
Getting Math Team Going!

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This article is focused on establishing and running a Math Team. In the first part, we give some suggestions for building a Math Team at your school from the ground up. In the second part, we suggest relevant contests and tournaments along with tips on funding them.

1 Part One

1.1 Interest

The first thing to do is determine interest among the students. If you or other math teachers already post extra credit problems, challenge problems, or problems-of-the-day, then you have an existing way to measure interest. Students that complete those problems are generally the same students that would be interested in Math Team, particularly if the problems posted are less curricular-based and involve more problem solving. If no such postings exist, why not? These are excellent ways to spark interest in Math Team-type activities.

The next job to do is to determine your personal interest in Math Team. Are you interested in encouraging problem-solving and interest in mathematics in any student that may join Math Team, or are you interested in Math Team as an enrichment activity aimed solely at the mathematically gifted? Your answer to this question drives all other decisions concerning the establishment of a Math Team.

The author's answer is that Math Team is for everyone, and it is the sponsor's job to increase both mathematical interest and problem-solving ability in each student on Math Team. Math Team should be an inclusive activity, not an exclusive one. By limiting membership, the sponsor and students reinforce the perception that only a gifted few can enjoy math. This is not to say one cannot establish a successful Math Team in this manner; however, one works much harder to establish an enjoyable and meaningful Math Team.

1.2 Publicity

Should you choose to open Math Team up to everyone, then publicity is the next step. Flyers posted around the school is the traditional method of publicity (for which there is still some merit), but targeted appeals can be more effective. For instance, posters on the walls of each math classroom are more noticeable than in the hallways. A short 3-minute talk to each math class is probably the best way to spread the word. Such a talk also gives the students a chance to at least know who you are (if they don't already), and to allow them to ask questions. If you do not have time to go to each math classroom, then ask your colleagues for suggestions. They can certainly tell you which classes of theirs would be interested in hearing your short talk.

As part of any talk, poster, or flyer, be sure to include one or two sample problems. The problems used to publicize Math Team should be chosen carefully. If the problems are too difficult, they will turn students away; if the problems are too similar to classroom material, students will assume it is like another math class; if the problems are too easy, the brighter students will not be interested. The problems must be challenging to all, and accessible to all. Number theory and combinatorics are good topics from which to pull these sample introductory problems. Since these topics are not explored in the traditional high school curriculum, such a problem puts all students on as even a playing field as possible. The author has used the following problem in introductory materials.

A popular fast-food restaurant offers a deal called "5 for \$5." Customers can choose any five items from the following eight: beef sandwich, ham sandwich, fries, cheese sticks, milkshake, soda, hashbrowns, and onion rings. The in-store poster that advertises this deal says "There are over 790 combinations!" Determine exactly how many combinations a customer can make, and demonstrate how you got your answer.

(The cleverer students quickly realized that if the answer was over 800, the ad would have indicated that there were "over 800 combinations.")

1.3 The First Meeting

In order to give as many students as possible the opportunity to join Math Team, you may consider holding more than one "first" meeting. The author has had success by offering up to four such meetings. Students are given the option of attending the "first" meeting at four different days and times. This gives busy students a chance to at least see what Math Team is all about - usually every student can manage to fit one of these times into his or her schedule.

Regardless of how many first meetings you offer, a few important things should always happen at the first meeting.

1. Take names, math classes, phone numbers, and email addresses of students. This will make communication with them much easier for announcements and reminders.

2. Explain solutions to the introductory problems. Or better yet, get the students to explain the solutions.
3. Have more problems ready to hand out! These problems can come from a variety of sources (contests, tournaments, problem-solving books, etc.), but it is vital that you keep the momentum going by always giving out more problems.

Other information is very helpful, such as your contact information, a schedule of meetings, or a schedule of contest and tournament dates.

1.4 Varsity or JV?

If you are starting a middle school Math Team, you do not need to worry about splitting your team into appropriate divisions. However, for high school teams, you must consider how to handle the different JV and Varsity divisions.

