

Algebra 1 Team Test Instructions

2025 James Clemens Math Tournament

1. Your team has 60 minutes to complete this exam. Four students from each grade level will participate in this round.
2. This exam consists of 15 free-response questions, each worth 10 points if answered correctly and points if answered incorrectly or left unanswered.
3. Calculators, books, and other aides are prohibited during this examination. Scratch paper will be provided for calculations. Diagrams are not necessarily drawn to scale.
4. Mark your answers to the questions in the provided team answer sheet. You may use the test booklets for scratch work, but only answers marked in the team answer sheet will be counted. If you require additional scratch paper, simply raise your hand and a volunteer will assist you.
5. All answers for the team test will be an positive integer from 1 to 999.
6. A team's final score will be calculated by adding each school's top 4 written test scores per grade (excluding tie breaking questions) as well as the team round score, for a maximum of 550 points.
7. In the event of a tie, the team with the highest team round score will be favored. If team round scores result in another tie, answers will be evaluated starting backwards from question 15 to 1 to determine a winner.
8. Although this math tournament is intended to demonstrate your knowledge and skills in math, it is also a great opportunity for you to interact with your fellow peers, so be sure to enjoy yourself and have fun!
9. This test will be taken in teams of 4, with unofficial teams being able to compete (i.e., groups can take it for fun).

1. How many 4 digit numbers exist where the second digit is twice the fourth digit and the third digit is 3 greater than the first digit?

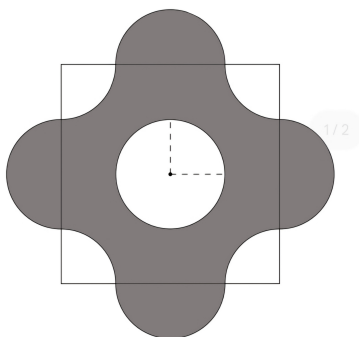
2. The year 2025 can be written as a product of primes. What is the sum of the exponents of those primes? (ex. $10 = (5^1) \times (2^1)$ - add $1 + 1$).

3. There are 6 different fruits, apple, orange, pear, mango, plum and peach. How many ways can the fruits be arranged so that no fruit starting with the letter p is adjacent (on either side) to another fruit starting with p?

4. If there are 56 ways that bob can select 3 books out of n books, how many books (n) are there in total? ($n > 3$)

5. There exists a loaded 6 sided dice where side 1 has a 1 in n chance of rolling, side 2 has a 2 in n chance of rolling ... side 6 has a 6 in n chance of rolling. What is n^2 ?

6. The box shown below has a side length of 4. The center of the box is the center of a unit circle O . Semicircles of radius 1 are on each side of the square. The corners of the square are quarter circles. What is the area of the shaded region?



7. Find the product of the solutions of the following system of equations.

$$-5x - 2y + z = -2,$$

$$4x + 8y + z = -10,$$

$$6x - 3y - z = -5$$

8. What is the sum of the two largest prime factors of $(3^3)^3 - 1$?
9. What is the measure of the exterior angles of a regular nonagon?
10. The mean of a set of integers a, b, c is 15 and their median is 5. What is the largest possible value of c ? ($a < b < c$ and $a, b, c > 0$)

11. A quadratic function is given in the form $f(x) = ax^2 + bx + c$. Let there be a quadratic function $g(x) = ax^2 - bx + 4$. If for $g(x)$, $c = 4$, the sum of the roots of $g(x)$ is 2, and the product of their roots is 4, what is $b + c$?

12. The GCF of two numbers a and b is 16, and their LCM is 24. What is $a \times b$?

13. A car departs from a city at $t = 0$ going 60 miles per hour (60 miles covered at $t = 1$) and a truck departs from the same city at s miles per hour at $t = 1$. If the car and the truck are at the same position at $t = 5$, what is s ?

14. A square is inscribed in a circle such that each corner of the square touches the outer rim of a circle. If the height of the square is 7, the diameter of the circle can be written as $a\sqrt{b}$. What is a ?

15. There are 9 marbles: marbles 1 – 3 are red; 4 – 6 are blue, and 7 – 9 are yellow. The marbles are identical except for color. If four marbles are drawn consecutively from a bag without replacement, there are n ways to draw 4 marbles such that each one is a different color from the previously drawn marble (cannot draw the same color consecutively). What is the sum of all of the distinct prime factors of n ?