Mathematical Olympiads for Elementary & Middle Schools

A Special Interest Group Session

National Council of Supervisors of Mathematics
Annual Conference
Indianapolis IN
April 13, 2011

Presented by:
Nicholas J. Restivo
Executive Director
E-mail: nrestivo@moems.org

(516) 781-2400 *Toll Free: (866) 781-2411* *Fax: (516) 785-6640*

WHAT EVERY YOUNG MATHLETE SHOULD KNOW

I. VOCABULARY AND LANGUAGE

The following explains, defines, or lists some of the words that may be used in Olympiad problems. To be accepted, an answer must be consistent with both this document and the wording of the problem.

1. BASIC TERMS

Sum, difference, product, quotient, remainder, ratio, square of a number (also, perfect square), factors of a number. The ***value*** of a number is the simplest name for that number. "**Or**" is inclusive: "*a* or *b*" means "*a* or *b* or both."

DIVISION M: Square root of a number, cube of a number (also, perfect cube).

2. READING SUMS

An ellipsis (…) means "and so forth":

Read "1 + 2 + 3 + …" as "one plus two plus three and so forth (without end)".

Read "1 + 2 + 3 + … + 10" as "one plus two plus three and so forth *up to ten.*"

3. STANDARD FORM OF A NUMBER

The **standard form of a number** refers to the form in which we usually write numbers (also called Hindu-Arabic numerals or positional notation).

A **digit** is any one of the ten numerals 0,1,2,3,4,5,6,7,8,9. Combinations of digits are assigned place values in order to write all numbers. A number may be described by the number of digits it contains: 358 is a three-digit number. The "**lead-digit**" (leftmost digit) of a number is not counted as a digit if it is 0: 0358 is a *three-digit* number. **Terminal zeros** of a number are the zeros to the right of the last nonzero digit: 30,500 has two terminal zeros because to the right of the digit 5 there are two zeros.

4. SETS OF NUMBERS

Counting Numbers = {1, 2, 3, …}.

Whole Numbers = {0, 1, 2, 3, …}

DIVISION M: **Integers** = {…, –3, –2, –1, 0, +1, +2, +3, …}. The terms **positive, negative, nonnegative,** and **nonpositive numbers** will appear only in Division M problems.

Consecutive numbers are counting numbers that differ by 1, such as 83, 84, 85, 86, and 87.

Consecutive even numbers are multiples of 2 that differ by 2, such as 36, 38, 40, and 42.

Consecutive odd numbers are nonmultiples of 2 that differ by 2, such as 57, 59, 61, and 63.

5. MULTIPLES, DIVISIBILITY AND FACTORS

The product of two whole numbers is called a **multiple** of each of the whole numbers. Zero is considered a multiple of every whole number. *Example: Multiples of 6 = {0,6,12,18,24,30,…}.*

Note: Many but not all authorities expand the definition of multiple to include all integers. To them, –24 is a multiple of 6. For Olympiad problems, no multiples will be negative.

A whole number ***a*** is said to be **divisible by** a counting number ***b*** if *b* divides *a* with zero remainder. In such instances: (1) their quotient is also a whole number, (2) *b* is called a **factor** of *a*, and (3) *a* is called a **multiple** of *b*.

6. NUMBER THEORY

a. A **prime number** (also, **prime**) is a counting number which has exactly two different factors, namely the number itself and the number 1. *Examples: 2, 3, 5, 7, 11, 13, …*

b. A **composite number** is a counting number which has <u>at least three</u> different factors, namely the number itself, the number 1, and at least one other factor. *Examples: 4, 6, 8, 9, 10, 12, …*

c. The number 1 is neither prime nor composite since it has <u>exactly one</u> factor, namely the number itself. Thus, there are 3 separate categories of counting numbers: prime, composite, and the number 1.

d. A number is **factored completely** when it is expressed as a product of only prime numbers.
Example: 144 = 2×2×2×2×3×3. It may also be written as $144 = 2^4 \times 3^2$.

e. The **Greatest Common Factor (GCF)** of two counting numbers is the largest counting number that divides each of the two given numbers with zero remainder. *Example: GCF(12,18) = 6.*

f. If the GCF of two numbers is 1, then we say the numbers are **relatively prime** or **co-prime**.

g. The **Least Common Multiple (LCM)** of two counting numbers is the smallest counting number that each of the given numbers divides with zero remainder. *Example: LCM(12,18) = 36*.

h. **Order of operations**. When computing the value of expressions involving two or more operations, the following priorities must be observed from left to right:
1) do operations in parentheses, braces, or brackets first, working from the inside out,
2) do multiplication and division from left to right, and then
3) do addition and subtraction from left to right.