The Junior Varsity division is for students that have **not** completed both Geometry and Algebra II. The Varsity division is for all other students. (How this split will be handled when the Georgia Performance Standards are fully introduced has not yet been determined.) Although JV students can challenge themselves and compete at the Varsity level, no Varsity student, under any circumstance, may compete at the JV level.

Hopefully you have enough interest so that your school can compete in Varsity and JV. If not, then focus your time on whichever division has the most members. If you have lots of interested students in both divisions, then you may consider having two separate meeting days for the two divisions. (This would also be a good time, if you haven't done so already, to bring in another sponsor. Then you, for example, can sponsor the Varsity team and the other person could sponsor the JV team.) You may also find it beneficial to simply combine JV and Varsity into one meeting. There are advantages to separating them and there are disadvantages.

Running separate JV and Varsity meetings certainly makes it easier on you to plan meetings. Additionally, since the skills needed in Varsity versus that in JV are different, you can focus on appropriate topics and strategies at each level. Having combined JV/Varsity meetings can lead to frustration at the JV level (they may not understand anything Varsity is doing) and inattentiveness at the Varsity level (they are bored because the JV students need so many explanations of things Varsity students already know). However, by combining meetings, you are giving students across grade levels to get to know one another. You also have the opportunity to allow the younger students to see what Varsity is like and to develop role models and leaders among the Varsity students. The author has run JV and Varsity meeting separately and combined, and feels that such a decision should be made to benefit the particular students involved.

2 Part Two

2.1 Funding

Once you have completed that first meeting and given the interested students some problems to sharpen their skills, then comes the fun part: money!

Nearly every contest and tournament requires a registration fee. With a small, beginning Math Team, you and parents may drive the students to the tournaments, but as your Math Team grows larger, that option becomes more unfeasible – and buses require money! So where do the funds come from?

One quick answer is dues. Charging the students money to join may seem like a great idea. However, one must think carefully about such an idea, especially for a new Math Team. Without the benefit of tangible goods, it is difficult for a parent or student to fork over some cash just to join, on the promise of all the great stuff that lies ahead.

If dues are not sufficient, go to your administrator. Many schools have academic accounts, general fund accounts, or other such “discretionary” accounts that can be used for some registration fees.

Fundraisers are useful. Aside from the traditional bake sale, dunking booths, and car washes, there are other math-related ideas. One such idea is to offer a tutoring service. The members of the Math Team gather after school or on the weekends at specified times, and assist any student who walks in the door. Charge, say, \$5 to \$10 per 30 minute tutoring session. Students who need the extra help can get it from those who are pretty good at math, and at competitive prices. Another idea is to sponsor a math tournament at your school. This is a great way to involve your students on the other end of a tournament. This activity is lots of work, but is very rewarding for the students, and can be very rewarding financially!

There are many grants available for mathematics activities. Goody’s, Georgia Power, Intel, Raytheon, and many other corporations offer grants that range from \$500 to \$10,000. As long as you are willing to fill out the paperwork and write the essays, this is an easy (if unpredictable) way to raise funds. The author’s Math Team received \$3000 in grants last year.

More and more businesses are realizing that the mathematically educated graduate results in a desirable employee. These businesses, when asked, are willing to make donations to support mathematics activities. Through only four local business and industries, the author’s Math Team has received nearly \$800 in donations this year.

Finally, do not be afraid to pay for some things yourself. When the author began a Math Team from scratch over a decade ago, there was no money at the school, and there was an unsympathetic administration. However, the author considered it important to give the students a powerful mathematical experience and lay the groundwork for the future. All registration and transportation costs for the first two years of the Math Team existence were paid for out-of-pocket. The initial expense proved worthy since this Math Team has grown to be successful and very enjoyable.

2.2 Contests

“Contests” are defined as timed math tests done at your school, whose results or answer papers are mailed in for scoring. There are dozens of contests out there, and it is difficult to choose which ones would be appropriate for a new Math Team. Below are some suggestions for contests that every Math Team should try to do.

