**GAME Written Topics for 2012-2013**

* At Meets #3 and #4, calculators will be allowed only for the candy bar contest and the orals.
* All symbolic manipulators, including HP's and the TI-Nspire CAS, are prohibited for the freshmen and sophomore levels at all meets.
* At Meets #1, #2, and #5, any calculator will be allowed at the junior and senior levels.
* Laptops, PDAs, phones, and other non-calculating devices are not allowed.

**Freshmen**

1. Ratios, Proportion and Percent: May include money, interest, discounts, unit conversions, percents of increase decrease and error, and direct variations. It should not require knowledge of advanced algebra. While questions should not be trivial, they should be approachable to most contestants.
2. Counting Basics and Simple Probability: Includes tree type problems, combinations, and permutations, with the emphasis on organized thinking, not using formulas.
3. **NO CALCULATOR**. Number Theory and Divisibility: may include patterns (such as trailing zeros), factors, primes, divisibility rules, unique factorization, LCM, GCD, and their relationships.
4. **NO CALCULATOR**. Systems of Linear Equations and Inequalities with Applications: Limited to two variables. May include absolute value and should know vocabulary such as consistent, inconsistent, dependent, independent.

**Sophomores**

1. Perimeter, Area, and Surface Area: including squares, triangles, rectangles, circles, and shapes made from these, including the Pythagorean Theorem.
2. Geometric Probability: emphasis on the concept of geometric probability rather than on difficult geometry problems. Students are not required to have a comprehensive knowledge of geometry.
3. **NO CALCULATOR**. Similarity: the standard geometric treatment including perimeter, area, and volume relationships, conditions determining similarity, similarity in right triangles and polygons. It may include a few proportion theorems that are not specifically similarity, such as the angle bisector theorem.
4. **NO CALCULATOR**. Advanced Geometry Topics Restricted to: Brahmagupta’s formula, point to line distance formula, area of a triangle given vertices, Stewart’s Theorem, Ptolemy’s Theorem, Mass points, inradius and circumradius, Ceva’s Theorem, and Theorem of Menelaus. A good reference would be Geometry by Rhoad, Milauskas, and Whipple, Chapter 16.

**Juniors**

1. Algebraic Coordinate Geometry including Circles: standard material including power theorems, arcs, angles, area, inscribed and circumscribed polygons, sectors and segments, and equations of circles. Coordinates are included. No trig.
2. Probability: the standard treatment of probability. It may include combinations, permutations, mutually exclusive events, dependent and independent events, and conditional probability. It should not include binomial distribution nor expected value.
3. **NO CALCULATOR**. Geometric Transformations Using Matrices on a Plane: In two dimensions. Includes reflections, rotations, translations, dilations, shears, and compositions. Standard treatment using Algebra 2 texts. For shears refer to Mathematics of Matrices, by Phillip Davis. Ginn and Co., 1965, Library of Congress: 64-24818. Pages 125-161 (Oral #2, 2007-8).
4. **NO CALCULATOR**. Sequences and Series: including, but not restricted to, sequences and series defined by recursion, iteration, or pattern; may include arithmetic, geometric, telescoping, and harmonic sequences and series. No calculus.

**Seniors**

1. Trigonometry Applications, Equations and Theory: including laws of sines and cosines, and of course, word problems.
2. Probability: may include combinations, permutations, mutually exclusive events, dependent and independent events, conditional probability, Bayes Theorem, binomial distribution, expected value, and some simple geometric probability.
3. **NO CALCULATOR**. Conics: including locus definitions, eccentricity, and directrix. No parametrics, no polar, and no rotations.
4. **NO CALCULATOR**. Theory of Equations: including factor, remainder, and rational root theorems, upper bounds, coefficient analysis, DesCartes' Rule of Signs, synthetic division, complex roots, and determining equations given various info. Possible sources: Advanced Mathematics by Richard G. Brown, or some older Pre-Calculus texts.

**Oral Topics for 2012-2013**

* Meet 1: **Conic Sections**. Analytic Geometry, by Gordon Fuller and Dalton Tarwater. Chapter 3.
* Meet 2: **Markov Chains**. Finite Mathematics, by Margaret Lial and Charles Miller (newer editions include Raymond Greenwell). Chapter 8 (Chapter 9 in later editions).
* Meet 3: **Tritangent Circles**. College Geometry, by Nathan Altshiller-Court (Dover paperback). Chapter 3D, pages 72-93.
* Meet 4: **Vectors**. Elementary Vector Geometry, by Seymour Schuster (Dover Publications, 2008, ISBN 978-0-486-46672-9 or 0486466728). Chapters 1 – 4, pages 1 – 134. , Crowe (Millenium Edition). Sections 5.1, 5.6, 5.7. resource available at [www.dovepublications.com](http://www.dovepublications.com) for $12.95