Example: $3 + 4 \times 5 - 8 \div (9 - 7)$
$= 3 + 4 \times 5 - 8 \div 2$
$= 3 + 20 - 4$
$= 19$

7. FRACTIONS

a. A **common (or simple) fraction** is a fraction of the form $\frac{a}{b}$ where a is a whole number and b is a counting number. One meaning is $a \div b$.

b. A **unit fraction** is a common fraction with numerator 1.

c. A **proper fraction** is a common fraction in which $a < b$. Its value is more than 0 and less than 1.

d. An **improper fraction** is a common fraction in which $a \geq b$. Its value is 1 or greater than 1. A fraction whose denominator is 1 is equivalent to an integer.

e. A **complex fraction** is a fraction whose numerator or denominator contains a fraction. They can be simplified by dividing the numerator by the denominator.

Examples: $\frac{\frac{2}{3}}{5}, \frac{7}{\frac{3}{8}}, \frac{\frac{2}{3}}{\frac{5}{7}}, \frac{3-\frac{1}{3}}{3+\frac{1}{3}}$

f. The fraction $\frac{a}{b}$ is **simplified** ("in lowest terms") if a and b have no common factor other than 1 [**GCF(a,b) = 1**].

g. A **decimal** or **decimal fraction** is a fraction whose denominator is a power of ten. The decimal is written using decimal point notation. *Examples: $\frac{7}{10}$ = .7; .36, .005, 1.4*

h. **DIVISION M:** A **percent** or **percent fraction** is a fraction whose denominator is 100, which is represented by the percent sign. *Examples: $\frac{45}{100}$ = 45%; 8%, 125%, 0.3%*

8. STATISTICS AND PROBABILITY

The **average** (**arithmetic mean**) of a set of N numbers is the sum of all N numbers divided by N. The **mode** of a set of numbers is the number listed most often. The **median** of an *ordered set* of numbers is the middle number if N is odd, or the mean of the two middle numbers if N is even.

The **probability** of an event is a value between 0 and 1 inclusive that expresses how likely an event is to occur. It is often found by dividing the number of times an event *does* occur by the total number of times

the event *can* possibly occur. *Example*: The probability of rolling an odd number on a standard die is $\frac{3}{6}$ or $\frac{1}{2}$. Either $\frac{3}{6}$ or $\frac{1}{2}$ will be accepted as a correct probability.

9. GEOMETRY

a. **Angles**: degree-measure, vertex, congruent; acute, right, obtuse, straight, reflex.

b. **Congruent segments** are two **line segments** of equal length.

c. **Polygons**, **circles**, and **solids**:

Parts: side, angle, vertex, diagonal; interior region, exterior region; diameter, radius, chord.

Triangles: acute, right, obtuse; scalene, isosceles, equilateral.

Note: an equilateral triangle is isosceles with all three sides congruent.

Quadrilaterals: parallelogram, rectangle, square, trapezoid, rhombus.

*Note: **a square is one type of rectangle** with all four sides congruent. It is also a rhombus with all four angles congruent.*

Others: cube, rectangular solid; pentagon, hexagon, octagon, decagon, dodecagon, icosagon.

Perimeter: the number of unit lengths in the boundary of a plane figure.

Area: the number of unit squares contained in the interior of a region.

Circumference: the perimeter of a circular region.

Congruent figures: two or more plane figures all of whose corresponding pairs of sides and angles are congruent.

Similar figures: two or more plane figures whose size may be different but whose shape is the same. *Note: all squares are similar; all circles are similar.*

d. **DIVISION M:** Geometric Solids: Right Circular Cylinder, face, edge.

Volume: the number of unit cubes contained in the interior of a solid.

Surface Area: the sum of the areas of all the faces of a geometric solid.

II. SKILLS

1. COMPUTATION

The tools of arithmetic are needed for problem-solving. Competency in the basic operations on whole numbers, fractions, and decimals is essential for success in problem solving at all levels.

DIVISION M: Competency in basic operations on signed numbers should be developed.

2. ANSWERS

Unless otherwise specified in a problem, equivalent numbers or expressions should be accepted. For example, 3½, $^7/_2$, and 3.5 are equivalent.

Units of measure are rarely required in answers but if given in an answer, they must be correct. More generally, an answer in which any part is incorrect is not acceptable. To avoid the denial of credit students should be careful to include *only* required information. While an answer that differs from the official one can be appealed, credit can be granted only if the wording of the problem allows for an alternate interpretation or if it is flawed so that no answer satisfies all conditions of the problem.

Measures of area are usually written as square units, sq. units, or units^2. For example, square centimeters may be abbreviated as sq cm, or cm × cm, or cm^2. In **DIVISION M**, cubic measures are treated in a like manner.

After reading a problem, a wise procedure is to indicate the nature of the answer at the bottom of a worksheet before starting the work necessary for solution. Examples: "*A* = ___, *B* = ___"; "*The largest number is* __". Another worthwhile device in practice sessions is to require the student to write the answer in a simple declarative sentence using the wording of the question itself. Example: "*The average speed is 54 miles per hour*." This device usually causes the student to reread the problem.

