



Maths Olympiad Prep

Maths Olympiad Teacher Pack

A free framework for identifying,
developing and challenging problem-
solving pupils

For maths clubs, enrichment lessons and independent practice.

mathsolympiadprep.com/teachers

What mathsolympiadprep.com is

A free website of competition mathematics problems, arranged so a pupil always has a sensible next problem to try. It's built for teachers and for pupils working on their own.

A structured progression

2,604 problems in a fixed order across 10 stages. Difficulty rises slowly and the four topics (algebra, combinatorics, geometry and number theory) take turns.

Problems from recognised competitions

Including UKMT Junior, Intermediate and Senior Challenges, UKMT Kangaroos, the British Mathematical Olympiad, the Waterloo (CEMC) contests, HMMT, USAMO and the International Mathematical Olympiad and its shortlist, and national olympiads from 43 countries, 1989–2026. Every problem names the competition that set it.

Worked solutions

2,299 of the 2,604 structured problems have a full worked solution on their page. The other 305 link to the publisher's own solution.

A searchable problem library

19,153 more problems from 616 competitions, filtered by competition, topic, difficulty and type.

Printable practice

Worksheets you set up by stage, topic and length (3 to 10 problems), each with a student and a teacher version, plus 50 ready-made sets.

A placement test

About 12 questions that start from the pupil's school year, adjust as they answer, and name a stage and a problem to start on.

No charge, and no pupil login

Everything is free and there are no adverts. Pupils use the problems, solutions and placement test without an account.

Where a problem has a short answer, the site checks what the pupil types. Where it asks for a proof, the pupil reads the solution and marks their own work, because a website can't mark a proof.

Who should use it

It suits pupils who:

- enjoy mathematical problem solving, whatever their current grades
- are ahead of their normal curriculum and need somewhere to go next
- are preparing for mathematics competitions
- need more challenge than standard classroom exercises give them
- are new to Olympiad maths and need a sensible starting point

Not only for the exceptional

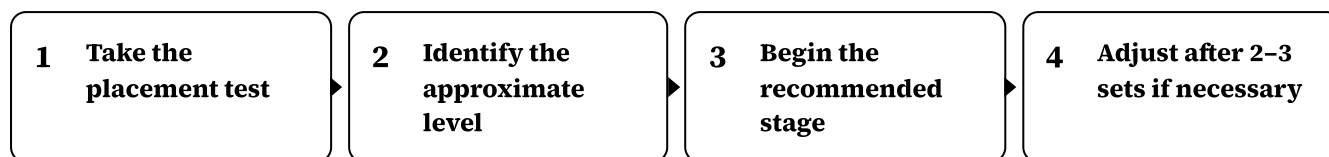
Olympiad problems reward persistence and a willingness to try things, and those can be taught. Many pupils who wouldn't call themselves competition mathematicians enjoy it once the problems start at the right level.

That's why the stages start low. Stage 1 is pitched at UK Junior Maths Challenge, CEMC Gauss, AMC 8. Nothing here needs mathematics you have not met. What it needs is reading the question carefully, working neatly, and noticing when an answer cannot be right.

Who tends to find it useful

- A maths department running an enrichment club or a challenge group.
- A teacher with one or two pupils who are well ahead of the class.
- A competition coordinator preparing pupils for a maths challenge or olympiad.
- Pupils working independently at home, with a teacher checking in now and then.

Finding the right starting point



How the test works

The pupil picks their school year, which sets the first question. After that each question follows from every answer so far: right answers bring harder questions, and a run of them jumps further. There are about 12, more if the pupil is still on a run. Answers are a letter or a short number. There's no clock, but pupils need pen and paper.

At the end it names a stage between 1 and 7 and the problem within it to start on. The result stays in the pupil's browser. Nothing is sent to you or stored against their name.



Placement test
mathsolympiadprep.com/diagnostic/

Reading the result

- The start is pitched a little below the pupil's level, so the first problems should be hard but doable.
- "Stage 7 or above" means the pupil cleared the hardest questions the test can mark. Beyond that almost everything wants a proof.
- It's an estimate from a handful of questions. After two or three sets, move a pupil up if they're solving nearly everything quickly, and down if they're making no headway.

The progression pathway

The site's 10 stages, easiest first. Each is named for the competition level it corresponds to, and the bar shows how many of its problems ask for a proof rather than an answer.

