#0 Theta Bowl
MAΘ National Convention 2016

Let **A** equal the sum of the integers that satisfy the open sentence: $x-5<7-2x\leq 3$

Let **B** equal the value of "n" so that the line through the points (-2, 3) and (6, n) has y-intercept 4.

Let **C** equal the greatest integer solution of the open sentence:
$7\leq 5-2x \text{ or } 1\geq 9+4x$

Let **D** equal the number of subsets the set $\{w,x,y,z\}$ has:

A + B + C + D =?

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#1 Theta Bowl
MAΘ National Convention 2016

The set of points equal distance from the points (-3, 4) and (5,-2) can be represented as a line in the Standard form **A**x + **B**y = **C**, where **A**, **B**, and **C** are relatively prime integers and A>0.

Find the value of "**L**" if the line through (7, 2**L**-5) and (3,-2) is parallel to the line through (-6, **L**+4) and (-9,5).

Points A (3,-4) and B (x, 8) are located in plane M. Let **U =** the sum of all the values of "**x**" such that the distance between points A and B is 13 units.

A+B+C+L+U =?

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A+B+C+L+U =?

#2 Theta Bowl
MAΘ National Convention 2016

The parabola whose vertex is (-3, 2) and whose focus is (-3, 7) has a directrix of y=**Z**

Let **L =** the product of the slopes of the asymptotes of the following conic: $y^2 = 4x^2 + 16$

Let **U =** the sum of the y-coordinates of the foci of the following conic:
$25x^2 + 9y^2 - 200x + 18y + 184 = 0$?

Z+L+U =?

#2 Theta Bowl
MAΘ National Convention 2016

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$25x^2 + 9y^2 - 200x + 18y + 184 = 0$?

Z+L+U =?

#3 Theta Bowl
MAΘ National Convention 2016

Let **A =** the smallest integral value of "n" for which the given equation will have exactly two imaginary (conjugate) roots. $(2\text{n-}1)\text{x}^2 - 8x + 1 = 0$

Let **B =** the sum of the imaginary solutions to: $x^3 = 8$

If $(a+bi)^2 = 7 - 24i$, let **C =** the absolute value of a +bi

$Z(1+2i) = 13 + i$, if Z =x+yi, then **D=** x+y

A+B+C+D =?

#3 Theta Bowl
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A+B+C+D =?

#4 Theta Bowl
MAΘ National Convention 2016

An isosceles triangle has a perimeter of 50. The sum of the length of the base (the side not congruent to either of the other two, and the height to the base is 31. Let **M =** the sum of all the possible values for the height to the base of this triangle

A regular octagon is formed by cutting an isosceles right triangle from each of the corners of a square with sides of length 10. Let **U =** the length of each side of the octagon

M+U =?

#4 Theta Bowl
MAΘ National Convention 2016

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M+U =?

#5 Theta Bowl
MAΘ National Convention 2016

Mu-Lu rolls two fair dice. One is an octahedral die numbered 1 through 8 and the other is a standard six-sided die. Let **M =** the probability that the product of the numbers showing on the dice is a multiple of 3

Two numbers are selected at random from the interval $\left[-20,10\right]$. Let **U =** the probability that the product of those numbers is greater than zero

M+U =?

#5 Theta Bowl
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M+U =?

#6 Theta Bowl
MAΘ National Convention 2016

A = $\dfrac{\left(5^{2016}\right)^2-\left(5^{2014}\right)^2}{\left(5^{2015}\right)^2-\left(5^{2013}\right)^2}$

B = $i^0+i^1+i^2+i^3+\ldots i^{2016}$

$\sqrt{2012\bullet 2014\bullet 2018\bullet 2020+36}=C^2$ **-D,** where **C>0** and 0<**D<**100

A+B+C+D =?

#6 Theta Bowl
MAΘ National Convention 2016

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A+B+C+D =?

#7 Theta Bowl
MAΘ National Convention 2016

Let point L be (2,7) and point U be (-6,-3). Find the point on the segment connecting L and U such that the distance from the point U is 4 times the distance from the point L. Let **A** = the product of the x and y coordinate of this point.

Theta students have 4 topic options in round 3. One-third of the theta students take topic 1, one-fourth take topic 2, one-fifth take topic 3, and 52 students take topic 4. Let **O=** the number of theta students.