3. **MEASUREMENT**

The student should be familiar with units of measurement for time, length, area, and weight (and for **DIVISION M**, volume) in English and metric systems. Within a system of measurement, the student should be able to convert from one unit to another.

III. SOME USEFUL THEOREMS

1. If a number is divisible by 2^n, then the number formed by the last n digits of the given number is also divisible by 2^n; and conversely.

   Example: 7,292,536 is divisible by 2 (or 2^1) because 6 is divisible by 2.
   Example: 7,292,536 is divisible by 4 (or 2^2) because 36 is divisible by 4.
   Example: 7,292,536 is divisible by 8 (or 2^3) because 536 is divisible by 8.

2. If the sum of the digits of a number is divisible by 9, then the number is divisible by 9.
   If the sum of the digits of a number is divisible by 3, then the number is divisible by 3.

   Example: 658,773 is divisible by 9 because 6+5+8+7+7+3 = 36 which is a multiple of 9.
   Example: 323,745 is divisible by 3 because 3+2+3+7+4+5 = 24 which is a multiple of 3.

3. A number is divisible by 5 if its units digit is 5 or 0.

4. A number is divisible by 11 if the difference between the sum of the odd-place digits and the sum of the even-place digits is 0 or a multiple of 11.

   Example: 90,728 is divisible by 11 because (9+7+8) – (0+2) = **22**, which is a multiple of 11.

5. If A and B are natural numbers, then:

   (i) GCF(A,B) × LCM(A,B) = A × B.
   (ii) LCM(A,B) = (A × B) ÷ GCF(A,B).
   (iii) GCF(A,B) = (A × B) ÷ LCM(A,B).

   Example: If A = 9 and B = 12: GCF(9,12) = 3, LCM(9,12) = 36, A × B = 9 × 12 =108.
   Then: (i) 3 x 36 = 108; (ii) 108 ÷ 3 = 36; (iii) 108 ÷ 36 = 3.

6. If p represents a prime number, then p^n has n+1 factors. Example: $2\times2\times2\times2\times2 = 2^5$ has 6 factors which are 1, 2, 2×2, 2×2×2, 2×2×2×2, 2×2×2×2×2. In **exponential form**, the factors are: 1, 2, 2^2, 2^3, 2^4, and 2^5. In **standard form**, the factors are: 1, 2, 4, 8, 16, and 32. Notice that the factors of 2^5 include both 1 and 2^5.

   Problem: *how many factors does 72 have?* $72 = 2\times2\times2\times3\times3 = 2^3\times3^2$. Since 2^3 has 4 factors and 3^2 has 3 factors, 72 has 4×3 = 12 factors. The factors may be obtained by multiplying any one of the factors of 2^3 by any one of the factors of 3^2: $(1, 2, 2^2, 2^3) \times (1, 3, 3^2)$. Written in order, the 12 factors are: 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72.

7. Any number divisible by x is divisible by every factor of x and should be checked for the highest power of each prime factor. For example, test multiples of 72 for divisibility by 2^3 and 3^2.

♦ ——————————————— ♦

Thorough discussions of these and many other useful topics may be found in *Creative Problem Solving in School Mathematics,* and in both volumes of *Math Olympiad Contest Problems*.

Mathematical Olympiads

PRICES VALID THROUGH JUNE 30, 2011

for Elementary and Middle Schools

2154 Bellmore Avenue, Bellmore, NY 11710-5645 Phone (516) 781-2400 Toll Free (866) 781-2411 FAX: (516) 785-6640

E-Mail: office@moems.org Web Site: www.moems.org

Enrollment Form

Please type or print.

Date _____

School _____ Team Letter (*if more than one team*) _____

School Address _____ District _____

City _____ State _____ Zip + 4 _____

Email Address _____

School phone ( ) _____ Fax ( ) _____

Person in Charge of Olympiad Team (PICO) _____

IMPORTANT — ***Check one box in each Category:***

1. I prefer to: (*a*) ❑ receive all materials and register students / report scores **ONLINE.**
   (*b*) ❑ receive all materials and register students / report score by **SNAIL MAIL.**

2. Division: ❑ **Division E** (*Gr. 4-6*) ❑ **Division M** (*Gr. 6-8*)

3. Payment: ❑ Check #_____ ❑ Purchase Order #_____

   Credit Card: ❑ *VISA* ❑ *MasterCard* ❑ *Discover* ❑ *American Express*

   # _____ _____ _____ _____ Expires _____ Security Code _____

Membership Fee Per Team:	Online	Snail Mail
USA, Canadian, or Mexican Zip Code.	❑ $89 US	❑ $99 US*
All Other Foreign.	❑ $125 US	❑ $150 US*

1. **ONLINE vs. SNAIL MAIL:**

   Item (1*a*) above – ONLINE: $89 ($125 foreign). Use our password-protected website to report and correct all student data and scores, and to receive all contests and practice materials. All materials will be available at our website and you will not need to bubble or mail any computer cards to MOEMS. Constantly updated statistics will be available at all times during the contest year. You will need to print out enough copies of the practice materials and Olympiads for all team members.

