SAN DIEGO MATH CIRCLE GROWTH ISSUES

Steps to meet the challenge

Summer 2012

Growth

- SDMC was founded in 2003 with an initial group of only 6-8 students.
- SDMC's registered base during the 2011-2012 school year exceeded 400.
- That's an average compounded growth rate of roughly 50% per year!

Accommodating Growth

- SDMC has attempted to absorb this growth by
  - subdividing ability groups (now 4 math, 1 physics)
  - maximizing the number of active Saturdays
  - scheduling the physics group on Sunday
  - scheduling movable events at “off peak” times
  - utilizing larger classrooms
  - creating in-home options for younger students
  - growing the instructor pool
  - providing opportunities for student service

Limits to Growth

- There are both physical and philosophical limits on math circle size – generally speaking, smaller is better.
- SDMC has been bumping against the philosophical limits for a few years now, but …
- … growth has been so rapid that managing the physical expansion has taken precedence.

Current Ability Group Structure

- SDMC subdivides the grade 5 – 12 range into four core ability groups:
  - Cauchy grades 11-12
  - Gauss grades 9-10
  - Euler grades 7-8
  - Fermat grades 5-6
- As always, nominal grade brackets are rough guides only; highly-motivated, high-ability students are encouraged to float to their own challenge level.

Auxiliary Groups

- EPGY Cluster grades K-8
- The EPGY Cluster is targeted at students who are too young to participate effectively in our on-site programs, but can be used by any student whose family is motivated to support in-home distance learning.

- Lagrange Physics Group primarily high school
- The Lagrange Group exists to support SDMC students with an interest to bring math circle learning styles to bear on physics.

Where is the greatest growth pressure?

- During the last season, growth in our high school age bracket (grades 9-12) was successfully managed by the split that created the current Gauss and Cauchy groups – these groups are “ok for now”.

- At the same time, however, both the Fermat and Euler groups surged to unsustainable sizes.

- With further growth pressure likely this season, we have arrived at the point that it is necessary to limit enrollment, particularly in these two groups – Fermat and Euler.

Why not split Fermat and Euler?

- The current ability group structure – four core groups, each nominally spanning two grades – represents a limit for us both philosophically and pragmatically.
- Math circles benefit from the fluidity afforded by ability groups spanning more than one grade level; further splitting would have adverse impact on learning style.
- Were we to expand to more than four core ability groups, our “footprint” on the UCSD campus – already quite substantial – would be too large, the staffing demands vis-à-vis instructors too great, and our ability to maintain essential order would be overwhelmed.

Guiding Principles

- We must …
- … maintain ability groups at sizes compatible with good order and coherent learning.
- … exercise selectivity in admission to assure that we are populating our groups with students exhibiting the intended levels of ability and motivation.
- … make continuing membership contingent upon students demonstrating track records of successful participation.
- … sustain broad parent support commensurate with the spectrum of activities that comprise the SDMC program.

New “Student Profile”

- Both original application and ongoing participation will be based on a “student profile” maintained by the student’s family in collaboration with SDMC.

- Like our former registration form, the student profile will contain essential student and family information, but …

- … will now also contain a variety of information relating to student schooling and pertinent areas of independent accomplishment.

How much information is necessary?

- There is no simple answer to this question.
- Clearly, new students with no SDMC track record should make an effort to provide ample information while less is needed from established students with deep SDMC experience.
- The Student Profile has been designed to anticipate a variety of student experiences common to SDMC students and with flexibility to allow students' individuality to be expressed.

Ultimately, how much information to provide is the amount that tells each student's own story.

Three Phase Admission

- New Students – students with no significant prior SDMC experience, admitted on the basis of the initial student profile.

- Transitional Students – admitted students with some SDMC experience who are in the process of developing a record.

- Established Students – admitted students with substantial SDMC experience and substantial records of independent accomplishment.

New Students

- New students usually have strong scholarship but may not yet have a history of independent learning or accomplishment in mathematics of the kind common to math circle students, thus …

- … all acceptances of new students will be considered provisional for their first, “get acquainted” year.

- During that first year, new students will be expected to participate substantially and develop an interpretable record that will support sound consideration of continuing participation.

