Leading a Math Club

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Must-have material for coaches of all levels

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Introduction to Math Club

First of all, congratulations on your decision to become a Math Club leader, whether you have already made that decision several years previously or just recently. We hope that your new endeavor will be as rewarding and fun for you as it was for each one of us.

As former and current Math Club leaders, we have written and compiled this "Starter Pack" for your informational purposes as well as for the purpose of hopefully expanding your knowledge of the opportunities that exist for Math Club in your statewide community. Our goal with this Starter Pack is to provide you with a brief and informative guide that will aid you in the process of running a math club and provide you with helpful information, advice and samples. If you haven't done so already, please take the time to explore our website, www.wastudentmath.org, to become acquainted with all the Math Club-related resources we provide for your general use, free of cost.

Here is our brief take on what Math Club is and why we believe it is both useful and rewarding:

> *Math club is a fun and competitive activity that any student can participate in. It is a great way for students to develop intuitive thinking skills and learn new types of math. Students will not only learn new material, but will apply their previous knowledge from school to fun and challenging problems. Furthermore, they will learn to view math not as a set of rules or guidelines, but as an art. Math is a subject full of creativity and opportunity that many students enjoy. Besides the academic benefits, math club is also a great way to meet new people and develop teamwork skills.*

We'll end this brief introduction here and cut to the chase. We hope you enjoy reading and using this starter pack as much as we enjoyed creating it! Please contact our officers online if you have any questions, suggestions, or other feedback.

- The Washington Student Math Association (2009-10)

Outline of Math Club Essentials

What it is about o Learn and refine problem solving strategies o Compete for both team and individual sport o Participate in group tutoring opportunities	
Why it's worthwhile o Explore subjects not covered in school o Build a foundation for college mathematics o Solidify concepts through teaching o Develop team cooperation, leadership and problem-solving skills	
Who can participate? o Elementary School (Grades 4 through 6) o Middle School (Grades 6 through 8) o High School (Grades 9 through 12) o Creating a Team – ask teachers, friends o Coaches – parents, teachers, older students	
When do club activities occur? o Weekly Practices o Practice season – September through January o Competitive season – February through May	
Where can club activities be held? o At school o At home o Public Meeting Locations (Starbucks, Library Rooms, etc.)	
Costs that should be considered o $40 to $80 per team per contest o Extras (T-shirts, snacks, transportation)	

Basic Tips and Tricks

Do	Do Not
o Inform teachers and principals o Have snacks o Allow socializing time o Make it fun o Play games o Get parental support	o Allow intimidation/bragging o Let group get too crowded; split into separate rooms if necessary o Allow excessive noise/disruption

Essential Practice Tips *(see pages 10 and 12 for details)*

- **Review Homework**
  - If you choose to assign homework, it may discourage students with busier schedules. However, homework is a great method for cementing advanced concepts (i.e. algebra, probability, geometry) in an elementary school math club.
- **Prepare Short Lessons** *(see pages 23-25 for sample high school lessons and problems)*
  - Lessons can range from a fifteen minute spiel at the beginning of a club meeting to planning out an hour-long lesson with practice problems. It is best to focus your lessons on a certain topic or subject (i.e. counting, shortcuts, proofs). Sample lesson plans are available online at our website for you to use.
- **Practice Team Problem Sets**
  - Practicing team problem sets (from past competitions) is the most direct way to prepare your club members for what they will see during the competition. It is a good idea to practice a problem set round at least once before competing in a quiet, focused environment. Determine teams beforehand to allow students regularity and the chance to know their teams' weaknesses and strengths well before the competition.
- **Relax With Games/Puzzles (Krypto, Set, Sudoku)**
  - Either after a main competition, or as frequently as once a month, give yourself and your club a fun and social break by relaxing with a Puzzle or Game Day in lieu of your regular club meeting. A good strategy that allows for individual freedom is to place puzzles on different tables for students to choose and solve collaboratively.

Essential Competition Tip

- **Assign a Team Captain**
  - Assigning team captains will not only save you work, but will give students the chance to develop their leadership skills and take responsibility for your teams' success.

Getting Started

What do I need?

Core Members

Any successful math club will need to have a core group of members who attend nearly all club meetings. A core group does not have to be sizable in order to be effective; many successful math club programs have around 3-8 students as core members. These members will take on leadership roles in a large club.

A Steady Meeting Time and Location

Most math clubs are held after school in a designated classroom, with meetings generally lasting around one hour each. Keep the meeting time and location consistent after establishing at the beginning of the year in order to optimize attendance rates. Math clubs generally meet once a week, although some meet twice a week and some meet monthly. Additional practices are generally held on weekends and are less formal – some switch locations and are held at various team members' houses. Decide upon which types of meetings *(see page 12)* are best for your individual club; it may take some experimentation before finding out what type your members like most. Skipping a few meetings is fine in order to accommodate to club members' schedules and needs.

