

# MAINE ASSOCIATION OF MATH LEAGUES

## DEFINITIONS 2011 - 2012

**PLEASE NOTE THAT THERE IS AN ACCOMPANYING DOCUMENT AVAILABLE THAT DEFINES THE EXPECTATIONS FOR ALL THREE POINT PROBLEMS IN EACH CATEGORY.**

ABSOLUTE VALUES/INEQUALITIES: The questions will be based on any inequality or absolute value problem up to a third degree equation or inequality in factorable form.

ALGEBRAIC FRACTIONS AND FACTORING: Questions will be geared to techniques of factoring and the operations on or simplification of algebraic fractions, or solving algebraic fractional equations. These questions may also employ LCM's, GCF's or LCD's.

ARITHMETIC: There will be 2 questions in each round dealing with the specialty categories. The remaining question will be arithmetic in nature, either simple number theory, consumer based, or pre Algebra in nature.

Meet 1: "\*" Star Operations

Meet 2: Ratio/Proportionality

Meet 3: Percentage

Meet 4: Literal Equations not to exceed the Algebra 1 level except on the team round.

Meet 5: Statistics \*\*

\*\* The Statistics questions will be geared to range, mean, mode, median, histograms or relative frequency histograms. Range is defined to be the difference between the largest and smallest numbers in the data set. In addition, the problem writer has the flexibility to give only one statistics question, instead of two like the other meets. If standard deviation appears in a question, it will always be a sample standard deviation. The problem writer will only include standard deviation on the team round.

AREAS/VOLUMES: The questions will be based on the areas of plane geometric figures, working with total and lateral areas of solids and finding the volumes of cylinders, cones, pyramids, frustums, prisms or spheres.

CIRCLES/SPHERES: The questions will be based on any non-coordinate circle or sphere concept specifically dealing with angles related to a circle, radii, chords, secants, tangents, angle-arcs, circumference or arc length.

COMPLEX NUMBERS: The questions will be based on the operations of complex numbers including simplifying complex number expressions, absolute value, roots of complex numbers, modulus, reciprocals, and roots of polynomial functions with real or complex coefficients. DeMoivre's Theorem will only appear in the Team Round.

CONICS: This category will deal with the properties of circles, ellipses, parabolas, or hyperbolas as applied to the coordinate plane. At least one question will include conics centered at the origin. ~~The first question will be a simple question, which is either an ellipse centered at the origin, or a circle centered at any location.~~ At most one latus rectum question. No trigonometric equations will be used.

COUNTING PRINCIPLES AND BINOMIAL THEOREM: The questions will involve combinations, permutations, binomial theorem and other basic counting principles. There will be at least one Binomial Theorem problem. Problems will not include trinomials except on the team round.

EXPONENTS/RADICALS: The questions will be based on the operations of exponents/radicals to include relationships, simplifications or equations.

FUNCTIONS: The questions will be based on the operations of functions, function notation, domain-range relationships, composition, and inverses. This category will exclude trigonometric functions.

GEOMETRIC SIMILARITIES: Questions will deal with Geometric Similarities and proportionality of polygons or solids

LINEAR COORDINATE GEOMETRY: The questions in this category will involve the equations of the coordinate plane including parallels and perpendiculars. It also may involve other geometric figures such as triangles, circles or quadrilaterals as they apply to the coordinate axes. **If the answer to any problem is an equation of a line, the problem writer will specify (by example, not name) the form of the equation to be used.**

LINES, ANGLES AND POLYGONS: The questions will deal with any line or angle relationship in a plane or any polygon material from triangles through n-gons. The questions will not deal with area or questions better suited for circles or spheres.

LOGS/LOG EQUATIONS: The questions will deal with concepts of logs, log equations and applications of logarithms.

MATRICES, DETERMINANTS AND SYSTEMS OF EQUATIONS: The questions will be based on simplification of determinants not to exceed a 4 by 4, matrix operations, matrix equations, inverses not to exceed a 3 by 3, transpositions, and applications of matrix and determinant properties.

NUMBER THEORY: The questions will be based on the theory of natural numbers to include but not limited to least common multiples, greatest common factors or divisors, divisibility tests, number of divisors, sum of divisors, primes and composites, remainders, bases and modular mathematics. **It should be noted that despite what apparently some textbooks report, zero is NOT a natural number.**

POLYNOMIALS: The questions will be based on the operations of polynomial expressions, zeros of functions, solving polynomial equations, applications of the theory of equations.

PROBABILITY: The questions will involve concepts of combinations, permutations, expected value problems, tree diagrams, mutually exclusive, complementary, independent and dependent events as applied to probability. This category will also include conditional probability and Binomial Theorem as applied to probability.

SERIES AND SEQUENCES: Questions will be based on arithmetic and geometric sequences and series and their related concepts.

TRIGONOMETRIC MECHANICS: The questions will be based on right and non-right triangles and their applications, circular trigonometry, and radian measure. One question may deal with the Laws of Sines or Cosines to non-right triangles. The Team Round may have a question dealing with angular and linear velocity.

TRIGONOMETRIC EQUATIONS AND IDENTITIES: The questions will deal with solving trigonometric equations with a specified domain, simplifying and working with trigonometric identities, as well as formulas for double, half, sum and difference. The team round may involve trig equations with unrestricted domains. In this

round,  $\text{Arcsin}$  and  $\text{Sin}^{-1}$  denote functions, where  $\arcsin$  and  $\sin^{-1}$  denote relations. In addition, students should understand the difference between  $\text{Sin } x$  and  $\sin x$ . Similar expectations will hold for the other trigonometric functions.