**#0 Theta Bowl**
**MAΘ National Convention 2015**

Factor the trinomial $36x^2 + 59x + 24$ into the form (A$x$ + B)(C$x$ + D);

what is the value of A + B+ C + D ?

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Factor the trinomial $36x^2 + 59x + 24$ into the form (A$x$ + B)(C$x$ + D);

what is the value of A + B+ C + D ?

Find the product of all the positive roots of the following equations:

$$|2x+5| = x-7$$

$$5x^2 - 7x - 24 = 0$$

$$10 - 5(2x+3) - 4(x-2) = -2\left[3(x-2) - (x-6)\right] - 7$$

$$x^3 - 14x^2 - 51x = 0$$

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$$x^3 - 14x^2 - 51x = 0$$

**#2 Theta Bowl**
**MAΘ National Convention 2015**

Find the sum of all real values of $x$ which are solutions of the given equations (write your answer as an improper fraction):

$(x-2)^2 - 5(x-2) + 6 = 0$

$\left(\log_{49} x\right)\left(\log_2 7\right) = -3$

$x^{-1} = 2^{-1} - 6^{-1}$

$x - \sqrt{x+6} = 6$

**#2 Theta Bowl**
**MAΘ National Convention 2015**

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A: The sum of the integral solutions of $3 \le |\, 2x-3 \,| < 7$

B: The greatest integral solution of the disjunction

$$-3(2-3x) < -6\left(\frac{5}{3}-\frac{x}{2}\right) \quad or \quad -5(x+3) > -8\left(\frac{x}{2}+\frac{1}{4}\right)+x$$

Find the value of $A^B$.

**#3 Theta Bowl**
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Find the value of $A^B$.

Simplify each of the following:

A = $i^{2015} + i^{-99} + (1-i)^{11} - |5-12i|$

B = The sum of the reciprocal of (3 – 4$i$) and the square of $\left(\frac{2-7i}{5i}\right)$

C = $\sqrt{-15} \cdot \sqrt{-60} - (i\sqrt{5})^2$

***Find the value of A – BC.***

**#4 Theta Bowl**
**MAΘ National Convention 2015**

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***Find the value of A – BC.***

Let A = the SUM of the lengths of the major and minor axes of $\dfrac{(x-5)^2}{36}+\dfrac{(y+1)^2}{256}=1$

Let B = the SUM of the coordinates of the focus of $(y+7)^2=-8(x-5)$

Let C = the SUM of the abscissas of the endpoints of both the minor axis and the major axis for

$$25x^2+9y^2-200x+54y+256=0$$

Find A + B + C.

**#5 Theta Bowl**
**MAΘ National Convention 2015**

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Find A + B + C.

**#6 Theta Bowl**
**MAΘ National Convention 2015**

A = The sixth term of the geometric sequence in which $a_1 = \frac{625}{4}$ and $a_8 = \frac{32}{125}$

B = The number $n$ of an arithmetic sequence with $a_n = 139$ and $a_1 = 7$, and $a_7 = 15$.

C = The fourth term of an arithmetic sequence in which the ninth term is -28 and the 16th term is -49.

D = The partial sum of the geometric sequence with $a_2 = 216$, $n = 5$, and $a_5 = 8$.

Find the value of $AB + C + D$.

**#6 Theta Bowl**
**MAΘ National Convention 2015**

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Find the value of $AB + C + D$.

**#7 Theta Bowl**
**MAΘ National Convention 2015**

For the function $f(x)=\dfrac{2x(x^2+5x-6)(4x^2-9)}{(2x^2+9x-18)(x^2+x-2)}$, find the true statements in the list below and write them ***in alphabetical order.***

**A**: There is a removable discontinuity at (-6, -27)
**B:** The line $x$ = 2 is a vertical asymptote.
**C**: The line $y$ = 0 is a horizontal asymptote.
**D**: There is a removable discontinuity at (1, $^{10}/_{3}$)
**E**: The slant asymptote is $y$ = 4$x$ -2
**F**: The line $x$ = 1 is a vertical asymptote.
**G:** There is a removable discontinuity at ($^{3}/_{2}$, $^{18}/_{7}$)
**H:** The line $x$ = -2 is a vertical asymptote.
**I**: The slant asymptote is $y$ = -2$x$ +3
**J.** The function $f(x)$ passes through the origin


**#7 Theta Bowl**
**MAΘ National Convention 2015**

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**H:** The line $x$ = -2 is a vertical asymptote.
**I**: The slant asymptote is $y$ = -2$x$ +3
**J.** The function $f(x)$ passes through the origin

A = $\sum_{n=3}^{8}(-2)^{n-2}$

B = $\sum_{n=5}^{105}(n-8)$

C = $\sum_{n=-1}^{\infty}\left(\frac{2}{5}\right)^{n}$

D = The first term of a geometric series which has a common ratio of 3 and whose partial sum of the first eight terms is equal to 13,120.

Find the value of $B - ACD$.