Parental Support

The importance of parental support cannot be overstated: the most successful programs have strong parent involvement and support to fuel their success. Enlist parent volunteers for help as early during the year as possible. One way to solicit support is to add parents to your club email thread to keep them updated of math club news events and needs. Supportive parents will not only take away much of the hassle of a club leader's job, but will also provide necessities such as transportation to and from competitions, snacks, and basic classroom supplies for club members. Parents can also be reliable sources of help during times of emergency to help with club procedures.

Finding a time and place to meet

Before recruiting students to the math club, it is important to find a meeting place and time that can be used throughout the school year. Especially during the first year, the math club should determine a time and place to meet that is convenient for as many people as possible. The most common option for this task is to contact a teacher advisor who will allow you to use their room after school. Other options include using a library, conference room, or cafeteria. One valuable planning strategy is to arrange a meeting with your school administrators and ASB to inform them of your plans and win their support as well as their approval, guidance and any helpful suggestions they may have.

Choosing an initial day of the week to meet is important, although this may change throughout the school year. Talk to other club leaders to determine what day will cause the least conflicts (but **be assertive**). In the event of a schedule conflict, remember that team members who are busy can still contribute greatly by attending just a few meetings.

Also important is choosing the frequency of the club meetings. Although nearly all clubs meet on a weekly basis, it may be a better option in rare cases to meet twice a week or once every two weeks. One approach is to have the math club meet once a week/two weeks in the first month of school and increase the frequency of meetings as math competitions approach.

Recruiting students to Math Club *(see page 11 for more suggestions)*

> *"Think of ourselves as gardeners, not fishermen. Fishermen know what gets the fish. But a gardener provides the environment and enables plants to grow. With math team, don't try to just get the best students and win; instead, get as many students as you can, and do whatever is possible to make them better at math."*
>
> - Ashley Reiter

Start recruiting early in the year for best results. Some recruiting suggestions:

- Post flyers with attention-grabbing slogans or illustrations around the school. Ask permission from teachers to hang them up in classrooms and/or announce them in class.
- Prepare an informational handout to hand to parents early on in the school year. Curriculum night is a great time to do this. Remember to introduce yourself politely and in an unimposing manner, yet still be assertive and take the time to sell your math club program. Play to math club strengths and hook your audiences' attention with stories, concrete examples/scenarios that they will find useful (i.e. team-bonding, tutoring, and competitive opportunities)
- Post intriguing math questions or puzzles around the school at popular locations
- Make a small presentation at the first school assembly possible – having the student body know about the math club is very important
- Talk to individual students at other related clubs.
- Get your friends to join – starting off with several familiar students in the math club is a great way to break any initial ice and form new relationships.

The one most important aspect of maintaining steady attendance that does not fade away within the first few weeks is to focus on making your math club an interesting, organized, and well-run organization. Although it may take a while, students will hear about your math club by word of mouth and attendance will grow steadily.

When should the first meeting be?

It is best to start the math club as early as possible; perhaps a week or two after the recruitment campaign begins. This will allows students to fit math club into their schedule and should give the club a sense of establishment. Another important benefit of starting the math club early will be that students will join the math club before they even think about joining other clubs, which will create fewer scheduling conflicts.

What to do at the first meeting *(see page 11 for more ideas)*

The first meeting of the year is often the most important one, as it gives newcomers a good idea of what a math club is and what is expected, and will also give you an opportunity to convince tentative students to remain in math club. Some students will come for the problems, and some will come for the food. **Your goal as the leader of a math club should be to try and get everyone interested in coming to math club to work on challenging problems with their peers**. For this to occur, it is also necessary to develop an encouraging environment where people who have trouble on a problem can simply ask anyone else in the club for help and a few pointers.

A few suggestions for what to do at the first meeting:

- Introduce yourself, math club and what the students will be doing in math club to those who are new to math club. Also, inform the students of how often math club will meet, and confirm the time and place of the next few meetings.
    - A good way to do this is to prepare a syllabus and/or informational handout. Sample handouts that have worked in the past are available online at our website *(see pages 20-22 to view sample handouts and agendas)*.
- Gather contact information to form an email list shortly after the first meeting and an Excel spreadsheet of basic contact info (name, grade, math level, phone, and email addresses).
- Plan ahead with your new members – decide upon officer election times and event times.
- Bring food to keep your new members entertained and in a positive mood.
- Provide answers to problems that may have been posted on recruitment posters.
- Provide new intriguing problems: problems that are interesting yet aren't too difficult. Basic proofs (i.e. Pythagorean Theorem, Euclid's Infinitude of Primes) will serve this purpose well.
- Continue to sell your math club. Find out what aspects students like about math club the most by being observant and listening to what club members have to say. If you are a second year club, re-announce what made your club successful last year, and what you plan to do in the following year. Remember: it is perfectly natural that your plan will change, but it is still important to announce your ideas and intentions. Take the time to find a balance between your club functions (i.e. games, tutoring, practicing) that will keep everybody satisfied.

