#1 Algebra – Hustle
MAΘ National Convention 2024

If an acute triangle has sides of length 9 and 12 and an area of $27\sqrt{3}$, what is the measure of the angle (**in degrees**) formed by the two given sides?

Answer : _____

Round 1 2 3 4 5

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Round 1 2 3 4 5

#2 Algebra – Hustle
MAΘ National Convention 2024

Evaluate:

$$\sum_{s=1}^{5}\left(\left(\sum_{n=1}^{4}(6n-7)\right)\cdot s-11\right)$$

Answer : _____

Round 1 2 3 4 5

#2 Algebra – Hustle
MAΘ National Convention 2024

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$$\sum_{s=1}^{5}\left(\left(\sum_{n=1}^{4}(6n-7)\right)\cdot s-11\right)$$

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Round 1 2 3 4 5

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Answer : _____

Round 1 2 3 4 5

#3 Algebra – Hustle
MAΘ National Convention 2024

Simplify:

$$\frac{3-2i}{2+\frac{5i}{1+2i}}$$

Answer : _____

Round 1 2 3 4 5

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MAΘ National Convention 2024

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Round 1 2 3 4 5

#4 Algebra – Hustle
MAΘ National Convention 2024

Evaluate the product:

$$\prod_{n=10}^{9999} \log_n(n+1)$$

Answer : _____

Round 1 2 3 4 5

#4 Algebra – Hustle
MAΘ National Convention 2024

Evaluate the product:

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Answer : _____

Round 1 2 3 4 5

#5 Algebra – Hustle
MAΘ National Convention 2024

Solve for x:

$$\frac{1}{3}\log_{20}(2x-1) = \log_{20} 11 - 2\log_{20}\left(\sqrt[3]{2x-1}\right)$$

Answer : _____

Round 1 2 3 4 5

#5 Algebra – Hustle
MAΘ National Convention 2024

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$$\frac{1}{3}\log_{20}(2x-1) = \log_{20} 11 - 2\log_{20}\left(\sqrt[3]{2x-1}\right)$$

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Answer : _____

Round 1 2 3 4 5

#6 Algebra – Hustle
MAΘ National Convention 2024

Find the length of the transverse axis of the hyperbola with equation:

$$9x^2 - 90x - 16y^2 + 64y + 17 = 0$$

Answer : ____________________

Round 1 2 3 4 5

#6 Algebra – Hustle
MAΘ National Convention 2024

Find the length of the transverse axis of the hyperbola with equation:

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#7 Algebra – Hustle
MAΘ National Convention 2024

Find the sum of the reciprocals of the roots taken 4 at a time:

$$6x^5 + 5x^4 + 4x^3 + 3x^2 + 2x + 7 = 0$$

Answer : _____

Round 1 2 3 4 5

#7 Algebra – Hustle
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Answer : _____

Round 1 2 3 4 5

#8 Algebra – Hustle
MAΘ National Convention 2024

What is the 5^{th} triangular number?

Answer : _____

Round 1 2 3 4 5

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#9 Algebra – Hustle
MAΘ National Convention 2024

Express 10431_5 in base 12.

Answer : _____

Round 1 2 3 4 5

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Answer : _____

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#9 Algebra – Hustle
MAΘ National Convention 2024

Express 10431_5 in base 12.

Answer : _____

Round 1 2 3 4 5

#10 Algebra – Hustle
MAΘ National Convention 2024

What is the units digit of 8^{3004}?

Answer : _____

Round 1 2 3 4 5

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Round 1 2 3 4 5

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Round 1 2 3 4 5

#11 Algebra – Hustle
MAΘ National Convention 2024

For the polynomial

$$f(x) = 7x^5 - 6x^4 - 5x^3 + 2$$

Let N be the remainder when it is divided by $(x - 1)$ and S be the remainder when it is divided by $(x + 1)$. Compute $N + S$.

