise win for an average player (1st)	1300	2315	+203 → capped at +150	1450
Exactly as expected (middle of the table)	1600	1600	0	1600

A contest with 40 established players rated evenly from 1300 to 1900. A zero-sum correction is then applied, which usually changes these numbers by only a few points.

Questions students ask about the rating

- **I solved two problems and my rating went down. Why?** Because more was expected from you against this field. Your previous rating was a little above your current performance. It is not a punishment.
- **Do I lose points if I don't show up?** No. Your rating freezes. After 3 consecutive missed rounds your name is hidden from the leaderboard until you return.
- **Can I see the calculation?** Yes. The `/me` command shows your performance and change, and the code is published (Appendix C).

2.6 Promotion and demotion

Move	Condition	Fast track
L1 → L2	Rating $\geq$ 1400 after 2 of your last 3 contests	Performance $\geq$ 1700 in a single contest
L2 → L3	Rating $\geq$ 1800 after 2 of your last 3 contests, and 60% of the problems in modules A3, A4, A6 and A7 solved	Performance $\geq$ 2100 + the module condition
L2 → L1 (demotion)	Rating below 1250 after 3 consecutive contests	—
L3 → L2 (demotion)	Rating below 1650 after 3 consecutive contests	—

- After any promotion, no demotion during your first 3 contests at the new level.
- Absence alone never demotes you.
- Demotion is not a punishment: the aim is for you to be at a level where you score 30–70% of the points, because that is where you learn most. You receive a private message and a review plan from a coach.
- The 1400 and 1800 thresholds are initial. They are calibrated after the third round of Season 1 and then frozen until the season ends.

2.7 The Elite Squad

A group of 8 to 12 players who train with international coaches.

- **8 selection seats:** the top 8 by rating among players eligible for the next IOI, who meet the activity requirement (4 rated contests in the last 6 months) and have a rating of at least 2000.
- **Up to 4 development seats:** for the top L3 players who will remain eligible for at least two more IOIs, with a rating of at least 1850.
- **Review every two months** (October, December, February). You leave only if you are below 12th at two consecutive reviews, become Inactive, or attend fewer than 75% of sessions.
- **What you get:** a session with an international coach every two weeks, a monthly one-to-one review, and priority for camps and international contests.
- **What is expected:** 75% attendance, a Virtual IOI every two weeks with a written post-mortem, and writing or testing two L1 or L2 problems per season.

2.8 The path to IOI

1. **Eligibility:** you are no older than 20 on 1 July of the IOI year; you were enrolled in secondary school (or lower) for most of 1 September to 31 December of the previous year; and you are not enrolled half-time or more at a university.
2. **LOI Round 1 (January):** an open qualifier for every eligible student, even if you have never taken part in anything before.
3. **LOI Final (February):** two proctored days, 5 hours and 3 problems each. Open to Round 1 qualifiers and all L3 players.
4. **TST Pool:** the top 10 by rating plus the top 10 in the LOI Final (both lists together, usually 12–16 players).
5. **The six selection days:** the two LOI Final days, two TST Camp days (March), APIO (May), and the third TST day (late May).
6. **The team:** the top 4 by the mean of their best 4 of the 6 days. Fifth place is the reserve.

Why doesn't the rating pick the team?

Because the rating is built on unproctored online contests and reflects your level over past months. The selection days are all proctored, in IOI format, and close to IOI. The rating still matters: it is your route into the Pool, it sets your level and your Elite seat, and it breaks ties.

If you are ill on a selection day

Don't worry: only your best 4 of 6 days count, so your bad day is the one that drops out automatically. If you miss 3 or more days with a documented reason, a make-up day is organised for you.

2.9 Integrity

Allowed	Not allowed
cppreference, machine translation of the statement, paper and pen	Any AI tool, including assistants built into editors
Discussing problems after the contest ends	Discussing or sharing anything during the contest
Reusing your own code after the contest, to learn	Pre-written code during the contest

What happens if something looks wrong? After every contest, code similarity is checked automatically. Any rise of more than 250 points in a month for an established player triggers a short (10-minute) interview where you explain your solution to a coach. This is routine, happens to everyone, and is not an accusation. A proven violation means zero for that contest, and on selection days may mean exclusion from the season.

2.10 Frequently asked questions

Question	Answer
I am a complete beginner. Can I join?	Yes. L1 is designed for people who have never written code and starts with C++ basics.
Can I use Python?	In L1 contests during Season 1 only. Teaching is in C++ from day one, because IOI accepts only C++.
I missed a contest. Can I make it up?	You can solve it afterwards (virtual), but it does not count toward the rating. There is no penalty for missing it.
Can I move down a level to win easily?	No. Stepping down voluntarily is permanent only, never for a single contest.
I joined in January. Have I missed IOI?	No. LOI Round 1 in January is open to everyone, and selection uses only the February–May days.



Question	Answer
I joined after the LOI Final. Is my chance over?	You can request a proctored Qualification Test before TST Day 1. If you pass, you join the Pool with the 4 remaining days.
How do I know where I stand?	The /me command: your rating, level, rank and what you need for promotion.
Whom do I contact about a problem?	Your level's help forum for technical questions, #faq for organisation, and the Selection Panel in writing for appeals.

Part 3 · LOI Rating specification

The official reference for the calculation. Any difference between this part and the code in Appendix C is resolved in favour of this part, and the code is corrected.

3.1 Parameters (Season 2026–27)

Parameter	Value	Meaning
Initial rating	1200	Rating of any new player before their first contest
α_{new}	0.60 / 0.45 / 0.35	Speed of movement in the first 3 contests
Established after	3 contests	After this the player is used as a reference for others and is subject to the cap
α_{event}	Table 3.3	Speed of movement by the measurement quality of the contest
Cap C	150 (Monthly) · 250 (official and international)	Maximum change for an established player in one contest
Minimum reference	8	Minimum established opponents for the Elo performance method
Fallback range	L1: 800–1600 L2: 1200–2000 L3: 1600–2400	Used when the reference set has fewer than 8 players
Inactive after	3 consecutive missed Monthly rounds	Hidden from the leaderboard and frozen
Return boost	$\alpha = 0.35$ for the first 2 contests after returning	Re-sync quickly
Activity requirement	4 rated contests in the last 6 months (3 in Season 1)	Required for promotion, Elite, and qualifying by rating
Integrity trigger	+250 within a month	Routine "explain your solution" interview
Level thresholds	1400 / 1800 (demotion: 1250 / 1650)	Initial; calibrated after Monthly #3
Elite floor	2000 (development seats 1850)	Initial; calibrated after the LOI Final

3.2 Algorithm

Step 1 · Score: S_i is player i 's total IOI score (best score per subtask across all submissions).

Step 2 · Reference set: Ref_i = established players in the same contest and level, excluding i . If there are fewer than 8, use the fallback step.

Step 3 · Wins:

$$W_i = \# \left\{ j \in \text{Ref}: S_j < S_i \right\} + \frac{1}{2} \# \left\{ j \in \text{Ref}: S_j = S_i \right\}$$

W is clamped to $[0.5, |\text{Ref}| - 0.5]$ so performance stays finite for someone who beats everyone.

