COMMON MATHEMATICAL NOTIONS

1. Answers should be exact and simplified. For more information on valid answer formats, see the Acceptable Answer Formats document.
2. On the proof part of the Power Round, the word *compute* only calls for an answer; no explanation or proof is needed. Unless otherwise stated, all other questions require explanation or proof.
3. If a diagram is given with a problem, it is not necessarily drawn to scale.
4. In a triangle ABC, the vertices are called A, B, and C. The sides are called a, b, and c, with side a opposite vertex A, side b opposite vertex B, and side c opposite vertex C. If a polygon is called $ABCDEF$, its vertices will occur in that order around the polygon. This convention holds for all namings of polygons.
5. Unless otherwise noted, polygons (including triangles) are simple and non-degenerate.
6. If *complex numbers* are used in a problem, i denotes $\sqrt{-1}$.
7. The *real part* and the *imaginary part* of a complex number z are denoted by $\operatorname{Re} z$ and $\operatorname{Im} z$ respectively. If $z = a + bi$ where a and b are real, then $\operatorname{Re} z = a$ and $\operatorname{Im} z = b$.
8. *Logs* are base e unless otherwise indicated. When logs are used in a different base, a subscript will be used, as in $\log_{10} 2$. Base e logs may also be written as $\ln 2$.
9. The word *prime* refers to positive numbers only. Note that 1 is not a prime.
10. *Divisors* and *factors* of an integer refer to positive numbers only. *Proper divisors* of an integer refer to divisors that are less than that integer.
11. A *lattice point* is a point such that all of its coordinates are integers.
12. If a problem refers to the *digits* of a number, those digits are underlined to distinguish the digits of a number from the product of the digits. For example, $\underline{3}\,\underline{1}\,\underline{A}\,\underline{B}$ refers to a four digit number and not the product $3 \cdot 1 \cdot A \cdot B$.
13. *Combinations* will denoted by $\binom{n}{k}$; this is the number of ways to choose k things from n things.
14. The expressions $\arcsin x$, $\sin^{-1} x$, $\arccos x$, $\cos^{-1} x$, $\arctan x$, $\tan^{-1} x$ refer to the principal values of these inverse trigonometric functions. This means that $-\frac{\pi}{2} \le \sin^{-1} x \le \frac{\pi}{2}$, $0 \le \cos^{-1} x \le \pi$, and $-\frac{\pi}{2} \le \tan^{-1} x \le \frac{\pi}{2}$.
15. If a trigonometric problem does not specify the use of degrees, all trigonometric expressions are given in radians.
16. The *floor function* (or *greatest integer function*) is denoted by $\lfloor x \rfloor$, and it is defined as $\lfloor x \rfloor = n$ when $n \le x < n+1$. Similarly, the *ceiling function* (or *least integer function*) is denoted by $\lceil x \rceil$, and it is defined as $\lceil x \rceil = n$ when $n - 1 < x \le n$.
17. The *fractional part* is denoted by $\{x\}$, and it is defined as $\{x\} = x - \lfloor x \rfloor$.
18. *Intervals* are written as a pair of numbers. Round brackets indicate that the endpoint is excluded, while square brackets indicate that the endpoint is included. For example, the interval $(2, 3]$ denotes $\{x : 2 < x \le 3\}$.
19. The *greatest lower bound* of a set is the largest number that is less than or equal to every number of the set. For example, the greatest lower bound of the intervals $(2, 3)$ and $[2, 3]$ are both 2. The *least upper bound* of a set is the largest number that is greater than or equal to every number of the set. For example, the least upper bound of intervals $(2, 3)$ and $[2, 3]$ are both 3.
20. $\max\{a_1, a_2, \ldots, a_n\}$ denotes the largest element in a set, and $\min\{a_1, a_2, \ldots, a_n\}$ denotes the smallest element in a set.