

Central Jersey Mathematics League Contest

[Problems]

October 15, 2025

Name: _____

Score: _____

School:

__ Bridgewater-Raritan HS

__ Colonia HS

__ East Brunswick HS

__ Edison Academy Magnet HS

__ Edison HS

__ Highland Park HS

__ Hillsborough HS

__ J.F. Kennedy HS

__ Metuchen HS

__ Middlesex HS

__ Monroe Twp. HS

__ Montgomery HS

__ South Plainfield HS

__ Union County AIT

__ Union County AAHS / APA

__ Union County Magnet HS

__ Union County Vo-Tech HS

__ Other

Directions:

Put all significant work related to the solution of the problem in the space provided, and place the final answer on the indicated line.

Note: Depending on the wording of the problem, answers may be required in specific format.

Always leave answers in simplest form: specifically, in your answer the following are required:

1. Fractions will be reduced ($\frac{4}{8}$ is not acceptable)
2. Denominators will be rationalized ($\frac{1}{\sqrt{3}}$ is not acceptable)
3. Radicals will be simplified ($\sqrt{18}$ is not acceptable)
4. Like terms will be combined ($2x + 3x$ is not acceptable)
5. Trigonometric functions of special right angles will be evaluated ($\sin \frac{\pi}{2}$ is not acceptable)
6. Log expressions with a rational result will be simplified ($\ln e$ is not acceptable)

Decimal answers must be exact. Never approximate π or radicals.

Although the problems vary in difficulty, in scoring, each problem has an equal value of one point and no partial credit is given.

1. In the coordinate plane, $A = (1, -2)$ and $B = (6, 10)$. Find the point P on the segment AB which is twice as far from A as it is from B . Express your answer as an ordered pair.

Answer: _____

2. The President of Dollarstan is weighing two income tax plans. In the first plan, all residents would pay tax 10% of their yearly income. According to the second plan, residents would pay tax 16% of any yearly income over \$150,000. The President noticed that his own tax under either plan is the same. What is the yearly income of the President of Dollarstan?

Answer: _____

3. In a given sequence, $a_1 = 2$, $a_2 = 3$, and the rule is: $a_{n+2} = a_{n+1} / a_n$ where $n = 1, 2, 3, \dots$. Find a_{2025} .

Answer: _____

4. Two freight trains, each $1/6$ miles long and traveling 60 miles per hour, meet and pass each other. How many seconds is it from the moment when the locomotives pass each other to the moment when the rear cars (the cabooses) pass each other?

Answer: _____

5. A square is drawn on each side of a triangle (each side of the triangle is a side of one of the squares). None of the four shapes overlap. The ratio of the areas of the squares is $1 : 2 : 3$. What is the degree measure of the largest angle of the triangle?

Answer: _____

6. It is known that in some math class, Al, Sam, and Mike are the same height. The average height of all students in the class except for Al is 63.1 inches. The average height of all students in the class except for both Al and Sam is 62 inches. The average height of all students in the class except for all three of them (Al, Sam, and Mike) is 60.625 inches. How many students are in this class?

Answer: _____

7. Find the positive square root of the sum of the cubes of the first 15 natural numbers.

Answer: _____

8. Find the real numbers a and b such that any pair (x, y) satisfying the equation $x/y = a$, satisfies the equation $(x + y)^2 = b$. Present your answer as an ordered pair (a, b) .

Answer: _____

9. In triangle ABC , $m\angle B = 80^\circ$. Point D is located on segment BC , and segment $AB \cong$ segment $AD \cong$ segment CD . Point F is located on segment AB , and segment $AF \cong$ segment BD . Point E is located on segment AC , and segment $AB \cong$ segment AE . Find $m\angle AEF$.

Answer: _____

10. Find all possible values of a such that $x^2 + 2x + a \leq 0$ and $x^2 - 4x - 6a \leq 0$ has one real solution.

Answer: _____