Establishing Organizational Procedures

Many schools require their math clubs to implement several club procedures and necessary tasks before becoming official. Other procedures used during the year will prove to be useful tools for club leaders to ensure that club meetings and communications will be smooth. The following is a short list of procedures that you may want to consider implementing:

Procedures Emphasized by the School

- Fill out initial paperwork and recruiting
  - Some schools require as many as twelve initial members to form a club.
- Craft a club constitution
  - See your local school's ASB for a sample club constitution
- Elect core officers
  - President, Vice President, Secretary, Treasurer
- Prepare a club budget
  - Most costs will be competition related, T-Shirts, transportation and books/magazines
  - Club income may include fundraisers and donations
- Plan ahead for transportation permission
  - Many school districts have many requirements regarding permission to go on school "field trips" and thus will need a good deal of paperwork to be filled out before each competition. If this is the case at your school, a good first step is to approach your principal, bookkeeper, and your ASB advisor for guidance.
  - In many cases, it is easier to ask for funding to get bus transportation (if possible), or simply require that students arrange their own transportation.
  - Notify your school administrators of competitions at least 20 days in advance.
- Plan ahead for event permission
  - If you plan to host an event at your school (i.e. inviting a guest speaker, hosting a mail-in competition), remember to fill out the necessary paperwork beforehand.
  - Hosting fundraisers requires paperwork as well. Consult your bookkeeper to guide you through this stage. A well-planned fundraiser can generate much-needed revenue for your math club, although funds are not absolutely necessary in order to run a math club.
- Take meeting minutes
  - Keep a short record log of who attended which meeting and for how long, as well as writing a short meeting summary of what occurred, to be sent out in your regular weekly emails. This task is usually managed by the club secretary.

Other Ideas/Procedures to Consider

- Have a math club binder to hold records, forms, and materials
- Send out regular emails to keep club members informed of events
  - Upcoming dates, reminders, and important information discussed
- Set up a math club website for convenient information exchange
  - A Facebook group or a blog are also viable alternatives
- Set up a club calendar with specific meeting agendas and objectives
  - Vary your meetings to make them fun: throw in a club pizza party, puzzle/game day, or movie day to keep things fun and reduce stress
- Delegate officer tasks and define them early on during the year
  - Initially, delegating work can be more work than doing the work by oneself, but as your new officers become acclimatized to your expectations, their work quality and speed will hopefully increase as their confidence and independence grows. Group collaboration is important in order for a club to run effectively once the leader leaves or graduates
- Briefly write up meeting agendas to be posted before each meeting
- Include results and accomplishments in regular emails
- Consider ordering club T-Shirts
- Add your email to helpful, math-related email threads to keep you updated and informed
  - Examples include: WSMA, Tom Norris (TJ), Tom Clymer, and Art of Problem Solving
- Start off your club meetings with warm-ups, and end your club meetings with further practice and/or homework.
- Establish club rules in order to keep meetings running smoothly (one person talking at a time, etc.)
- Bring in an empty shoebox with a rectangle cut out of the top lid to create your own “Math Club Suggestions” box to gather anonymous feedback.

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During the Year

Recruiting during the year *(see pages 26 and 27 for sample flyers)*

Recruiting can be done at any time during the year. However, it is best to keep recruiting a lower priority than running and improving your math club.

Here are some strategies you should consider:

- If you are running a high school math club, continue recruiting freshmen, as they are very likely to return in the following years and maybe even take a leadership role in the club.
- Call families/parents to spread awareness and promote interest.
- Ask math teachers if they could offer extra credit for students going to competitions or attending math club meetings
- Host a school-wide event (Mock Competition, Casino/Probability Day, Occupational Guest Speaker, etc.) and advertise your event across the school.
- Have students who are currently in the math club to ask their friends to join

Running a meeting

While providing problems (and often food) for a math club is an important task for a math club leader, this is just one of many essentials at math club meetings. If prepared and planned out well in advance, your math club meetings will be more efficient, effective, and educational. However, running a math club meeting to be both informative and inspirational can be difficult without prior experience. Here are a few tips to keep things friendly and fun:

- Prepare a warm-up (a puzzle or a quick problem) to keep students thinking as they settle at the beginning of the meeting. The students can work individually or collaboratively. Once a solution to the warm-up has been presented by one of the students, the math club can begin, but allow no more than fifteen minutes to do the warm-up.
- If your teacher keeps a bell in the classroom, utilize it to let the students know when to stop or start something (i.e. a problem set, talking). This saves your voice and keeps blood pressure low.
- Encourage idle members to step up their participation levels. An effective way to do this is to get them involved in a group activity, to avoid singling them out. Be assertive and energetic, but avoid being aggressive or too energetic.
- Change the pace during the meetings to keep energy levels high. It is a good idea to incorporate short math “breaks” into your meeting times if your meeting is longer than 45 minutes. Keep students occupied during the break with snacks, or a short discussion about an upcoming event.
- If you have the fortune to be working with student officers, utilize their talents! Delegate leadership responsibilities to them to encourage them to think creatively for your club.

Meeting Models

While many clubs succeed by running one meeting model consistently and effectively, you may want to vary your own meetings in order to keep student interest fresh while having your members learn and improve their math skills from all different sorts of angles. The largest and most popular math clubs in Washington generally have many team bonding activities and thus can encourage math club members of all levels to compete and participate. Indeed, one of the most common problems that math clubs face is to satisfy the needs of both the brilliantly talented math students as well as the newer math club members with less experience. A strategy you can use to combat this problem is to vary your meeting types and focus. The following is a list of common meeting models you may wish to try.