1	Learn to read a problem properly. UK Junior Maths Challenge · CEMC Gauss · AMC 8	320 problems 2% proof
2	Learn to try something. UK Intermediate Challenge · CEMC Pascal and Cayley	320 problems 8% proof
3	Learn to spot the idea. AMC 10/12 early · UK Senior Maths Challenge	260 problems 15% proof
4	Learn to connect ideas. Late AMC 12 · early AIME	340 problems 54% proof
5	Learn to keep going when the first idea fails. Late AIME	400 problems 85% proof
6	Learn to turn an idea into a proof. BMO Round 1 · national Olympiad first rounds	400 problems 94% proof
7	Learn to find the structure the problem is hiding. BMO Round 2 · USAMO P1/P4 · IMO P1/P4	300 problems 86% proof
8	Learn to work without knowing whether you are close. IMO Shortlist mid-range · USAMO P2/P5	180 problems 76% proof
9	Learn to stay with one problem for hours. IMO P2/P5 · hard shortlist	52 problems 98% proof
10	Face problems you may not solve at all. Hardest shortlist tier	32 problems 100% proof

Stage 10 is ordered by rank, not measured against a fixed standard: the sources don't record which of the hardest problems are hardest. Full descriptions at mathsolympiadprep.com/stages/.

How to use the site with one pupil

1. **Take the placement test.** It takes one sitting and gives a starting stage.
2. **Start at the recommended stage.** Open the first problem of that stage and work forward in order. The order is deliberate: topics rotate and difficulty climbs slowly.
3. **Complete a small number of problems regularly.** A few problems each week, attempted properly, does more than a long session once a month. If a pupil is aiming at a particular competition, the routes on the site set out a weekly load.
4. **Read worked solutions after a serious attempt.** Not before, and not after two minutes. The page on worked solutions below says how.
5. **Move up when the level becomes consistently manageable.** If most problems in a stage are falling without much of a struggle, skip ahead to the next stage.

What the pupil is really learning

The aim isn't to pile up solved questions. It's to build a set of techniques the pupil can reach for when a problem doesn't look like anything they've seen: trying small cases, drawing the diagram properly, splitting a problem into cases. A pupil who solves fewer problems but can explain how they found each idea is making better progress than one racing through.

Checking in

Ask the pupil to bring one problem they solved and one they didn't. The unsolved one is usually the better conversation. If you'd like to see a pupil's progress without asking, the optional class feature at mathsolympiadprep.com/teachers/ shows how far each pupil has got, but it needs the pupil to have an account and to join your class.

How to run a school Olympiad club

A weekly structure for a 45 or 60-minute session. Adapt it freely: the point is a steady routine where pupils attempt problems before anyone explains them.

60 MIN	45 MIN	ACTIVITY
10	5	Warm-up problem. One accessible problem, tackled individually as pupils arrive. Take it from a stage below the group so everyone starts with something they can do.
20	15	Main problem set. Three or four problems at the group's stage. Pupils work alone or in pairs and write down what they tried, including what didn't work.
15	12	Discussion. Pupils compare methods before anyone is told the answer. Ask for a second way to reach the same result, and why each one works.
10	8	Solution walkthrough. Read one or two worked solutions carefully together. Stop at the key step and ask what might have suggested it.
5	5	Challenge problem. One harder problem to take away. Start the next session by asking who got anywhere with it.

Practical notes

- Choose the club's stage from the placement results. When the group is mixed, pitch the main set at the middle and use the warm-up and challenge problems for the ends.
- Print sheets at mathsolympiadprep.com/teachers/club/. The student version has space to work; the teacher version has the answers and worked solutions for the same problems.
- Discussion works best in pairs or threes before it goes to the whole group.
- No pupil needs an account, and nothing needs installing.

A ten-week Olympiad club programme

Weeks follow the site's four topics, then mix them and step up a stage. Every week has a worksheet at mathsolympiadprep.com/teachers/club/?week=1 (change the number for each week) where you choose your club's stage.