Step 4 · Performance P_i : the value that makes expected wins equal actual wins, found by binary search:

$$\sum_{j \in \text{Ref}} \frac{1}{1 + 10^{(R_j - P_i) / 400}} = W_i$$

Fallback step: $P_i = L + (H - L) \times (\text{share of all other participants beaten})$, where (L, H) is the level's range in Table 3.1.

Step 5 · Raw change:

$$d_i = \alpha_i (P_i - R_i), \quad \alpha_i = \max(\alpha_{\text{event}}, \alpha_{\text{new}}(k_i))$$

k_i is the player's number of previous contests. $\alpha_{\text{new}} = 0.60, 0.45, 0.35$ for $k = 0, 1, 2$, then zero.

Step 6 · Cap: for established players only, d_i is clamped to $[-C, +C]$.

Step 7 · Zero-sum: the mean d of the established players in the contest is subtracted from each of them. This keeps the average rating from inflating or deflating (simulation: 1187 after 16 contests, starting from 1200). Provisional players are not part of this step.

Step 8 · Update: $R_i \leftarrow R_i + d_i$. Stored as a decimal, displayed rounded. Each change is logged in RatingChange with: before, performance, α , delta_raw, delta_final, after, and the algorithm version.

3.3 Contests and their weights

Contest	How P is computed	α	C	Selection day?
LOI Monthly	Elo against established players in the level	0.20	150	No
Placement Contest	Elo or fallback	0.20 (newcomers get 0.60)	150	No
LOI Round 1	Elo against all established players	0.25	250	No (qualifying)

Contest	How P is computed	α	C	Selection day?
LOI Final (per day)	Elo against all established players	0.30	250	Yes
TST (per day)	Elo within the Pool	0.30	250	Yes
APIO	$1500 + 1200 \times q$	0.35	250	Yes
NAOI	$1300 + 1000 \times q$	0.30	250	No
PAIO (both days together)	$1300 + 1000 \times q$	0.35	250	No
IOI (both days together)	$1700 + 1200 \times q$	0.40	250	No

q = the share of contestants you outscores in the international contest's full ranking (0 to 1). **Why these numbers?** A contest's value comes from three separate things: opponent strength enters through P , measurement quality (length, number of days, IOI format) enters through α , and integrity and openness decide whether it is a selection day. NAOI and PAIO are closed (LOI chooses who goes), so they do not count for selection. APIO is open to up to 100 students per country, so every L3 player is registered for it.

The conversion ranges are initial. After each international contest the Scientific Committee compares Libyan participants' ratings before the contest with their q values, and adjusts the ranges for the next season only.

3.4 Leaderboard states

State	Condition	Visibility
Provisional	Fewer than 3 contests	Separate "Rising" list
Active	Established and has not missed 3 consecutive rounds	Official leaderboard
Inactive	Missed 3 consecutive Monthly rounds	Hidden until return
Alumni	Past eligibility	Historical archive only

3.5 What changes between seasons only

Thresholds, international conversion ranges, α and cap values, and the activity requirement. Any change is published in a new Handbook before the season starts, and old parameters are kept in the Season table so any historical rating can be recomputed.

Part 4 · IOI team selection regulation

A formal regulation of 17 articles. It is approved and published before the season and is not amended during it.

Article 1 · Scope. This regulation governs the selection of four students and a reserve to represent Libya at IOI in Season 2026–27, and sets guidance for selecting the NAOI and PAIO teams.

Article 2 · Eligibility. A candidate must: (a) be no older than 20 on 1 July of the IOI year; (b) have been enrolled in secondary education or lower for most of 1 September to 31 December of the year before IOI; (c) not be enrolled in a university programme at half-time load or more; (d) meet the nationality requirement set by LOI leadership. Documents are verified on entry to the Pool, not after selection.

Article 3 · Selection Panel. A sub-committee formed by the Scientific Committee, of three to five members, at least one from outside Libya. Every member declares any conflict of interest (a relative, or private coaching of a candidate) and does not vote on decisions concerning that candidate. The panel applies this regulation; it does not judge candidates. The Executive Director approves the team list after checking that it complies with this regulation, and does not change its order.

Article 4 · TST Pool. The Pool consists of: (a) the top 10 eligible players by LOI Rating at the end of the LOI Final who meet the activity requirement; (b) the top 10 eligible players by the total of the two LOI Final days; (c) up to two candidates through the Qualification Test (Article 13). Maximum 18.

Article 5 · Selection days. Six days: D1 and D2 are the LOI Final (February); D3 and D4 are the TST Camp (March); D5 is APIO (May, proctored by LOI, with the whole Pool registered); D6 is the third TST day (late May). Each day is 5 hours with 3 IOI-style problems, except APIO, which follows its own rules.

Article 6 · Normalized day score. For each day d and candidate i :

$$s_{i,d} = 100 \times \frac{S_{i,d}}{\max_{j \in \text{Pool}} S_{j,d}}$$

If the top score in the Pool is zero, the day is void.

Article 7 · Selection Score. SEL_i = the mean of the candidate's 4 highest normalized day scores among the days attended, with at least 4 days attended. The LOI Rating is not part of this formula.

$$\text{SEL}_i = \frac{1}{4} \sum_{d \in \text{Top4}(i)} s_{i,d}$$

Example

A candidate scores 92, 78, 100, 41 (ill), 85, 88 → best 4 = 100 + 92 + 88 + 85 → SEL = 91.25. A late joiner who attended only D3–D6 with 95, 90, 97, 93 → SEL = 93.75. The late joiner ranks higher because they are stronger now, but they had no chance to drop a bad day.

Article 8 · The team. The team is the top 4 eligible candidates by SEL; fifth is the official reserve and sixth the second reserve.

Article 9 · Tie-breaking. A tie means equal SEL to two decimal places. It is broken in this order: (1) mean of all attended days; (2) mean of the three TST days; (3) highest single-day score; (4) LOI Rating on the announcement date; (5) a proctored tie-break contest (3 hours, two problems). Age, gender and city are never used.

Article 10 · Absence. Missing one or two days requires no action, because only the best 4 count. A candidate who misses 3 or more days with a documented reason (medical or official) is entitled to a make-up day with new problems under the same conditions before the announcement date, scored against the top score of the original day.

Article 11 · Technical failures. A general failure (CMS, power, internet) affecting 20% or more of the Pool voids the day or re-runs it with reserve problems. An individual failure documented by the proctor gives extra time equal to the time lost; if that is impossible, the day is treated as a dropped day.

Article 12 · Integrity. A proven violation means zero for that day, and may mean exclusion from the season. The decision is taken by the Selection Panel, including its external member, after hearing the candidate and their guardian.

Article 13 · Late entry. A candidate who appears after the LOI Final may take a proctored Qualification Test before TST Day 1. The threshold is the 10th-ranked Pool member's mean LOI Final score. A candidate who passes joins the Pool and competes on the 4 remaining days. A candidate who appears after TST Day 1 cannot reach 4 days, is not selected for IOI that season, and is nominated for the Elite Squad and PAIO.

