#1 Precalculus – Hustle
MAΘ National Convention 2023

What unique value of *x* will make matrix *A* singular if $A = \begin{pmatrix} 5 & x \\ 2 & 3 \end{pmatrix}$?

Answer : _____

Round 1 2 3 4 5

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MAΘ National Convention 2023

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#1 Precalculus – Hustle
MAΘ National Convention 2023

What unique value of *x* will make matrix *A* singular if $A = \begin{pmatrix} 5 & x \\ 2 & 3 \end{pmatrix}$?

Answer : _____

Round 1 2 3 4 5

#2 Precalculus – Hustle
MAΘ National Convention 2023

If $\overline{V} = \begin{pmatrix} -25 \\ 52x \\ -13 \end{pmatrix}$ and $\overline{W} = \begin{pmatrix} x \\ 4 \\ 1 \end{pmatrix}$, then for what value of x are $\overline{V}$ and $\overline{W}$ orthogonal?

Answer : _____

Round 1 2 3 4 5

#2 Precalculus – Hustle
MAΘ National Convention 2023

If $\overline{V} = \begin{pmatrix} -25 \\ 52x \\ -13 \end{pmatrix}$ and $\overline{W} = \begin{pmatrix} x \\ 4 \\ 1 \end{pmatrix}$, then for what value of x are $\overline{V}$ and $\overline{W}$ orthogonal?

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Answer : _____

Round 1 2 3 4 5

#3 Precalculus – Hustle
MAΘ National Convention 2023

What is the range of $f(x) = sin\,\theta + cos\,\theta$? Express your answer in interval notation.

Answer : _____

Round 1 2 3 4 5

#3 Precalculus – Hustle
MAΘ National Convention 2023

What is the range of $f(x) = sin\,\theta + cos\,\theta$? Express your answer in interval notation.

Answer : _____

Round 1 2 3 4 5

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Round 1 2 3 4 5

#3 Precalculus – Hustle
MAΘ National Convention 2023

What is the range of $f(x) = sin\,\theta + cos\,\theta$? Express your answer in interval notation.

Answer : _____

Round 1 2 3 4 5

#4 Precalculus – Hustle
MAΘ National Convention 2023

Simplify $\left|e^{\frac{\pi}{3}i} - e^{\frac{\pi}{2}i}\right|^2$.

Answer : _____

Round 1 2 3 4 5

#4 Precalculus – Hustle
MAΘ National Convention 2023

Simplify $\left|e^{\frac{\pi}{3}i} - e^{\frac{\pi}{2}i}\right|^2$.

Answer : _____

Round 1 2 3 4 5

#4 Precalculus – Hustle
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Answer : _____

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#4 Precalculus – Hustle
MAΘ National Convention 2023

Simplify $\left|e^{\frac{\pi}{3}i} - e^{\frac{\pi}{2}i}\right|^2$.

Answer : _____

Round 1 2 3 4 5

#5 Precalculus – Hustle
MAΘ National Convention 2023

In terms of **angles**, a triangle with sides 49, 63, and 84 units can be classified as…

Answer : _____

Round 1 2 3 4 5

#5 Precalculus – Hustle
MAΘ National Convention 2023

In terms of **angles**, a triangle with sides 49, 63, and 84 units can be classified as…

Answer : _____

Round 1 2 3 4 5

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MAΘ National Convention 2023

In terms of **angles**, a triangle with sides 49, 63, and 84 units can be classified as…

Answer : _____

Round 1 2 3 4 5

#5 Precalculus – Hustle
MAΘ National Convention 2023

In terms of **angles**, a triangle with sides 49, 63, and 84 units can be classified as…

Answer : _____

Round 1 2 3 4 5

#6 Precalculus – Hustle
MAΘ National Convention 2023

How many 5-digit palindromes have at most one 3?

Answer : _____

Round 1 2 3 4 5

#6 Precalculus – Hustle
MAΘ National Convention 2023

How many 5-digit palindromes have at most one 3?

Answer : _____

Round 1 2 3 4 5

#6 Precalculus – Hustle
MAΘ National Convention 2023

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Answer : _____

Round 1 2 3 4 5

#6 Precalculus – Hustle
MAΘ National Convention 2023

How many 5-digit palindromes have at most one 3?

Answer : _____

Round 1 2 3 4 5

#7 Precalculus – Hustle
MAΘ National Convention 2023

What is the smallest number $x > 2023$ that satisfies all of the conditions: $x \equiv 6 \, mod \, 5$, $x \equiv 7 \, mod \, 6$, and $x \equiv 5 \, mod \, 4$?

