

# Nassau County Interscholastic Mathematics League

## A Note on Terminology and Conventions

The items below list some of the terminology, conventions, and theorems that the league expects mathletes to be familiar with. The list is not exhaustive. The author and editor are also aware of these conventions and are expected to write and edit questions with them in mind.

1. The word **compute** or the word **find** requires that your answer be expressed in simplest form. In general, fractions must be expressed in lowest terms, radicals must be expressed in simplest radical form, and exact values for trig functions of special angles must be used. The following forms of answers are unacceptable:  $10/4$ ,  $4\pi/2$ ,  $\sqrt{18}$ ,  $\tan 45^\circ$ , and  $3^4$ . Acceptable forms would be  $5/2$  or  $2\frac{1}{2}$  or  $2.5$ ,  $2\pi$ ,  $3\sqrt{2}$ ,  $1$ ,  $81$  respectively. An answer like  $7^{52}$  is acceptable because it is too large to work out. If an expression involves trigonometric functions then “simplify” means to minimize the number of functions involved and to eliminate fractions whenever possible. For example:  $\frac{\sin x}{\cos x}$  must be reduced to  $\tan x$ ,  $\sin^2 x + \cos^2 x$  must be replaced with  $1$ ,  $\sin \alpha \cdot \cos \beta - \sin \beta \cdot \cos \alpha$  simplifies to  $\sin(\alpha - \beta)$ , and  $\frac{1}{\sin x}$  must be changed to  $\csc x$ . The decision of the judges is final as to what form of a particular answer is acceptable, but in general, it is expected that the author and editor will list acceptable forms of correct answers when there is the potential for disagreement.
2. If a problem calls for exact values, do not use decimal approximations like  $3.14$  for  $\pi$ ,  $1.732$  for  $\sqrt{3}$ , etc. If decimal approximations are permitted, they must be expressed to 4 or more significant digits.
3. If a polygon is named by its vertices it is understood that the vertices occur in the order given, moving either clockwise or counterclockwise. In the case of a triangle a lower case letter refers to the side opposite its upper case vertex designation. According to context a vertex name such as  $A$  may refer either to the vertex  $A$  or the angle  $A$ . Similarly,  $a$  may refer either to side  $a$  or to the length of side  $a$ . The length of segment  $\overline{AB}$  is written as  $AB$ .
4. Permutations:  $P(n,r) = {}_n P_r = \frac{n!}{(n-r)!}$  is the number of permutations of  $n$  objects taken  $r$  at a time.
5. Combinations:  $C(n,r) = {}_n C_r = \frac{n!}{r!(n-r)!}$  is the number of combinations of  $n$  objects taken  $r$  at a time.
6. Probability. If an experiment is performed, such as drawing a card from a deck, which has  $n \geq 1$  different outcomes, the set of all possible outcomes is called the **sample space**  $S$ . Any subset of  $S$  is called an **event**  $E$ . If  $S$  has  $n$  elements and  $E$  has  $m$  elements, with  $m \geq 0$  and  $n \geq 1$ , then the **probability** of event  $E$ , written  $P(E)$ , is defined to be  $\frac{m}{n}$ .
7. The letter  $i$  refers to the complex unit which has the property  $i^2 = -1$ .
8. Unless otherwise specified, the terms **prime**, **divisor**, and **factor** refer to positive integers [Note: **divisor** and **factor** are interchangeable]. A **proper divisor** of an integer is a divisor other than the integer itself.
9. If an answer is an ordered pair  $(a,b)$ , such as  $(2,5)$ , parentheses and the comma *must* be used, or else the form of  $a = 2$ ,  $b = 5$  must be used. The answer  $2,5$  would *not* be acceptable. The same holds true for an ordered triple, an ordered quadruple, etc.
10. **Lattice points** are points on a coordinated system, all of whose coordinates are integers.
11. Logarithms are expressed in base 10 unless otherwise specified. Logarithms are taken of positive numbers only.
12. The Pythagorean triples which turn up most often in mathlete questions, more or less in order of occurrence:  $(3,4,5)$ ,  $(5,12,13)$ ,  $(8,15,17)$ ,  $(7,24,25)$ ,  $(9,40,41)$ , and  $(20,21,29)$ .
13. The Pythagorean trigonometric identities are  $\sin^2 \theta + \cos^2 \theta = 1$ ,  $\tan^2 \theta + 1 = \sec^2 \theta$ , and  $1 + \cot^2 \theta = \csc^2 \theta$  for any angle  $\theta$ .