#0 Theta Bowl
MAΘ National Convention 2017

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

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** the greatest integer solution of the open sentence:
$7 \le 5-2x \text{ or } 1 \ge 9+4x$

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
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Let **A** = The sum of the values of "k" that make k – 4, k – 1, and 2k – 2 a geometric sequence (common ratio "r' cannot equal zero).

The repeating decimal: $2.1\overline{34}$ can be expressed as a fraction of positive integers in reduced form: $\frac{B}{C}$

D= $\frac{1}{\sqrt{7}-\sqrt{6}}+\frac{1}{3-\sqrt{8}}+\frac{1}{\sqrt{5}-2}-\frac{1}{\sqrt{6}-\sqrt{5}}-\frac{1}{\sqrt{8}-\sqrt{7}}$

A+B+C+D=?

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A+B+C+D=?

#2 Theta Bowl
MAΘ National Convention 2017

If you rolled two fair standard dice let **A=**the probability that the absolute value of the difference is a prime number

Let **B =**the number of ways that 7 students can be seated in a row if Paul and Thom must **not** be seated next to each other

Three standard fair dice are randomly tossed. Let **C=**the probability the numbers form an arithmetic sequence with a common difference of 1

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

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

#3 Theta Bowl
MAΘ National Convention 2017

Let **A** = $3^{2\log_9 5} + 5^{\log_5 2 + \log_5 3}$

Let **B** = the sum of the solutions to: $\log_{10} x + \log_{10}(x+3) = 1$

Let **C** = the sum of the solutions to: $\log_2(x+6) - \log_2(x-1) = 3$

Let **D =** the sum of the solutions to: $x^2 \log 2 + 5x = \log 64 + 5x \log 5$

A+B+C+D=?

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A+B+C+D=?

#4 Theta Bowl
MAΘ National Convention 2017

Let **A =**the y-coordinate of the focus for the given conic: $x^2+2x+12y+37=0$

The equation of the ellipse with major axis of length 10, and with foci (0,-7) and (8,-7), can be put in the form $\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$. Let **B =**the value of $h+k+a^2-b^2$?

The equation of the hyperbola with foci at (0,5) and (0,-5) has asymptotes whose equations are $y=2x$ and $y=-2x$. This hyperbola can be put in the $\frac{(y-k)^2}{a^2}-\frac{(x-h)^2}{b^2}=1$.Let **C=** the value of $h+k+a^2-b^2$.

A+B+C=?

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A+B+C=?

#5 Theta Bowl
MAΘ National Convention 2017

Let **A, B, C,** and **D** respectively be the sum of the solution(s) for the equations below.
If no solutions exist put down zero as the sum.

A: $\sqrt{x+83}=x-7$

B: $\sqrt{6-x}+1=\sqrt{3-x}$

C: $\dfrac{2}{x+2}-\dfrac{x}{2-x}=\dfrac{x^2+4}{x^2-4}$

D: $1+\dfrac{30}{y^2-9}-\dfrac{5}{y-3}=0$

A – B – C + D =?

#5 Theta Bowl
MAΘ National Convention 2017

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D: $1+\dfrac{30}{y^2-9}-\dfrac{5}{y-3}=0$

A – B – C + D =?

#6 Theta Bowl
MAΘ National Convention 2017

Let **A =** the ratio of the surface area of a sphere to the lateral area of a circumscribed right cylinder

Let **B=** the length of the longest line segment connecting any two midpoints of the edges of a cube with volume 512

A right circular cone is inscribed in a hemisphere of radius 8 so that the base of the cone is on the base of the hemisphere. Let **C =** the ratio of the lateral area of the cone to the lateral area of the hemisphere

ABC=?

#6 Theta Bowl
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ABC=?

#7 Theta Bowl
MAΘ National Convention 2017

A= $\sqrt[8]{25} \bullet \sqrt[4]{125} \bullet \frac{\sqrt[6]{25}}{\sqrt[3]{625}}$

B=the sum of the solutions to $3 \bullet 9^k - 82 \bullet 3^k = -27$

C= $\frac{\sqrt[3]{81}}{\sqrt[12]{81}} \bullet \sqrt{\sqrt{27}} \bullet \sqrt[4]{3} \bullet \sqrt[3]{\sqrt[4]{27}} \bullet \sqrt{\sqrt{27}}$

Let **D =** the sum of the solutions to: $x - 4x^{\frac{1}{2}} + 3 = 0$

A+B+C+D=?