Answer : _____

Round 1 2 3 4 5

#7 Precalculus – Hustle
MAΘ National Convention 2023

What is the smallest number $x > 2023$ that satisfies all of the conditions: $x \equiv 6 \, mod \, 5$, $x \equiv 7 \, mod \, 6$, and $x \equiv 5 \, mod \, 4$?

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Round 1 2 3 4 5

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MAΘ National Convention 2023

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Answer : _____

Round 1 2 3 4 5

#7 Precalculus – Hustle
MAΘ National Convention 2023

What is the smallest number $x > 2023$ that satisfies all of the conditions: $x \equiv 6 \, mod \, 5$, $x \equiv 7 \, mod \, 6$, and $x \equiv 5 \, mod \, 4$?

Answer : _____

Round 1 2 3 4 5

#8 Precalculus – Hustle
MAΘ National Convention 2023

Find $x^4 + y^4$, given that $x + y = 7$ and $xy = 12$.

Answer : _____

Round 1 2 3 4 5

#8 Precalculus – Hustle
MAΘ National Convention 2023

Find $x^4 + y^4$, given that $x + y = 7$ and $xy = 12$.

Answer : _____

Round 1 2 3 4 5

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MAΘ National Convention 2023

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Answer : _____

Round 1 2 3 4 5

#8 Precalculus – Hustle
MAΘ National Convention 2023

Find $x^4 + y^4$, given that $x + y = 7$ and $xy = 12$.

Answer : _____

Round 1 2 3 4 5

#9 Precalculus – Hustle
MAΘ National Convention 2023

Find the sum of the coefficients in the full expansion of $(x + 2y + 5)^6$.

Answer : _____

Round 1 2 3 4 5

#9 Precalculus – Hustle
MAΘ National Convention 2023

Find the sum of the coefficients in the full expansion of $(x + 2y + 5)^6$.

Answer : _____

Round 1 2 3 4 5

#9 Precalculus – Hustle
MAΘ National Convention 2023

Find the sum of the coefficients in the full expansion of $(x + 2y + 5)^6$.

Answer : _____

Round 1 2 3 4 5

#9 Precalculus – Hustle
MAΘ National Convention 2023

Find the sum of the coefficients in the full expansion of $(x + 2y + 5)^6$.

Answer : _____

Round 1 2 3 4 5

#10 Precalculus – Hustle
MAΘ National Convention 2023

If the roots of $x^4 - 3x^3 - 3x^2 + 4x + 3 = 0$ are a, b, c, and d, then find $a^2 + b^2 + c^2 + d^2$.

Answer : _____

Round 1 2 3 4 5

#10 Precalculus – Hustle
MAΘ National Convention 2023

If the roots of $x^4 - 3x^3 - 3x^2 + 4x + 3 = 0$ are a, b, c, and d, then find $a^2 + b^2 + c^2 + d^2$.

Answer : _____

Round 1 2 3 4 5

#10 Precalculus – Hustle
MAΘ National Convention 2023

If the roots of $x^4 - 3x^3 - 3x^2 + 4x + 3 = 0$ are a, b, c, and d, then find $a^2 + b^2 + c^2 + d^2$.

Answer : _____

Round 1 2 3 4 5

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MAΘ National Convention 2023

If the roots of $x^4 - 3x^3 - 3x^2 + 4x + 3 = 0$ are a, b, c, and d, then find $a^2 + b^2 + c^2 + d^2$.

Answer : _____

Round 1 2 3 4 5

#11 Precalculus – Hustle
MAΘ National Convention 2023

What is the tangent of 120 degrees?

Answer : _____

Round 1 2 3 4 5

#11 Precalculus – Hustle
MAΘ National Convention 2023

What is the tangent of 120 degrees?

Answer : _____

Round 1 2 3 4 5

#11 Precalculus – Hustle
MAΘ National Convention 2023

What is the tangent of 120 degrees?

Answer : _____

Round 1 2 3 4 5

#11 Precalculus – Hustle
MAΘ National Convention 2023

What is the tangent of 120 degrees?

Answer : _____

Round 1 2 3 4 5

#12 Precalculus – Hustle
MAΘ National Convention 2023

Find the dot product of $\langle 4, 6\rangle$ and $\langle 2, 4\rangle$.

Answer : ____________________

Round 1 2 3 4 5

#12 Precalculus – Hustle
MAΘ National Convention 2023

Find the dot product of $\langle 4, 6\rangle$ and $\langle 2, 4\rangle$.