**#8 Theta Bowl**
**MAΘ National Convention 2015**

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Find the value of $B - ACD$.

**#9 Theta Bowl**
**MAΘ National Convention 2015**

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Consider the following quartic equation: $x^4 - 2x^3 - 10x^2 + 20x - 8 = 0$,
one of whose roots is $-1-\sqrt{5}$.

Find $\boldsymbol{L}$, which is the least of the other three roots, and then answer the following question:

What is the value of the expression $\sqrt{338} - L$ ?

**#9 Theta Bowl**
**MAΘ National Convention 2015**

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Consider the following quartic equation: $x^4 - 2x^3 - 10x^2 + 20x - 8 = 0$,
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What is the value of the expression $\sqrt{338} - L$ ?

**#10 Theta Bowl**
**MAΘ National Convention 2015**

Let A = the area enclosed by the ellipse defined by $25x^2 + 9y^2 - 200x + 18y + 184 = 0$

Let B = the area of the region bounded by the line $2x - 3y = -12$ and the x and y axes.

Let C = the area of a sector of a circle with radius 12 and central angle 135°

Let D = the area enclosed by the isosceles trapezoid with bases of length 2 and 4 and base angles of 60°.

Express $\frac{CD^2}{AB}$ as a simplified fraction.

**#10 Theta Bowl**
**MAΘ National Convention 2015**

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Let D = the area enclosed by the isosceles trapezoid with bases of length 2 and 4 and base angles of 60°.

Express $\frac{CD^2}{AB}$ as a simplified fraction.

**Let A =** $\sqrt[3]{324}+\sqrt[3]{\frac{3}{2}}-3\sqrt[3]{96}$

**And B =** $\sqrt{\frac{1}{3}}+\sqrt{108}-\sqrt{16\frac{1}{3}}$

**And C =** $\left(\sqrt[3]{2}-\sqrt[3]{5}\right)\left(\sqrt[3]{4}+\sqrt[3]{10}+\sqrt[3]{25}\right)$

**And D** = $\dfrac{\sqrt{\sqrt[3]{4096}}}{\sqrt[3]{\sqrt[4]{729}}}$

***What is the value of*** $A\cdot B\cdot C\cdot D$?

**#11 Theta Bowl**
**MAΘ National Convention 2015**

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**And B =** $\sqrt{\frac{1}{3}}+\sqrt{108}-\sqrt{16\frac{1}{3}}$

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***What is the value of*** $A\cdot B\cdot C\cdot D$?

## #12 Theta Bowl
## MAΘ National Convention 2015

Let $A$ = the answer to this question:
A chemist wants to make 700 ml of a 6% acetic acid solution by mixing 5% and 12% acetic acid solutions. How many milliliters of the 5% solution will be needed?

Let $B$ = the answer to this question:
It normally takes 2 hours to fill an empty swimming pool without any leaks; however, the pool has developed a slow leak. If the pool were full, it would take 10 hours for all the water to leak out. If the pool is empty, how many hours will it take to fill the pool?

Let $C$ = the answer to the following question:
Amy walks from home to a repair shop at a rate of 2 mph, picks up her bike, and then rides back home at 10 mph. If the round trip took 1½ hours, how far in miles is the repair shop from Amy's home? Assume, theoretically, that Amy immediately begins riding her bike back once she reaches the shop.

What is the value of $A \div \frac{B}{C}$?


## #12 Theta Bowl
## MAΘ National Convention 2015

Let $A$ = the answer to this question:
A chemist wants to make 700 ml of a 6% acetic acid solution by mixing 5% and 12% acetic acid solutions. How many milliliters of the 5% solution will be needed?

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What is the value of $A \div \frac{B}{C}$?

*Evaluate each of the following:*

*A:* The abscissa of the midpoint of the line segment with endpoints ( -5 , 3) and ( 9 , -7 )

*B:* The y-intercept of the equation of the perpendicular bisector of the line segment with endpoints (2, -7) and ( -4 , -1 )

*C:* The ordinate of the vertex of the graph of y = | x + 2 | + 5

***Find the value of A – B + 2C.***

**#13 Theta Bowl**
**MAΘ National Convention 2015**

*Evaluate each of the following:*

*A:* The abscissa of the midpoint of the line segment with endpoints ( -5 , 3) and ( 9 , -7 )

*B:* The y-intercept of the equation of the perpendicular bisector of the line segment with endpoints (2, -7) and ( -4 , -1 )

*C:* The ordinate of the vertex of the graph of y = | x + 2 | + 5

***Find the value of A – B + 2C.***

Factor the trinomial $54x^2 - 177x - 200$ into the form (A$x$ + B)(C$x$ + D);

what is the value of A + B + C + D ?

**#14 Theta Bowl**
**MAΘ National Convention 2015**

Factor the trinomial $54x^2 - 177x - 200$ into the form (A$x$ + B)(C$x$ + D);

what is the value of A + B + C + D ?