Article 14 · Transparency. After each day the cumulative SEL table is published in #selection-info by LOI ID, with raw and normalized scores. Any exceptional decision is published with its reason, without personal data.

Article 15 · Appeals. A written appeal within 48 hours of a day's results; the Selection Panel answers within 72 hours. An appeal about procedure (not scores) may then go to the Executive Director. Appeals about grading are referred to the problem author and an independent tester.

Article 16 · Amendment. This regulation is not amended after the season starts. Any amendment takes effect from the next season.

Article 17 · Other teams. NAOI (April): the top candidates by SEL computed over D1–D4 (best 3 of 4), up to the allowed number. **PAIO (July):** the top candidates by final SEL; up to two places may be reserved



for candidates with at least two years of eligibility left, also chosen by SEL. **EGOI (if LOI decides to take part):** the same SEL among eligible girls.

Part 5 · Curriculum

31 modules mapped to the IOI 2025 Syllabus, in prerequisite order.

5.1 Philosophy

- **L1 and L2 by topic:** you cannot apply what you do not know, so each week covers one module.
- **L3 by mixed problems:** IOI problems do not tell you the topic. 70% of L3 problems are mixed and untagged.
- **In every problem set:** 70% from the current module and 30% review from earlier modules, so skills are not forgotten.
- **Set structure:** 3 warm-up, 5 core and 2–4 challenge problems (L3: 6 hard problems).

Explicitly excluded by the IOI 2025 Syllabus

String algorithms (KMP, Rabin-Karp hashing, suffix arrays, Aho-Corasick), modular division and inverses, complex numbers, FFT, matrix exponentiation and all linear algebra, Sprague-Grundy and general combinatorial game theory, 3D geometry, and hash tables. These are taught only as electives after L3 is complete.

Included and often overlooked

Basic max flow and min cut, bipartite matching, HLD and centroid decomposition, persistent data structures, DP optimizations, SCC and bridges, convex hull and sweep line, and constructive, interactive and output-only tasks.

5.2 L1 · Foundations (about 18 weeks)

#	Module	Content	Prerequisite	Weeks
F1	C++ basics	I/O, variables, conditions, loops, functions, arrays, strings	—	3
F2	Complexity	Big-O, 10^8 operations per second, reading constraints, overflow	F1	1
F3	STL	vector, pair, sort, set/map, stack/queue, priority_queue	F1	2
F4	Brute force and simulation	Trying all cases, careful implementation	F1	1

#	Module	Content	Prerequisite	Weeks
F5	Basic maths	Divisibility, gcd, primes and sieve, modular add/multiply, fast exponentiation	F2	1
F6	Sorting and first greedy	Sorting as a tool, first exchange argument	F3	2
F7	Prefix sums	1D and 2D, difference arrays	F2	1
F8	Binary search	On sorted arrays and on the answer	F6	2
F9	Two pointers	Sliding window	F7, F8	1
F10	Recursion	Backtracking, subsets, permutations, bitmask enumeration	F1	2
F11	First DP	1D DP, coins, LIS $O(n^2)$, knapsack	F10	1
F12	First graphs	Graph representation, BFS/DFS on grids, connected components	F3, F10	1

Exit skills: writes correct C++ without help, estimates complexity before coding, and regularly solves problems at USACO Bronze or Codeforces ~1200 level.

5.3 L2 · Algorithms (about 22 weeks)

#	Module	Content	Prerequisite	Weeks
A1	Greedy with proof	Exchange argument, scheduling, when greedy fails	F6	2
A2	Binary search on answer	Check function + monotonicity	F8	1
A3	DP II	2D DP, LCS, knapsack variants, interval DP, bitmask DP	F11	4
A4	Graphs II	Dijkstra, 0-1 BFS, Bellman-Ford, Floyd, topological sort, DP on DAGs	F12	3
A5	DSU and MST	Union-find, Kruskal, Prim	A4	1
A6	Trees I	DFS order, subtree sizes, tree DP, diameter, LCA (binary lifting)	F12, A3	3
A7	Range queries	Sparse table, Fenwick, segment tree (point update), coordinate compression	F7	3
A8	Combinatorics	Counting, Pascal, inclusion–exclusion, pigeonhole	F5	1
A9	Ad-hoc and constructive	Invariants, parity, building examples, reasoning from small cases	All of L1	2

#	Module	Content	Prerequisite	Weeks
A10	IOI task formats	Function-signature graders, interactive, output-only, subtasks	F1	1
A11	Stress testing	Brute + generator + comparison, systematic debugging	F4	1

Exit skills: solves USACO Gold or Codeforces 1600–1700 problems, collects subtasks on medium IOI problems, and stress-tests by habit.

5.4 L3 · Olympiad (continuous yearly cycle)

#	Module	Content	Prerequisite
O1	Segment tree II	Lazy propagation, merging, walk, persistent segment tree	A7
O2	Trees II	Euler tour + DS, small-to-large, HLD, centroid decomposition, virtual tree	A6, O1
O3	Advanced DP	Convex hull trick / Li Chao, divide & conquer opt, Knuth, digit DP, SOS, DP + DS	A3, O1
O4	Graphs III	SCC, bridges/articulation points, 2-SAT, Euler paths, bipartite matching, max flow / min cut	A4, A5
O5	Offline techniques	Sweep line, sqrt decomposition, Mo, parallel binary search, DSU rollback, offline D&C	A7
O6	Geometry within IOI scope	Cross product, orientation, polygon area, point in polygon, convex hull, integers only	F5
O7	Advanced problem solving	Constructive, interactive with query limits, communication tasks, randomization, heuristics for partial scoring	A9, A10
O8	IOI strategy	Reading all three problems, harvesting subtasks, splitting 5 hours, when to move on	A10
E	Electives	KMP / Z / hashing / suffix array, modular inverse, FFT, matrix exponentiation, Sprague-Grundy	After O1–O8

5.5 Recommended resources

Level	Core resources
L1	USACO Guide (Bronze), CSES (Introductory, Sorting and Searching), France-IOI (levels 1–2), EOI's Arabic C++ playlist
L2	USACO Guide (Silver–Gold), CSES (DP, Graph, Tree, Range queries), Codeforces EDU (binary search, two pointers, DSU, segment tree), AtCoder DP Contest



Level	Core resources
L3	USACO Guide (Gold–Platinum), oj.uz (IOI, APIO, BOI, CEOI, JOI problems), past IOI tasks with graders, the LOI archive

Part 6 · Contests and operations

How problems are made, how a contest is run, and how selection days are proctored.

6.1 Season 2026–27 calendar (proposed)

Month	Events
October 2026	Design approved, appointments, Handbook v1
November 2026	Discord and bot built, participant registration, CMS set up
December 2026	Placement Contest (5 Dec), LOI Monthly #1 (19 Dec), first Elite review
January 2027	LOI Round 1 (16 Jan), Monthly #2
February 2027	LOI Final (2 days, late Feb), Monthly #3, threshold calibration, Pool announced
March 2027	TST Camp (2 days), Monthly #4
April 2027	NAOI, Monthly #5
May 2027	APIO, TST Day 3 (late May), Monthly #6
June 2027	IOI team announced (early June), season report, backtesting
July–August 2027	IOI team preparation, PAIO, website work begins

Official school exam periods are avoided in coordination with the Ministry of Education. The APIO 2027 date is not yet announced (usually May).

