#0 Theta School Bowl
MAΘ National Convention 2011

For the line $17x - 9y = 126$:

$A =$ the x-intercept

$B =$ the y-intercept

$C =$ the slope

$D =$ the y-value of the point with $x = 18$

Find the value of $ACD + B$.

#0 Theta School Bowl
MAΘ National Convention 2011

For the line $17x - 9y = 126$:

$A =$ the x-intercept

$B =$ the y-intercept

$C =$ the slope

$D =$ the y-value of the point with $x = 18$

Find the value of $ACD + B$.

#1 Theta School Bowl
MAΘ National Convention 2011

The equation of the line having x-intercept $\frac{3}{2}$ and y-intercept -6 can be represented in the form $Ax+By=C$, where $A, B,$ and C are relatively prime integers and $A>0$.

The lines with equation $Dx+2y=E$ and $4x+3y=F$ are perpendicular and both lines contain the point $(-2,3)$.

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

#1 Theta School Bowl
MAΘ National Convention 2011

The equation of the line having x-intercept $\frac{3}{2}$ and y-intercept -6 can be represented in the form $Ax+By=C$, where $A, B,$ and C are relatively prime integers and $A>0$.

The lines with equation $Dx+2y=E$ and $4x+3y=F$ are perpendicular and both lines contain the point $(-2,3)$.

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

#2 Theta School Bowl
MAΘ National Convention 2011

There are 7 points on a plane, no three of which are collinear. Let $A =$ the number of different polygons that can be drawn using only these points as vertices.

If $1.2\overline{567}$ is expressed as a fraction in lowest terms, let $B =$ the positive difference between the numerator and denominator.

Given that $(2+3i)x+(1-2i)=(5+i)x-(4-3i)$, let $x=a+bi$ be the solution to this equation, and let $C=a+b$.

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

#2 Theta School Bowl
MAΘ National Convention 2011

There are 7 points on a plane, no three of which are collinear. Let $A =$ the number of different polygons that can be drawn using only these points as vertices.

If $1.2\overline{567}$ is expressed as a fraction in lowest terms, let $B =$ the positive difference between the numerator and denominator.

Given that $(2+3i)x+(1-2i)=(5+i)x-(4-3i)$, let $x=a+bi$ be the solution to this equation, and let $C=a+b$.

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

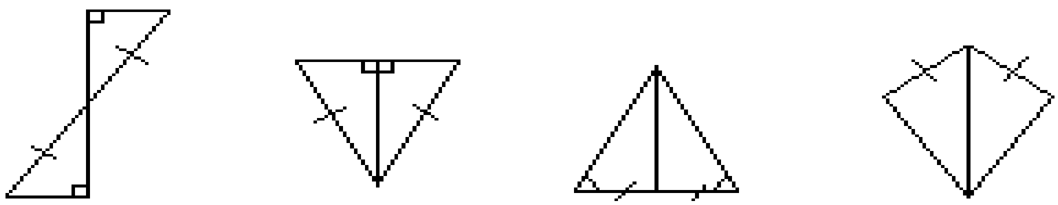
#3 Theta School Bowl
MAΘ National Convention 2011

ABCDEFGHIJ is a regular decagon. If sides AB and CD are extended to meet at point K, let $A =$ the number of degrees in the smaller measure of angle K.

In triangle WIG, side WI has length 20, side IG has length 13 and side WG has length 21. Let $B =$ the length of the altitude to side WG.

Two vertical poles have heights of 6 and 12. A rope is stretched from the top of each pole to the bottom of the other. Let $C =$ the height above the ground that the ropes cross.

Let $D =$ the number of situations below where the two triangles can be proven congruent.