Answer : _____

Round 1 2 3 4 5

#11 Algebra – Hustle
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Answer : _____

Round 1 2 3 4 5

#12 Algebra – Hustle
MAΘ National Convention 2024

Solve for x:

$$x = \sqrt{132 - \sqrt{132 - \cdots}}$$

Answer : _____

Round 1 2 3 4 5

#12 Algebra – Hustle
MAΘ National Convention 2024

Solve for x:

$$x = \sqrt{132 - \sqrt{132 - \cdots}}$$

Answer : _____

Round 1 2 3 4 5

#12 Algebra – Hustle
MAΘ National Convention 2024

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Answer : _____

Round 1 2 3 4 5

#12 Algebra – Hustle
MAΘ National Convention 2024

Solve for x:

$$x = \sqrt{132 - \sqrt{132 - \cdots}}$$

Answer : _____

Round 1 2 3 4 5

#13 Algebra – Hustle
MAΘ National Convention 2024

What is the sum of the coefficients in the expansion of $(7x - 6y)^{11}$?

Answer : _____

Round 1 2 3 4 5

#13 Algebra – Hustle
MAΘ National Convention 2024

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#14 Algebra – Hustle
MAΘ National Convention 2024

The endpoints of the major axis of an ellipse are $(13,0)$ and $(-13,0)$. The coordinates of the foci are $(\sqrt{5},0)$ and $(-\sqrt{5},0)$. What is the area enclosed by the ellipse?

Answer : _____

Round 1 2 3 4 5

#14 Algebra – Hustle
MAΘ National Convention 2024

The endpoints of the major axis of an ellipse are $(13,0)$ and $(-13,0)$. The coordinates of the foci are $(\sqrt{5},0)$ and $(-\sqrt{5},0)$. What is the area enclosed by the ellipse?

Answer : _____

Round 1 2 3 4 5

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Answer : _____

Round 1 2 3 4 5

#15 Algebra – Hustle
MAΘ National Convention 2024

Let $N = \begin{bmatrix} 7 & 11 \\ 12 & 6 \end{bmatrix}$ and let $S = \begin{bmatrix} 6 & 4 \\ 5 & 7 \end{bmatrix}$.
If $SN = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, then what is $b - c$?

Answer : _____

Round 1 2 3 4 5

#15 Algebra – Hustle
MAΘ National Convention 2024

Let $N = \begin{bmatrix} 7 & 11 \\ 12 & 6 \end{bmatrix}$ and let $S = \begin{bmatrix} 6 & 4 \\ 5 & 7 \end{bmatrix}$.
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Answer : _____

Round 1 2 3 4 5

#16 Algebra – Hustle
MAΘ National Convention 2024

Two **different** 2-digit positive integers are randomly chosen and multiplied together. What is the probability that the resulting product is odd?

Answer : ____________________

Round 1 2 3 4 5

#16 Algebra – Hustle
MAΘ National Convention 2024

Two **different** 2-digit positive integers are randomly chosen and multiplied together. What is the probability that the resulting product is odd?

Answer : ____________________

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#16 Algebra – Hustle
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Round 1 2 3 4 5

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Round 1 2 3 4 5

#17 Algebra – Hustle
MAΘ National Convention 2024

Find the eccentricity of the conic section defined by:

$$\frac{(x-6)^2}{49}+\frac{(y-7)^2}{36}=1$$

Answer : _____

Round 1 2 3 4 5

#17 Algebra – Hustle
MAΘ National Convention 2024

Find the eccentricity of the conic section defined by:

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Answer : _____

Round 1 2 3 4 5

#18 Algebra – Hustle
MAΘ National Convention 2024

Find the equations of all vertical asymptotes of

$$y = \frac{x^3 - 2x^2 - 29x + 30}{x^3 - 19x + 30}$$

Answer : _____

Round 1 2 3 4 5

#18 Algebra – Hustle
MAΘ National Convention 2024

Find the equations of all vertical asymptotes of

$$y = \frac{x^3 - 2x^2 - 29x + 30}{x^3 - 19x + 30}$$

Answer : _____

Round 1 2 3 4 5

#18 Algebra – Hustle
MAΘ National Convention 2024

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MAΘ National Convention 2024

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Answer : _____

Round 1 2 3 4 5

#19 Algebra – Hustle
MAΘ National Convention 2024

What is the tens digit of 7^{2024}?

Answer : _____

Round 1 2 3 4 5

#19 Algebra – Hustle
MAΘ National Convention 2024

What is the tens digit of 7^{2024}?

Answer : _____

Round 1 2 3 4 5

#19 Algebra – Hustle
MAΘ National Convention 2024

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Round 1 2 3 4 5

#19 Algebra – Hustle
MAΘ National Convention 2024

What is the tens digit of 7^{2024}?