   Item (1*b*) above – SNAIL MAIL: $99 ($150 foreign). Use US mail or UPS to report all scores on our computer bubble forms and to receive all contests and materials. You will not receive a password and you will not have access to the secure part of our website. You will not be able to report scores online, nor to switch into the online system during the year. Only the early statistics will be available and will appear in the printed newsletters which are mailed monthly.

2. *Make P.O. or payment payable to:* ***MOEMS.*** [**Teams outside the United States must use credit cards.*]

3. *Mail form with P.O. or payment to:* *Mr. John Lufrano, Executive Secretary*
   MOEMS
   2154 Bellmore Avenue
   Bellmore, NY 11710-5645

4. ***Please enroll by September 30.*** *All payments or purchase orders should be received by that date. Refunds are granted only to schools that withdraw prior to October 1.*

5. *A team consists of 35 or fewer students, none above grade 8. A team with any members in grade 7 or 8 must be in Division M.*

6. *Only fulltime registered students from the same member school or homeschool association are eligible to participate on a School Team. All other teams, called District Teams or Institute Teams, are ineligible for Team Awards and other restrictions apply.*

Mathematical Olympiads

PRICES VALID THROUGH JUNE 30, 2011

for Elementary and Middle Schools

2154 Bellmore Avenue, Bellmore, NY 11710-5645 Phone (516) 781-2400 Toll Free (866) 781-2411 FAX: (516) 785-6640

E-Mail: office@moems.org Web Site: www.moems.org

Enrollment Form

Please type or print.

Date _____

School _____ Team Letter (*if more than one team*) _____

School Address _____ District _____

City _____ State _____ Zip + 4 _____

Email Address _____

School phone ( ) _____ Fax ( ) _____

Person in Charge of Olympiad Team (PICO) _____

IMPORTANT — ***Check one box in each Category:***

1. I prefer to: (*a*) ❑ receive all materials and register students / report scores **ONLINE.**
   (*b*) ❑ receive all materials and register students / report score by **SNAIL MAIL.**

2. Division: ❑ **Division E** (*Gr. 4-6*) ❑ **Division M** (*Gr. 6-8*)

3. Payment: ❑ Check #_____ ❑ Purchase Order #_____

   Credit Card: ❑ *VISA* ❑ *MasterCard* ❑ *Discover* ❑ *American Express*

   # _____ _____ _____ _____ Expires _____ Security Code _____

Membership Fee Per Team:	Online	Snail Mail
USA, Canadian, or Mexican Zip Code.	❑ $89 US	❑ $99 US*
All Other Foreign.	❑ $125 US	❑ $150 US*

1. **ONLINE vs. SNAIL MAIL:**

   Item (1*a*) above – ONLINE: $89 ($125 foreign). Use our password-protected website to report and correct all student data and scores, and to receive all contests and practice materials. All materials will be available at our website and you will not need to bubble or mail any computer cards to MOEMS. Constantly updated statistics will be available at all times during the contest year. You will need to print out enough copies of the practice materials and Olympiads for all team members.

   Item (1*b*) above – SNAIL MAIL: $99 ($150 foreign). Use US mail or UPS to report all scores on our computer bubble forms and to receive all contests and materials. You will not receive a password and you will not have access to the secure part of our website. You will not be able to report scores online, nor to switch into the online system during the year. Only the early statistics will be available and will appear in the printed newsletters which are mailed monthly.

2. *Make P.O. or payment payable to:* ***MOEMS.*** [**Teams outside the United States must use credit cards.*]

3. *Mail form with P.O. or payment to:* *Mr. John Lufrano, Executive Secretary*
   MOEMS
   2154 Bellmore Avenue
   Bellmore, NY 11710-5645

4. ***Please enroll by September 30.*** *All payments or purchase orders should be received by that date. Refunds are granted only to schools that withdraw prior to October 1.*

5. *A team consists of 35 or fewer students, none above grade 8. A team with any members in grade 7 or 8 must be in Division M.*

6. *Only fulltime registered students from the same member school or homeschool association are eligible to participate on a School Team. All other teams, called District Teams or Institute Teams, are ineligible for Team Awards and other restrictions apply.*

Mathematical Olympiads

EFFECTIVE JULY 1, 2011

for Elementary and Middle Schools

2154 Bellmore Avenue, Bellmore, NY 11710-5645 Phone (516) 781-2400 Toll Free (866) 781-2411 FAX: (516) 785-6640

E-Mail: office@moems.org Web Site: www.moems.org

Enrollment Form

Please type or print.

