

#0 Alpha Ciphery
MA@ National Convention 2026

If the vertex of $y = 4x^2 - 6x + 9$ is (a, b) , find the value of $a + b$, written as a mixed number.

#0 Alpha Ciphery
MA@ National Convention 2026

If the vertex of $y = 4x^2 - 6x + 9$ is (a, b) , find the value of $a + b$, written as a mixed number.

#0 Alpha Ciphery
MA@ National Convention 2026

If the vertex of $y = 4x^2 - 6x + 9$ is (a, b) , find the value of $a + b$, written as a mixed number.

#0 Alpha Ciphery
MA@ National Convention 2026

If the vertex of $y = 4x^2 - 6x + 9$ is (a, b) , find the value of $a + b$, written as a mixed number.

#1 Alpha Cipheryng
MA@ National Convention 2026

Find the coefficient of x^7 in the expansion of $(x^2 - 3x - 1)^4$.

#1 Alpha Cipheryng
MA@ National Convention 2026

Find the coefficient of x^7 in the expansion of $(x^2 - 3x - 1)^4$.

#1 Alpha Cipheryng
MA@ National Convention 2026

Find the coefficient of x^7 in the expansion of $(x^2 - 3x - 1)^4$.

#1 Alpha Cipheryng
MA@ National Convention 2026

Find the coefficient of x^7 in the expansion of $(x^2 - 3x - 1)^4$.

#2 Alpha Ciphering**MAΘ National Convention 2026**

The equation of a hyperbola with vertices $(0, \pm 4)$ and eccentricity 2.5 can be written in the form $\frac{y^2}{m} - \frac{x^2}{n} = 1$. Find the value of $2m + n$.

#2 Alpha Ciphering**MAΘ National Convention 2026**

The equation of a hyperbola with vertices $(0, \pm 4)$ and eccentricity 2.5 can be written in the form $\frac{y^2}{m} - \frac{x^2}{n} = 1$. Find the value of $2m + n$.

#2 Alpha Ciphering**MAΘ National Convention 2026**

The equation of a hyperbola with vertices $(0, \pm 4)$ and eccentricity 2.5 can be written in the form $\frac{y^2}{m} - \frac{x^2}{n} = 1$. Find the value of $2m + n$.

#2 Alpha Ciphering**MAΘ National Convention 2026**

The equation of a hyperbola with vertices $(0, \pm 4)$ and eccentricity 2.5 can be written in the form $\frac{y^2}{m} - \frac{x^2}{n} = 1$. Find the value of $2m + n$.

#3 Alpha Cipheryng
MA@ National Convention 2026

The equation $\log_b \sqrt{x} = \sqrt{\log_b x}$ has two solutions for x , the sum of which is 10. Find the value of b .

#3 Alpha Cipheryng
MA@ National Convention 2026

The equation $\log_b \sqrt{x} = \sqrt{\log_b x}$ has two solutions for x , the sum of which is 10. Find the value of b .

#3 Alpha Cipheryng
MA@ National Convention 2026

The equation $\log_b \sqrt{x} = \sqrt{\log_b x}$ has two solutions for x , the sum of which is 10. Find the value of b .

#3 Alpha Cipheryng
MA@ National Convention 2026

The equation $\log_b \sqrt{x} = \sqrt{\log_b x}$ has two solutions for x , the sum of which is 10. Find the value of b .

#4 Alpha Ciphering**MAΘ National Convention 2026**

Find the distance between the point $(7, 11, 10)$ and the plane $3x - 4y + 11z = 13$.

#4 Alpha Ciphering**MAΘ National Convention 2026**

Find the distance between the point $(7, 11, 10)$ and the plane $3x - 4y + 11z = 13$.

#4 Alpha Ciphering**MAΘ National Convention 2026**

Find the distance between the point $(7, 11, 10)$ and the plane $3x - 4y + 11z = 13$.

#4 Alpha Ciphering**MAΘ National Convention 2026**

Find the distance between the point $(7, 11, 10)$ and the plane $3x - 4y + 11z = 13$.

#5 Alpha Ciphering
MA@ National Convention 2026

Three positive integers a , b , and c have the properties that $a + b + c = 40$ and $abc = 1196$. Find the value of $a^2 + b^2 + c^2$.

#5 Alpha Ciphering
MA@ National Convention 2026

Three positive integers a , b , and c have the properties that $a + b + c = 40$ and $abc = 1196$. Find the value of $a^2 + b^2 + c^2$.

#5 Alpha Ciphering
MA@ National Convention 2026

Three positive integers a , b , and c have the properties that $a + b + c = 40$ and $abc = 1196$. Find the value of $a^2 + b^2 + c^2$.

#5 Alpha Ciphering
MA@ National Convention 2026

Three positive integers a , b , and c have the properties that $a + b + c = 40$ and $abc = 1196$. Find the value of $a^2 + b^2 + c^2$.

#6 Alpha Cipherring
MA@ National Convention 2026

If $\cos 2x = \frac{1}{5}$, find the value of $\sin^2 x \cos^2 x$.

