Alpha School Bowl Question #1 2010 MAΘ National Convention

$$\frac{x^2+4x+4}{x^3-x^2+2x-2}=\frac{A}{x-1}+\frac{Bx+C}{x^2+2}$$

Let D = the number of vertical asymptotes of: $\dfrac{x^3-2x^2+x-2}{x^2-5x-6}$

Let E = the number of vertical asymptotes of: $\dfrac{10x^3-15x^2+2x-3}{18x^3-27x^2+8x-12}$

Let F = the number of vertical asymptotes of: $\dfrac{45x^2+54x-8}{60x^2-68x+8}$

Find the value of A + B + C + D + E +F.

Alpha School Bowl Question #2 2010 MAΘ National Convention

Let A = $\sin\left(Tan^{-1}\left(\frac{-3}{4}\right)+Tan^{-1}\left(\frac{7}{24}\right)\right)$

Let B = $\tan(\theta-\beta)$, if $\sin\theta=\frac{5}{13}$, *and* $\sin\beta=\frac{-5}{13}$. θ is in quadrant 1 and β is in quadrant 4.

Let C (measured in degrees) = θ if $\sin(1-4\theta)=\cos(7+10\theta)$

Find the value of $\dfrac{169ABC}{44}$.

Alpha School Bowl Question #3 2010 MAΘ National Convention

Let A = $\lim_{x\to\infty}\frac{\sqrt{4x^2+3}}{x-3}$

Let B = $\lim_{x\to 1} f(x) = \begin{cases} x^2+4, & x\neq 1 \\ 2 & x=1 \end{cases}$

Let C = $\lim_{x\to 0}\frac{\frac{1}{x+4}-\frac{1}{4}}{x}$

Let D = $\lim_{x\to 3}\frac{3-\sqrt{x+6}}{3-x}$

Find the value of $A\bullet B\bullet C\bullet D$.

Alpha School Bowl Question #4 2010 MAΘ National Convention

During the spin cycle on a certain washing machine, the chamber inside the washer rotates 20 times per second. If a coin is on the chamber wall (assume the diameter of the chamber is 28 inches), Let A = the angular velocity in radians per minute.

A circular Ferris wheel needs 42.0 seconds to complete one revolution. The radius of the wheel is 165 feet. Let B = the number of feet a person would travel during a 7 minute ride.

Find the value of A + B **.**

Alpha School Bowl Question #5 2010 MAΘ National Convention

Let A = $\frac{\sin 3x-\sin x}{\cos x+\cos 3x}$

Let B = $\frac{\cot\left(\frac{\pi}{2}-x\right)}{\sec\left(\frac{\pi}{2}-x\right)+\tan\left(\frac{\pi}{2}-x\right)}+1$

Find the value of $\frac{A}{B}$.

Alpha School Bowl Question #6 2010 MAΘ National Convention

There exists a triangle with sides of length X, Y, and Z. If $YZ = X^2$ and $Y + Z = 2X$, Let A = the acute angle(in degrees) opposite the side of length X.

Let B = the angle (in degrees) between the two tangents which can be drawn from the point $(1,2)$ to the conic $2x^2 + 2y^2 - 12x - 16y + 42 = 0$?

Find the value of A – B.

Alpha School Bowl Question #7 2010 MAΘ National Convention

Let A = the product of the solutions of $(\log_2 x)^2 - \log_2 x = \log_2 64$

Let B = the y-coordinate of the point of intersection, if $y = 2 - \log_2(x-2)$ and $y = -1 + \log_2 x$

Let C = the value of $\log_{x^2} 32$ in terms of "y" if $y = (\log_x 32)(\log_{32} 16)$

Find the value of $A \bullet B \bullet C$.

Alpha School Bowl Question #8 2010 MAΘ National Convention

Let A = the value of the determinant

$$\begin{vmatrix} 1 & 2 & -1 & 1 \\ 3 & 4 & 2 & 0 \\ 0 & 1 & 3 & 2 \\ 2 & 1 & -1 & 0 \end{vmatrix}$$

Let B = the sum of the elements in the inverse of the following matrix

$$\begin{pmatrix} 1 & 1 & 1 \\ 3 & 5 & 4 \\ 3 & 6 & 5 \end{pmatrix}$$

Find the value of A + B**.**

Alpha School Bowl Question #9 2010 MAΘ National Convention

Let A = the sum of the zeros of f(x), if $f(2x-6)=4x^2-8x+1$

Let B = the number of rational solutions to $(x^2-9)(x^4-3x^2-2)=2(x^2-9)$

Let C = the absolute value of the difference between the largest and smallest root of:
$(x^2+x-2)^2-(x^2-x-6)^2=0$

Find the value of A + B + C.

Alpha School Bowl Question #10 2010 MAΘ National Convention

Let A = *x*-*y*, if $\sqrt{x}+\sqrt{y}\,i=\sqrt{9+4\sqrt{5}\,i}$

Let B = $|5-2i|\bullet|2-5i|$

Let C = $2010i^{2010}$

Let D = *x*+*y*, if $(5-4i)-(x+yi)=2$

Find the value of A + B + C + D.

Alpha School Bowl Question #11 2010 MAΘ National Convention

$(-\sqrt{3}+i)^9$ can be expressed as a complex number in the form $A+Bi$

$20cis\frac{11\pi}{6}$ can be expressed as a complex number in the form $C+Di$

Find the value of A +B + C + D.

Alpha School Bowl Question #12 2010 MAΘ National Convention

Let A = the area of the triangle formed by the vertex and the two endpoints of the latus rectum of the following conic: $y^2 + 8x = 6y - 25$

Let B = the area of the rectangle formed by the four vertices of the latus recti of the following conic: $9x^2 + 25y^2 - 18x - 150y + 9 = 0$

Find the value of $\frac{B}{A}$.

Alpha School Bowl Question #13 2010 MAΘ National Convention

Let A = how many numbers between 450 and 700 that can be formed using only the digits 3, 4, 5, 6, 7, and 8.

Let B = the number of 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 C = the number of triangles that have 3 of these points as vertices.

Find the value of A + B + C.

Alpha School Bowl Question #14 2010 MAΘ National Convention

Let A = the acute angle(in radians) between the vectors $u = i + 2j - k \; and \; v = i + j$

Let B = $\csc\left(Cot^{-1}\left(-4\right)\right)$

Express the rectangular point $\left(0,-12\right)$ in polar form $\left(r,\theta\right)$ if $r \geq 0$ and $-360^\circ \leq \theta < 0$.

Find the value of $A \bullet B \bullet r \bullet \theta$.