

Math Club Worksheet: COMC Preparation #7)

Warmup: A positive integer “m” has the property that when multiplied by 12, the result is a four-digit number “n” of the form 20A2 for some digit “A”. What is the 4 digit number “n”?

Warm up#2) 5X's and 4 O's are arranged in a 3by3 grid below such that each number is covered by either an “X” or an “O”. There are a total of 126 different ways that the X's and O's can be replaced. Of these 126 ways, how many of them contain a line of 3O's and no line of 3X's?

A line of 3 in a row can be horizontal line, a vertical line, or one of the diagonal lines 1-5-9 or 7-5-3.

1	2	3
4	5	6
7	8	9

Question #1) Find the positive values of "x" that satisfy $x^{(2\sin x - \cos 2x)} < \frac{1}{x}$ (COMC POW)

Question #2)

$$\text{Let } S = \sqrt{9 - \sqrt{\frac{13}{9} + \sqrt{\frac{13}{81} - \sqrt{\frac{13}{6561} + \sqrt{\frac{13}{43046721} - \dots}}}}}$$

If $S = \sqrt{\frac{a}{b}}$ where a, b are both primes, find $a + b$.

Question #4) Given the function $f(x)$ below, we know that $f\left(\frac{\pi}{3}\right) = \frac{A\sqrt{B}}{C}$, Where "A", "C" are co prime integers {meaning they are mutually prime} and "B" is square free [Not a perfect square]. Find the value of $A + B + C$ [Brilliant Level 4]

$$f(x) = \sin(x) + \frac{1}{3}\sin(3x) + \frac{1}{3^2}\sin(5x) + \dots$$