In the sequence 2013, 2014, 2015..., each term after the third is found by subtracting the previous term from the sum of the two terms that precede that term. For example, the fourth term is 2013 + 2014 - 2015 = 2012. Let **M =** the 2016th term in the sequence.

M+A+O =?

#7 Theta Bowl
MAΘ National Convention 2016

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M+A+O =?

#8 Theta Bowl
MAΘ National Convention 2016

A sphere is inscribed in a cube that has surface area of 24 square units. A second cube is then inscribed within the sphere. Let **M =** the surface area in square units of the inner cube

A pyramid with a square base is cut by a plane that is parallel to its base and is 2 units from the base. The surface area of the smaller pyramid that is cut from the top is half the surface area of the original pyramid. Let **U =** the altitude of the original pyramid.

M+U =?

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M+U =?

#9 Theta Bowl
MAΘ National Convention 2016

A 4 liter solution is X% acid. If $\frac{4}{3}$ liters of pure acid are added, the solution becomes $\left(X+20\right)\%$ acid. Let **M =**the percent of the new solution that is acid.

Cindy and Benjamin each bought a 12 ounce bottle of Gatorade. Cindy drank 2 ounces of her Gatorade and then added 2 ounces of water. Benjamin added 2 ounces of water, stirred well, and then drank 2 ounces of the mixture. Let **U=** the resulting ratio of the amount of water in Benjamin's bottle to that in Cindy's bottle.

MU =?

#9 Theta Bowl
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MU =?

#10 Theta Bowl
MAΘ National Convention 2016

A line with slope 2 intersects a line with slope 6 at the point (10,24). Let **M** = the distance between the x-intercepts of these two lines

A line has a slope of -2 and passes through the point (5,-3). A second line, perpendicular to the first line at (a,b) passes through the point (6,5). Let **A**=a+b

Let **O** = the positive difference between the greatest and least solution to: $\left(x^2+5x-24\right)\left(x^2-3x+2\right)=\left(4x-10\right)\left(x^2+5x-24\right)$

MAO=?

#10 Theta Bowl
MAΘ National Convention 2016

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MAO=?

#11 Theta Bowl
MAΘ National Convention 2016

Suppose $3^k = 12$ let **M**= 9^{k-1}

If $2\log_3(x+4) - \log_3(4x-11) - 2 = 0$, let **R=** the product of the solutions

Let **L**= $\dfrac{2^{\log_4 108}}{2^{\log_4 3}}$

Let **U** = $\dfrac{4}{\log_{10} 5} - \dfrac{2}{\log_4 5}$

(M+R)(L+U)=?

#11 Theta Bowl
MAΘ National Convention 2016

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(M+R)(L+U)=?

#12 Theta Bowl
MAΘ National Convention 2016

Circles with centers X and Y have radii 3 and 8, respectively. A common internal tangent touches the circles X and Y at points Z and U, respectively. Lines XY and ZU intersect at L, and XL = 5. Let **A =** the length of ZU

The perimeter of an equilateral triangle equals the area enclosed by its circumscribed circle. Let **B =** the diameter of the circle.

Two diagonals of a rhombus are in the ratio 3:2. The perimeter of the rhombus is $16\sqrt{13}$. Let **C=** the length of the shorter diagonal.

$\frac{AB}{C}$ **=?**

#12 Theta Bowl
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#13 Theta Bowl
MAΘ National Convention 2016

The lateral surface area of a cone is three-fifths the total surface area. Let **M =** the ratio of the radius to the slant height of the cone.

A regular hexagonal pyramid with base edge 6 and height 8 is inscribed in a cone such that the bases of the pyramid and the cone are coplanar. Let **U =** the lateral surface area of the cone.

MU =?

#13 Theta Bowl
MAΘ National Convention 2016

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MU =?

#14 Theta Bowl
MAΘ National Convention 2016

Let **M =** the number of distinct arrangements of the letters in the word TRIANGLE that begin with three vowels.

Given 10 points, 6 of which are collinear, but no other three are, let **U =** the number of triangles that have 3 of these points as vertices.

M+U =?

#14 Theta Bowl
MAΘ National Convention 2016

Let **M =** the number of distinct arrangements of the letters in the word TRIANGLE that begin with three vowels.

Given 10 points, 6 of which are collinear, but no other three are, let **U =** the number of triangles that have 3 of these points as vertices.

M+U =?