Team Practice

Team practices focus primarily on training students' individual and team ability to solve problems under time pressure. Most problem rounds consist of around 15-20 team questions and around 30-40 individual questions. It is essential to host many team practices before a competition in order to make sure that your math club members are familiar with the competition format and time limits. Many new students will become discouraged if they feel unprepared or intimidated at a competition by problems they've never seen before.

- Take your problem sets directly from the competition's website: many competitions will post problems from competitions of the previous years. All competitions will have a general theme and focus on certain types of problems. Our website compiles a growing database of competition problems from past years' posted legally for public, educational use.
- If the problem round or test is a team or individual test, have your students solve the problem round according to the specifications for each round. Thus, it is better to form teams ahead of time so that students become accustomed to practicing with the same team. Most competitions require four members to a team.
- Give the students a five minute warning and a one minute warning.
- Take the test with your math club if you haven't done the problems before!
- Score each team/individual once the test is over. Allow students around five minutes to discuss amongst themselves which problems they got wrong and how to solve these problems.
- Go over as a club which problems gave students difficulty. To save time, don't go over the problems that some students miss because of careless errors. Go over the ones that students don't know how to do. It is a good idea to have students who solved these more difficult problems present their solutions in front of the club.
- If there is a large discrepancy in student ability levels, practice over the weekends with the more advanced students to keep them interested and to improve their learning curve as well. Your main focus on the weekly in-club practices is to spark interest in competitive math at all levels.

Problem Solving Lecture (presentation, lesson)

If you or any of your club members are especially knowledgeable about problem solving strategies and/or mathematical topics, this meeting model will be an effective idea. Students will enjoy focusing their time and energy to learning about a specific category of math. This will also improve the confidence of your math club in tackling more difficult problems.

- Give students a few warm-up problems specifically related to your topic before delving into our lesson. This will help get students thinking and will help you notice which students have prior knowledge about your topic and which ones don't.
- Focus your lecture around topics that generally aren't covered in the school curriculum. There are certain areas of math and certain strategies that will be the same difficulty for students of all math levels to learn. A good topic is one that will be educational and doable for both Geometry students and Calculus students.
    - Some math topics that work well: number theory, advanced probability, series, combinatorics, bijection, etc.
    - Some problem solving strategies that work well: how to write proofs and use proof methods, recognizing similarities, noticing patterns, etc.
- Include a follow-up problem set for students to finish after your lecture.
    - Problems should range in difficulty and should vary in format and style as much as possible. Although it may be tempting to give every problem set a narrow theme, this is not beneficial to the students' ability to recognize the type of a problem, which will aid them greatly in recognizing a solution to the problem.
    - Each problem should directly relate to your earlier presentation topic
    - Also, try to include at least two problems per set that seem nearly impossible to do at first. These problems often have a very simple solution if a different approach is used to solve it. Students will need to be familiar with the technique of stepping back a little and trying to solve a problem from a different angle. Eventually, the students will be able to attack problems from the simplest angle on their first try.
- It is also a good idea to have your own club members present on topics that they know. This will save you work and build a sense of ownership and responsibility amongst your members.
- Keep in mind that these topics will be advanced for many students, and will be challenging and potentially discouraging. Recognize which students are struggling to give them extra help during the problem set, and to answer any individual questions students may have.

Game Day/Puzzle Day

A great way for your math club to relax while still engaging the mind is to host a specific meeting dedicated to playing math related games and solving math related logic puzzles. Allow your members to work collaboratively, and try to bring in several types of puzzles and/or games. Many puzzles can be found online (refer to the WSMA links page) and any hand puzzles or board games will work well. Students also enjoy having a probability themed, card playing game day.

Practicing with other local teams

Practicing with other local teams regularly is beneficial. Students may get tired of seeing the same people throughout the year, and will also benefit from being familiarized with more faces they may see at competitions. Use the WSMA website or forum to contact the team president of a local school and decide when a good time and place would be to practice.

Try to hold these practices on the weekends at a local library or similar place. Make sure you are familiar with the host site's policies regarding such meetings. If very few students seem like they would like to go to such a weekend math club, you could always form a network of several schools to increase the population. The WSMA hosts regular practices available for high school and middle school students near the Sammamish/Bellevue area – check our website for more details.

Be organized

One of the most common ways to discourage members is to give your club members the impression that your math club is not organized. Here are some suggestions for things to keep track of:

- What problems you have given the math club
  - Giving the same problems twice usually doesn't help the math club, unless it is one that the students could not resolve. On a similar note, keep track of the types of problems (often probability and counting) that math club as a whole has trouble with, and offer mini-lectures in these areas.
- Students' conflicts
  - Knowing when students have conflicts with other clubs or extracurricular activities should help gain the students' trust in you.
- A list of students who come each meeting
  - Record which students stay until the end of each meeting, and keep a mental note of which students tend to arrive late to meetings. Ask students who come late to meetings consistently why they are late.