Date _____

School _____ Team Letter (*if more than one team*) _____

School Address _____ District _____

City _____ State _____ Zip + 4 _____

Email Address (PICO) _____

School phone ( ) _____ Fax ( ) _____

Person in Charge of Olympiad Team (PICO) _____

IMPORTANT — ***Check one box in each Category:***

1. I prefer to: (*a*) ❑ receive all materials and register students / report scores **ONLINE.**
   (*b*) ❑ receive all materials and register students / report score by **SNAIL MAIL.**

2. Division: ❑ **Division E** (*Gr. 4-6*) ❑ **Division M** (*Gr. 6-8*)

3. Payment: ❑ Check #_____ ❑ Purchase Order #_____

   Credit Card: ❑ *VISA* ❑ *MasterCard* ❑ *Discover* ❑ *American Express*

   # _____ _____ _____ _____ Expires _____ Security Code _____

Membership Fee Per Team:	Online*	Snail Mail*
USA, Canadian, or Mexican Zip Code.	❑ $99 US	❑ $119 US
All Other Foreign.	❑ $135 US	❑ $170 US

1. **ONLINE vs. SNAIL MAIL:**

   Item (1*a*) above – ONLINE: $99 ($135 foreign). Use our password-protected website to report and correct all student data and scores, and to receive all contests and practice materials. All materials will be available at our website and you will not need to bubble or mail any computer cards to MOEMS. Constantly updated statistics will be available at all times during the contest year. You will need to print out enough copies of the practice materials and Olympiads for all team members.

   Item (1*b*) above – SNAIL MAIL: $119 ($170 foreign). Use US mail or UPS to report all scores on our computer bubble forms and to receive all contests and materials. You will not receive a password and you will not have access to the secure part of our website. You will not be able to report scores online, nor to switch into the online system during the year. Only the early statistics will be available and will appear in the printed newsletters which are mailed monthly.

2. *Make P.O. or payment payable to:* ***MOEMS.*** [**Teams outside the United States must use credit cards.*]

3. *Mail form with P.O. or payment to:* *Mr. John Lufrano, Executive Secretary*
   MOEMS
   2154 Bellmore Avenue
   Bellmore, NY 11710-5645

4. ***Please enroll by September 30.*** *All payments or purchase orders should be received by that date. Refunds are granted only to schools that withdraw prior to October 1.*

5. *A team consists of 35 or fewer students, none above grade 8. A team with any members in grade 7 or 8 must be in Division M.*

6. *Only fulltime registered students from the same member school or homeschool association are eligible to participate on a School Team. All other teams, called District Teams or Institute Teams, are ineligible for Team Awards and other restrictions apply.*

YOUR ORGANIZATION'S MATH TOURNAMENT

FOR GRADES 4-6 or 6-8

New!

Your local organization (of mathematics educators, principals or superintendents), midsized school district (of 10 or more elementary schools), or college or university ["group"] can conduct its own tournament with considerable help from MOEMS. The main features of the Tournament are:

1. **This is your group's tournament.** Everything is packaged under the name and logo of your group, which you place in large print at the top of nearly every sheet of paper. Contests, flyers, and awards all display your name prominently. "MOEMS" only appears in small print in the copyright statements.
2. The potential **benefits** to your group are many. Among others, the tournament can: enhance your group's reputation for promoting excellence in mathematics; provide inexpensive publicity to schools in your area; recruit new members and workers; and help new and veteran teachers to network.
3. Your group invites several schools to send teams to **compete face-to-face** at one site. Picture 100-200 students together just to do mathematics. This creates excitement and underscores the importance of mathematics.
4. **STRUCTURE:** Students from grades 4-6 or 6-8 can be mixed on each of the 5-member teams. There are 3 rounds and an awards ceremony. **Individual round:** each student works alone on 10 timed short-answer problems. **Team round:** all five team members work cooperatively on another 10 timed short-answer problems. **Playoff round:** up to 5 additional problems with time constraints break ties for awards. All problems are supplied by MOEMS and are non-routine short answer questions.
5. The 4-hour, 30-minute **schedule** includes time after each event to discuss solutions, an important feature. MOEMS supplies transparency masters, detailed solutions, and, where possible, multiple methods. There is also time for a mid-morning snack and lunch, and an awards ceremony.
6. **FINANCES:** An organization sets, collects, and keeps all per-team fees. Your total expenses, including the $250 MOEMS fee, is likely to be less than $500. At a suggested per-team fee of $50, the break-even point is just 10 teams. Our two pilot tournaments each hosted 25-30 teams after turning away teams in order to control numbers.
7. **MOEMS provides** electronic tournament-ready masters for five major components: camera-ready copy for all problems, solutions, scoring keys, etc.; transparency masters for the discussion sessions; 7 edit-ready letters in Word® for all communications; a formatted scorekeeping spreadsheet in Excel®; and a highly detailed instruction and reference manual. The MOEMS flat fee of $250 per tournament is a fraction of your organization's income that is generated by the registration fee.
8. The Tournament Handbook, a very thorough **reference manual**, walks your tournament committee through every aspect of mounting a tournament, including that of recruiting new workers. It addresses a wide range of procedures and subtle decisions that need to be made. Topics include: how to recruit workers and teams; how to handle every aspect of preparation; how to efficiently conduct each facet of the tournament day itself; and how to follow up afterwards. As few as 3 people can organize and prepare it all.