6.2 Contest formats

	L1	L2	L3	Selection days
Duration	3 hours	4 hours	5 hours	5 hours
Problems	5	4	3	3
Difficulty	2 easy, 2 medium, 1 challenge	1 easy, 2 medium, 1 hard	Like an IOI day	Like an IOI day
Subtasks per problem	2–3	3–4	4–6	4–6
Shared problems	P5 = L2 P1	P4 = L3 P1	—	—
Target results	90% score points, median 40–60%	Median 35–55%	Median 30–50%	Rarely 300/300

	L1	L2	L3	Selection days
Supervision	Online, low-stakes, automatic similarity check			On-site, or camera + screen share

6.3 Problem budget

Source	Per year	Original?
LOI Monthly (8 rounds × 10 problems)	80	48 original (L2 and L3); 32 for L1 may be adapted
Placement Contest (twice)	12	Partly reusable
LOI Round 1	4	Original
LOI Final + TST (5 days × 3)	15	Original; tested only by alumni or coaches
Reserve problems for make-up days	3	Original

That is about 70 original problems a year at 150–200 participants. How we get there: each Elite member writes two problems, problem exchange with NAOI countries, and alumni as setters.

6.4 Problem lifecycle

#	Stage	Owner	Output	Due
1	Proposal	Any setter	Idea, level, topic, short solution (Appendix D)	6 weeks before
2	Approval	Problem Coordinator	Accepted / revise / rejected with a written reason	5 weeks before
3	Package	Setter	Arabic and English statement, official solution, brute force, expected wrong solutions, generator, validator, checker, subtasks	4 weeks before
4	Testing	Two testers	Independent solutions; confirm each wrong solution gets the right score per subtask	2 weeks before
5	Editorial	Setter, reviewed by a tester	In the standard template (6.6)	1 week before
6	Contest	Contest Director	Upload to CMS, dry run, handle clarifications	Contest day
7	Results	Data Secretary	Export results, similarity check, ratings, leaderboard	Within 48 hours

#	Stage	Owner	Output	Due
8	Archive	Problem Coordinator	Tags, level, solve rate, editorial link, package in Git	Within a week

6.5 Package checklist

- ☐ Statement in Arabic and English, with examples covering every subtask
- ☐ Official C++ solution passing all tests in at most half the time limit
- ☐ Brute-force solution for verification
- ☐ Expected wrong solutions (wrong greedy, slower complexity, overflow) with the expected score for each
- ☐ Generator with a fixed seed, and a validator checking every constraint
- ☐ Checker if more than one answer is correct
- ☐ Subtasks with points, each with boundary tests
- ☐ Two independent tester solutions that agree
- ☐ Editorial complete and reviewed

6.6 Editorial template

1. **The idea in one sentence**, with hint 1 hidden, then hint 2.
2. **Each subtask's solution** in order: why it works and its complexity.
3. **The full solution** with the proof or key argument.
4. **Common mistakes** actually seen in submissions.
5. **Clean official code** with comments, and a second approach when useful.
6. **Similar problems** for practice (2–3 links).

6.7 Contest day runbook

When	Task	Owner
7 days before	Problems on CMS, full dry run, announcement in #calendar	Contest Director
24 hours before	Bot reminder, extra workers confirmed, backup taken	Bot, Contest Admin
1 hour before	Close #contest-discussion, test logins	Bot, Contest Admin
During	Answer CMS clarifications within 10 minutes, watch the server	On-call setters
18:00	Open discussion, open upsolving	Bot

When	Task	Owner
Within 48 hours	Similarity check, ratings, promotions, publish #results	Data Secretary
Within 72 hours	Editorials published in the #editorials forum	Problem Coordinator

6.8 Proctoring selection days

Option 1: on-site

At one venue (camp) or 2–3 simultaneous centres (Tripoli, Benghazi, a third city). One proctor per 8 students, machines with no internet except CMS, no phones.

Option 2: remote (last resort)

- Proctoring groups of 6–8 students per proctor on a video call.
- A side camera showing the student and screen, plus full screen sharing for the whole contest.
- Breaks up to 15 minutes after telling the proctor; longer breaks are logged.
- Session recordings kept for 30 days for appeals, then deleted.

6.9 Integrity process

1. **Detection:** automatic similarity check (Dolos or MOSS) after each contest, the +250-in-a-month trigger, and proctor reports.
2. **Review:** the Integrity Officer reviews the evidence within 7 days.
3. **Interview:** 10 minutes "explain your solution" with a coach who has not seen the case.
4. **Decision:** nothing, a warning, zero for the contest, or exclusion from the season (selection days only), with the guardian present for minors.
5. **Appeal:** within 7 days, to a panel including the external member.

Part 7 · Coaching and mentoring

International coaches work with the Elite; local coaches own the levels; mentors are the backbone of L1 and L2.

7.1 Governance and roles

The system runs inside LOI's existing structures and creates no parallel bodies: the **Executive Director** approves, the **Scientific Committee** owns everything scientific, and the **Organizing Committee** owns everything operational.

Existing body	What it owns in this system
Executive Director	Approving the handbook and selection regulation before each season, approving and announcing team lists (without changing their order), international relations, sponsors, appointments
Scientific Committee	Curriculum, problems and editorials, rating parameters and calibration, the scientific content of selection days, the Selection Panel (a sub-committee), integrity, choosing coaches and mentors
Organizing Committee	Calendar, venues and proctoring centres, registration and guardian consent, the Discord server, bot and data, proctors, travel and accommodation, certificates and the sponsors strip

Role	Reports to	Number (200 participants)	Responsibility	Hours/week
Head Coach	Scientific Committee	1	Curriculum, coach allocation, lesson quality	6
International Coach	Scientific Committee	2–3	Elite sessions, TST problem review, camp lectures	2–3 each
Level Lead	Scientific Committee	3	The weekly lesson and the level's problem set	4
Mentor	Level Lead	13–16	Office hours, help-forum answers within 24 hours, code review	2–3
Problem Coordinator	Scientific Committee	1	The problem lifecycle (6.4)	4
Setters + Testers	Problem Coordinator	8–10	Monthly problems and selection-day problems	2–4

Role	Reports to	Number (200 participants)	Responsibility	Hours/week
Selection Panel	Sub-committee of the Scientific Committee + one external member	3–5	Applying the selection regulation and exceptional cases	Seasonal
Integrity Officer	Scientific Committee	1	Similarity checks, interviews	2
Contest Director	Organizing Committee	1	Running CMS and contest day, with the Scientific Committee	3
Data Secretary	Organizing Committee	1	Results, ratings, the bot, backups	3
Proctors and Discord moderators	Organizing Committee	As needed	Proctoring selection days, moderating the server	—

7.2 The Elite programme

- **A two-hour session every two weeks** with an international coach: analysing IOI and APIO problems, ways of thinking rather than just solutions.
- **A Virtual IOI every two weeks** (5 hours) followed by a written post-mortem: what you tried, where time went, which subtasks you missed.
- **A monthly one-to-one review** (15 minutes) and a personal plan: 2–3 weak topics to work on next month.
- **The camp** alongside the TST Camp: lectures between test days.