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

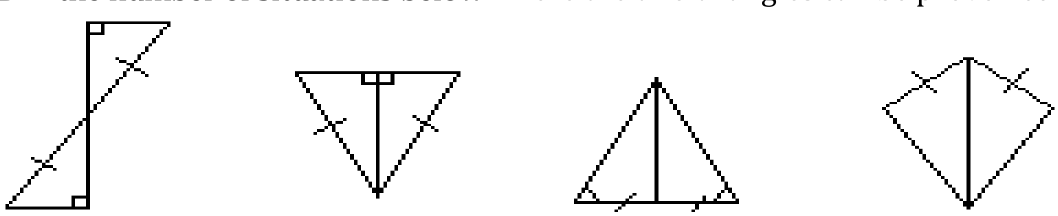
#3 Theta School Bowl
MAΘ National Convention 2011

ABCDEFGHIJ is a regular decagon. If sides AB and CD are extended to meet at point K, let $A =$ the number of degrees in the smaller measure of angle K.

In triangle WIG, side WI has length 20, side IG has length 13 and side WG has length 21. Let $B =$ the length of the altitude to side WG.

Two vertical poles have heights of 6 and 12. A rope is stretched from the top of each pole to the bottom of the other. Let $C =$ the height above the ground that the ropes cross.

Let $D =$ the number of situations below where the two triangles can be proven congruent.



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

#4 Theta School Bowl
MAΘ National Convention 2011

$$A = \begin{vmatrix} 2 & 1 & -5 & -6 \\ -1 & 4 & 3 & 5 \\ 1 & 0 & -2 & -3 \\ 3 & -2 & -8 & -10 \end{vmatrix}$$

$B =$ the perfect square whose factorial ends in exactly 10 consecutive zeros

Find the value of $A + B$.

#4 Theta School Bowl
MAΘ National Convention 2011

$$A = \begin{vmatrix} 2 & 1 & -5 & -6 \\ -1 & 4 & 3 & 5 \\ 1 & 0 & -2 & -3 \\ 3 & -2 & -8 & -10 \end{vmatrix}$$

$B =$ the perfect square whose factorial ends in exactly 10 consecutive zeros

Find the value of $A + B$.

#5 Theta School Bowl
MAΘ National Convention 2011

Below are 6 statements that can be correctly completed with one of the words “always”, “sometimes” or “never”. If the correct answer is “always”, put a capital A. If the correct answer is “sometimes”, put a capital S. If the correct answer is “never”, put a capital N. Your final answer should be a series of 6 letters in the correct order as below; e.g. ASSANA.

When there is a transversal of two lines, the three lines are _________ coplanar.

Three lines intersecting in one point are _________ coplanar.

Two lines that are not coplanar _________ intersect.

Two lines parallel to a third line are _________ parallel to each other.

Lines in two parallel planes are _________ parallel to each other.

Two planes parallel to the same plane are _________ parallel to each other.

#5 Theta School Bowl
MAΘ National Convention 2011

Below are 6 statements that can be correctly completed with one of the words “always”, “sometimes” or “never”. If the correct answer is “always”, put a capital A. If the correct answer is “sometimes”, put a capital S. If the correct answer is “never”, put a capital N. Your final answer should be a series of 6 letters in the correct order as below; e.g. ASSANA.

When there is a transversal of two lines, the three lines are _________ coplanar.

Three lines intersecting in one point are _________ coplanar.

Two lines that are not coplanar _________ intersect.

Two lines parallel to a third line are _________ parallel to each other.

Lines in two parallel planes are _________ parallel to each other.

Two planes parallel to the same plane are _________ parallel to each other.

#6 Theta School Bowl
MAΘ National Convention 2011

$A =$ the solution to the equation $\left(\frac{(x-4)!}{(x-2)!}\right) = \frac{1}{2x}$

Beavis can count and roll a large jar of nickels in 8 hours. Together Beavis and his friend can count and roll the nickels in 5 hours. Let $B =$ the number of hours that it would take his friend to count and roll the nickels alone.

An office has three copy machines; two can make a copy in 4 seconds each and one can make a copy in 6 seconds. Let $C =$ the number of minutes it will take to make 480 copies if all three machines work together.

Let $D =$ the number of liters of 40% nitric acid solution that must be added to 175 liters of a solution that is 6% nitric acid to produce a 30% nitric acid solution.