For further information contact MOEMS at *info@moems.org* or 866-781-2411. Please supply the name of your organization, district, or college, and all appropriate contact information.

The Basics of the Tournament

— Organizations —

1. Overview
    a. Format: full-day; grades 4-6 or 6-8; 5-member teams from many schools; one site (face-to-face)
    b. Tournament bears the name of the local organization — it is your contest
    c. Local organization controls the tournament with much support from MOEMS
    d. Events: individual, team, tiebreakers; plus review of all solutions
    e. Two large rooms are used, one for the events under a Head Proctor and the other for the solution discussion with a Head Reviewer
    f. Answers are scored during the contest and awards are distributed
    g. You set the tournament date. We recommend springtime as a year-end cap for the students.
2. Benefits
    a. To local organization
        i. Enhance regionwide reputation for furthering math education
        ii. Attract new members from the elementary schools
        iii. Retain the money generated by per-team fees for other organizational projects
        iv. MOEMS sets basic structure, but local is free to adapt it as needed
    b. To MOEMS
        i. Contest year is capped
        ii. Reputation is enhanced nationally
        iii. Additional income: moderate fee charged to many regions helps subsidize our operation
3. Responsibilities
    a. Of local
        i. Attract and register teams
        ii. Select and prepare site
        iii. Print and package copies of all papers and transparencies from blackline masters
        iv. Administer the contest
        v. Provide all awards
    b. Of MOEMS
        i. Provide all problems and detailed solutions (camera-ready)
        ii. Provide blackline masters for review transparencies
        iii. Provide complete and detailed instructions for all adults
        iv. Provide all forms electronically, from registration to formatted scorekeeping spreadsheets
        v. Provide ready help and advice as needed

Each contest sheet will have about 2 inches of blank space at the top for the local organization to insert its own masthead. Only the copyright statement at the bottom of each problem page will indicate MOEMS' role.

The local organization pays a moderate flat fee to MOEMS for the complete "kit", including all problems and solutions, regardless of the number of teams entered. The local then sets, charges, and keeps the per-team registration fee. Other than the MOEMS' flat fee, awards, and incidental expenses (perhaps including mailing), the local keeps all proceeds. The local will probably advise students to bring their own lunch.

Chaperones for all teams serve as proctors. Other adults serve as scorers. The major roles are: registration person, head proctor, head problem reviewer, head scorer, packager (of problems beforehand), site chair, awards person. Tournaments have been mounted by as few as three people.

The Basics of the Tournament

— School Districts —

1. Overview
    a. Format: full-day; grades 4-6 or 6-8; 5-member teams from many schools; one site (face-to-face)
    b. Tournament bears the name of the School District — it is your contest
    c. Your District controls the tournament with much support from MOEMS
    d. Events: individual, team, tiebreakers; plus review of all problems
    e. Two large rooms are used, one for the events under a Head Proctor and the other for the solution discussion with a Head Reviewer
    f. Answers are scored during the contest and awards are distributed
    g. You set the tournament date. We recommend springtime as a year-end cap for the students.
2. Benefits
    a. To School District
        i. Enhance reputation for furthering math education
        ii. Increase interest in mathematics among both students and teachers
        iii. Allow showcasing and networking of interested students and teachers
        iv. MOEMS sets basic structure, but district is free to adapt it as needed
    b. To MOEMS
        i. Contest year is capped
        ii. Reputation is enhanced nationally
        iii. Additional income: moderate fee charged to many regions helps subsidize our operation
3. Responsibilities
    a. Of School District
        i. Attract and register teams
        ii. Select and prepare site
        iii. Print and package copies of all papers and transparencies from blackline masters
        iv. Administer and score the contest
        v. Provide all awards
    b. Of MOEMS
        i. Provide all problems and detailed solutions (camera-ready)
        ii. Provide blackline masters for review transparencies
        iii. Provide complete and detailed instructions for all adults
        iv. Provide all forms electronically, from registration to formatted scorekeeping spreadsheets
        v. Provide ready help and advice as needed

Each contest sheet has about 2 inches of blank space at the top for the School District to insert its own masthead. Only the copyright statement at the bottom of each problem page will indicate MOEMS' role.

The School District pays a moderate flat fee to MOEMS for the complete "kit", including all camera-ready problems and solutions, regardless of the number of teams entered. Costs are low: the MOEMS' flat fee, awards, and incidental expenses (perhaps including mailing). The School District may wish to advise students to bring their own lunch.

Chaperones for all teams serve as proctors. Other adults serve as scorers. The major roles are: registration person, head proctor, head problem reviewer, head scorer, packager (of problems beforehand), site chair, awards person. Tournaments have been mounted by as few as three people.