7.3 Mentoring and help

- Every technical question goes to the level's help forum (not DMs), so everyone benefits and it stays searchable.
- Mentors reply within 24 hours. They guide with questions and hints, not full code.
- Office hours are scheduled on the level's Stage channel and listed in #calendar.
- All lessons are recorded and published in #lessons, and reused every year.

7.4 Safeguarding

Mandatory rules for every coach and mentor

- Guardian consent at registration for everyone under 18.
- No direct messages between an adult and a minor. One-to-one contact happens in private threads visible to other coaches.
- One-to-one voice sessions have a second coach present, or are recorded with the student's and guardian's knowledge.
- No requests for personal data or photos beyond what official registration needs.
- A code of conduct signed by every coach and mentor before they receive the Discord role.
- Any violation is reported to the Executive Director immediately.

7.5 Recruiting and recognition

International coaches come from nearby countries with IOI experience (Egypt, Algeria, Tunisia, Saudi Arabia) and from Arab and African IOI alumni. LOI's hosting of NAOI 2026 created relationships to build on. Local coaches and mentors come from ICPC students at Libyan universities, then from LOI's own alumni. Every volunteer receives an official yearly certificate stating their hours.

Part 8 · Discord server

Discord is the interface, not the database. All official records live in the database; the bot mirrors them.

8.1 Channel map

Category	Channels	Who writes
START HERE	#welcome, #rules, #handbook (this handbook, versioned), #faq (forum)	Staff
NEWS	#announcements, #calendar, #results	Staff + Bot
LEARN	#lessons (forum tagged L1/L2/L3), #resources (curated forum), #weekly-set	Coaches
L1 · FOUNDATIONS	#l1-chat, #l1-help (forum), 🗣️ L1 Classroom (Stage)	L1 and above
L2 · ALGORITHMS	#l2-chat, #l2-help (forum), 🗣️ L2 Classroom	L2 and above
L3 · OLYMPIAD	#l3-chat, #l3-help (forum), #virtual-ioi, 🗣️ L3 Classroom	L3
CONTESTS	#contest-info, #contest-discussion (closed during contests), #editorials (forum: one post per problem)	Staff, then everyone in threads
ELITE (private)	#squad-news, #squad-chat, #squad-postmortems, a private thread per student, 🗣️ Squad Room	Elite + Coaches
SELECTION	#selection-info, #tst-pool (private, seasonal)	Selection Panel
COMMUNITY	#general, #introductions, #achievements, #off-topic, 🗣️ Lounge	Everyone
STAFF (private)	#staff, #problemsetting (forum tagged by problem status), #testing, #integrity, #coach-notes, #bot-logs	By role
SECURITY	#do-not-post (honeypot that removes anyone who posts), #mod-log	—

8.2 Roles

Type	Roles	Granted by
Staff	Executive Director, Scientific Committee, Organizing Committee, International Coach, Local Coach, Mentor, Problem Setter, Tester, Contest Admin, Moderator, Data Secretary	Organizing Committee, by decision of the Executive Director
Level	L1 Foundations, L2 Algorithms, L3 Olympiad	The bot, from the rating

Type	Roles	Granted by
Programmes	Elite Squad, TST Pool, IOI Team 2027, Alumni	The bot, after a Selection Panel decision
Cohort	Class of 2027 ... 2032	Onboarding
Status	Provisional, Inactive	The bot
Notifications	Contest Pings, Lesson Pings (opt-in)	Onboarding

Optional identity names for the levels, from Libya's ancient cities: Sabratha (L1), Leptis (L2), Cyrene (L3).

8.3 Permissions matrix

Category	L1	L2	L3	Elite	Mentor/Coach
START HERE, NEWS	Read	Read	Read	Read	Read (Staff writes)
LEARN	Read	Read	Read	Read	Write
L1	Write	Write	Write	Write	Write
L2	Read	Write	Write	Write	Write
L3	Read	Read	Write	Write	Write
CONTESTS (after the contest)	Write in threads	Write in threads	Write in threads	Write in threads	Write
ELITE	—	—	—	Write	Coaches only
STAFF	—	—	—	—	By role

8.4 Joining flow in Discord

1. Onboarding: graduation year (cohort role), city, prior experience, notifications.
2. #welcome explains the steps and links the registration form.
3. After registering: /link LY-2026-0137.
4. The bot grants a temporary L1 role (or the right level after placement).



8.5 LOI Bot

Command or job	What it does
/link	Connects the Discord account to the LOI ID and the CMS account
/me	Rating, level, rank, last change, what is needed for promotion, activity requirement
/next	The next contest and your registration status
/leaderboard	Top 20 in your level or overall
Automatic	Updates level roles, posts results and promotions, opens and closes #contest-discussion, reminders 24 hours and 1 hour before, the honeypot

Implementation: discord.py reading and writing a Google Sheet in Season 1, then the website API. The /me command alone removes most of the administrative questions that usually flood training servers.

8.6 Moderation

- Honeypot channel: any message there means a compromised account or bot, which is removed automatically and its recent messages deleted.
- No invite links or advertising without Staff permission.
- #contest-discussion and the help forums close automatically during contests.
- Every moderation action is logged in #mod-log.

Part 9 · Data

The same schema starts in a Google Sheet and moves unchanged to PostgreSQL for the website.

9.1 Principles

1. **A stable ID for every person** (LOI ID), never the name.
2. **Store raw data:** CMS results as exported, not only computed values.
3. **Recomputable:** every rating change carries the algorithm version and the season's parameters.
4. **Automated writes:** scripts and the bot write; one human editor only (Data Secretary), and every manual edit goes to AuditLog.

9.2 Tables

Table	Key fields
Person	loi_id, name (Arabic/English), date of birth, gender, nationality, city, school, grade, graduation year, discord_id, cms_username, guardian consent
StaffRole	person_id, role, from, to
Eligibility	person_id, season, loi_eligible, reason, verified_by, verified_at
Season	id, dates, rules_version, rating_params
LevelMembership	person_id, level, from, to, reason
Event	id, season, type, level, date, rated, selection_day, proctored, alpha, cap, map_low, map_high, cms_contest_id
Problem	id, title, setter, testers, topics, level, difficulty, source, status, package_path, editorial_url
EventProblem	event_id, problem_id, order, subtasks
Participation	event_id, person_id, score, rank, per-problem scores, attended, proctor_group, integrity_flag
Submission	cms_submission_id, event_id, person_id, problem_id, time, language, subtask_scores
RatingChange	person_id, event_id, before, performance, alpha, delta_raw, delta_final, after, provisional, algo_version
EliteSeat	person_id, seat_type, from, to, reason
SelectionScore	season, person_id, event_id, raw, normalized, counted
TeamSelection	season, competition, person_id, rank, role, decided_at

Table	Key fields
TrainingSession / Attendance	level, module, coach, date, recording_url / session_id, person_id, present
IntegrityCase / Appeal	person_id, event_id, type, evidence, decision, appeal
AuditLog	who, when, which record, value before and after

The ranking is not a table: it is a view computed from each active player's latest RatingChange.