1. *The American Math Competition (AMC)*. Offered in three levels (The AMC8 for middle school, the AMC10 for 9th and 10th grades, and the AMC12 for 9th through 12th grades), this is by far the most prestigious contest in the nation. Over 300,000 high school students in the U.S. participate in the AMC10/AMC12 each year. If you lack the time or funds to do lots of contests, be sure to participate in this one. The registration fees are not cheap, but it is worth the money. Visit <http://www.unl.edu/amc> for much more info.
2. *The Georgia Math League*. The high school version of this state-wide contest comprises six rounds of six question tests, with the rounds spaced a month apart beginning in October and ending in March. More Georgia high schools participate in the Math League than any other contest of its type. The middle school Math League consists of a once a year test similar to the AMC8. Both middle and high school versions are well worth the time and money. Visit <http://www.mathleague.com> for more info.
3. *Atlantic-Pacific Math League*. This is another contest comprising six rounds of six questions each. Slightly easier than Math League, this could be a great contest for beginning high school Math Teams, or to challenge the best middle school Math Teams. Visit <http://www.atpacmath.com> for more.
4. *Mandelbrot*. This is a five round, seven question contest that is slightly harder than Math League. The problems, however, are very well-written. Each contest has at least one problem the students find just fascinating. There is also a Mandelbrot Team contest, designed for groups of four students to work together. This is a three round contest. The registration fees are a little easier on the wallet than the others, so check out <http://web.mandelbrot.org/index.html> for more.

2.3 Tournaments

Tournaments are a vital part of a Math Team. It is through the tournaments that students can be exposed to other mathematically-minded students in a positive way. It can be frustrating to be one of a small group in a school that likes math. At a tournament, that frustration is eased with the knowledge that there are lots of people who like math. Tournaments are fun, exciting, and mathematically rewarding.

Tournaments can be classified into two categories: curricular tournaments and problem-solving tournaments. This is a broad categorization, with lots of overlap, but they accurately describe the focus of most tournaments. By *curricular* is meant that the problems are mostly similar to what one may find in a textbook or on a classroom test, only a bit more difficult. For example, the following is a good

example of a “curricular” question.

What is the period of the function $f(x) = \sin(x/2) \cos(x/3)$?

Although not a particularly interesting or exciting question, it certainly does test the students’ knowledge. By *problem-solving* is meant that the problems may bear no relation to anything specifically learned in a math class, but can be figured out, usually in multiple ways. The problem-solving focused tournaments provide deep mathematical understanding and problem-solving ability to shine. An example of such a problem is below.

How many times during a 24-hour day are the hour and minute hands of a clock perpendicular to each other?

This problem is understood by all, but only some will get the answer. Those that do get the right answer possess independent, on-the-fly, problem-solving skill. By contrast, if a student forgets or has never learned what the term *period* means in the problem above, the problem is virtually unanswerable.

The two types of tournaments are discussed so that you have some understanding that tournaments are different. You should not expect the same students to do well at every tournament, since the tournaments focus on different aspects of mathematics. You should sign up your students for tournaments that play to their strengths. Of course, this is not to say that a “curricular” tournament has no problem-solving questions; simply that problem-solving is not the focus of such a tournament.

For high schools, two of the best “curricular” tournaments are the Mercer University and Georgia Southwestern State University tournaments. The best “problem-solving” tournament for high schools is by far the University of Georgia tournament. For middle schools, the best tournament of any kind is MathCounts. For a list, with contact info, of all tournaments in the state, visit http://www.gctm.org/math_competitions.htm. For MathCounts, visit <http://www.mathcounts.org>.

2.4 Good Luck!

Running a Math Team is very hard work. There is lots of time spent copying practice problems, teaching, facilitating, and organizing. But running a Math Team can be extremely fun and rewarding! This author finds it incredible that there are math teachers that are not interested in running a Math Team. Those teachers are missing out on getting to know the best bunch of mathematically-talented students at their school!

Now, get that Math Team going!