#1 Algebra II – Hustle
MAΘ National Convention 2010

Solve \((3x - 1)^5 = 2\)

Answer: _____________

Round 1 2 3 4 5

#2 Algebra II – Hustle
MAΘ National Convention 2010

After taking 5 quizzes, Mia Lee has an average of 73 out of 100. What must her average score be on the next five quizzes to increase her average to 81?

Answer: _____________

Round 1 2 3 4 5

#3 Algebra II – Hustle
MAΘ National Convention 2010

Consider the following information about the polynomial \(P(x)\).

- \(P\) is degree 3
- \(P(0) = -24\)
- Zeros: \(-3, -4, 2\)

Evaluate \(P(-1)\).

Answer: _____________

Round 1 2 3 4 5

#4 Algebra II – Hustle
MAΘ National Convention 2010

Let \(\begin{bmatrix} 1 & 5 \\ 5 & 6 \end{bmatrix}; \begin{bmatrix} -5 & 6 \\ 0 & 5 \end{bmatrix}; \begin{bmatrix} 1 & 1 \\ -5 & 5 \end{bmatrix}\).

If \(AC - CB = \begin{bmatrix} w & x \\ y & z \end{bmatrix}\), then find \((x + y)\).

Answer: _____________

Round 1 2 3 4 5
#5 Algebra II – Hustle
MAΘ National Convention 2010

Evaluate the sum of the series:

\[ \sum_{k=5}^{9} (2k + 3) \]

Answer: _________________

Round  1  2  3  4  5

#6 Algebra II – Hustle
MAΘ National Convention 2010

Find the focus of the parabola given by the equation \( x^2 + 4x = -8y - 12 \).

Answer: _________________

Round  1  2  3  4  5

#7 Algebra II – Hustle
MAΘ National Convention 2010

What is the multiplicity of the root \(-1\) in the equation \( y = x^4 - 2x^3 - 3x^2 + 4x + 4 \) ?

Answer: _________________

Round  1  2  3  4  5

#8 Algebra II – Hustle
MAΘ National Convention 2010

Write the expression as a single common logarithm, where all exponents and coefficients are positive, and simplify:

\[ \log 4x + 3(\log x - \log y) \]

Answer: _________________

Round  1  2  3  4  5
#9 Algebra II – Hustle
MAΘ National Convention 2010

Find the 8th term of the geometric sequence
2, 6, 18, 54 ...
5 5 5 5

Answer: _____________

Round 1 2 3 4 5

#10 Algebra II – Hustle
MAΘ National Convention 2010

Simplify, for $i = \sqrt{-1}$:

$\left(7i^2\right)\left(-8i\right)^2 + \left(5i^3\right)\left(-4i\right) + \left(\frac{\sqrt{441}}{i^2}\right)\left(\frac{\sqrt{-9}}{i}\right)$

Answer: _____________

Round 1 2 3 4 5

#11 Algebra II – Hustle
MAΘ National Convention 2010

There are 7 international runners competing in the Penn Relays 100m women’s final. How many different ways can three of the 7 different runners finish in first, second and third place in the race?

Answer: _____________

Round 1 2 3 4 5

#12 Algebra II – Hustle
MAΘ National Convention 2010

Graceful Living Senior Citizens Drama Club is planning a bus trip to New York City to see the Color Purple Broadway play. The cost per person for the bus rental varies inversely as the number of people going on the trip. It will cost $26 per person if 63 people go on the trip. How much (in dollars and cents) will it cost per person if 72 people go on the trip?

Answer: _____________

Round 1 2 3 4 5
#13 Algebra II – Hustle
MAΘ National Convention 2010

The equation for a line that passes through the points $(-6, -3)$ and $(-3, -10)$ is $y = mx + b$. Evaluate $\frac{b}{m}$.

Answer: _____________

Round 1 2 3 4 5

#14 Algebra II – Hustle
MAΘ National Convention 2010

The function $f(x) = x^2 + Bx + C$ has solutions $1 + 3i$ and $1 - 3i$. Evaluate $(2B + C)$.

Answer: _____________

Round 1 2 3 4 5

#15 Algebra II – Hustle
MAΘ National Convention 2010

Simplify: $5\sqrt{27} + 6\sqrt{3} - 4\sqrt{48}$

Answer: _____________

Round 1 2 3 4 5

#16 Algebra II – Hustle
MAΘ National Convention 2010

For the pair of functions, $f(x) = 2x^3 - x$ and $g(x) = 3x^2 - 2$, find $g(f(-1))$ when $f(x) = 2 - 7x$ and $g(x) = 3x^2 - 2$.

Answer: _____________

Round 1 2 3 4 5
#17 Algebra II – Hustle  
MAΘ National Convention 2010

Simplify the rational expression and express as a single fraction, where defined:

\[
\frac{x^2 - 16x + 64}{10x} - \frac{x - 8}{2x}
\]

Answer : _____________

Round 1 2 3 4 5

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#18 Algebra II – Hustle  
MAΘ National Convention 2010

Solve the equation:

\[
\frac{1}{9^{4x}} = 27^{8-2x}
\]

Answer : _____________

Round 1 2 3 4 5

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#19 Algebra II – Hustle  
MAΘ National Convention 2010

Find the positive x-intercept of a circle with the given radius and center:
Radius: 4
Center: (3,−1)

Answer : _____________

Round 1 2 3 4 5

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#20 Algebra II – Hustle  
MAΘ National Convention 2010

When \(3x^2 - x - 10\) is factored as \((Ax + B)(Cx - D)\), where A,B,C, and D are positive integers, find \(BC\).

Answer : _____________

Round 1 2 3 4 5
#21 Algebra II – Hustle
MAΘ National Convention 2010

The solution to the system below is the point \((x, y, z)\). Evaluate \((z - x)\).

\[
\begin{align*}
3y &= 6 \\
x + 3y + 3z &= 10 \\
y - z &= \quad (1)
\end{align*}
\]

Answer : _____________

Round 1 2 3 4 5

#22 Algebra II – Hustle
MAΘ National Convention 2010

Write an explicit formula for the nth term of the geometric sequence 3, 6, 12, 24…

Answer : _____________

Round 1 2 3 4 5

#23 Algebra II – Hustle
MAΘ National Convention 2010

What is the 17th prime number?

Answer : _____________

Round 1 2 3 4 5

#24 Algebra II – Hustle
MAΘ National Convention 2010

Find the least value of \(x\) that satisfies the equation:

\[
\frac{x - 3}{4x} - \frac{-2x + 2}{9} = -\frac{29}{36}
\]

Answer : _____________

Round 1 2 3 4 5
Find the greatest integer that is not in the solution set of the inequality:

\[
\frac{2x - 2}{x - 25} \geq \frac{1}{x + 5}
\]

Answer: _____________

Round 1 2 3 4 5