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

#6 Theta School Bowl
MAΘ National Convention 2011

$A =$ the solution to the equation $\left(\frac{(x-4)!}{(x-2)!}\right) = \frac{1}{2x}$

Beavis can count and roll a large jar of nickels in 8 hours. Together Beavis and his friend can count and roll the nickels in 5 hours. Let $B =$ the number of hours that it would take his friend to count and roll the nickels alone.

An office has three copy machines; two can make a copy in 4 seconds each and one can make a copy in 6 seconds. Let $C =$ the number of minutes it will take to make 480 copies if all three machines work together.

Let $D =$ the number of liters of 40% nitric acid solution that must be added to 175 liters of a solution that is 6% nitric acid to produce a 30% nitric acid solution.

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

#7 Theta School Bowl
MAΘ National Convention 2011

$$A=\left(x\left(x-\frac{y^2}{x}\right)\div\left(\frac{1}{y}-\frac{1}{x}\right)\right)\div\left(\left(\frac{x^2}{y}-y\right)\left(\frac{x}{y}-1\right)^{-2}\right)$$

$$B=\left(\frac{x^3}{y^3}-1\right)\left(\frac{x^3-3x^2y+3xy^2-y^3}{x^3-y^3}\right)\left(\frac{x}{y}-1\right)^{-1}\div\left(\frac{x^2}{y^2}-1\right)$$

Where defined, $\dfrac{A}{B}=?$

#7 Theta School Bowl
MAΘ National Convention 2011

$$A=\left(x\left(x-\frac{y^2}{x}\right)\div\left(\frac{1}{y}-\frac{1}{x}\right)\right)\div\left(\left(\frac{x^2}{y}-y\right)\left(\frac{x}{y}-1\right)^{-2}\right)$$

$$B=\left(\frac{x^3}{y^3}-1\right)\left(\frac{x^3-3x^2y+3xy^2-y^3}{x^3-y^3}\right)\left(\frac{x}{y}-1\right)^{-1}\div\left(\frac{x^2}{y^2}-1\right)$$

Where defined, $\dfrac{A}{B}=?$

#8 Theta School Bowl
MAΘ National Convention 2011

$A=\sum_{n=1}^{9}(-2)^{n-1}$

$B=\sum_{n=0}^{\infty}\left(\frac{1}{10}\right)^{n}$

$C=\sum_{n=1}^{100}(n+3)$

$D=$ the number of the term -143 in the arithmetic sequence $-3,-10,-17,-24,\ldots$

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

#8 Theta School Bowl
MAΘ National Convention 2011

$A=\sum_{n=1}^{9}(-2)^{n-1}$

$B=\sum_{n=0}^{\infty}\left(\frac{1}{10}\right)^{n}$

$C=\sum_{n=1}^{100}(n+3)$

$D=$ the number of the term -143 in the arithmetic sequence $-3,-10,-17,-24,\ldots$

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

#9 Theta School Bowl
MAΘ National Convention 2011

The height of a Phil Mickelson drive launched at time $t=0$ can be patterned by the quadratic function $h(t)=15t-\frac{3}{4}t^2+4$, where $h(t)$ represents the height of the ball as a function of time t. Let

$A=$ the time t when the golf ball returns to its original launch height.

$B=(66600731427)(66600731417)-(66600731437)(66600731407)$

$C=-3^2+0!+6x^0\ \ (x\neq 0)$

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

#9 Theta School Bowl
MAΘ National Convention 2011

The height of a Phil Mickelson drive launched at time $t=0$ can be patterned by the quadratic function $h(t)=15t-\frac{3}{4}t^2+4$, where $h(t)$ represents the height of the ball as a function of time t. Let

$A=$ the time t when the golf ball returns to its original launch height.

$B=(66600731427)(66600731417)-(66600731437)(66600731407)$

$C=-3^2+0!+6x^0\ \ (x\neq 0)$

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

#10 Theta School Bowl
MAΘ National Convention 2011

The solutions to the equation $x^3 - 6x^2 - 24x + A = 0$ form an arithmetic sequence.

$B = \left| k - \frac{1}{k} \right|$, such that $k + \frac{1}{k} = 3$

Find the value of AB.

#10 Theta School Bowl
MAΘ National Convention 2011

The solutions to the equation $x^3 - 6x^2 - 24x + A = 0$ form an arithmetic sequence.