Answer : ____________________

Round 1 2 3 4 5

#12 Precalculus – Hustle
MAΘ National Convention 2023

Find the dot product of $\langle 4, 6\rangle$ and $\langle 2, 4\rangle$.

Answer : ____________________

Round 1 2 3 4 5

#12 Precalculus – Hustle
MAΘ National Convention 2023

Find the dot product of $\langle 4, 6\rangle$ and $\langle 2, 4\rangle$.

Answer : ____________________

Round 1 2 3 4 5

#13 Precalculus – Hustle
MAΘ National Convention 2023

Find the distance between the points with polar coordinates $\left(-7, -\frac{\pi}{6}\right)$ and $\left(24, \frac{\pi}{2}\right)$.

Answer : ____________________

Round 1 2 3 4 5

#13 Precalculus – Hustle
MAΘ National Convention 2023

Find the distance between the points with polar coordinates $\left(-7, -\frac{\pi}{6}\right)$ and $\left(24, \frac{\pi}{2}\right)$.

Answer : ____________________

Round 1 2 3 4 5

#13 Precalculus – Hustle
MAΘ National Convention 2023

Find the distance between the points with polar coordinates $\left(-7, -\frac{\pi}{6}\right)$ and $\left(24, \frac{\pi}{2}\right)$.

Answer : ____________________

Round 1 2 3 4 5

#13 Precalculus – Hustle
MAΘ National Convention 2023

Find the distance between the points with polar coordinates $\left(-7, -\frac{\pi}{6}\right)$ and $\left(24, \frac{\pi}{2}\right)$.

Answer : ____________________

Round 1 2 3 4 5

#14 Precalculus – Hustle
MAΘ National Convention 2023

Evaluate $\sum_{n=3}^{\infty} \frac{6}{n^2+5n+4}$.

Answer : _____

Round 1 2 3 4 5

#14 Precalculus – Hustle
MAΘ National Convention 2023

Evaluate $\sum_{n=3}^{\infty} \frac{6}{n^2+5n+4}$.

Answer : _____

Round 1 2 3 4 5

#14 Precalculus – Hustle
MAΘ National Convention 2023

Evaluate $\sum_{n=3}^{\infty} \frac{6}{n^2+5n+4}$.

Answer : _____

Round 1 2 3 4 5

#14 Precalculus – Hustle
MAΘ National Convention 2023

Evaluate $\sum_{n=3}^{\infty} \frac{6}{n^2+5n+4}$.

Answer : _____

Round 1 2 3 4 5

#15 Precalculus – Hustle
MAΘ National Convention 2023

Find the area of the triangle created by connecting the points $(4,1,2)$, $(6,4,-1)$, and $(3,-2,6)$.

Answer : _____

Round 1 2 3 4 5

#15 Precalculus – Hustle
MAΘ National Convention 2023

Find the area of the triangle created by connecting the points $(4,1,2)$, $(6,4,-1)$, and $(3,-2,6)$.

Answer : _____

Round 1 2 3 4 5

#15 Precalculus – Hustle
MAΘ National Convention 2023

Find the area of the triangle created by connecting the points $(4,1,2)$, $(6,4,-1)$, and $(3,-2,6)$.

Answer : _____

Round 1 2 3 4 5

#15 Precalculus – Hustle
MAΘ National Convention 2023

Find the area of the triangle created by connecting the points $(4,1,2)$, $(6,4,-1)$, and $(3,-2,6)$.

Answer : _____

Round 1 2 3 4 5

#16 Precalculus – Hustle
MAΘ National Convention 2023

Find the length of the conjugate axis of the figure defined by the parametric questions;

$x(t) = 3 + 7\,sec(t)$
$y(t) = 16 - 5\,tan(t)$.

Answer : _____

Round 1 2 3 4 5

#16 Precalculus – Hustle
MAΘ National Convention 2023

Find the length of the conjugate axis of the figure defined by the parametric questions;

$x(t) = 3 + 7\,sec(t)$
$y(t) = 16 - 5\,tan(t)$.

Answer : _____

Round 1 2 3 4 5

#16 Precalculus – Hustle
MAΘ National Convention 2023

Find the length of the conjugate axis of the figure defined by the parametric questions;

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Answer : _____

Round 1 2 3 4 5

#16 Precalculus – Hustle
MAΘ National Convention 2023

Find the length of the conjugate axis of the figure defined by the parametric questions;

$x(t) = 3 + 7\,sec(t)$
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Answer : _____

Round 1 2 3 4 5

#17 Precalculus – Hustle
MAΘ National Convention 2023

Given that a and b are real numbers randomly selected between 0 and 20. What is the probability that $a + b$ is greater than 20 but less than 30?

