



Introduction



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Welcome to the Brookings Math Circle Summer 2018 Problem Sets!

The Summer 2018 Problem Sets will run over 14 weeks, 6/3 to 9/9 (the first one is being released early). A new problem set and solutions to the previous problem set will be released on our website every Sunday afternoon at approximately 4:00 pm. In addition, all registered participants will receive an email containing the new problem set and the previous problem set's solution shortly after it is posted on the website. Even if a student has not registered for a particular session or is unable to come to class, problem sets and solutions will still be sent so all students can get some math practice throughout the summer. Note that problem sets will be released throughout the entire summer, including on weeks that there is no BMC.

We have some basic rules for these problem sets that we hope are very understandable and reasonable. Firstly, no cheating, which includes looking up problems online and asking online for answers. If you cheat, you are really only cheating yourself and making the situation unfair for fellow mathletes. For the Puzzle and Bonus Problem Set we will allow collaboration, but we strongly urge all students to try all problems individually first. For the Summer Challenge, we do not allow any collaboration. Unless specified, for all of these problems, you may only use a pencil or pen and paper; in particular, calculators are not allowed and not needed. Also, please don't hesitate to contact Serena or Samyok if you have a question about a problem, want us to check your work, would like help, or anything else (but we won't give hints for the Summer Challenge; that's to test your ability!).

When there is BMC, the first thing we will do in each class is to go over the problems from the previous problem set. Thus, we strongly encourage every student to try to solve as many problems as possible throughout the week, and come to class prepared with solution sketches or progress with every problem. Remember, you have an entire week, and spreading out work time is typically the most effective. At BMC, we will also hand out a paper copy of the next problem set.

Every problem set contains a Puzzle, multiple Bonus Problems, and five Summer Challenge Problems. The theme of each problem set will vary from week to week. This first week, it will include an assortment of topics, but moving forward, every week's problem set will focus on one of the main competition math areas: algebra, geometry, counting, probability, and number theory.

The Puzzle requires careful thinking and problem solving. Being puzzles, they contrast from the more contest-math themed problems in the bonus problem set. For the Puzzle, we want the student to write a solution sketch as he/she solves the problem to show the thought process. Puzzles will usually require more time than problems in the Bonus Problem Set, but none the less, each Puzzle is fun and doable with some effort.



In the Bonus Problem Set, there is an apple point value to the right of each problem. As a general rule of thumb, the more apples a problem is worth, the more difficult it is (and the more accomplished you should feel after solving it!). Keep in mind though, that these apples are not perfectly objective, especially considering that everyone has different strengths and weaknesses. Feel free to skip around when solving the problems, and definitely don't feel obligated to do problems in order. Try the ones you think are the most interesting first! This summer, we will be doing problems of difficulty from 1 apple to 5 apples, and the overall difficulty of bonus and challenge problems will increase every week. Try to gain as many apples as you can each week! There will be prizes at each BMC class... ;)

Now we come to the part everyone has been waiting for: The Summer Challenge! Every week, the Summer Challenge will consist of 5 original problems written by Serena and Samyok. Each problem will contain a certain number of apples by it, and for each problem you solve, we will reward you that many apple points. These apple points are based on relative difficulty to each other, and may not exactly align to Bonus Problem Set difficulties. There will be 4 short answer problems worth 1, 2, 3, and 4 apples, and one writing problem worth 5 apples. The writing problem will typically be phrased like any other short answer problem, but what we want you to do is to write out your full solution, not just the answer. Partial credit is possible on the writing problem, so even if you don't have a complete solution, submit what you have!

To submit for the Summer Challenge, go to the BMC website and input your short answers. The writing problem may be handwritten or typed. For those unable to attend BMC that week, you must type your solution and submit on the website. For those attending BMC that week, you may hand us a handwritten solution at class or submit online. If you do plan to hand in a handwritten solution, please indicate so on the website in the space of the writing problem submission.

Just as we said that there will be prizes for the Bonus Problems, there will be better prizes for the Summer Challenge! We will split into 2 divisions, novice and advanced, for prizes. All students participating in BMC or competition math for at least the second year must be in the advanced division, although first year students may choose either division. We will keep a running leaderboard of the top 3 in each division over the entire summer, so try to solve as many as you can to be on the leaderboard! Don't be discouraged if you're not on the leaderboard though, if you put in effort, you will be rewarded. :)

Finally, we are not expecting every student to solve every problem, as the problems, overall, are quite challenging. However, we do expect all BMC students to at least try every problem and still spend some time on a problem even if you don't see the solution immediately. Only with time, effort, and patience will your problem solving skills improve, and trust us, the journey is worth it.

We hope you enjoy the weekly Summer 2018 Problem Sets! Keep calm and do the math!