9.3 Privacy

- Dates of birth and guardian details are kept in a separate file with restricted access (Executive Director and Data Secretary).
- The public leaderboard shows name, level and rating only.
- Proctoring recordings are deleted after 30 days unless an appeal is open.
- Anyone who leaves the programme may ask to hide their name from the public archive; the internal record is kept anonymised.

Part 10 · Implementation roadmap

First LOI Monthly on 19 December 2026, the IOI 2027 team in early June 2027, and the website with Season 2.

10.1 Phases and gates

Phase	Period	Deliverables	Gate (exit condition)
1 · Design	6–31 October 2026	Handbook v1 approved by the Executive Director; the Scientific Committee appoints the Head Coach, 3 Level Leads and at least 6 mentors	Selection regulation approved and published
2 · Discord	1–28 November 2026	The server (Part 8), LOI Bot MVP, registration form and LOI IDs	50 registered players linked to the bot
3 · CMS	15 November – 19 December 2026	CMS on the server, two dry runs, Placement (5 Dec), Monthly #1 (19 Dec)	Dry run with 20 users and no failures
4 · Season 1	December 2026 – June 2027	6 Monthlies, LOI Round 1 and Final, TST, APIO, team announcement	Season report + backtesting
5 · Website	July – December 2027	MVP (profiles, leaderboard, archive, editorials), then registration and CMS integration	Full migration off the Sheet

10.2 Season 1 is a transition season

By the LOI Final each player will have only 3–4 rated contests. That does not harm IOI 2027 selection, because selection uses the proctored days. In Season 1 only: the activity requirement is 3 contests, and the LOI Final route is the main route into the Pool.

10.3 First 30 days

- ☐ Scientific Committee reviews the design; Executive Director approves it with the selection regulation
- ☐ Appoint the Head Coach and Problem Coordinator (Scientific Committee), and the Contest Director and Data Secretary (Organizing Committee)
- ☐ Recruit at least 6 mentors and 5 setters
- ☐ Book the CMS server and create the problems Git repository
- ☐ Write the Placement Contest (6 problems) and Monthly #1 (10 problems) with editorials
- ☐ Build the Discord server and LOI Bot MVP



- ☐ Contact two international coaches and confirm Libya's APIO 2027 registration
- ☐ Registration form and guardian consent

10.4 Calibration checkpoints

When	What is calibrated
After Monthly #3	L2/L3 thresholds (target: L3 about the top 10%, L2 the next 25–30%), then frozen
After the LOI Final	Elite floor (2000)
After APIO	International conversion table (for next season)
June 2027	Backtesting: cumulative points vs Best-K vs LOI Rating on real data; Handbook v2

10.5 Success indicators

Indicator	Season 1 target
LOI Monthly attendance among registered players	70% or more
Editorials published within 72 hours	100%
Share of L1 promoted to L2 during the season	20% or more
Correlation of LOI Rating before the Final with the LOI Final result	0.7 or more (confirms the rating measures something real)
Help-forum replies within 24 hours	90% or more
Selection appeals upheld because of a rules error	Zero

Part 11 · Scenarios

The same design works at 100, 150 and 200 participants. The only important difference: at 100, the L2 and L3 contests are merged.

	A · 100	B · 150	C · 200
L1 / L2 / L3	60 / 28 / 12	90 / 42 / 18	120 / 55 / 25
Elite Squad	6–8	8–10	8–12
Expected attendance per Monthly (L1 / L2 / L3)	45 / 21 / 9	68 / 32 / 14	90 / 41 / 19
L2/L3 contests	Merged (4 problems, 5 hours, two leaderboards)	Separate	Separate
Original problems per month	4	6	6
International coaches	1–2	2	2–3
Level Leads	2	3	3
Mentors	7–8	10–11	13–16
Setters + Testers	5	6–8	8–10
Team hours per week (estimate)	About 65	About 80	About 95
TST Pool	10–12	12–14	14–18

Recommendation: plan for B and run as A in Season 1 until real numbers are known. Above 250 participants, the number of mentors becomes the first bottleneck.

Appendix A · The AOI study

A walkthrough of the Algerian Olympiad in Informatics Discord server (October 2026) and algerianoi.com. The aim was understanding, not copying.

AOI does	Our decision
Two tiers: Phlox for everyone, Incarnadine as the national squad	3 levels + Elite, because the middle level is where most development happens
Monthly upgrade test: 2 hours, 6–8 problems, pass by solving 3	A continuous rating with fixed thresholds, and IOI-style contests with subtasks
Remote proctoring with groups and invigilators; explicit ban on LLMs	Adopted as is for selection days
Cohort role from the baccalaureate year at onboarding	Adopted: Class of 20XX role
Honeypot channel against compromised accounts	Adopted
Volunteer-run POTD, active May–August 2025, then stopped	Bi-weekly Practice Sets from the archive instead
Editorials mostly code without explanation	A mandatory editorial template written before the contest
Rules in a PDF; many administrative questions in channels	Handbook in #handbook + the /me command
Incarnadine curriculum includes complex numbers	Curriculum mapped to the IOI Syllabus, which excludes them

Observations are limited to what a regular member can see; private channels and AOI_Phlox_doc.pdf were not reviewed.

Appendix B · Evidence

Python simulations used to test the core decisions before applying them.

B.1 The strong late joiner

80 players and 16 contests; the strongest player joins at contest 11:

After the newcomer's contests	Rank by LOI Rating	Rank by cumulative points
1	4	57
2	1	49
4	1	37
6	1	29

Correlation of LOI Rating with true skill: 0.98 on average over 20 runs. The mean rating stayed at 1187 after 16 contests (starting at 1200).

B.2 Accuracy of team selection methods

20,000 simulated seasons, a 16-player Pool, realistic day-to-day variance:

Best 4 of 6 days picks 3.23 of the truly strongest four; a single contest picks 2.58

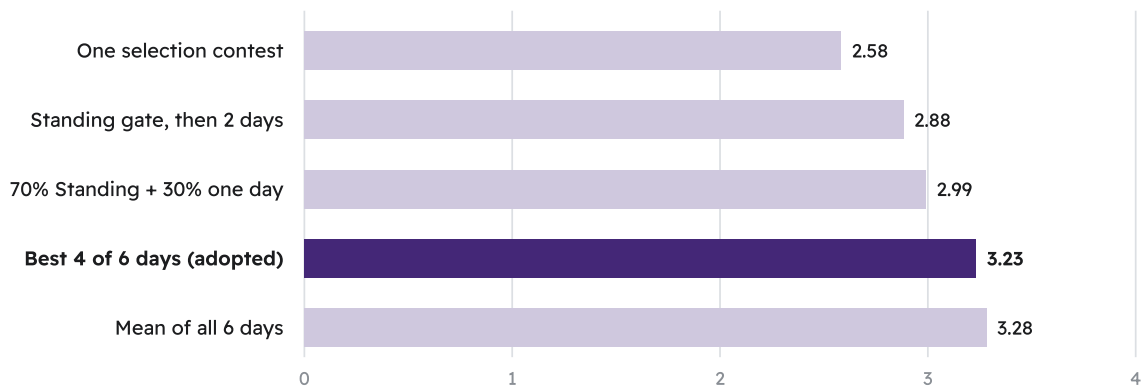


Figure 2 · Average number of the truly strongest four who are selected (out of 4). LOI simulation, 20,000 seasons.

