Alpha Ciphering

MAΘ National Convention 2014

What is the period of the function

$f\ x\ = \cos^4 x - \sin^4 x?$

Question #1
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ΜΑΘ National Convention 2014

$$\begin{vmatrix} 3 & 4 & -2 & 1 \\ 5 & 1 & 0 & -1 \\ 0 & -3 & 2 & 3 \\ 4 & -1 & 0 & -5 \end{vmatrix}$$

Question #2
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The sum of the first two terms of a geometric series is 90. The sum of the sixth and seventh terms is $\dfrac{-10}{27}$. Find the sum of the first seven terms.

Question #3
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If $x - y = 12$ and $\sqrt{x} + \sqrt{y} = 8$

What does "x"=?

Question #4
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Three dice are thrown. What is the probability that two or more of the dice show the same number?

Question #5

The distance between the centers of two circles, with radii 5 and 6 is 16. How long is the common internal tangent segment?

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Question #6
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Find the number of integers between 221 and 695
which are divisible by 4 or 7?

Question #7
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$\dfrac{\sqrt{18+2\sqrt{79}}}{\sqrt{20+2\sqrt{84}}} = \dfrac{\sqrt{J}+\sqrt{O}-\sqrt{Y}-7\sqrt{2}}{-8}$. What does

$J + O + Y =$?

Question #7
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Question #8
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Find the equation of the tangent line that intersects the circle: $x^2 + y^2 - 12x + 8y + 7 = 0$ at the point (3,2). The answer must be in the form Ax + By = C, where A>0 and A, B, and C are relatively prime.

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Evaluate : $\sin\left(Cos^{-1}\dfrac{-\sqrt{5}}{5}+Tan^{-1}\dfrac{-1}{3}\right)$

Question #10
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$$\tan \frac{17\pi}{12} = ?$$