

FAIRFIELD COUNTY MATH LEAGUE 2025–2026

Match 2

Individual Section

Please write your answers on the answer sheet provided.

Round 1: Factors and Multiples

- 1-1 Consider all positive integers from 1 to 100 inclusive that have an odd number of factors (including themselves). Set A contains all of the distinct factors of these numbers with nothing repeated. Find the number of elements in set A .
- 1-2 If n is an integer such that $\text{lcm}(n, 2025) = 20250$ and $\text{lcm}(n, 360) = 9000$, find the sum of all possible values of n .
- 1-3 A positive integer n has exactly 2025 factors, including four distinct prime factors, and ends in four zeros. The number $\frac{n}{10!}$ is an odd integer that is divisible by 21 but not 245. Find the largest possible integer value of k such that 3^k is a factor of n .

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Round 2: Polynomials and Factoring

2-1 Given that -13 is a zero of the polynomial $g(x) = x^3 + 3x^2 - 106x + 312$, find the product of the remaining zeros.

2-2 Assume $h(x) = 2x^2 + 5x - 42$ and $j(x) = x^2 + bx - 1219$, with $j(x)$ having integer zeros. If a and b are integers such that $h(a) = 0$ and b is the largest positive value it can be, find $a + b$.

2-3 If $f(x) = x^4 + ax^2 + 2025$, where a is a nonzero constant, is a polynomial with four integer zeros, find the sum of all possible values of $f(1)$.

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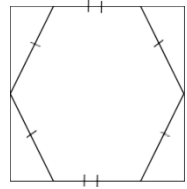
Individual Section

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Round 3: Area and Perimeter

- 3-1 A rhombus has diagonals in a ratio of 15: 8 and an area of 240 square units. What is the perimeter of the rhombus?

- 3-2 An equiangular hexagon is inscribed in a square as shown in the diagram. If the perimeter of the square is 300 units, then the perimeter of the hexagon is $a + b\sqrt{c}$ where a , b , and c are positive integers and c has no perfect square factors greater than 1. Find $a + b + c$.



- 3-3 A semicircle with radius 10 is inscribed in a trapezoid such that the shorter base of the trapezoid is the diameter of the semicircle and the longer base is tangent to the semicircle. If the semicircle takes up exactly half of the area of the trapezoid, then the longer base is k units longer than the shorter base. Find the value of k rounded to the nearest integer.

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Round 4: Absolute Value & Inequalities

4-1 Find the sum of all integer solutions to $|3x - 5| < 10$.

4-2 The equations $y - 3x = 11$ and $|x + 2| + |y - 5| = 4$ intersect at (a, b) and (c, d) . What is the value of $|abcd|$?

4-3 Given the function $f(x) = |x^2 + 6x - 4|$, there is a set of three and only three values a, b , and c such that $f(a) = f(b) = f(c)$. Find the product abc .

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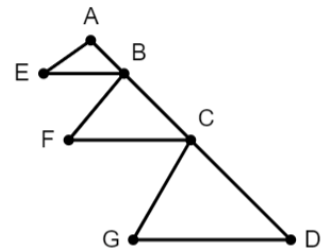
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Round 5: Law of Sines and Cosines

- 5-1 Consider the acute triangle XYZ with an area of 14. If $XY = 7$ and $XZ = 5$, find the value of $(YZ)^2$.

- 5-2 Consider triangle ABC with point D on $\overline{AC}$. If $AB = 8$, $DC = 3$, the area of triangle ABD is 21, and the area of triangle ABC is 30, find AD .

- 5-3 See the diagram (not drawn to scale). Points B and C lie on line $\overline{AD}$ such that $AB = 2$, $BC = 3$, and $CD = 4$. $\overline{EB} \parallel \overline{FC} \parallel \overline{GD}$, and $AE = 1$, $BF = 2$, and $CG = 3$. If $\sin(D) + \sin(E) + \sin(F) + \sin(G) = 1$, then $\sin(E) = \frac{a}{b}$ where a and b are positive integers with no perfect square factors greater than 1. Find $a + b$.



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Round 6: Equations of Lines

6-1 The points $(-2, s)$ and $(-8, t)$ are on a line perpendicular to $y = \frac{2}{5}x + 2$. What is the value of $t - s$?

6-2 A triangle is formed by the three lines $y = 1$, $x = -3$, and $y = -1 + \frac{\sqrt{2}}{6}x$. The area of the triangle is $a + \frac{b\sqrt{c}}{d}$, where a, b, c , and d are positive integers, b and d have no common factors greater than 1, and c has no perfect square factors greater than 1. Find $a + b + c + d$.

6-3 A particular line can be defined parametrically such that there exist integer constants a and b where $x = abt + b$ and $y = at - \frac{1}{b}$. If the line intersects the line $y = x$ when $x = -\frac{13}{12}$, find the value of b .

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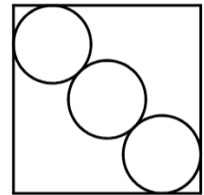
Team Round

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T-1 There are 10 different positive numbers who have 16 total factors, including 1 and themselves, and whose distinct prime factors add to 21. The least common multiple of these 10 numbers has 4^k total factors for some integer k . Find the value of k .

T-2 Mike and Andrew were playing a rousing game of “Guess My Polynomial”. Andrew tells Mike, “My polynomial is a cubic with a leading coefficient of 1, a constant of -18, and three integer zeros.” Mike says, “I need more information than that.” Andrew replies, “Okay, the quadratic coefficient is my favorite number, which I told you last week.” Mike says, “That’s still not enough information.” Andrew answers, “Fine, three of the coefficients are positive.” “Ah,” Mike says. “Now I know it.” What is the value of the largest positive coefficient of Andrew’s cubic?

T-3 See the diagram. Three congruent circles are arranged in a square such that one circle’s center is in the center of the square and the other two circles are tangent to the sides of the square as well as tangent to the center circle. If one circle has an area of 2025π , then the area of the square is $a + b\sqrt{c}$ where a, b , and c are positive integers and c has no perfect square factors greater than 1. Find $a + b + c$.



T-4 Consider the sequence of functions $f_1(x), f_2(x), \dots, f_{2025}(x)$, where $f_1(x) = |x|$ and for all $n > 1$, $f_n(x) = |f_{n-1}(x) - n|$. Find the sum $f_1(0) + f_2(0) + f_3(0) + \dots + f_{2025}(0)$.

T-5 Right triangle ABC has area 120 and a hypotenuse length $BC = 29$. Triangle DEF has $AB = DE$, $AC = DF$, $EF = 21$, and area k . Find the value of k^2 .

T-6 The coefficients A, B , and C of a linear equation $Ax + By = C$ are chosen independently and randomly from a list of 100 consecutive integers that includes 0. The probability that the resulting line has a positive slope and a negative y -intercept has a maximum value that can be expressed as $\frac{k}{20,000}$. Find the value of k .