Answer : ____________________

Round 1 2 3 4 5

#17 Precalculus – Hustle
MAΘ National Convention 2023

Given that a and b are real numbers randomly selected between 0 and 20. What is the probability that $a + b$ is greater than 20 but less than 30?

Answer : ____________________

Round 1 2 3 4 5

#17 Precalculus – Hustle
MAΘ National Convention 2023

Given that a and b are real numbers randomly selected between 0 and 20. What is the probability that $a + b$ is greater than 20 but less than 30?

Answer : ____________________

Round 1 2 3 4 5

#17 Precalculus – Hustle
MAΘ National Convention 2023

Given that a and b are real numbers randomly selected between 0 and 20. What is the probability that $a + b$ is greater than 20 but less than 30?

Answer : ____________________

Round 1 2 3 4 5

#18 Precalculus – Hustle
MAΘ National Convention 2023

Simplify: $\frac{1}{1+\cos x}+\frac{1}{1+\sin x}+\frac{1}{1+\sec x}+\frac{1}{1+\csc x}$.

Answer : _____

Round 1 2 3 4 5

#18 Precalculus – Hustle
MAΘ National Convention 2023

Simplify: $\frac{1}{1+\cos x}+\frac{1}{1+\sin x}+\frac{1}{1+\sec x}+\frac{1}{1+\csc x}$.

Answer : _____

Round 1 2 3 4 5

#18 Precalculus – Hustle
MAΘ National Convention 2023

Simplify: $\frac{1}{1+\cos x}+\frac{1}{1+\sin x}+\frac{1}{1+\sec x}+\frac{1}{1+\csc x}$.

Answer : _____

Round 1 2 3 4 5

#18 Precalculus – Hustle
MAΘ National Convention 2023

Simplify: $\frac{1}{1+\cos x}+\frac{1}{1+\sin x}+\frac{1}{1+\sec x}+\frac{1}{1+\csc x}$.

Answer : _____

Round 1 2 3 4 5

#19 Precalculus – Hustle
MAΘ National Convention 2023

Eridan has a keychain that has his name on it in beads. There are 6 beads in total, each of which has one letter of his name. How many different ways can Eridan rearrange these beads on his keychain?

Answer : ____________________

Round 1 2 3 4 5

#19 Precalculus – Hustle
MAΘ National Convention 2023

Eridan has a keychain that has his name on it in beads. There are 6 beads in total, each of which has one letter of his name. How many different ways can Eridan rearrange these beads on his keychain?

Answer : ____________________

Round 1 2 3 4 5

#19 Precalculus – Hustle
MAΘ National Convention 2023

Eridan has a keychain that has his name on it in beads. There are 6 beads in total, each of which has one letter of his name. How many different ways can Eridan rearrange these beads on his keychain?

Answer : ____________________

Round 1 2 3 4 5

#19 Precalculus – Hustle
MAΘ National Convention 2023

Eridan has a keychain that has his name on it in beads. There are 6 beads in total, each of which has one letter of his name. How many different ways can Eridan rearrange these beads on his keychain?

Answer : ____________________

Round 1 2 3 4 5

#20 Precalculus – Hustle
MAΘ National Convention 2023

What is the sine of the angle between the vectors $\binom{2}{2}$ and $\binom{4}{2}$?

Answer : _____

Round 1 2 3 4 5

#20 Precalculus – Hustle
MAΘ National Convention 2023

What is the sine of the angle between the vectors $\binom{2}{2}$ and $\binom{4}{2}$?

Answer : _____

Round 1 2 3 4 5

#20 Precalculus – Hustle
MAΘ National Convention 2023

What is the sine of the angle between the vectors $\binom{2}{2}$ and $\binom{4}{2}$?

Answer : _____

Round 1 2 3 4 5

#20 Precalculus – Hustle
MAΘ National Convention 2023

What is the sine of the angle between the vectors $\binom{2}{2}$ and $\binom{4}{2}$?

Answer : _____

Round 1 2 3 4 5

#21 Precalculus – Hustle
MAΘ National Convention 2023

If a cylinder, of radius 3 and height 17, has a hole of diameter 2 drilled through the center of it, what is the total surface area of the resulting figure?

Answer : ____________________

Round 1 2 3 4 5

#21 Precalculus – Hustle
MAΘ National Convention 2023

If a cylinder, of radius 3 and height 17, has a hole of diameter 2 drilled through the center of it, what is the total surface area of the resulting figure?

