#0 Alpha Bowl
MAΘ National Convention 2016

Let **A =** the number of integers that satisfy the in equality: $-2<4-3x\le 7\ \ or\ 17>5x+12>7$

Let **B =** the value of "n" so that the line through the points (0, 4) and (n-2, 6) has X-intercept "n".

Let **C =** $\dfrac{x^3-y^3}{x^4+x^2y^2+y^4}\bullet\dfrac{x^3+y^3}{x^2-y^2}$

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

ABCD =?

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#1 Alpha Bowl
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$r = 3\csc\theta - 5r\csc\theta$ can be expressed in rectangular form: $Ax^2 + By^2 + Cx + Dy - E = 0$, where A, B, C, D, and E are non-negative integers

$r = \frac{2}{6 - \sin\theta}$ can be expressed in rectangular form: $Fx^2 + Gy^2 + Hx - Iy - J = 0$, where F, G, H, I, and J are non-negative integers

If A, B, C, D, and E are relatively prime, and if F, G, H, I, and J are relatively prime, what is the value of **A+B+C+D+E+F+G+H+I+J=?**

#1 Alpha Bowl
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#2 Alpha 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 **A =** 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 **B =** the altitude of the original pyramid.

A+B =?

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#3 Alpha Bowl
MAΘ National Convention 2016

Two-thirds of the adults in the U.S. are high school graduates. If you randomly selected 4 adults, let **A =** the probability at least three of them were high school graduates.

The Buchholz Math Team is looking to find 8 elite mathletes to fill out their team. They believe that only 12.5% of all mathletes have the required characteristics to make the team. Let **B =** the average number of mathletes that should be invited to tryout before they fulfill their target of 8 that have the required characteristics.

$\frac{A}{B}$ **= ?**

#3 Alpha Bowl
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$\frac{A}{B}$ **= ?**

#4 Alpha Bowl
MAΘ National Convention 2016

Given $y^2 - 12x - 48 = 0$: Let **A=** the area enclosed by the triangle formed by connecting the endpoints of the latus rectum to the vertex

Given $4x^2 + y^2 - 8x + 6y + 9 = 0$: Let **B=** the area of the rectangle formed by connecting the endpoints of the latus recti.

A + B =?

#4 Alpha Bowl
MAΘ National Convention 2016

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A + B =?

#5 Alpha Bowl
MAΘ National Convention 2016

Let **A** = $\lim_{x\to 0}\frac{2-\sqrt{4-x}}{x}$

Let **B** = $\lim_{x\to\infty}\left(\sqrt{x^2+2x}-x\right)$

Let **C** = $\lim_{x\to 0}\frac{4^x-4^{-x}}{4^x+4^{-x}}$

Let **D** = $\lim_{x\to 0}\frac{\frac{1}{x+6}-\frac{1}{6}}{x}$

A+B+C+D=?

#5 Alpha Bowl
MAΘ National Convention 2016

Let **A** = $\lim_{x\to 0}\frac{2-\sqrt{4-x}}{x}$

Let **B** = $\lim_{x\to\infty}\left(\sqrt{x^2+2x}-x\right)$

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A+B+C+D=?

#6 Alpha Bowl
MAΘ National Convention 2016

To raise money to go to nationals the King math team sells 140 raffle tickets for a total of $2001. They sell some tickets for full price (some whole dollar amount), and the rest for half price. Let **A =** the number of dollars that are raised by the full-price tickets.

Mr. Lu leaves his mansion for Buchholz every morning at 10:00 A.M. (he likes to sleep in). When he averages 40 mph, he arrives at Buchholz 3 minutes late. When he averages 60 mph, he arrives 3 minutes early. Let **B =** the number of mph Mr. Lu should average to arrive at Buchholz on time.

A + B =?

#6 Alpha Bowl
MAΘ National Convention 2016

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A + B =?