Answer : _____

Round 1 2 3 4 5

#20 Algebra – Hustle
MAΘ National Convention 2024

What is the ordinate of the highest point on the graph of $f(x) = -2x^2 + 4x - 17$?

Answer : _____

Round 1 2 3 4 5

#20 Algebra – Hustle
MAΘ National Convention 2024

What is the ordinate of the highest point on the graph of $f(x) = -2x^2 + 4x - 17$?

Answer : _____

Round 1 2 3 4 5

#20 Algebra – Hustle
MAΘ National Convention 2024

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Answer : _____

Round 1 2 3 4 5

#20 Algebra – Hustle
MAΘ National Convention 2024

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Answer : _____

Round 1 2 3 4 5

#21 Algebra – Hustle
MAΘ National Convention 2024

If two real numbers differ by 7, what is their least possible product?

Answer : _____

Round 1 2 3 4 5

#21 Algebra – Hustle
MAΘ National Convention 2024

If two real numbers differ by 7, what is their least possible product?

Answer : _____

Round 1 2 3 4 5

#21 Algebra – Hustle
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Round 1 2 3 4 5

#21 Algebra – Hustle
MAΘ National Convention 2024

If two real numbers differ by 7, what is their least possible product?

Answer : _____

Round 1 2 3 4 5

#22 Algebra – Hustle
MAΘ National Convention 2024

Compute the sum of the arithmetic series
$2 + 8 + 14 + \cdots + 398$.

Answer : _____

Round 1 2 3 4 5

#22 Algebra – Hustle
MAΘ National Convention 2024

Compute the sum of the arithmetic series
$2 + 8 + 14 + \cdots + 398$.

Answer : _____

Round 1 2 3 4 5

#22 Algebra – Hustle
MAΘ National Convention 2024

Compute the sum of the arithmetic series
$2 + 8 + 14 + \cdots + 398$.

Answer : _____

Round 1 2 3 4 5

#22 Algebra – Hustle
MAΘ National Convention 2024

Compute the sum of the arithmetic series
$2 + 8 + 14 + \cdots + 398$.

Answer : _____

Round 1 2 3 4 5

#23 Algebra – Hustle
MAΘ National Convention 2024

Determine how many consecutive zeros are at the end of the expansion of 11760!.

Answer : ____________________

Round 1 2 3 4 5

#23 Algebra – Hustle
MAΘ National Convention 2024

Determine how many consecutive zeros are at the end of the expansion of 11760!.

Answer : ____________________

Round 1 2 3 4 5

#23 Algebra – Hustle
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Answer : ____________________

Round 1 2 3 4 5

#23 Algebra – Hustle
MAΘ National Convention 2024

Determine how many consecutive zeros are at the end of the expansion of 11760!.

Answer : ____________________

Round 1 2 3 4 5

#24 Algebra – Hustle
MAΘ National Convention 2024

Find the sum of the reciprocals of the positive integral divisors of 496.

Answer : _____

Round 1 2 3 4 5

#24 Algebra – Hustle
MAΘ National Convention 2024

Find the sum of the reciprocals of the positive integral divisors of 496.

Answer : _____

Round 1 2 3 4 5

#24 Algebra – Hustle
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Round 1 2 3 4 5

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Find the sum of the reciprocals of the positive integral divisors of 496.

Answer : _____

Round 1 2 3 4 5

#25 Algebra – Hustle
MAΘ National Convention 2024

When 0.5 (base 10) is expressed in base 5 notation, what is the sum of the first six digits after the decimal point?

Answer : ____________________

Round 1 2 3 4 5

#25 Algebra – Hustle
MAΘ National Convention 2024

When 0.5 (base 10) is expressed in base 5 notation, what is the sum of the first six digits after the decimal point?

Answer : ____________________

Round 1 2 3 4 5

#25 Algebra – Hustle
MAΘ National Convention 2024

When 0.5 (base 10) is expressed in base 5 notation, what is the sum of the first six digits after the decimal point?

Answer : ____________________

Round 1 2 3 4 5

#25 Algebra – Hustle
MAΘ National Convention 2024

When 0.5 (base 10) is expressed in base 5 notation, what is the sum of the first six digits after the decimal point?

Answer : ____________________

Round 1 2 3 4 5