Event Topics

Meet 1

1A Pre-algebra Topics (No Calculators)

Fractions to add and express as the quotient of two relatively prime integers
Complex fractions and continued fractions
Decimals, repeating decimals
Percentage, interest, and discount
Least common multiple, greatest common divisor
Number bases; change of base
Modular arithmetic, number theory

1B Angles and Special Triangles (Calculators Allowed)

The Theorem of Pythagoras; familiar Pythagorean triples
Complementary, supplementary, and vertical angles
Interior and exterior angles for triangles and polygons
Angles formed by transversals cutting parallel lines
Properties of isosceles and equilateral triangles
Relationships in $30°$-$60°$-$90°$ and $45°$-$45°$-$90°$ triangles

1C Elementary Trigonometry (No Calculators)

Definitions and solution of right triangles
Elementary identities
Radian measure and graphs of elementary functions
Trigonometric functions of multiples of $\pi/6, \pi/4, \pi/3, \pi/2.$

1D Roots of Quadratic and Polynomial Equations (No Calculators)

Solution of quadratic equations by factoring, by completing the square, by formula
Complex roots of quadratic equations; the discriminant and the character of the roots
Relations between roots and coefficients
Synthetic division
Function notation

Meet 2

Can include topics from meet 1

2A Linear Equations in One Unknown (Calculators Allowed)

- Solving numeric equations (perhaps involving a second-degree term which drops out)
- Solving literal equations
- Story problems leading to linear equations in one variable
- Linear inequalities

2B Triangular Figures and Solids (Calculators Allowed)

- Medians, angle bisectors, and altitudes
- Ceva's and Stewart's Theorems
- Area of a triangle (including Hero's Formula)
- Triangular prisms & pyramids (including volume and surface area)

2C Trigonometry (No Calculators)

- Functions of sums of angles and sums of functions of angles
- Half and double angle formulas
- Reduction formulas

2D Analytic Geometry of Straight Lines and Circles (Calculators Allowed)

- Slope, families of parallel, perpendicular, or coincident lines
- Point-slope, slope-intercept, intercept, normal forms of the straight line
- Intersections (solution of simultaneous systems)

Meet 3

Can include topics from meets 1 and 2

3A Systems of Linear Equations in Two (or on occasion three) Variables (Calculators Allowed)

- Numeric and literal systems
- Relation to graphical procedures
- Word problems leading to such systems
- Systems of inequalities used to define a region in the plane
- Determinants

3B Polygonal Figures and Solids (Calculators Allowed)

- Special quadrilaterals and regular polygons (including area formulas)
- Intersecting diagonals
- Ptolemy's Theorem
- Polygonal prisms & pyramids (including volume and surface area)

3C Trigonometry (No Calculators)

- Law of sines, law of cosines
- Inverse functions and their graphs
- Solving trigonometric equations
- De Moivre's Theorem and the roots of unity

3D Exponents and Logarithms (No Calculators)

- Use of fractional, negative exponents
- Simplifying expressions involving radicals
- Solving equations involving radicals
- Use of logarithms; identities involving logarithms
- Solving logarithmic equations
- Relationships between logarithms to different base

Meet 4

Can include topics from meets 1-3

4A Algebraic Manipulation (No Calculators)

Factoring (including $x^3 + y^3$, $x^3 - y^3$)
Sums, products, quotients of rational expressions
Solving equations (including radical equations) involving these skills, but ultimately solvable by factoring or the quadratic formula (but no complex roots)
Rational exponents
Simplifying radical expressions
Function notation and variational dependencies

4B Circular Figures and Solids (Calculators Allowed)

Central, inscribed, tangential, and exterior angles
Power of a point (chords, secants, tangents)
Interior and exterior tangents of two circles
Intercepted arcs
Area of circles, sectors, circular segments
Cylinders, cones, & spheres (including volume and surface area)

4C Miscellaneous Topics (No Calculators)

Sequences: patterns and recursion formulas, arithmetic and geometric sequences
Series: partial sums, formulas for sums of consecutive integers $1 + 2 + \cdots + n$, consecutive squares $1^2 + 2^2 + \cdots + n^2$, and consecutive cubes $1^3 + 2^3 + \cdots + n^3$
Function notation
Factorial notation and the Binomial Theorem

4D Analytic Geometry of the Conic Sections (No Calculators)

Using the standard forms of equations of the conic sections
Graphs, including the location of foci, directrices, and asymptotes
Use of properties of conics to solve applied problems, including max-min for parabolas

Meet 5

Can include topics from meets 1-4.

5A Puzzle Problems (20 minutes) (Calculators Allowed)

- Word problems, one or more variables
- Max-min problems not requiring calculus
- Problems found in "brain-teaser" type books
- Logic puzzles, including the use of Venn Diagrams

5B Congruence and Similarity (Calculators Allowed)

- Ratio and proportion
- Segments intercepted by parallel lines
- Identification of similar/congruent figures
- Ratios of areas and volumes
- Elementary trigonometric ratios

5C Counting and Probability (Calculators Allowed)

- Permutations, with and without replacement
- Combinations, with and without replacement
- Using the principle of inclusion - exclusion
- Using the binomial and multinomial expansions
- Nonnegative integer solutions to $x_1 + x_2 + \cdots + x_n = b$
- Definition, simple applications of probability (when to multiply, when to add, etc.)

5D Variations of Problems appearing on the previous year's AMC 12 (contest A and B) (No Calculators)