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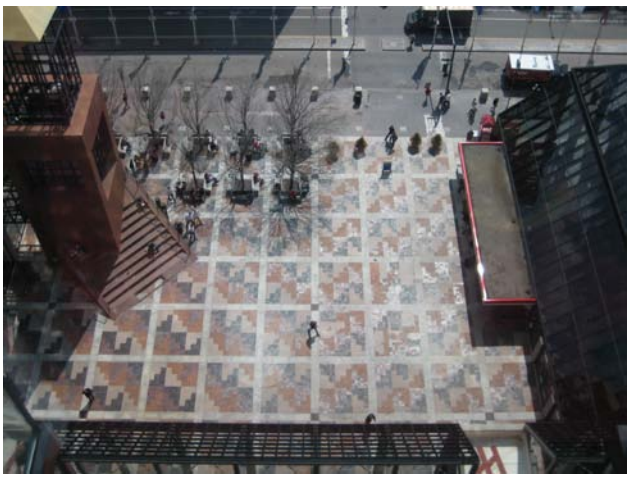

Competitions

Registration and transportation

Before registering for any given competition, you should check to make sure that math club members are fully committed to that competition.

For each competition, you will need to keep in mind when you register:

- How many teams will you register?
- Which grade divisions will teams be competing in?
- Who will pay for the registration?

And you will also need to keep transportation in mind:

- School permission forms
- Carpools/Buses
- Chaperones

Know the rules and format

Rules for on-site competitions will probably be announced before the tests, but it is still helpful to know the rules beforehand. In particular, know which tests calculator use is accepted on.

Arriving at the site of a competition and having no idea of how the competition is structured will not go in your favor. Instead, you should know how long the tests are (both in terms of how many problems are on each test and what the time limits are), the schedule for the tests, and what kinds of problems will be on each test.

The best way to prepare for any competition is simply to do past tests; this will give students an idea of how hard the problems are and how they should divide up their time. Also, split time between doing problems in test-like environments and doing problems with no time limit and/or as in groups.

Have fun

Being a math club leader can be especially difficult during a hectic competition with excited students. In order to avoid things from becoming disorganized and to save yourself some stress, it may be a good idea to bring puzzles, cards, or games to occupy your students' time while you handle things such as registration. Enlist the help of parent volunteers to help you monitor your students' needs at the competition, avoid people from getting lost, distribute any informational sheets necessary and to help you arrange lunch and snacks, if needed. This will save you time and stress, and keep things flowing smoothly at the competition.

A Typical Competition Schedule

9:00 to 9:30 Registration
9:30 to 9:40 Opening directions
9:40 to 12:00 Medley of Individual and Team Rounds (Individual Test, Team tests, etc.)
12:00 to 1:15 Lunch
1:15 to 2:30 Medley of Team Tests (Mental Math, College Bowl, etc.)
2:30 to 3:15 Awards

A Quick Competition Outline

- Before the competition
    1. Choose teams
        - Teams of 4, within grade division (9/10, or 11/12)
    2. Divisions (Both grade and math level)
    3. Transportation
        - Carpooling, buses, drive individually
    4. Studying
        - Study in teams, individually
        - Plan for someone to go to the competition early to order pizza, etc.
    5. Materials
        - Pencils, erasers, pens
        - Calculators, rulers, protractors (check the competition if they are allowed)
- Typical Competition
    1. Morning
        - Check in
        - Gather everyone-choose a meeting place
        - Know testing rooms
        - Who is taking what test
        - Student numbers (if applicable)
        - Order pizza
    2. Testing
        - Tests last from 20-90 minutes
        - *High school tests last longer than elementary school tests*
        - Can be multiple choice, or single answer response
        - Individual, Team tests at minimum
        - Normally have at least 1 or 2 other team or individual tests
        - Tests can be split before and after lunch
    3. Lunch
        - Lasts more or less 1 hour
        - Pizza is normally given, there are normally restaurants nearby
        - A time to regroup, relax, talk to coaches, give advice
    4. Awards
        - Trophies for top students and teams
        - There are some “fun” awards like raffles

During the Summer

Summer Practices

Many teams choose to continue hosting practices and meeting during the summer. If you are able to accommodate this to your schedule, you may want to consider doing so as well. Summer practices are a great way to keep your team fresh during the off-season and get a leg up on the competition. Host summer practices only if there are at least a core group of people who are willing to come, and if you are willing to use your own time to prepare for these meetings. Summer practices are usually hosted at club members' different homes or school facilities.

Summer Competitions and Math Programs

There are also a few summer competitions available for your team to go to during the summer. One prominent competition is the *Mu Alpha Theta National Convention*, which is a six day math convention that is typically held in late July and will be held from July 25th – July 30th in Washington D.C. in 2010. The National Convention will consist of several competitive math events that schools around the nation will compete in, as well as several other competitions such as math jeopardy (FACTorial!), a scrapbook competition and a field trip to the Smithsonian Museums.