Method	Strongest player excluded (normal variance)	With 8% disaster days (illness, outage)
One contest	15.6%	—
Two days	8.2%	—



Method	Strongest player excluded (normal variance)	With 8% disaster days (illness, outage)
70% Standing + 30% one day	5.7%	—
Best 4 of 6 (adopted)	2.3%	2.9%
Mean of all 6 days	1.8%	4.2%

The mean of all six days is slightly more accurate when there are no disaster days, but with illness or outages "best 4 of 6" does better, and it also lets a late joiner compete. That is why it was adopted.

Appendix C · Reference code

Python 3, no external libraries, tested against the examples in this handbook (test_reference.py).

C.1 loi_rating.py

```

"""LOI Rating - reference implementation (Handbook v1.0).

Every rated contest moves a player's rating part of the way toward their
performance, where performance is the rating that would be expected to beat
exactly as many established opponents as the player actually beat.
"""
from dataclasses import dataclass

INITIAL_RATING = 1200.0
ALPHA_NEW = (0.60, 0.45, 0.35)          # first three rated contests
ESTABLISHED_AFTER = 3                   # contests before a player is "established"
MIN_REFERENCE = 8                       # established opponents needed for Elo performance
FALLBACK_RANGE = {"L1": (800, 1600), "L2": (1200, 2000), "L3": (1600, 2400)}

@dataclass
class Player:
    loi_id: str
    rating: float = INITIAL_RATING
    contests: int = 0

    @property
    def established(self) -> bool:
        return self.contests >= ESTABLISHED_AFTER

def expected(performance: float, opponent: float) -> float:
    return 1.0 / (1.0 + 10 ** ((opponent - performance) / 400.0))

def elo_performance(wins: float, reference: list[float]) -> float:
    """Rating P such that the expected number of wins against `reference` equals `wins`."""
    n = len(reference)
    wins = min(max(wins, 0.5), n - 0.5)
    lo, hi = -1000.0, 5000.0
    for _ in range(100):
        mid = (lo + hi) / 2
        if sum(expected(mid, r) for r in reference) < wins:
            lo = mid
        else:
            hi = mid
    return (lo + hi) / 2

def wins_against(score: float, others: list[float]) -> float:
    return sum(1.0 for s in others if s < score) + 0.5 * sum(1.0 for s in others if s == score)

```

```

def rate_contest(players: dict[str, Player], scores: dict[str, float],
                alpha_event: float = 0.20, cap: float = 150.0, level: str = "L2") ->
list[dict]:
    """Update `players` in place from one contest. `scores` maps loi_id -> total IOI score."""
    ids = list(scores)
    established = [i for i in ids if players[i].established]
    changes = {}
    for i in ids:
        p = players[i]
        ref_ids = [j for j in established if j != i]
        if len(ref_ids) >= MIN_REFERENCE:
            perf = elo_performance(wins_against(scores[i], [scores[j] for j in ref_ids]),
                                   [players[j].rating for j in ref_ids])
        else: # small contest: percentile fallback within the level's range
            others = [scores[j] for j in ids if j != i]
            share = wins_against(scores[i], others) / max(1, len(others))
            low, high = FALLBACK_RANGE[level]
            perf = low + (high - low) * share
        alpha = max(alpha_event, ALPHA_NEW[p.contests] if p.contests < len(ALPHA_NEW) else 0.0)
        delta = alpha * (perf - p.rating)
        if p.established:
            delta = max(-cap, min(cap, delta))
        changes[i] = {"loi_id": i, "before": p.rating, "performance": perf, "alpha": alpha,
                     "delta_raw": delta, "provisional": not p.established}
    est_in_contest = [i for i in ids if players[i].established]
    if est_in_contest: # zero-sum correction among established players only
        mean = sum(changes[i]["delta_raw"] for i in est_in_contest) / len(est_in_contest)
        for i in est_in_contest:
            changes[i]["delta_final"] = changes[i]["delta_raw"] - mean
    for i in ids:
        c = changes[i]
        c.setdefault("delta_final", c["delta_raw"])
        players[i].rating += c["delta_final"]
        players[i].contests += 1
        c["after"] = players[i].rating
    return list(changes.values())

```

C.2 loi_selection.py

```

"""IOI Selection Score - reference implementation (Handbook v1.0).

SEL = mean of a player's best 4 normalized day scores; a day is normalized so the
best pool member that day gets 100. At least 4 attended days are required.
"""

def selection_scores(days: dict[str, dict[str, float]], pool: set[str],
                    best_k: int = 4, min_days: int = 4) -> dict[str, float]:
    normalized: dict[str, list[float]] = {}
    for day, raw in days.items():
        top = max((v for i, v in raw.items() if i in pool), default=0.0)
        if top <= 0:
            continue # void day: nobody in the pool scored
        for i, v in raw.items():
            if i in pool:
                normalized.setdefault(i, []).append(100.0 * v / top)
    return {i: sum(sorted(v, reverse=True)[:best_k]) / best_k

```



```
for i, v in normalized.items() if len(v) >= min_days}

def team(sel: dict[str, float], size: int = 4) -> list[str]:
    return sorted(sel, key=lambda i: -sel[i])[:size + 1]    # team + reserve
```

Appendix D · Forms

D.1 Problem proposal form

Field	Required content
Working title	A short name
Proposed level	L1 / L2 / L3 / selection day
Topic	Curriculum module number (for example A6)
Short statement	3–5 lines
Intended solution	Idea + complexity
Proposed subtasks	Constraints and points for each subtask
Originality	Original / adapted from (source)
Known similar problems	Is there a well-known similar problem?

D.2 Registration form fields

Name in Arabic and English, date of birth, gender, nationality, city, school, current grade, expected graduation year, email, Discord username, prior experience (optional), Codeforces handle (optional), guardian details and consent (under 18), agreement to the code of conduct and integrity rules.

D.3 Appeal form

LOI ID, the day or contest, the problem (if any), appeal type (grading / technical failure / integrity decision / eligibility), description, attached evidence. Submitted within 48 hours of the result; answered within 72 hours.