Answer : ____________________

Round 1 2 3 4 5

#21 Precalculus – Hustle
MAΘ National Convention 2023

If a cylinder, of radius 3 and height 17, has a hole of diameter 2 drilled through the center of it, what is the total surface area of the resulting figure?

Answer : ____________________

Round 1 2 3 4 5

#21 Precalculus – Hustle
MAΘ National Convention 2023

If a cylinder, of radius 3 and height 17, has a hole of diameter 2 drilled through the center of it, what is the total surface area of the resulting figure?

Answer : ____________________

Round 1 2 3 4 5

#22 Precalculus – Hustle
MAΘ National Convention 2023

Evaluate $\left(sin\frac{7\pi}{12}\right)\left(cos\frac{5\pi}{4}\right)\left(tan\frac{\pi}{3}\right)\left(csc\frac{\pi}{6}\right)$.

Answer : _____

Round 1 2 3 4 5

#22 Precalculus – Hustle
MAΘ National Convention 2023

Evaluate $\left(sin\frac{7\pi}{12}\right)\left(cos\frac{5\pi}{4}\right)\left(tan\frac{\pi}{3}\right)\left(csc\frac{\pi}{6}\right)$.

Answer : _____

Round 1 2 3 4 5

#22 Precalculus – Hustle
MAΘ National Convention 2023

Evaluate $\left(sin\frac{7\pi}{12}\right)\left(cos\frac{5\pi}{4}\right)\left(tan\frac{\pi}{3}\right)\left(csc\frac{\pi}{6}\right)$.

Answer : _____

Round 1 2 3 4 5

#22 Precalculus – Hustle
MAΘ National Convention 2023

Evaluate $\left(sin\frac{7\pi}{12}\right)\left(cos\frac{5\pi}{4}\right)\left(tan\frac{\pi}{3}\right)\left(csc\frac{\pi}{6}\right)$.

Answer : _____

Round 1 2 3 4 5

#23 Precalculus – Hustle
MAΘ National Convention 2023

Evaluate: $\lim_{x\to 0} \frac{\sin x+1}{\sin x}$.

Answer : _____

Round 1 2 3 4 5

#23 Precalculus – Hustle
MAΘ National Convention 2023

Evaluate: $\lim_{x\to 0} \frac{\sin x+1}{\sin x}$.

Answer : _____

Round 1 2 3 4 5

#23 Precalculus – Hustle
MAΘ National Convention 2023

Evaluate: $\lim_{x\to 0} \frac{\sin x+1}{\sin x}$.

Answer : _____

Round 1 2 3 4 5

#23 Precalculus – Hustle
MAΘ National Convention 2023

Evaluate: $\lim_{x\to 0} \frac{\sin x+1}{\sin x}$.

Answer : _____

Round 1 2 3 4 5

#24 Precalculus – Hustle
MAΘ National Convention 2023

How many prime numbers are there that are less than 50?

Answer : _____

Round 1 2 3 4 5

#24 Precalculus – Hustle
MAΘ National Convention 2023

How many prime numbers are there that are less than 50?

Answer : _____

Round 1 2 3 4 5

#24 Precalculus – Hustle
MAΘ National Convention 2023

How many prime numbers are there that are less than 50?

Answer : _____

Round 1 2 3 4 5

#24 Precalculus – Hustle
MAΘ National Convention 2023

How many prime numbers are there that are less than 50?

Answer : _____

Round 1 2 3 4 5

#25 Precalculus – Hustle
MAΘ National Convention 2023

If Will's test scores are 97, 98, 101, 77, 99, 110, and 111, what does he need to get on his next test to average exactly 100?

Answer : _____

Round 1 2 3 4 5

#25 Precalculus – Hustle
MAΘ National Convention 2023

If Will's test scores are 97, 98, 101, 77, 99, 110, and 111, what does he need to get on his next test to average exactly 100?

Answer : _____

Round 1 2 3 4 5

#25 Precalculus – Hustle
MAΘ National Convention 2023

If Will's test scores are 97, 98, 101, 77, 99, 110, and 111, what does he need to get on his next test to average exactly 100?

Answer : _____

Round 1 2 3 4 5

#25 Precalculus – Hustle
MAΘ National Convention 2023

If Will's test scores are 97, 98, 101, 77, 99, 110, and 111, what does he need to get on his next test to average exactly 100?

Answer : _____

Round 1 2 3 4 5