The Basics of the Tournament

— Colleges and Universities —

1. Overview
    a. Format: full-day; grades 4-6 or 6-8; 5-member teams; one site (face-to-face)
    b. Tournament bears the name of the College — it is your contest
    c. College group controls the tournament with much support from MOEMS
    d. Events: individual, team, tiebreakers; plus review of all solutions
    e. Two large rooms are used, one for the events under a Head Proctor and the other for the solution discussion with a Head Reviewer
    f. Answers are scored during the contest and awards are distributed
    g. You set the tournament date. We recommend springtime as a year-end cap for the students.
2. Benefits
    a. To College Group
        i. Enhance regional reputation for furthering math education
        ii. Promote problem solving and excitement about mathematics among local teachers
        iii. Provide a service to local school districts
        iv. Broaden the education of student teachers
        v. MOEMS sets basic structure, but local is free to adapt it as needed
    b. To MOEMS
        i. Contest year is capped
        ii. Reputation is enhanced nationally
        iii. Additional income: moderate fee charged to many regions helps subsidize our operation
3. Responsibilities
    a. Of College Group
        i. Attract and register teams
        ii. Select and prepare site
        iii. Print and package copies of all papers and transparencies from blackline masters
        iv. Administer the contest
        v. Provide all awards
    b. Of MOEMS
        i. Provide all problems and detailed solutions (camera-ready)
        ii. Provide blackline masters for review transparencies
        iii. Provide complete and detailed instructions for all adults
        iv. Provide all forms electronically, from registration to formatted scorekeeping spreadsheets
        v. Provide ready help and advice as needed

Each contest sheet will have about 2 inches of blank space at the top for the College group to insert its own masthead. Only the copyright statement at the bottom of each problem page will indicate MOEMS' role.

The local organization pays a moderate flat fee to MOEMS for the complete "kit", including all problems and solutions, regardless of the number of teams entered. If a per-team fee is charged, it is set and retained by the College group. Expenses are minimal: MOEMS' flat fee, awards, and incidental expenses (perhaps including mailing). The College group may wish to advise students to bring lunch.

Chaperones for all teams serve as proctors. Other adults serve as scorers. The major roles are: registration person, head proctor, head problem reviewer, head scorer, packager (of problems beforehand), site chair, awards person. Tournaments have been mounted by as few as three people.

Tournament Agreement

Contact person _____ Phone (W) _____

Organization _____ FAX (W) _____

School Address _____ Email: _____

_____ Tournament Date _____

_____ Grades: ☐ 4-6 ☐ 6-8 (choose one)

Region covered by the Tournament _____

Name for the Tournament (see condition 8 below): _____

Payment: Check #_____ Purchase Order #_____ VISA__ MC__ Disc__ AMEX__

Credit card # _____ Expires _____ Security Code _____

The person named above, representing the organization named above, agrees to the following conditions:

1. **The organization will pay the Mathematical Olympiads for Elementary and Middle Schools, Inc. (MOEMS, 2154 Bellmore Avenue, Bellmore NY 11710 (516-781-2400), a fee of $250 for the following services:**
   a. **The electronic Tournament Handbook, which contains detailed procedures necessary to organize all aspects of the tournament, and suggestions for publicizing the Tournament to schools and the media, organizing the complete day, and reporting results to the participants and media;**
   b. **The complete set of flyers and forms covering all aspects of the Tournament, ready for personalizing and reproducing;**
   c. **The complete set of 25 problems and solutions in electronic print-ready form;**
   d. **The complete set of problems and solutions in PowerPoint™ format:**
   e. **Two complete sets of previous years' tournament problems to be provided beforehand to all teams for practice;**
   f. **A formatted electronic spreadsheet for recording scores and for assigning teams and proctors; and**
   g. **All advice and guidance as needed.**
2. **The organization is responsible for all other aspects and materials, including prizes and certificates, used to hold the Tournament. Additional fees will be required if MOEMS provides any other services.**
3. **The organization sets the per-team entry fee and keeps all proceeds after all operating expenses.**
4. **The $250 fee covers a one-time use for either level Tournament. A discounted payment of $175 is required for each additional time the Tournament (either level) is held by the sponsoring organization during the same year in the same region.**
5. **Schools participating in the Tournament must be located within the Region named above.**
6. **The Tournament must be held after mid-March, when the problems are provided. The exact date of the Tournament is at the discretion of the organization.**
7. **All materials provided by MOEMS, including the Handbook, the problems and the solutions, belong to MOEMS, the copyright holder. Permission is granted to reproduce them for purposes of the Tournament and for subsequent classroom use. For any other use, express written permission from MOEMS is required. No materials supplied to the organization may be resold by anyone other than MOEMS.**
8. **Permission is given to the organization to choose its own name for the Tournament, provided the word "Tournament" is part of that name and "Olympiad" is <u>not</u> part of that name. Furthermore, it may print that name and its masthead on the top of every sheet, where possible. The copyright statements supplied by MOEMS must not be altered or removed.**
9. **At the conclusion of the Tournament, the organization will supply each team with a Final Packet, consisting of all problems and solutions from the Individual and Team Events.**

Signature below and payment of the fee constitutes agreement with all conditions above.

