What is MBL?

We, the Maths Beyond Limits' organising team, believe that the level of mathematical education in schools is insufficient and not suitable for talented youth. The camp aims to create space for development of young maths enthusiasts through working on interesting and demanding subjects. Moreover, we crave to awaken youth's curiosity and to help them make important habits of creative thinking, self-development, ambition and ability to cooperate. We also want to ensure equal opportunities in access to non-formal education to the best of our ability.

MBL is a two week long camp taking place in the Polish mountains every September since 2016. It is attended by 60 participants and over 20 tutors from countries all around the world. Each day consists of both mathematical classes led by tutors and non-maths activities, often organised by the participants: art workshops, improv shows, water paint balloon fights, football or frisbee matches. There are also three special days which include hikes, puzzle hunts and campfires.

Being a tutor at MBL

The main role of the tutors at the camp is to **give mathematical classes**. Each class lasts 80 minutes a day, for three consecutive days (summing up to 240 minutes in total). The lectures are grouped in three slots – the first starts around 9am, the second around 11am, and the third one around 2.30pm – and there are three classes given at the same time. As there are 60 participants, you can expect between 10 and 30 of them to come to your class. After three days of lectures, which we call a block, comes a day of a break, and then we resume with another set of lectures – there are three blocks of classes during the camp.

After the third class, around 4pm, there is a one-hour-long **Time Academic Unscheduled** (TAU for short). It's a time when participants can ask questions to tutors or solve problems by themselves. We ask tutors to make themselves available during that time and hang out in the area of the classrooms (snacks provided).

The classes and TAU are the only fixed responsibilities that the tutors have during the camp. **The rest is pure fun** – you are welcome to socialise with participants, play sports with them, attend other lectures or take part in the Evening Activities. We have a "Cafeteria", which is a space dedicated to tutors and organisers to hang out in – a staple of the camp is the "coffee and cake" organised daily after the first slot of classes.

We are not able to pay you for your work, but we will cover your stay, as well as travel (cf. travel reimbursement below).

How to apply

The main part of the application is to fill out the google form available on our website. You don't need to fill out the entire form all at once – you will be emailed an editable copy of your response. The most important part of the application are naturally the course proposals, so allow yourself appropriate time to think about them.

<u>Section 1</u> is short, but contains two important technical matters. First, please remember to upload your **data processing consent**. Second, if you'll be coming to teach at the camp,

we'll need your **criminal background check** obtained from your country of citizenship, as well as from any country you have lived in during the past 20 years. We will also need you to sign and acknowledge our **child protection standards**. This can be done after you get qualified for the camp, and we will help you with it and reimburse costs for that (if any).

Section 2: profile + logistics is mostly so that we can get to know you, but also contains questions about your availability and travel reimbursement.

The description of the "**about yourself**" question is hopefully good enough – we want to know more about your path and experience. This is not a personal statement though, so you can be brief – a couple of informative sentences would be absolutely fine.

For the **availability**, each block lasts three days. We will arrange your dates of stay afterwards. The default option is that you arrive two days before your classes start, and depart two days after they end. We are flexible though, and should be fine with shorter or longer stays.

We are providing **travel reimbursement** to those who need it. However, we are a non-profit organisation, so if you have access to an entity with potentially infinite amounts of money (e.g. your university), please ask it to pay for your travel if possible. If you don't have any other source of funding, we will support you – please use the cheapest reasonable option of transport. For reimbursement, we will ask you during the camp to provide your tickets, so make sure to retain them. We also have an upper bound for the reimbursement, which in 2025 should be around 300 EUR.

Section 3: course proposals

This is the most important part of your application! If you haven't been to MBL, we strongly recommend looking at our **camp brochures** (available on our website under "Previous MBLs") to get an idea of the typical difficulty of the courses. We welcome a wide variety of subjects, both from pure and applied maths. There are also many styles of classes present, from a more theoretical lecture-like approach, through problem-solving sessions, to workshops on some particular topic. We leave the style up to tutors, but it would be nice if you enable some audience participation – from our experience, even simply asking a question to an audience makes them more engaged, and you more perceptive to their level of understanding.