Transitional Students

- It is common for both students and families to take some time to adjust to the ways that open up the full value of the math circle experience, including independent motivation, creative, problem-solving learning styles, peer interactivity, social integration, family cooperation, etc.
- Thus, if a student continues into a second year, we look to that year to confirm that he/she has adjusted successfully and …
- … we look for the student's record to demonstrate the independent accomplishment common to most established math circle students.

Established Students

- Students who have demonstrated both successful adjustment and a strong record of independent accomplishment as previously discussed can be considered established students.

- Many students will have met this standard by the end of a transitional year.

- The exceptions have to do with maturity and discipline –

Maturity and Discipline

- SDMC can only put forward successful programs if student conduct supports it.

- Part of becoming an established student, therefore, is demonstrating maturity consistent with one's ability group and exercising appropriate discipline at all times.

- Students who are very young (e.g., 5th and 6th grade or strongly accelerated) will often need extended time to grow into the needed blend of academics, maturity, and discipline and may spend longer time as transitional students; this is normal.

The Importance of the Euler Group

- The Euler group is an important place for advancing Fermat students to demonstrate the maturity and focus it takes to participate successfully in an ongoing manner.

- For many 8th graders, the Euler group presents an important evaluation period right before high school, to consider whether continuing with SDMC is their most sound choice, or whether the student's time might be better directed toward new opportunities open to high school students.

PREEMPTIVE PROBLEM SOLVING

Some notes on avoidable problems

Some Mistakes We Encounter

- Some of the problems we encounter in SDMC arise from mistakes of perception or action, *sometimes more by parents than by students*. Some significant ones are:

- Scholastic perspective
- Forcing
- Looking good
- Dropping off
- Maturity and discipline
- Unhealthy expectations

Scholastic Perspective

- It natural to anticipate that high scholastic indicators may translate into successful SDMC experience; this is very possible, but is not automatic.

- A rewarding SDMC experience does not flow from sterling school grades or GATE/AP participation or impressive standardized test scores.

- It has more to do with individual motivation, positive peer interaction, a creative, problem-solving learning style, and a genuine passion for mathematics.

Forcing

- One of the biggest errors parents can make is forcing students to participate in SDMC when they lack honest motivation of their own.

- Certainly, children of all ages need parental guidance that sometimes includes a push of the guiding hand …

- … but if that pushing is more than an occasional feature of a student's SDMC experience, the key motivation is the parent's not the student's; this makes for an unsatisfying student experience and generates difficulties for SDMC.

Looking Good

- It is understandable that exhibiting SDMC participation on resumes or college applications might be desirable.
- This is fine, of course, provided students participate in a substantial and constructive manner.
- However, participating in a limited, technical sense just to claim membership, is not what we intend for our students.
- The new admission process aims to curb this practice.

Dropping Off

- Some parents view SDMC as a “drop off” activity for their students only.
- In fact, however, hands-on parent participation is crucial in almost every corner of SDMC activities.
- Active parent participation is a key element of SDMC’s success.
- We also find that student success is correlated with the quality of family support.
- SDMC views student participation as a family matter and we look to parents to do their part.

Maturity and Discipline

- Parents' dedication to providing for students' educational needs may sometimes obscure their awareness of difficulties related to maturity and discipline.
- Some parents find it difficult to accept that such concerns may be relevant to their child; however, these can arise quite naturally among students who are intellectually advanced.
- We must be clear that successful SDMC participation depends on students displaying maturity and discipline that is as exceptional as their intellectual abilities.
- We rely upon parents to assure appropriate conduct.

Unhealthy Expectations

- Parents or students themselves may set expectations that may be unrealistic despite everyone's positive intentions and the students' exceptional abilities.
- At SDMC, where most if not all students are exceptional, it is still true that half of all students will be below the median on any given day; thus, it is more than likely that most students will encounter some humbling experiences in terms of relative performance – this does not warrant concern in itself.
- On the other hand, if a student's learning style or motivations are not aligned with the math circle approach, SDMC may not be the best choice of activity no matter how exceptional the student or how well motivated the students' or parents' expectations.