#7 Alpha Bowl
MAΘ National Convention 2016

Let **A** = cos2x, if tanx = $\frac{-4}{3}$ and $90^\circ < x < 180^\circ$

Let **B** = sin2x, if sinx = $\frac{5}{13}$ and $90^\circ < x < 180^\circ$

Let **C** = cos2x, if sinx = $\frac{3}{5}$ and $90^\circ < x < 180^\circ$

Let **D** = tan2x, if cosx = $\frac{5}{13}$ and $270^\circ < x < 360^\circ$

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

#7 Alpha Bowl
MAΘ National Convention 2016

Let **A** = cos2x, if tanx = $\frac{-4}{3}$ and $90^\circ < x < 180^\circ$

Let **B** = sin2x, if sinx = $\frac{5}{13}$ and $90^\circ < x < 180^\circ$

Let **C** = cos2x, if sinx = $\frac{3}{5}$ and $90^\circ < x < 180^\circ$

Let **D** = tan2x, if cosx = $\frac{5}{13}$ and $270^\circ < x < 360^\circ$

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

#8 Alpha Bowl
MAΘ National Convention 2016

Both roots of the equation $x^2 - 63x + n = 0$ are prime numbers. Let **A =** the number of possible values of n.

Two different positive numbers differ from their reciprocals by 1. Let **B =** the sum of these two positive numbers.

AB =?

#8 Alpha Bowl
MAΘ National Convention 2016

Both roots of the equation $x^2 - 63x + n = 0$ are prime numbers. Let **A =** the number of possible values of n.

Two different positive numbers differ from their reciprocals by 1. Let **B =** the sum of these two positive numbers.

AB =?

#9 Alpha 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 **A =** 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 **B =** the probability that the product of those numbers is greater than zero.

A+B =?

#9 Alpha Bowl
MAΘ National Convention 2016

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

A+B =?

#10 Alpha Bowl
MAΘ National Convention 2016

If w, x, y, z are positive numbers such that w, x, y, z forms an increasing arithmetic sequence and w, x, z form a geometric sequence, let **A =** $\frac{z}{w}$

The geometric series $a + ar + ar^2 + \ldots$ has a sum of 7, and the terms involving odd powers of r have a sum of 3. Let **B =** a + r

AB =?

#10 Alpha Bowl
MAΘ National Convention 2016

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The geometric series $a + ar + ar^2 + \ldots$ has a sum of 7, and the terms involving odd powers of r have a sum of 3. Let **B =** a + r

AB =?

#11 Alpha Bowl
MAΘ National Convention 2016

For each equation below assume the domain is $(0, 2\pi]$

Let **A** = the sum of the solutions of: $\csc^2 x - 2\cot x = 0$

Let **B** = the sum of the solutions of: $\tan x + \sqrt{3} = \sec x$

Let **C** = the sum of the solutions of: $2\cos 2x + 2\sin^2 x = 1$

A + B + C = ?

#11 Alpha Bowl
MAΘ National Convention 2016

For each equation below assume the domain is $(0, 2\pi]$

Let **A** = the sum of the solutions of: $\csc^2 x - 2\cot x = 0$

Let **B** = the sum of the solutions of: $\tan x + \sqrt{3} = \sec x$

Let **C** = the sum of the solutions of: $2\cos 2x + 2\sin^2 x = 1$

A + B + C = ?

#12 Alpha Bowl
MAΘ National Convention 2016

If $\log\left(a^2b\right)=1 \, and \; if \; \log\left(ab^3\right)=1$, let **A =** log(ab)

A circle has a radius of $\log x^2$ and a circumference of $\log y^4$, let **B =** the $\log_x y$

AB =?

#12 Alpha Bowl
MAΘ National Convention 2016

If $\log\left(a^2b\right)=1 \, and \; if \; \log\left(ab^3\right)=1$, let **A =** log(ab)

A circle has a radius of $\log x^2$ and a circumference of $\log y^4$, let **B =** the $\log_x y$

AB =?

#13 Alpha Bowl
MAΘ National Convention 2016

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

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 **B =** the lateral area of the cone.

AB =?

#13 Alpha Bowl
MAΘ National Convention 2016

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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 **B =** the lateral area of the cone.

AB =?

#14 Alpha Bowl
MAΘ National Convention 2016

Let **A =** $\frac{1}{\sqrt{4}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{6}}+\frac{1}{\sqrt{6}+\sqrt{7}}+\ldots\frac{1}{\sqrt{63}+\sqrt{64}}$.

Let **B** be the number such that the sum of the **B** least positive integers is 4950.

A – B =?

#14 Alpha Bowl
MAΘ National Convention 2016

Let **A =** $\frac{1}{\sqrt{4}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{6}}+\frac{1}{\sqrt{6}+\sqrt{7}}+\ldots\frac{1}{\sqrt{63}+\sqrt{64}}$.

Let **B** be the number such that the sum of the **B** least positive integers is 4950.

A – B =?