

FAIRFIELD COUNTY MATH LEAGUE 2017-2018

Match 3 Round 1 Arithmetic: Scientific Notation and Bases

1.) $A = \underline{\hspace{2cm}}$ $B = \underline{\hspace{2cm}}$

2.) $\underline{\hspace{4cm}}$

3.) $\underline{\hspace{4cm}}$

1.) $\underline{\hspace{1cm}} ABB_5$ is one less than one half of ABB_8 . Find A and B.

2.) Mr. Matte from Greens Farms was on the TV show "Superhuman" last summer and solved a problem by converting a sequence of ice cream flavors to base 3 numbers and then converting ten base 3 numbers into letters using the chart below. If the ten base 3 numbers were in this order:

$102_3, 001_3, 210_3, 221_3, 100_3, 102_3, 012_3, 001_3, 202_3, 100_3$ write the 10 letter pattern that he needed to remember.

1=A, 2=B, 3=C, 4=D, 5=E, 6=F, 7=G, 8=H, 9=I, 10=J, 11=K, 12=L, 13=M
14=N, 15=O, 16=P, 17=Q, 18=R, 19=S, 20=T, 21=U, 22=V, 23=W, 24=X,
25=Y, 26=Z.

3.) Find all integers n such that $\frac{(3 \cdot 10^n)^{2n} (5 \cdot 10^n)^3}{(1.5 \cdot 10^n)^n (5 \cdot 10^n)^{n+2}}$ is between 0.000001 and 1000000.

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Match 3 Round 2
Algebra: Word Problems

1.) _____

2.) $M =$ _____ ml $N =$ _____ ml

3.) _____ mph

1.) The smallest of a set of N consecutive integers is -32 and the sum of the integers is 67 . How many integers are in the set?

2.) You have M milliliters of a solution of water and acid that is 30% acid. If you add N milliliters of pure acid, you get a solution that is 50% acid. If you then add 21 milliliters of pure acid, you get a solution that is 75% acid. Find M and N .

3) A person in a paddleboat travels along a river and on a lake. On the river, she paddles 2 miles with a current of 1.5 mph in the same direction as she is traveling. On the lake she paddles 0.5 miles with no current. The total time for the trip is one hour. If she paddles at a constant speed, what is her paddling speed in mph?

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Match 3 Round 3
Geometry: Polygons

1.) _____

2.) _____

3.) _____

1.) The measure of one interior angle of a regular polygon is 175 degrees. How many sides does the polygon have?

2) The number of sides plus the number of diagonals of a regular polygon add up to 120. Find the number of diagonals of the polygon.

3) Two regular polygons of sides M and N respectively where $M \neq N$ are such that their exterior angles are both whole numbers of degrees and the exterior angles add up to 60 degrees. Give all possible values of $M+N$.

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Match 3 Round 4
Algebra 2: Functions and
Inverses

1.) _____

Note: The inverse of a function
is not necessarily itself
a function.

2.) _____

3.) Domain: _____ Range: _____

1.) If $f(x) = 3x + 2$ and $g(x) = 4x - 5$, find $f(g(f(x)))$.

2.) What is the range of $k(x) = \frac{2x^2 - 6x + 4}{x^2 - 5x + 4}$?

3. Let $h(x) = \sqrt{x - 4} + 3$, and let $g(x) = -h(-3x)$ Find the domain and range of g^{-1} .

If you choose to use inequalities instead of interval notation, use x for the domain and y for the range.

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Match 3 Round 5
Advanced Math:
Exponents and Logarithms

1.) _____

2.) _____

3.) _____

1.) If $b^x = y$, what is $\log_{b^2}(y)$ in terms of x ?

2.) Solve for all possible values of x :

$$(\log_3(x))^2 = \log_3(x^2) + 8$$

3.)_ If $z = \log_2(y)$, solve for all possible values of y :

$$\frac{64^{z-1}}{(0.125)^{z^2-4}} = 512^{2z+5}.$$

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Match 3 Round 6
Discrete Math: Matrices

1.) _____

2) _____

3.) $\left[\begin{array}{c} \\ \\ \end{array} \right]$ _____

1. $C = \begin{bmatrix} 2 & 4 \\ -3 & 1 \\ 0 & 5 \end{bmatrix}$ and $D = \begin{bmatrix} 3 & -1 \\ -4 & 0 \\ 2 & 5 \end{bmatrix}$.

Give the sum of the six entries of $3C - 2D$.

2) Find all values of k such that

$$\begin{vmatrix} k-1 & k+2 & 1 \\ 2 & k-4 & 1 \\ 3 & 2 & -1 \end{vmatrix} = 30$$

3.) If $A = \begin{bmatrix} 4 & 3 \\ -2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 \\ 3 & -4 \end{bmatrix}$, find $(AB)^{-1}$

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Note: The inverse of a function or relation is not necessarily a function.

1.) In the base 16 (hexadecimal) system, A=10, B=11, C=12, D=13, E=14 and F=15.

Express the base 10 number $\frac{(2 * 10^4)^7 (8 * 10^7) (3 * 10^2)^9 (5 * 10^3)}{(9 * 10^4)^4 (4 * 10^4)^9}$ as a

hexadecimal number.

2.) Donald, Eric, and Ivanka work together to mow the lawn. The time it takes Donald to mow the lawn by himself is 3 times the amount of time it takes Eric to mow the lawn by himself. The time it takes Ivanka to mow the lawn by herself is 45 minutes more than the time it takes Eric to mow the lawn by himself. If all three work together, the lawn is done in 45 minutes. How long would it take to mow the lawn if only Eric and Ivanka work together?

3.) The number of diagonals of a regular N-gon is the product of two distinct primes, p_1 and p_2 , where $p_1 \neq p_2$. Find all such values of N where $N \leq 30$ and N is odd.

4.) If $f(x) = 2^x$ and $g(x) = \log_4(x - 2)$, what is the domain and range of the inverse of $y = f(g(x))$? If you use inequalities instead of interval notation, use x for the domain and y for the range.

5.) If $ABCBA = \begin{bmatrix} -25 & 200 \\ 75 & 200 \end{bmatrix}$, $A = \begin{bmatrix} 1 & -2 \\ 3 & 4 \end{bmatrix}$, and $B = \begin{bmatrix} 4 & -3 \\ 2 & 1 \end{bmatrix}$,

find matrix C.

6.) Solve for x: $\log_5(x - 7) - \log_{25}(5x^2 - 95) = -1$