When **planning your classes**, remember that the participants are high-school students and although many of them have a broad background e.g. from olympiads, most of them are not fluent in calculus, linear algebra, group theory, etc. If you plan to extensively use some methods/concepts from these areas, either reserve some time to introduce them, or prepare an introductory handout to be distributed to the interested students a few days before the class. (Please let us know if you want to use the second approach – we will aim to limit the number of courses doing that, so as not to overload the participants with preparation).

You are welcome to send more than one proposal, but we value quality over quantity so there is no pressure to fill out all five, and we'll much prefer having one well-explained proposal than five vague prompts. Ideally, each proposal should be elaborated on in about 5 sentences – what are you planning to cover during the class and how, perhaps with a (rough) day-by-day breakdown of what is going to happen. You can find some examples of good descriptions at the end of the file.

(If you're a person with many ideas and little time, please give at least one proposal with a comprehensive description – we will treat it as your main entry – and if you want to throw a couple more concepts for the courses in, but don't have time for the details, we can just ask you later if we find them interesting).

<u>Final section</u>

If you have finished your entire application and would like for us to start processing it, please answer yes in this question.

After choosing yes, please do not further edit the form as we might not notice the changes. Please make sure to fill out all the necessary fields before choosing yes. If you have any updates afterwards, please email us directly at mathsbeyondlimits@gmail.com

If you choose no, you can continue freely editing your application :)

There is also a space for your additional comments, and a question about how you found out about MBL.

Next steps

After you send the form and mark it as finished, we will analyse your application. We might then want to arrange a **short meeting online** with you, to get to know you better, hear more about your course proposal and see how you would approach teaching at the camp. For the last part, we will ask you to prepare a short fragment of the class of approx. 15 minutes, and present it for us. We will be in touch to schedule a time that fits you.

After we finish processing the applications, we will send you **the email with the outcome** – we aim to do it by the end of June, but in some cases we might do it earlier. Some applicants might be waitlisted – usually a few tutors can't make it to the camp at the end – if that's your fate, but you'd prefer to make other plans for September, do let us know.

Meanwhile, we will be in touch with the accepted tutors regarding the classes and the formalities. We will arrange your **dates of stay** with you, and also ask you for the **description of your course** which will be included in the camp brochure. We are happy to provide advice, especially for new tutors, and help you prepare your classes, so do reach out if you have any questions. We will also provide a LaTeX template for the **handouts** (most classes do have handouts in some form, though they're not mandatory).

As mentioned earlier, we'll need a background check for working with children, along with a signed copy of our "Child Protection Standards" document (you can find it on our website). We take safeguarding seriously, but we also believe in creating a **positive and fun environment** where participants and tutors can connect as friends—while keeping everything within appropriate boundaries.

If at any stage you have questions, we will be happy to answer them – just send them to mathsbeyondlimits@gmail.com .

Examples of good descriptions for course proposals:

EXOTIC COUSINS OF INTEGERS — This class would be about a few examples of algebraic number theoretical rings such as Z[i], Z[omega], Z[sqrt(-5)] and how the concepts of divisibility, units, irreducibles and primes become suddenly much less intuitive there than they are in Z. Specifics would include:
– Euclid's algorithm and when it fails,
– uniqueness of prime decomposition and when it fails,
– some applications to olympiad-styled problems (e.g. proof of Fermat's Last Theorem for n=3),
– some ideas of what lies beyond, i.e. some glimpses of 'adult' Algebraic Number Theory.

Title: Probabilistic Methods
Content: A typical manner to prove existence results is to explicitly construct a solution satisfying the conditions. However this is not the only way to show such results. If one can prove that the probability of satisfying the given conditions is positive, it must hold there exists an instance that satisfies the conditions (else the probability of it existing would be zero), and hence this proves existence of said object, although it gives us no idea whatsoever on how to construct it.
There are of course a lot of different probabilistic methods, but I would focus the course more on problem-solving methods. Specifically, we would firstly introduce the basic notions of random variables, probabilities and expectation (and their properties), followed by different ideas used (mainly concentration inequalities). All in all, the categories of the types of problems would group; Linearity of expectation, First order moment ideas (Markov inequality), Second order moment ideas (Chebyshev inequality), Sums of random events (Chernov bounds). If time permits maybe the idea of alterations could be introduced, although the previous concepts should be enough already.
Type of class: The class will have some theory (required concepts, and some solved problems), but would mainly be about solving problems, either olympiad style (Example: IMO 2006 C3) or non-olympiad style (Example: Sperners Lemma)