_____ _____

Signature **Date**

Tournament Agreement

Contact person _____ Phone (W) _____

Organization _____ FAX (W) _____

School Address _____ Email: _____

_____ Tournament Date _____

_____ Grades: ☐ 4-6 ☐ 6-8 (choose one)

Region covered by the Tournament _____

Name for the Tournament (see condition 8 below): _____

Payment: Check #_____ Purchase Order #_____ VISA__ MC__ Disc__ AMEX__

Credit card # _____ Expires _____ Security Code _____

The person named above, representing the organization named above, agrees to the following conditions:

1. **The organization will pay the Mathematical Olympiads for Elementary and Middle Schools, Inc. (MOEMS, 2154 Bellmore Avenue, Bellmore NY 11710 (516-781-2400), a fee of $250 for the following services:**
   a. **The electronic Tournament Handbook, which contains detailed procedures necessary to organize all aspects of the tournament, and suggestions for publicizing the Tournament to schools and the media, organizing the complete day, and reporting results to the participants and media;**
   b. **The complete set of flyers and forms covering all aspects of the Tournament, ready for personalizing and reproducing;**
   c. **The complete set of 25 problems and solutions in electronic print-ready form;**
   d. **The complete set of problems and solutions in PowerPoint™ format:**
   e. **Two complete sets of previous years' tournament problems to be provided beforehand to all teams for practice;**
   f. **A formatted electronic spreadsheet for recording scores and for assigning teams and proctors; and**
   g. **All advice and guidance as needed.**
2. **The organization is responsible for all other aspects and materials, including prizes and certificates, used to hold the Tournament. Additional fees will be required if MOEMS provides any other services.**
3. **The organization sets the per-team entry fee and keeps all proceeds after all operating expenses.**
4. **The $250 fee covers a one-time use for either level Tournament. A discounted payment of $175 is required for each additional time the Tournament (either level) is held by the sponsoring organization during the same year in the same region.**
5. **Schools participating in the Tournament must be located within the Region named above.**
6. **The Tournament must be held after mid-March, when the problems are provided. The exact date of the Tournament is at the discretion of the organization.**
7. **All materials provided by MOEMS, including the Handbook, the problems and the solutions, belong to MOEMS, the copyright holder. Permission is granted to reproduce them for purposes of the Tournament and for subsequent classroom use. For any other use, express written permission from MOEMS is required. No materials supplied to the organization may be resold by anyone other than MOEMS.**
8. **Permission is given to the organization to choose its own name for the Tournament, provided the word "Tournament" is part of that name and "Olympiad" is not part of that name. Furthermore, it may print that name and its masthead on the top of every sheet, where possible. The copyright statements supplied by MOEMS must not be altered or removed.**
9. **At the conclusion of the Tournament, the organization will supply each team with a Final Packet, consisting of all problems and solutions from the Individual and Team Events.**

Signature below and payment of the fee constitutes agreement with all conditions above.

_____ _____

Signature **Date**

MATH OLYMPIADS Since 1979

Mathematical Olympiads

A Nonprofit Public Foundation

for Elementary and Middle Schools

2154 Bellmore Avenue, Bellmore, NY 11710-5645 Phone: (516) 781-2400 FAX: (516) 785-6640

Teachers of Teachers.....District Supervisors

We can help you.

We believe the best way to teach math is through rich, engaging problems. Students develop problem solving skills and experience the thrill of success while reviewing important concepts. They learn to see math as a tool, not as an end in itself.

We would like to supply you with enough InfoPax (like the one in this folder) for all your colleagues or students who currently teach math in grades 4-8 or expect to do so within 2 years. In addition to descriptive material, each packet contains 28 of our problems for immediate use. Let us underline your message that learning to solve problems is essential to learning mathematics.

Created as a not-for-profit organization by Dr. George Lenchner, Director of Mathematics for the Valley Stream, NY school districts in 1979, the Math Olympiads currently serves about 6000 teams and 200,000 students worldwide annually.

If you are interested in receiving sets of InfoPax, please fill out the form below and return. We will contact you every September and February for the number of InfoPax you need for the following term, until told otherwise. We prefer to contact you via e-mail. Feel free to pass this request along to colleagues who could be interested.

Sincerely,

Nicholas J. Restivo
Executive Director, MOEMS

☐ Teacher of Teachers (College) *or* ☐ District Math Supervisor, K-12

Please send me ☐ ***InfoPax*** **(enough for all who might be interested).**

(Dr. Miss Mr. Mrs. Ms. Prof.) Name:_____

E-mail: _____ (important) Work Phone: _____

School: _____ Position: _____

(*Note to Teachers of Teachers who also teach K-12: We will mail the InfoPax wherever you want, but please name your college or university to avoid confusion.*)

School Mailing Address: _____

_____

_____

_____