Offseason Preparation

Consider holding at least one meeting with your officers, and schedule a meeting with your school principal and ASB representative in order to gain the necessary information to pre-plan for the upcoming year. Paperwork and scheduling preparation are best done in the summer to help things flow smoothly during the year. If nothing else, correspond with your officers and your school administrators via email to inform them of any of your plans and/or ideas for the upcoming year.

A few weeks before the season starts, prepare important documents such as your club constitution, syllabus, calendar, and flyers in order to avoid overloading yourself at the beginning of the year. This is also a good method to give your club an organized and structured appearance at your initial meetings to make the best possible impression on prospective members and visitors. Getting your paperwork done early will also allow you to take advantage of recruitment opportunities early in the year, such as parent-teacher curriculum night.

Appendix

Online Resources

A multitude of resources are available for you to use and download from www.wastudentmath.org. It is one of our goals to include materials on our website that both new and veteran club leaders will benefit from. As part of our Electronic Data Initiative (EDI), we are compiling everything you'll need to run a math club effectively accessible with only a few clicks of the mouse. Currently, our website provides math problems, leadership materials and sample documents. If you find that there is a resource or a piece of information you need that our website doesn't provide, please let us know and we will do our best to make sure that resource becomes available for you promptly.

A few of our current online resources:

- Quick access to math problems to use for team practices and meetings
- Lists of available competitions and summer programs
    - With each competition and summer program, we will include basic information as well as a link for further information that is not provided on our website.
- Sample documents used by previous years' math clubs with success
    - These include model flyers, letters, and lecture materials
- Leadership guidance and ideas
- Live community forum
    - Our forum is a place where club leaders can ask each other and our student leaders questions regarding general math and Math Club
- Lists of helpful math texts, articles, software programs, and other online math links

Additional resources:

- We host monthly practices for middle and high school students free of charge
- In our efforts to keep club leaders informed and interested in new opportunities year-round, we provide a state-wide mailing list for club leaders
- We also provide a calendar of events for math-related events besides competitions

Sample handouts

Shown in the following pages are a few of the sample handouts you can find online at wastudentmath.org:

Essential Documents

Sample Warm-Ups

Sample Flyers

Further Reading

For further reading, refer to the following resources:

- Art of Problem Solving (AoPS)
    - www.artofproblemsolving.com is a popular math forum and site designed for both math club students and coaches. This is a culmination of the problem solving book series "Art of Problem Solving". Volume I and Volume II are must-reads for all math competitors.
- A Mathematician's Lament
    - www.maa.org/devlin/LockhartsLament.pdf contains an inspiring viewpoint of creativity and mathematics written by Professor Paul Lockhart.
- Circle In a Box
    - http://minerva.msri.org/files/circleinabox.pdf is a thorough and comprehensive guide to starting up and running a math circle effectively, written by Sam Vandervelde. Math circles are very similar to math clubs, except math circles generally are not exclusive to one school, tend to be larger, and encompass math concepts of all different levels.

Your name
Home: *Insert your phone number*
Email*: Insert your email here*

Insert club meeting location here
Month 20XX
Club Advisor: Insert here

Math Club Letter 1 (08-09)

Welcome to another year of Math Club! This year, our club will focus on sufficiently answering a question that is all too commonly asked in the math classroom: "Why does any of this matter? How can this information be of use to me? Can I make all my hard work pay off practically?" If you've ever had to ask yourself this question before, then you've come to the right place. In short, *Insert Club Name* will give you the opportunity to make math fun and applicable, while improving your ability to tackle the school curriculum at the same time. There will be no definite course for us to cover, nor will there be any homework. All students attending *Insert School(s) Here* are welcome to join.

A cap-up of last year..

We had a steady group of members last year coming to our weekly meetings on Tuesday afternoons. We covered material not frequently discussed in the typical high school curriculum, and we prepared for math competitions. Social highlights included *Insert activities here*. We attended four competitions, and we struck gold at the last one in Blaine, with the upperclassmen team placing 8th and the sophomore team placing 10th *(etc.)*. It was a great year for our start-up club.

What I hope to see this year..

First things first, I would love to see our club mirror the successes of last year. However, I also hope to implement a balanced approach to seeing math as more of an art and hobby, instead of as an obligation. To achieve these ends, I will introduce a broader variety of problems, and mathematical puzzles and oddities. I hope to also bring in guest lecturers from both ends of the spectrum: those who apply math at work, and those who pursue math purely for enjoyment. There will also be new math games and opportunities for community service.

Expectations

Good classroom behavior is encouraged. I expect positivity and active listening from all members, in order for the club to function smoothly and to allow spontaneity and freedom of thought for everyone. I also expect organization and punctuality in dealing with dates, deadlines, and events. If unexpected happenings occur that will prevent you from going to a club meeting or attending an event, please do let one of the club officers know. Your commitment level is your own to decide, as always, but please be serious and firm to your word.

