Mu Alpha Theta February Regional
Algebra 2 Team Question 1

$A = |3+i|$

$B = |4+3i|$

$C = |2+i|$

$D = |1-i|$

Find $\frac{A^B}{CD}$

Mu Alpha Theta February Regional
Algebra 2 Team Question 2

Let $x = 1\cdot 2 + 2\cdot 3 + 3\cdot 4 + \ldots + 99\cdot 100$. Find the sum of the digits of x.

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Algebra 2 Team Question 3

What's the first time (to the nearest whole minute), after midnight, that the hands of a clock form an obtuse angle? (am/pm not necessary)

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Algebra 2 Team Question 4

M = the number of odd functions listed below
N = the number of even functions listed below

$d(j) = \sin(j)$ $\quad e(j) = 1$ $\quad f(j) = |j+1|$ $\quad g(j) = j^3$ $\quad [h(j)]^2 = j$

Find $|M-N|$.

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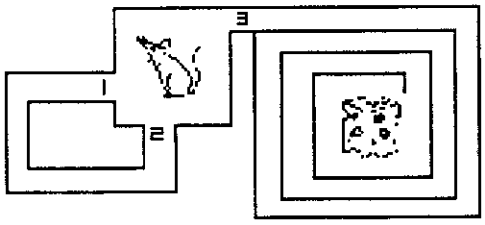
Algebra 2 Team Question 5

A mouse is placed in the center of a maze. The mouse can choose only paths 1,2, or 3. Paths 1 and 2 are connected and thus are the same path, while path 3 leads to the cheese, as illustrated below. It always takes 5 minutes to tour through path 1 (or 2), bringing the mouse back to the center of the maze, while it always takes the mouse 10 minutes to find the cheese after choosing path 3. The mouse chooses path 1 with probability .4 and path 2 with probability .4, and never stops in between navigating paths. Also, the mouse begins by immediately choosing one of the three paths. On average, how long (in minutes) does it take for the mouse to find the cheese?



Mu Alpha Theta February Regional
Algebra 2 Team Question 6

Solve for x^3 if $\log_2(3x) - \log_9(243) = \log_{81}(9) - \log_4(5x)$

Mu Alpha Theta February Regional
Algebra 2 Team Question 7

A = the units digit of 7^{2002}

B = the units digit of 8^{2002}

C = the units digit of 9^{2002}

D = the units digit of 10^{2002}

Find $A+B+C+D$.

Mu Alpha Theta February Regional
Algebra 2 Team Question 8

Suppose you have a square. Inside the square a circle is inscribed. Inside this circle a square is inscribed. Inside this 2nd square a 2nd circle is inscribed. If this process continues indefinitely, find the combined area of all regions inside the squares but outside their respective inscribed circles. (Express to the nearest percentage of the largest square)

Mu Alpha Theta February Regional
Algebra 2 Team Question 9

After rolling two fair 7-sided dice (each with faces numbered 1-7), let E be the event that the product of the faces shown is a perfect number. If $P(E)$ is expressed as $\frac{V}{W}$, where V and W are relatively prime, find W – V.

Mu Alpha Theta February Regional
Algebra 2 Team Question 10

Let the n^{th} row of Pascal's triangle be defined as having n elements. If the sum of the elements in the k^{th} row and the $(k+7)^{th}$ row is 528,384, find the 2nd element (from the end of the row) of the $(k-4)^{th}$ row.

Mu Alpha Theta February Regional
Algebra 2 Team Question 11

$w(x) = 2x^2 - 4x + 6$

A = sum of the roots of $w(x)$

B = product of the roots of $w(x)$

C = sum of the reciprocals of the roots of $w(x)$

D = sum of the squares of the roots of $w(x)$

Find $\frac{BCD}{A}$.

Mu Alpha Theta February Regional
Algebra 2 Team Question 12

A = maximum number of distinct handshakes between 2002 math competitors

B = maximum number of distinct seatings of 2002 math competitors around a circular table

C = maximum number of distinct ways 2002 objects can be placed on a giant keyring

Find $\frac{AB}{2001 \cdot C}$ to the nearest thousandth.

Mu Alpha Theta February Regional
Algebra 2 Team Question 13

If $2x \cdot c(x) - 3 \cdot c\left(x - \frac{1}{3}\right) = x^2$ and $c(x)$ crosses the x-axis at $x = 2$, find the positive difference between the numerator and the denominator of $-c(1)$ when it is expressed in lowest terms.

Mu Alpha Theta February Regional
Algebra 2 Team Question 14

Find $\log_3\left[\sum_{i=0}^{5}\left(\left(\sum_{j=0}^{5} ij\right)+3\right)\right]$.

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Algebra 2 Team Question 15

Let $p = (2x + y - 3z)^7$.

After p is expanded and like terms are combined,

R = number of terms in p

Q = coefficient of $x^3 y z^5$ in p.

Find $\frac{Q}{R}$.