Appendix E · Sources

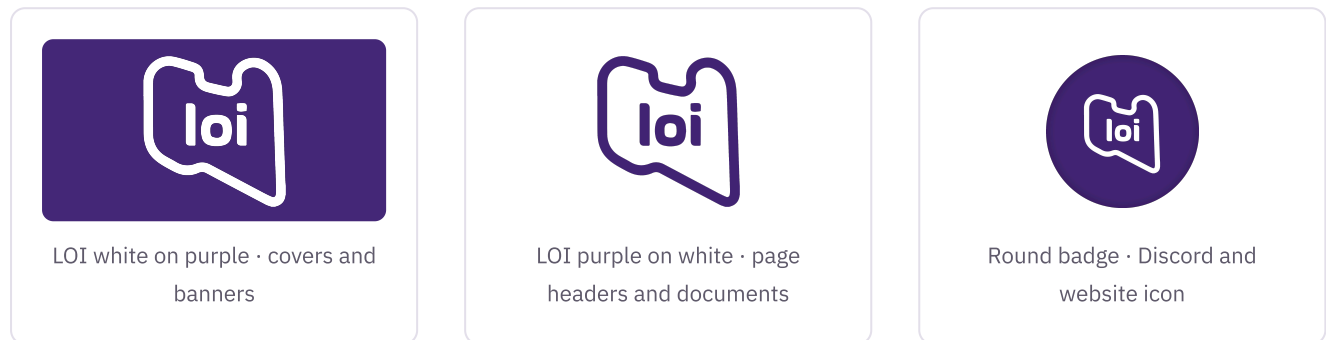
- IOI Syllabus 2025 — ioinformatics.org/page/syllabus/12
- IOI eligibility (age and school enrollment) — IOI Regulations
- APIO participation rules (up to 100 per delegation, top 6 official) — wcipeg.com/wiki/Asia-Pacific_Informatics_Olympiad
- NAOI 2026 (hosted by LOI, 58 contestants, 9 countries) — spa.gov.sa/en/N2585662, naoi2026.ly
- PAIO 2026 (2 days × 5 hours, 24 countries) — techreviewafrica.com/news/6595
- Algerian Olympiad in Informatics — algerianoi.com (training, rules, competitions) and its Discord server (visited 5–6 October 2026)
- USACO Guide — usaco.guide · CSES Problem Set — cses.fi · oj.uz · Codeforces EDU
- CMS (Contest Management System) — cms-dev.github.io · Dolos plagiarism detection — dolos.ugent.be



Appendix F · Unified visual identity

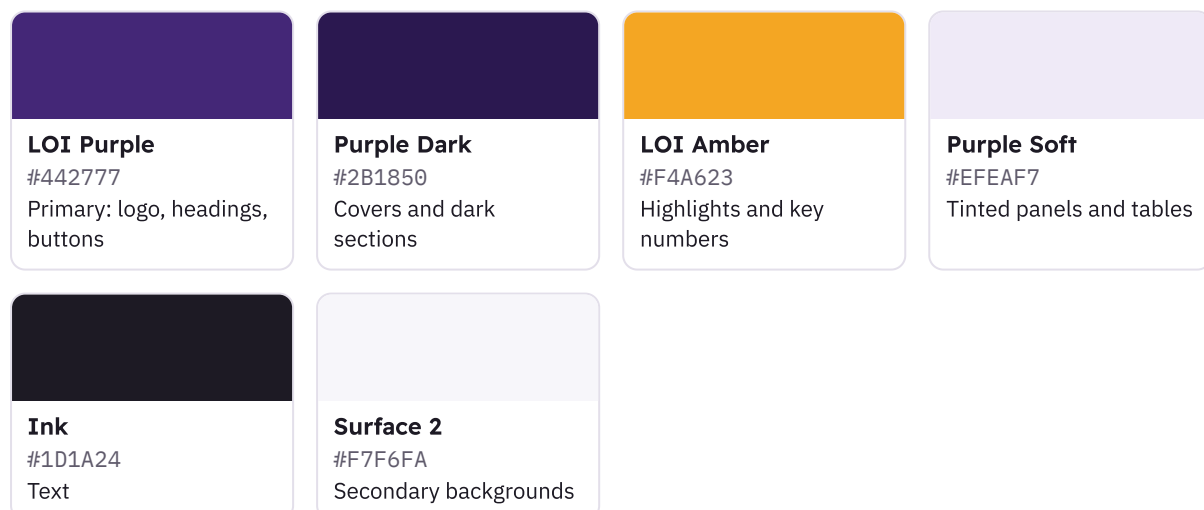
One theme taken from the LOI logo for every document, the training materials, the Discord server and the website. The code tokens are in `brand/loi-theme.css`.

F.1 Logos



- **LOI is always the primary logo.** The organizer and sponsors appear in a separate band, never next to the LOI logo at the same size.
- **Minimum size:** 7 mm in print, 24 px on screen.
- **Clear space:** at least the width of the "o" in loi on every side.
- **Never altered:** no stretching, rotating, shadows, or colors other than white and purple.

F.2 Colors



The purple is sampled from the official logo file. The amber is approximated from the LOI 2023 banner and should be replaced with the official value when a brand guide is available.

Level colors (Discord roles and badges)

Level	Color	Use
L1 · Foundations (Sabratha)	#3FA7D6	Discord role, level badge on the website
L2 · Algorithms (Leptis)	#1F9E8F	Same
L3 · Olympiad (Cyrene)	#8B6FD1	Same
Elite Squad	#F4A623	Same

F.3 Typography

Use	Typeface	Why
Headings (Arabic and English)	Readex Pro	Geometric and rounded like the "loi" wordmark, with Arabic support
Arabic body text	IBM Plex Sans Arabic	Very legible in long paragraphs and tables
English body text	IBM Plex Sans	Same family, so it matches the Arabic
Code	IBM Plex Mono	Same family

All typefaces are free on Google Fonts, so they work in documents and on the website without licensing; local copies are in brand/fonts.

F.4 Organizer and sponsors strip

The rule

The organizer (Libyan Academy for Telecom and Informatics · LATI) always appears under an "Organized by" label, and sponsors appear in a separate strip under a "Sponsors" label. The strip is designed to hold more than one sponsor.



Organized by · LATI (the logo has no text, so the name is always set next to it)



Sponsors · LPTIC (first sponsor in the strip)



- **Where it appears:** the front and back cover of every document, the website footer, contest banners, certificates, and the #welcome banner. Not on every inside page.
- **In the strip:** white background, every logo at the same visual height (12 mm in print, 40 px on the web), 8 mm apart, up to 6 logos per row.
- **Order:** by sponsorship tier, then date of agreement; set in `build_handbook.py` (the SPONSORS list) and in the website settings.
- **Sponsor colors** stay inside their logos and are never used in the LOI interface.

F.5 Applying it to Discord, the website and training

Where	How
Discord server icon	The round purple badge
Server banner and #welcome	Purple #442777, white logo, organizer and sponsors band at the bottom
Bot messages (embeds)	Color #442777; promotions in the new level's color
Level roles	Colors from F.2
Website	<code>loi-theme.css</code> tokens with a ready dark mode, Readex Pro headings, purple buttons, amber highlights
Lesson slides	Purple cover, white pages, small LOI mark in the header like this handbook
Certificates	LOI logo on top, organizer signature, sponsors strip at the bottom
Problem statements (PDF)	Small header with the LOI mark and contest name, no sponsor logos



Libyan Olympiad in Informatics

الأولمبياد الليبي للمعلوماتية



LOI Handbook v1.0 · October 2026 · The approved copy is the one published in #handbook

ORGANIZED BY · تنظيم



Libyan Academy for Telecom and Informatics
الأكاديمية الليبية للاتصالات والمعلوماتية · LATI

SPONSORS · الرعاية



القبضة
للاتصالات
LPTIC