



FAQs for the Math+CS Integrated Olympiad Course:

Combinatorics and Probability – Basic Level¹

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Question: Why do you offer an integrated course for both Math and CS Olympiads?

Answer: First, combinatorics and probability is a core module in Math Olympiads.

Second, the concepts and problem-solving skills in combinatorics and probability tested in Math Olympiads are foundations of CS Olympiads, such as USACO.

Third, because of the close tie of Math and CS Olympiads, there are many students who have succeeded in, or are preparing for both two Olympiads. To capture the essential connection between the Math and CS Olympiads and save student efforts to prepare for both without repetition, we have decided to offer this integrated course.

Question: Does this course focus on Math Olympiads (such as AMC and AIME) or CS Olympiads (such as USACO)?

Answer: Our focus is on Math Olympiads (75% of the lecture time). To be specific, after taking this course, we expect students to solve most combinatorics and probability problems in middle school math competitions (AMC 8 and MATHCOUNTS) and basic and intermediate level problems in high school math competitions (AMC 10, 12, AIME).

We also have a non-trivial reach to CS Olympiads, such as USACO (25% of the lecture time). Combinatorics and probability is one core foundation in CS Olympiads. However, this is not

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covered in the in-school math or CS courses. This is also quite different from learning a computer programming language. Students cannot do well in CS Olympiads without having this foundation. Therefore, the CS component in this course builds up such foundation.

Question: AMC 8 and AMC 10/12 seem to test different things. Why is this course appropriate for students who plan for these different contests?

Answer: Math Olympiads consist of four modules: algebra, geometry, combinatorics and probability, and number theory.

In algebra and geometry, the required knowledge in different competitions that target students of different ages are different. For example, in algebra, AMC 8 does not require a student to know complex numbers. But there are quite a few complex numbers problems in AMC 12. By contrast, in combinatorics and probability and number theory, the knowledge required for different competitions are the same. For example, the problem-solving skills required for permutation are the same from AMC 8 to AIME.

Given the reasons above, we have carefully designed this course to make it suitable for a wide range of students who plan to take different levels of math competitions, from AMC 8 to AIME.

Question: Why do you offer two levels of courses in combinatorics and probability, basic level and advanced level?

Answer: Students who plan to take Math and CS Olympiads have quite diverse backgrounds. Some already have solid backgrounds in combinatorics and probability. Some may have never seen this. Given this fact, we have decided to offer two levels of courses for students with different backgrounds.

This course is designed for students with no or very little background in combinatorics and probability.

Question: I only plan to take Math Olympiads (such as AMC), not CS Olympiads (such as USACO). Does it mean the CS component in this course is useless for me?

Answer: Absolutely not.



First, many students who take Math Olympiads also take CS Olympiads. If you do not have a solid background in combinatorics and probability, you cannot do well in CS Olympiads. As an extreme example, there are many USACO problems that are stated by using combinatorics terminologies and assume contestants to have the abilities to understand them. If you have never studied combinatorics, you may not even know what these problems are talking about. Second, for those who do not plan to take CS Olympiads, understanding combinatorics and probability from algorithmic perspective is also valuable. This is used a lot in modern research.

Question: I only plan to take CS Olympiads (such as USACO), not Math Olympiads (such as AMC).

Does it mean the math component in this course is useless for me?

Answer: Absolutely not.

First, many people incorrectly think CS Olympiads is equal to computer programming. Coding is only a communication tool between humans and machines. Humans instruct machines to implement their algorithms. This is achieved through coding. Advanced CS Olympiads, such as USACO silver division contest and above, presume students to know how to program. They primarily test student abilities to design, analyze and implement algorithms. These are beyond coding.

Second, the foundations of CS algorithms and data structures are math, particularly discrete math that includes combinatorics and probability, and number theory. However, these topics are not deeply taught in the in-school math or CS courses. By contrast, they are extensively and deeply tested in various levels of math competitions, from AMC 8 to AIME.

Therefore, suppose you have no interest in any math competition and only plan to take CS Olympiads, you definitely need to have a very solid background in combinatorics and probability. This course makes your well prepared for it.

Question: After taking this course, am I fully prepared for taking AMC and AIME?

Answer: This is partially correct.

First, Math Olympiads typically have four modules, algebra, geometry, combinatorics and probability, and number theory. This course particularly focuses on combinatorics and



probability. Therefore, this course is designed to help you be prepared for this particular module.

Second, we have two courses for this module, a basic one and an advanced one. After taking the basic course, you should be well prepared for solving most problems in this module tested in the middle school math competitions, such as AMC 8 and MATHCOUNTS, and basic and intermediate problems in this module tested in the high school math competitions, such as AMC 10, 12, and AIME. If your goal is to solve those hard problems in the high school math competitions, you may consider continuing to take our advanced level course.

Question: After taking this course, am I fully prepared for taking CS Olympiads, such as USACO?

Answer: A brief but accurate answer is, this training course is necessary, but not sufficient.

Being necessary means that this course gives you necessary and essential mathematical and algorithmic foundations for taking CS Olympiads. Let us use USACO as an example. Without knowing combinatorics and probability, it is almost impossible for you to qualify for USACO gold or above.

Being not sufficient means that you still need additional trainings for CS Olympiads, such as knowing how to code (particularly C++ if your goal is to qualify for USACO Gold or above), learning various types of data structures, and seeing more.

Question: Since this course has the CS component, why does not this course require students to have any prior knowledge in programming?

Answer: As we explained above, this course helps students build foundation for the CS Olympiads from mathematical and algorithmic perspective, not coding perspective. This is not a coding course.

Question: If I do not know computer programming, do I have trouble understanding the CS components in your course, such as some algorithms?

Answer: No. If you have no coding background, you can still follow our lectures that have the CS components. If you need a machine to implement your thought and execute your order, then



you need to know how to code. However, if you just want to understand an algorithm or implement a small-sized problem by hand rather than on a machine, coding is not needed.

