

FAIRFIELD COUNTY MATH LEAGUE (FCML) 2012-2013

Match 3 Round 1
Arithmetic: Scientific
Notation and Bases

1.) _____

2.) _____

3.) _____

1.) Find all possible values of the digit d such that $dd1_5$ is prime.

2.) Express the following in Scientific Notation:

$$\frac{(2 \times 10^3)^2 (3 \times 10^7)}{(4 \times 10^{-5})^2}$$

3.) Multiply the number 1212_3 by the number 1212_4 and express your answer as a number in base 6.

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Match 3 Round 2
Algebra: Word Problems

1.) _____

2.) _____

3.) _____

1.) Train A leaves Norwalk at 9:00 AM and travels due east at 40 mph. Train B leaves Greenwich, which is 10 miles west of Norwalk, at 9:10 AM and travels due west at 60 mph. At what time will the two trains be 60 miles apart?

2.) Nancy has nickels, dimes, and quarters in her change purse. The total value of the money is \$10. The value of the nickels and dimes combined is equal to the value of the quarters. Nancy has twice as many dimes as she has nickels. How many coins does Nancy have?

3.) Working together, Harry, Ron, and Hermione can clean Hagrid's stables in 1 hour. If Harry worked by himself, it would take 1.5 times as long as it would take Hermione to do the job by herself. If Ron worked by himself, it would take 3 hours longer than it would take Harry to do the job by himself. How many hours would Hermione need to clean Hagrid's stables by herself?

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Match 3 Round 3
Geometry: Polygons

1.) _____

2.) _____

3.) _____

1.) The total number of sides and diagonals of a convex polygon is 55. How many sides does the polygon have?

2.) A regular hexagon has apothem 6 cm. Find the positive numerical difference between its area in cm^2 and its perimeter in cm.

3.) For two regular convex polygons, if you add a single interior angle from one to a single interior angle from the other, you get 306 degrees. For how many different combinations of polygons is this true?

FAIRFIELD COUNTY MATH LEAGUE (FCML) 2012-2013

Match 3 Round 4
Algebra 2: Functions and
Inverses

1.) _____

2.) _____

3.) _____

1.) If $f(x) = 2x - 3$ and $h(x) = f(f(f(f(f(x))))$, find $h^{-1}(x)$. Give your answer in terms of x .

2.) $k(x) = g(h(x))$. $g(x) = \frac{1}{x^2 - 1}$ and $h(x) = \frac{1}{x}$. Give the range of $k(x)$.

3.) $f(2x) = x^2 - 2x - 4$. Give the domain of the relation $f^{-1}(x)$.

FAIRFIELD COUNTY MATH LEAGUE (FCML) 2012-2013

Match 3 Round 5
Advanced Math:
Exponents and Logarithms

1.) _____

2.) _____

3.) _____

1.) If $\log_9 a = x$, and $\log_{27} b = y$, what is the product of a and b if $2x+3y=6$? (Give a simplified decimal number.)

2.) Solve for x : $\log_4 (9x^2 - 73) - \log_4 (3x-7) = 1$

3.) If $\log_y (b^3) = 1$, what is $\log_{b^2} (y) + \log_b (y)$?

FAIRFIELD COUNTY MATH LEAGUE (FCML) 2012-2013

Match 3 Round 6
Discrete Math: Matrices

1.) _____

2.) _____

3.) _____

1 point: Give the values of x , y , and z that make the following true:

The inverse of $\begin{bmatrix} 6 & x \\ 2 & 14 \end{bmatrix}$ is $\begin{bmatrix} 7 & y \\ -1 & z \end{bmatrix}$

2 points: If A is the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and B is the matrix $\begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix}$

give the determinant of the matrix represented by $AB^{-1} + BA^{-1}$.

3 points: Find all possible values of x such that the matrix

$\begin{bmatrix} 1 & 2 & x \\ 4 & 5 & 6 \\ 7 & 8 & x^2 \end{bmatrix}$ does not have an inverse.

FAIRFIELD COUNTY MATH LEAGUE (FCML) 2012-2013
Match 3 Team Round

- 1.) _____ 4.) _____
2.) _____ 5.) _____
3.) _____ 6.) _____

1.) Express the number $\frac{(6 \cdot 10^8)(7 \cdot 10^3)}{(2 \cdot 10^3)^3(3 \cdot 10^2)}$
as a number in base 2. Your answer will have a "binary
point" instead of a "decimal point".

2.) Rufus walked into the bank with a check to cash, and the teller mistakenly gave him exactly the same number of cents as there were dollars marked on the check, and exactly half the number of dollars as there were cents marked on the check. When Rufus got home and checked his money, he found that the value of his money was exactly half of what it should have been. Assuming the number of dollars and number of cents are both two-digit numbers, what was the original amount of the check?

3.) Solve for all possible values of x :
 $\log_2(x-4) + \log_{\sqrt{2}}(x^3-2) + \log_{0.5}(x-4) = 14$

4.) Find all values of x such that the determinant of $\begin{vmatrix} 1 & 1 & 1 \\ 2 & \log_4(x) & 1 \\ 1 & 2 & \log_4(x) \end{vmatrix}$
is equal to 1.

5.) $f(x)$ has form $f(x) = ab^x + c$. The graph of $2 \cdot f(x-1) + 3$ passes through the points (1,3), (2, 7) and (3, 19). Find $f^{-1}(80)$.

6.) A regular hexagon is created by connecting the alternating vertices of a dodecagon. If the area of the hexagon is $\frac{27\sqrt{3}}{2}$ cm². Find the total area inside the dodecagon but outside the hexagon.