WEEK	FOCUS	WORKSHEET
1	Placement and a first sheet. Pupils take the placement test on a device and note the stage it gives them. Anyone who finishes early starts a short mixed sheet one stage below the club's level. Habit: try small cases.	4 problems, mixed one stage down
2	Number theory. Divisibility, primes and remainders. When a problem is about every whole number, ask what happens for odd and even, or for each remainder on division by 3. Habit: split into cases.	5 problems, number theory club stage
3	Combinatorics. Counting and arrangements. Ask pupils to show how they organised the count, not only the number they got. Habit: organise information systematically.	5 problems, combinatorics club stage
4	Geometry. Every problem starts with a large, accurate diagram. Compare diagrams in the discussion: a good one often shows the answer. Habit: draw a diagram.	5 problems, geometry club stage
5	Algebra. Equations, sequences and inequalities. Look for the substitution or rearrangement that makes the problem smaller. Habit: simplify the problem.	5 problems, algebra club stage
6	Mixed problems. The topic is no longer given away. Before solving, each pupil writes down which kind of problem they think it is and why. Habit: look for patterns.	5 problems, mixed club stage
7	Harder mixed problems. One stage up and fewer problems. Expect partial progress; the discussion is about what was tried and why it stalled. Habit: find an invariant.	4 problems, mixed one stage up
8	Timed competition-style sheet. Forty minutes, working alone, no hints, the way a competition paper is sat. Mark it together in the last part of the session. Habit: test conjectures.	8 problems, mixed club stage
9	Reviewing strategies. Pick the topic the group found hardest in week 8 and choose it on the sheet. Spend the discussion on methods that worked across several problems. Habit: work backwards.	5 problems, mixed club stage
10	End-of-term challenge. Teams of two or three, one stage up. Points for a correct answer and for a clear explanation of why it is right. Habit: explain why the method works.	6 problems, mixed one stage up

Problem-solving habits to teach

Name these out loud when they come up. A pupil who can say what they've already tried is in a much better position to decide what to try next.

Draw a diagram

Make it large and label it. A careful sketch often shows an equal length or a right angle the question never mentioned.

Organise information systematically

A table or an ordered list shows what has been counted, and more usefully what hasn't.

Work backwards

Start from what the answer would have to look like and ask what the step before it must have been.

Split into cases

If n is odd and n is even behave differently, deal with them separately. Two easy problems beat one hard one.

Test conjectures

Before trying to prove a guess, try to break it with an example. A counterexample can save an afternoon.

Try small cases

Work the problem for 1, 2, 3 and 4 before trying to say anything about n .

Look for patterns

Write the small cases out in a row and ask what changes from one to the next.

Find an invariant

When something is repeated or rearranged, look for a quantity that never changes, such as a total or a remainder.

Simplify the problem

Try it with smaller numbers or fewer variables first, then see which part of that solution carries over.

Explain why the method works

An answer isn't finished until the pupil can say why it must be right, out loud or on paper.

A useful question when a pupil is stuck: "Which of these have you tried?" It's better than a hint, because next time they can ask it themselves.

Using worked solutions properly

Reading a solution isn't the same as solving a problem. Pupils who read solutions passively feel they understand and then can't do the next problem. This routine turns a solution into practice.

1. **Make a genuine attempt first.** Long enough to have tried two different approaches, and written down.
2. **Compare their approach with the solution.** Where did they go the same way? Where did the solution go somewhere they didn't?
3. **Identify the key insight.** Usually one step makes the rest routine. Pupils should be able to say which one in a sentence.
4. **Close the solution.** Physically: close the tab or turn the page over.
5. **Reproduce the argument themselves.** Write it out from memory. Gaps show up immediately, and filling them is where the learning happens.

On the site

Each problem's solution is folded away under the question and stays closed until the pupil opens it. Where a problem has a short answer, the pupil can check it first and keep working if it's wrong. Some problems have more than one solution, and comparing two makes a good club discussion.

305 problems link to the publisher's solution instead of showing one. The same routine applies.

Printable resources

Scan a code or type the address. Nothing needs an account.



Placement test

About 12 adaptive questions that suggest a stage and a problem to start on.

mathsolympiadprep.com/diagnostic/



The stages

What each stage asks of a pupil.

mathsolympiadprep.com/stages/



Club worksheets

Make a printable sheet by stage and topic, with a teacher version.

mathsolympiadprep.com/teachers/club/



Worksheets with solutions

The teacher version: answers, worked solutions and sources.

mathsolympiadprep.com/teachers/club/?version=teacher



Search all problems

19,153 more problems, filtered by competition, topic and difficulty.

mathsolympiadprep.com/library/



For teachers

The page to send a colleague.

mathsolympiadprep.com/teachers/

Also useful: the 50 ready-made sets at mathsolympiadprep.com/teachers/sets/, and the club guide at mathsolympiadprep.com/teachers/start-a-club/.

Know another maths teacher who would find this useful?

Pass it on. It's free for every school and there's nothing to sign up for.



mathsolympiadprep.com/teachers

or say “mathsolympiadprep.com/teach”

The problems belong to the competitions that set them and are used under the licences listed at mathsolympiadprep.com/credits. mathsolympiadprep.com adds the difficulty ratings, stages and order.

Questions, corrections or class accounts: schools@mathsolympiadprep.com. Figures in this pack were counted from the site when it was produced.