

Acton-Boxborough Math Competition Online Contest

Saturday, October 17 — Sunday, October 18, 2026

Contest Rules and Format

The 2026 October Contest consists of 15 problems worth 1 point each — each with an answer between 0 and 100,000. The contest window is

Saturday, October 17 to Sunday, October 18.

The following rules supersede any others regarding the Online Contests.

- To submit your responses, fill out a form on our website, abmathcompetitions.org. Include your email, name, school, grade (we require this information for prize purposes).
- Submissions will close at 11:30PM Eastern Standard Time, on the final day of the round.
- Computational aids such as WolframAlpha, calculators, abaci, and other related materials are prohibited. Graphing technology such as GeoGebra, Desmos, or a graphing calculator are also prohibited. Drawing aids such as rulers and protractors are permissible.
- You may only work individually on the problems—consultation with others is not permitted.
- You may take as much time as you wish during the contest window.
- Ties will be broken by the most difficult problem solved, determined by the number of correct answers to the question. If problem A is solved by a contestants, and problem B is solved by b contestants, with $a < b$, then problem A is said to be “more difficult” than B.

Awards and Prizes

- Top scoring contestants within each round will have their names posted on our website.
- Scores will be emailed to contestants within one week of the contest’s end.

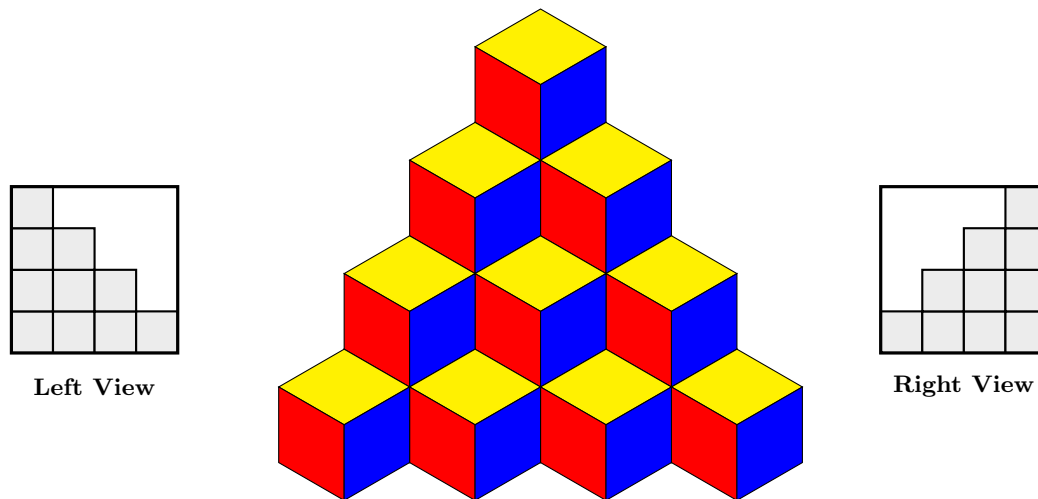
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Good Luck!

Problems

1. Compute $(2 + 0 + 2 + 5) - (2 + 0 + 2 + 6) + (2 + 0 + 2 + 7)$.
2. Bob selects two positive real numbers a and b that sum to 10. What is the largest possible value of ab ?
3. If the edge length of each cube below has a side length of 5 in, find the surface area of the 3-D structure shown below. Assume that there are exactly 20 cubes in the object and there are 10 cubes in the first layer from the bottom, 6 cubes in the second layer from the bottom, 3 cubes in the third layer from the bottom, and 1 cube in the top layer.



4. Let the operation $\text{lcm}(a, b)$ denote the least value such both a and b divide it. Determine the value of $\text{lcm}(\text{lcm}(\text{lcm}(4, 25), 6), 70)$.
5. Madeline is baking a strawberry pie. She has a cylindrical pie tin of radius 8 inches and height 2 inches. A pie crust with uniform thickness 0.5 inches coats the bottom and sides of the tin. The amount of strawberry filling Madeline will need to completely fill the remaining space in cubic inches can be written as $\frac{a}{b}\pi$, where a and b are coprime positive integers. Find $a + b$.
6. How many ways are there to arrange the word HOOGEBOB so that no two O's are next to each other?
7. Given that $x^{x^{x^{\cdots}}} = 10$, find x^{20} .
8. Haruto and Minato are playing badminton against each other. They are currently tied at a score of 9-9. The winner of the set must both achieve at least 11 points and hold a 2 point lead over their opponent. In any given round, Haruto has a $\frac{2}{3}$ chance to win. If the probability that Haruto wins the set is expressed as $\frac{a}{b}$ where a and b are relatively prime positive integers, compute $a + b$.
9. Dylan writes the prime factorization of $n!$ on a whiteboard and figures out that the exponent of 7 is 2 more than the exponent of 13. However, before he can write anything else down, Andrew runs in and erases the entire board. How many possible values of n are there?
10. An equiangular hexagon has side lengths 9, 4, 5, 6, 7, 2, in that order. The sides of the hexagon are then extended so that they intersect in 6 distinct points. The area of the hexagon formed by the 6 newly-created points can be expressed as $a\sqrt{b}$, where b is not divisible by the square root of any prime. Find $a + b$.

11. The system of equations

$$x + \frac{x}{x^2 + y^2} = \frac{12}{5} \quad \text{and} \quad y + \frac{y}{x^2 + y^2} = \frac{4}{5}$$

has two solutions for real values of x and y . One of them is (a, b) and the other is (c, d) . The product $ab + cd$ can be written as $\frac{m}{n}$, where m and n are relatively prime positive integers. Find $m + n$.

12. A 5×5 grid is filled with 0's and 1's. A filling is called *balanced* if every row and every column contains exactly two 1's. How many *balanced* fillings are possible?
13. Let a, b, c, d be the four roots of the polynomial $x^4 + 4x^3 + 6x^2 - 12x + 1 = 0$. Find the value of $\sqrt[4]{a} + \sqrt[4]{b} + \sqrt[4]{c} + \sqrt[4]{d}$.
14. Consider a triangle $\triangle ABC$ with side lengths $AB = 4$, $BC = 5$, and $AC = \sqrt{21}$. The midpoints of the three sides are drawn such that D is the midpoint of $\overline{AB}$, E is the midpoint of $\overline{BC}$, and F is the midpoint of $\overline{AC}$, and a triangle is formed using those three points as vertices. Then, we form a triangular pyramid by folding triangles $\triangle ADF$, $\triangle BDE$, $\triangle CEF$ up, leaving $\triangle DEF$ as the base. The volume of the pyramid can be expressed as $\frac{a}{b}$ in simplest form. Find $a + b$.
15. Aarush loves prime numbers! His favorite past time is making numbers prime using Anirudh's favorite algorithm defined as follows for an integer $N > 1$:
- (1) If N is prime, the process stops.
 - (2) Otherwise, N is replaced by $N - d$ where d is the largest proper divisor of N .
 - (3) Repeat (1) and (2) until a prime number is reached.

One day, he sits down and decides to test every number from 100 to 200. How many numbers are there such that Aarush only uses exactly 4 moves before the number turns prime?

For example, starting with $N = 20$, the process is $20 \rightarrow 10 \rightarrow 5$, which is 2 steps.

Note: the largest proper divisor of N is defined to be the largest divisor of N other than N itself.