$B = \left| k - \frac{1}{k} \right|$, such that $k + \frac{1}{k} = 3$

Find the value of AB.

#11 Theta School Bowl
MAΘ National Convention 2011

$A =$ the degree measure of an interior angle of a regular polygon with 40 sides
$B =$ the length of the altitude to the hypotenuse of a right triangle with legs of length 6 and 8
$C =$ the distance a chord of length 8 of a circle with radius of length 10 is from the center of the circle
$D =$ the length of a chord of a circle with radius of length 5 that is a distance of 2 from the center of the circle

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

#11 Theta School Bowl
MAΘ National Convention 2011

$A =$ the degree measure of an interior angle of a regular polygon with 40 sides
$B =$ the length of the altitude to the hypotenuse of a right triangle with legs of length 6 and 8
$C =$ the distance a chord of length 8 of a circle with radius of length 10 is from the center of the circle
$D =$ the length of a chord of a circle with radius of length 5 that is a distance of 2 from the center of the circle

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

#12 Theta School Bowl
MAΘ National Convention 2011

The point nearest to the origin on a line has coordinates $(5,3)$. The point nearest to the origin on a second line has coordinates $(-4,1)$. The two lines intersect at the point (x, y). Let $A = x + y$.

The Stoneman Douglas math team bought some \$10, \$20, and \$50 seats to the Wiggles concert for a total expenditure of \$1000. They bought at least one of each kind of seat and bought ten times as many \$10 seats as \$20 seats. Let $B =$ the number of \$50 seats the Stoneman Douglas math team bought.

Find the value of $A - B$.

#12 Theta School Bowl
MAΘ National Convention 2011

The point nearest to the origin on a line has coordinates $(5,3)$. The point nearest to the origin on a second line has coordinates $(-4,1)$. The two lines intersect at the point (x, y). Let $A = x + y$.

The Stoneman Douglas math team bought some \$10, \$20, and \$50 seats to the Wiggles concert for a total expenditure of \$1000. They bought at least one of each kind of seat and bought ten times as many \$10 seats as \$20 seats. Let $B =$ the number of \$50 seats the Stoneman Douglas math team bought.

Find the value of $A - B$.

#13 Theta School Bowl
MAΘ National Convention 2011

The first term of an arithmetic sequence is $A-2$, the fifth term is $2A$, and the common difference is $A-7$.

$B=$ the sum of the entries in matrix Y, where $\begin{bmatrix} 4 & 9 \\ 2 & 3 \end{bmatrix} Y = \begin{bmatrix} -4 & 5 \\ -2 & 7 \end{bmatrix}$

Find the value of $A+B$.

#13 Theta School Bowl
MAΘ National Convention 2011

The first term of an arithmetic sequence is $A-2$, the fifth term is $2A$, and the common difference is $A-7$.

$B=$ the sum of the entries in matrix Y, where $\begin{bmatrix} 4 & 9 \\ 2 & 3 \end{bmatrix} Y = \begin{bmatrix} -4 & 5 \\ -2 & 7 \end{bmatrix}$

Find the value of $A+B$.

#14 Theta School Bowl
MAΘ National Convention 2011

A high school crew team can paddle 12 km upstream and 12 km back downstream in the same amount of time as it can paddle 25 km in still water. If the rate of the current is 2 km/h, let $A =$ the crew team's rate in still water (in km/h).

Increasing the average speed of the Batmobile by 13 mph resulted in a 260 mile trip taking one hour less than before. Let $B =$ the original average speed of the Batmobile, in mph.

Find the value of AB.

#14 Theta School Bowl
MAΘ National Convention 2011

A high school crew team can paddle 12 km upstream and 12 km back downstream in the same amount of time as it can paddle 25 km in still water. If the rate of the current is 2 km/h, let $A =$ the crew team's rate in still water (in km/h).

Increasing the average speed of the Batmobile by 13 mph resulted in a 260 mile trip taking one hour less than before. Let $B =$ the original average speed of the Batmobile, in mph.

Find the value of AB.