

Massachusetts Mathematics League

Some Mathematical Terms and Ideas Whose Understanding Will Be Assumed in Each Contest

- 1) If a diagram is given with a problem, it is not necessarily drawn to scale.
- 2) The word “compute” will always call for an exact answer in simplest form.
 - Fractions must be completely reduced. $\frac{9}{15} \rightarrow \frac{3}{5}$
 - All radicands are simplified, i.e. square roots are ‘square-free’, cube roots are ‘cube-free’, etc. $\sqrt{12} \rightarrow 2\sqrt{3}$
 - Where possible, denominators must be rationalized. $\frac{6}{\sqrt{3}} \rightarrow 2\sqrt{3}$
- 3) If the base of a number is not specifically indicated, it is understood to be base 10.
- 4) Divisors (or factors) of an integer refer to positive integer divisors only.
Proper divisors of an integer are divisors that are less than the integer itself.
- 5) Prime numbers will refer to positive integers with exactly two different factors.
- 6) Lattice points are points on a grid, both of whose coordinates are integers.

Advanced Stuff

- 7) The letter i will always be used for $\sqrt{-1}$.
- 8) The capital A that begins the expressions $\text{Arcsin } x$, $\text{Arccos } x$, and $\text{Arctan } x$ calls for the principal values of these inverse trigonometric functions. The ranges are as follows: $-\frac{\pi}{2} \leq \text{Arcsin } x \leq \frac{\pi}{2}$, $0 \leq \text{Arccos } x \leq \pi$, $-\frac{\pi}{2} < \text{Arctan } x < \frac{\pi}{2}$
Degrees should be used instead of radians if the problem uses degrees.
- 9) The product $n(n-1)(n-2) \cdot \dots \cdot 2 \cdot 1$ is frequently written as $n!$ (and read as n factorial).
Note: As a special case, $0! = 1$.
- 10) The symbols $\binom{n}{r}$ or ${}_n C_r$ denote a combination of n things taken r at a time, i.e. an arrangement, where order is not important. The formula is $\frac{n!}{r! \cdot (n-r)!}$.
- 11) The symbol ${}_n P_r$ denotes a permutation of n things taken r at a time, i.e. an arrangement, where order is important. The formula is $\frac{n!}{(n-r)!}$.