Issues to be covered:

- T-Shirt design contest
- Fundraisers
- Snack Schedule
- Voting for officer positions

Advisor: Name
emailaddress@emailprovider.com

President [07-08]: Name
emailaddress@emailprovider.com

SKYLINE MATH CLUB

Promoting mathematical importance & amusement
Nurturing excellence in mathematics

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Basic Information

When: Day of Week from Start Time – End Time
Where: Location, Skyline High School
Next Meeting: Next Meeting Date

Basic Statistics

Over forty members in attendance last year
Skyline attended nine competitions, regional, statewide, and nationwide last year
Skyline Math Club held an IPod Accessories Fundraiser last year
Skyline Math Club members regularly tutoring for community service
Skyline Math Club won a total of 21 awards and recognitions last year

What to expect this year

A multitude of competition and tutoring opportunities
A fun environment for problem solving
Movies, puzzles/logic games, mock contests, and pizza/snack parties
Fundraising Opportunities
End of Year Banquet
(New) Opportunities to reach out to elementary and middle school students
(New) Opportunities to work with the Washington Student Math Association (wastudentmath.org)
(New) Access to math modeling software, textbooks, and magazines

If you have any further questions, please don't hesitate to contact Our Advisor at [Advisor's Email Address] or me at [My Email Address]. Thank you!!

Agenda for Skyline Math Club (and Robotics Team): 9/14/09

2:30 – 2:40 Intro Activity; Sign in
2:40 – 3:20 Discuss Math Club and Robotics Team future plans
- Math is Cool Competition
- Washington Student Math Association
- Robotics presentation – Mr. Blair Cooper
- Robotics team plans

3:20 – 3:30 Officer Elections

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Intro Activity
- Small taste of math seen at math competitions

Math is Cool Competition
- Will be held on Friday, October 23rd at Mount Rainier High School
- Registration deadline is September 30th
- Team and Individual Events

Washington Student Math Association
- Expand your knowledge boundaries of math
- Meet new people who share a similar interest in math around the state
- Casual math practices and events
- Service and learning opportunities
- Opportunities to lead elementary/middle school math clubs

Robotics Presentation
- Mr. Blair Cooper was last year's Robotics Team supervisor, and part of the Blackberry Project
- He will come to speak with us about the details of Robotics Team in-depth

Robotics Team Plans
- Robotics and math club will meet in separate rooms, but with the same meeting time
- Don't worry - it is possible to attend both Robotics and Math competitions and do both Robotics and Math related activities

Officer Elections
- Please prepare to speak briefly in the event that you are running opposed on Monday
- For now, the positions will constitute of:
- President, Vice President, Robotics Team Captain, Secretary, Treasurer, Webmaster

Problem Solving Method 1:

Test the first few values of "n" and look for patterns

Example: Find the remainder when 7^{2008} is divided by 19.

- Test: What are the remainders of 7^n when divided by 19?

- When n = 1, the value becomes 7 and the remainder is ***7***
- When n = 2, the value becomes 49 and the remainder is ***11***
- When n = 3, the value becomes 343 and the remainder is ***1***
- When n = 4, the value becomes 2401 and the remainder is ***7***
- When n = 5, the value becomes 16807 and the remainder is ***11***

At this point, we notice a recurring pattern of 7, 11, and 1 as the remainders. This cycle repeats itself for every three values of "n".

Assuming this pattern holds, we find the remainder when 7^{2008} is divided by 19 by taking the remainder of 2008/3, which is 1.

Therefore, 7^{2008} has the same remainder as 7^1 and the answer is 7, the remainder we found when n = 1.

Problem Solving Method 2:

Use only the necessary information to avoid complex calculations

It is difficult to calculate larger powers and take remainders of larger numbers without using a calculator. Fortunately, there is a shorter method.

It is possible to calculate remainders of powers without evaluating the powers themselves.

Why is this? Each time a number is divided, it is split into a **quotient** (a number divisible by the divisor, ex. 19) and a **remainder** (a positive integer smaller than 19).

The remainder is the only necessary information. The quotient is irrelevant, because **it is already divisible by 19 and multiplying it by 7 won't change its divisibility**.

Thus, all we need to do in order to find the remainder of 7^{n+1} is to multiply the remainder of 7^n by seven, and divide by 19 if necessary.

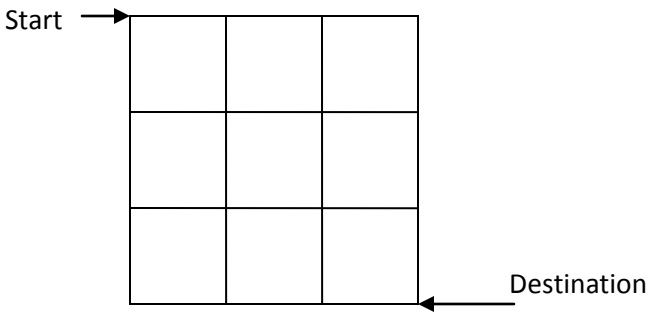
Our problem now is much simpler, and looks like:

- Test: What are the remainders of 7^n when divided by 19?

- When n = 1, the value becomes 7x1=7 and the remainder is ***7***
- When n = 2, the value becomes 7x7=49 and the remainder is ***11***
- When n = 3, the value becomes 7x11=77 and the remainder is ***1***
- When n = 4, the value becomes 7x1=7 and the remainder is ***7***
- When n = 5, the value becomes 7x7=49 and the remainder is ***11***

Using this method, the reason why the values repeat and follow a cycle of three becomes much clearer.