#7 Theta Bowl
MAΘ National Convention 2017

A= $\sqrt[8]{25} \bullet \sqrt[4]{125} \bullet \frac{\sqrt[6]{25}}{\sqrt[3]{625}}$

B=the sum of the solutions to $3 \bullet 9^k - 82 \bullet 3^k = -27$

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Let **D =** the sum of the solutions to: $x - 4x^{\frac{1}{2}} + 3 = 0$

A+B+C+D=?

#8 Theta Bowl
MAΘ National Convention 2017

The coordinates of three vertices of a parallelogram are (3,4), (9,4), and (6,8). Find all the possibilities you can for the coordinates of the fourth vertex. Let **A =** the sum of the x and y coordinates of all these points. (Be sure to include in the sum every instance of a particular number)

In triangle MAO, the median from vertex M is perpendicular to the median from vertex A. If the lengths of sides MO and AO are 6 and 7 respectively, then let **B =** the length of side MA

$\frac{A}{B^2}$ =?

#8 Theta Bowl
MAΘ National Convention 2017

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#9 Theta Bowl
MAΘ National Convention 2017

Let **A=**the number of perfect squares that are between 5^4 and 6^6 inclusive

If M is 50% of R and O is 40% of R, then what percent of O is M will be called **B** (for example, if the percentage is 30%, then B = 30)

The Buchholz Math team pays $6.25 for every team shirt. It prices the shirts at $**C** so that at a 25%-off sale, they still make a profit of 20% per shirt. What does **C=?**

Eight math teamers can solve 20 interschool questions in three hours. Let **D=** the number of math teamers that are needed to solve 50 interschool questions in 5 hours.

A+B+C+D=?

#9 Theta Bowl
MAΘ National Convention 2017

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#10 Theta Bowl
MAΘ National Convention 2017

Let **A =**the sum of the positive integer values of "n" for which the given equation will have exactly two imaginary (conjugate) roots. $x^2+4(n+1)x+4n^2=0$ (if there aren't any, let **A** = 0)

Let **B =** the sum of the positive integer values of "n" for which the given equation will have exactly two distinct real roots. $5nx^2+4x+2=0$ (if there aren't any, let **B** = 0)

Let **C =** the sum of all the positive values of "n" for which the given equation will have exactly one real root. $x^2-2nx+n+6=0$ (if there aren't any, let **C** = 0)

A+B+C=?

#10 Theta Bowl
MAΘ National Convention 2017

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A+B+C=?

#11 Theta Bowl
MAΘ National Convention 2017

Determine “**A**” and “**B**” (both rational) so that -2i is a root of $2x^5+6x^4+Ax^3+Bx^2+4x-36=0$

Let **C=** the number of unique solutions to: $(3x-2)\left(x^2+12x-64\right)=\left(x^2+12x-64\right)\left(x^2-4x+10\right)$

Let **D =** the value of “n” so that G(2) = -2 for G(x) = $2x^3-7x^2+5x+n$.

A+B+C+D=?

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

#12 Theta Bowl
MAΘ National Convention 2017

Ray LM bisects angle ZLU, ray LR bisects angle ZLM, ray LW bisects angle ZLR, ray LJ bisects angle ZLW, and ray LF bisects angle JLM. The measure of angle ULJ equals 165. Let **A =** the number of degrees in the measure of angle RLW

A circle has secant LU with L an external point and U on the circle with Z being the point where the secant segment LU intersects the circle. The circle has tangent segment LM with M as the point of tangency. If LM = 14 and ZU = 21, Let **B =** the length of LZ

Two circles have radii of length 2 and 4, and the distance between the points of tangency on the two circles of their common external tangent is $2\sqrt{15}$. Let **C =** the distance between the two circles.

A+B+C=?

#12 Theta Bowl
MAΘ National Convention 2017

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A+B+C=?

#13 Theta Bowl
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In one year Mr. Lu increased his running speed by 60 miles per minute (he is fast!!). At the end of that year it took him 3 minutes less time to run a 3600 mile course than it took him at the beginning of the year. Let **A =** how many minutes it took Mr. Lu originally to run the course

After leaving his river house, a canoeist rowing upstream passes a log 2 miles upstream from his house. The canoeist rows upstream for one more hour and then rows back to his house, arriving at the same time as the log. Let **B =**the speed of the current in miles per hour?

AB=?

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AB=?

#14 Theta Bowl
MAΘ National Convention 2017

Let **A =** the apothem of a square with side length of 3.

Let **B =** the area enclosed by an isosceles trapezoid with bases 3 and 5 and base angle of 60°

Let **C =** the number of degrees in the sum of the exterior angles of a regular nonagon, one at each vertex.

Let **D =** the area enclosed by an equilateral triangle with side length $3\sqrt{2}$

$\frac{1280 \bullet AD}{BC}$ **= ?**

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