Question #0 – Calculus Seat – 2025 MAO Nationals Convention Relay

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Get ready for a Musical Adventure! The number of songs Mauithedog10 listens to over time can be modeled by $f(x) = \frac{1}{B}x^2 + 1$. Let C be the area in the first quadrant between $y = f(x)$ and $x = 1$.

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Question #1 – Calculus Seat – 2025 MAO Nationals Convention Relay

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Charli XCX is going Vroom Vroom in her car which has a displacement given by $x(t) = \cos(t^B e^t)$. Let C be the velocity of the car when $t = 1$.

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Question #2 – Calculus Seat – 2025 MAO Nationals Convention Relay

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Take The Eagles to the limit! Let

$$C = \lim_{x \to \infty} \left(\sqrt{x^2 + Bx} - \sqrt{x^2 - x} \right)$$

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Question #3 – Calculus Seat – 2025 MAO Nationals Convention Relay

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The Weeknd is blinded by the lights, and starts walking in a straight line directly away from a lamppost of height H meters at a speed of $|B|$ m/s. If The Weeknd has a height of of $H/3$ meters, let C be how fast is the length of his shadow changing when he is 10 meters away.

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Question #4 – Alpha Seat – 2025 MAO Nationals Convention Relay

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Bruno Mars needs to study angles at the APT if he wants to get good at astronomy. Given triangle ΔPQR with $\overline{PQ} = \overline{QR} = B$ and $\angle Q = \frac{\pi}{4} + \frac{\pi}{3}$, let $C = (\overline{PR})^2$. **Note C is the square of the side length**.

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Question #5 – Alpha Seat – 2025 MAO Nationals Convention Relay

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Not all questions can be music themed, and not all areas can be found without knowing linear algebra. A convex region in the xy-plane with positive area k is redrawn so that every point (x, y) now has the coordinate $(3kx - y, Bx + 2y)$. This new region has area B^2. Let $C = k$.

Question #5 – Alpha Seat – 2025 MAO Nationals Convention Relay

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Question #6 – Alpha Seat – 2025 MAO Nationals Convention Relay

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ABBA is trying to train their angle eyes by practicing their trigonometry. They are interested in finding the maximum value of

$$B\sqrt{3}\sin(\theta) + 2\cos(\theta + \pi/3)$$

Let C be **the square of this maximum value.**

Question #6 – Alpha Seat – 2025 MAO Nationals Convention Relay

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Question #7 – Theta Seat – 2025 MAO Nationals Convention Relay

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Not all questions can be music themed, and not all roots can be found without useful tricks. Let $B = n\pi + m$ for integers n, m. If p, q are the complex roots to the polynomial $nx^2 + mx + 1$, then let

$$C = \frac{1}{p-1} + \frac{1}{q-1}$$

Question #7 – Theta Seat – 2025 MAO Nationals Convention Relay

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Question #8 – Theta Seat – 2025 MAO Nationals Convention Relay

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The members of Magdelena Bay are Killing Time waiting for each other to arrive. Let $T = |\ln(B)|$. Two band members are going to a meeting that begins at 9 AM. One person will arrive anywhere from 9 AM to $(T + 1/2)$ hours after 9 AM, while the other person will arrive anywhere from **9:15 AM** to T hours after **9:15 AM**. Assume both people arrive at a random time uniformly on their respective intervals and are independent of each other. Let C be the probability that the two arrive within 15 minutes of each other.

Question #8 – Theta Seat – 2025 MAO Nationals Convention Relay

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Question #9 – Theta Seat – 2025 MAO Nationals Convention Relay

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The 1975 are done learning About You and moving on to Somebody Else. Matty is standing at $(24, B)$ and must get to $(x, 20)$, where $x > 24$, while stopping along the line $y = 1$ along the way. They travel a distance D doing so. If $D^2 = 12025$, let C be the maximum value of x.

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