Relay Problem # 1



The 3x3 square grid above represents a bird's-eye view of a section of street blocks in New York City. Suppose that I were to start at the upper left hand corner and walk along the street blocks to the lower right hand corner **only** to the right or downwards. In how many different ways can I reach my destination?

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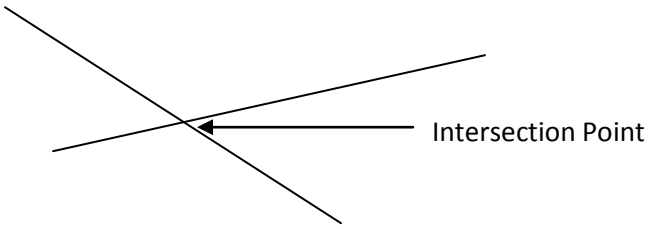
Relay Problem # 2

Define "T" to be the answer that was found in Relay Problem # 1. Suppose I draw "T/2" number of straight lines in a plane. What is the maximum number of intersection points between these lines?



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Relay Problem # 3

Define "X" to be the answer that was found in Relay Problem # 2. Determine the number of the consecutive end digits of zero of the number "*X!*", where "*X!*" denotes "X factorial", which is equal to the expression "*X * (X-1) * (X-2) … * 2 * 1*".

*Ex.) 456000 is a number with three consecutive end digits of zero.

"Mathematics is like love; a simple idea, but it can get complicated." – George Polya

Starting the school year with a new relationship? You might want to get some practice first…

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Skyline Math Club

Monday afternoons from **2:20-3:50 P.M.**

~ First meeting is on **September 15th**, Portable 4~

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- Community service opportunities
- Math tutoring & lectures
- Competition opportunities & prep
- Make math fun!

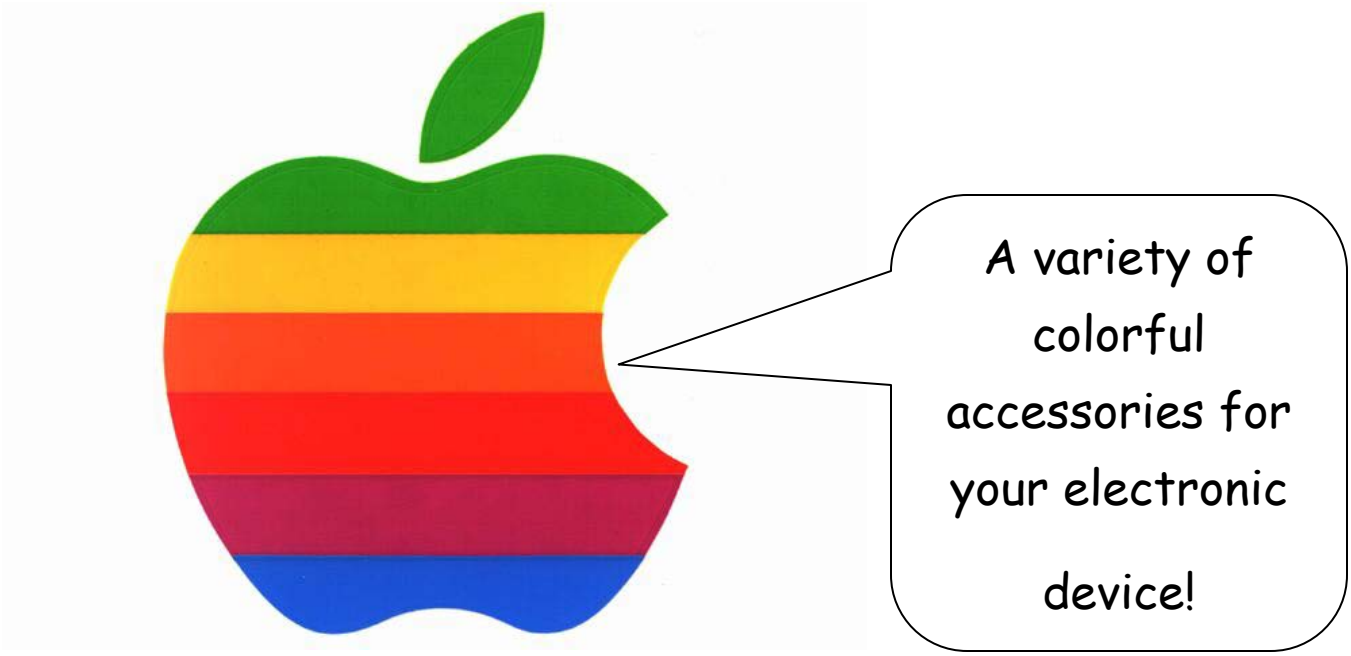
The Annual

IPod & Zune Accessories

Fundraiser

Feb. 2 – Feb. 6

A and B Lunch



Prices range from $2 - $10

All benefits go to SHS Math Club.