#6 Alpha Cipherring
MA@ National Convention 2026

If $\cos 2x = \frac{1}{5}$, find the value of $\sin^2 x \cos^2 x$.

#6 Alpha Cipherring
MA@ National Convention 2026

If $\cos 2x = \frac{1}{5}$, find the value of $\sin^2 x \cos^2 x$.

#6 Alpha Cipherring
MA@ National Convention 2026

If $\cos 2x = \frac{1}{5}$, find the value of $\sin^2 x \cos^2 x$.

#7 Alpha Ciphering**MAΘ National Convention 2026**

If $-5 \leq c \leq 30$, where c is an integer, find the probability that $f(x) = x^2 + 2(c+4)x - 5c + 64$ produces only positive values.

#7 Alpha Ciphering**MAΘ National Convention 2026**

If $-5 \leq c \leq 30$, where c is an integer, find the probability that $f(x) = x^2 + 2(c+4)x - 5c + 64$ produces only positive values.

#7 Alpha Ciphering**MAΘ National Convention 2026**

If $-5 \leq c \leq 30$, where c is an integer, find the probability that $f(x) = x^2 + 2(c+4)x - 5c + 64$ produces only positive values.

#7 Alpha Ciphering**MAΘ National Convention 2026**

If $-5 \leq c \leq 30$, where c is an integer, find the probability that $f(x) = x^2 + 2(c+4)x - 5c + 64$ produces only positive values.

#8 Alpha Cipherring
MA@ National Convention 2026

If $\sin x + \sin y = \frac{\sqrt{15}}{3}$ and $\cos x + \cos y = 1$, find the value of $\cos(x - y)$.

#8 Alpha Cipherring
MA@ National Convention 2026

If $\sin x + \sin y = \frac{\sqrt{15}}{3}$ and $\cos x + \cos y = 1$, find the value of $\cos(x - y)$.

#8 Alpha Cipherring
MA@ National Convention 2026

If $\sin x + \sin y = \frac{\sqrt{15}}{3}$ and $\cos x + \cos y = 1$, find the value of $\cos(x - y)$.

#8 Alpha Cipherring
MA@ National Convention 2026

If $\sin x + \sin y = \frac{\sqrt{15}}{3}$ and $\cos x + \cos y = 1$, find the value of $\cos(x - y)$.

#9 Alpha Ciphering**MAΘ National Convention 2026**

Find the equation of the plane in the form $Ax + By + Cz = D$, where $A > 0$ and A, B, C , and D are relatively prime integers, that contains the points $(1, 2, 3)$, $(3, -1, 0)$, and $(2, 2, -1)$.

#9 Alpha Ciphering**MAΘ National Convention 2026**

Find the equation of the plane in the form $Ax + By + Cz = D$, where $A > 0$ and A, B, C , and D are relatively prime integers, that contains the points $(1, 2, 3)$, $(3, -1, 0)$, and $(2, 2, -1)$.

#9 Alpha Ciphering**MAΘ National Convention 2026**

Find the equation of the plane in the form $Ax + By + Cz = D$, where $A > 0$ and A, B, C , and D are relatively prime integers, that contains the points $(1, 2, 3)$, $(3, -1, 0)$, and $(2, 2, -1)$.

#9 Alpha Ciphering**MAΘ National Convention 2026**

Find the equation of the plane in the form $Ax + By + Cz = D$, where $A > 0$ and A, B, C , and D are relatively prime integers, that contains the points $(1, 2, 3)$, $(3, -1, 0)$, and $(2, 2, -1)$.

#10 Alpha Ciphering
MA@ National Convention 2026

The parametric equations $x = 4 + 7\cos 5t$ and $y = 8 + 3\sin 5t$ generate an ellipse. Find the area of the triangle formed by the center, a focus, and a minor axis endpoint of the ellipse.

#10 Alpha Ciphering
MA@ National Convention 2026

The parametric equations $x = 4 + 7\cos 5t$ and $y = 8 + 3\sin 5t$ generate an ellipse. Find the area of the triangle formed by the center, a focus, and a minor axis endpoint of the ellipse.

#10 Alpha Ciphering
MA@ National Convention 2026

The parametric equations $x = 4 + 7\cos 5t$ and $y = 8 + 3\sin 5t$ generate an ellipse. Find the area of the triangle formed by the center, a focus, and a minor axis endpoint of the ellipse.

#10 Alpha Ciphering
MA@ National Convention 2026

The parametric equations $x = 4 + 7\cos 5t$ and $y = 8 + 3\sin 5t$ generate an ellipse. Find the area of the triangle formed by the center, a focus, and a minor axis endpoint of the ellipse.

#11 Alpha Ciphering
MA@ National Convention 2026

An isosceles right triangle is inscribed in a circle of radius 8, creating three segments, two of which are congruent. Find the area of one of these two congruent segments.

#11 Alpha Ciphering
MA@ National Convention 2026

An isosceles right triangle is inscribed in a circle of radius 8, creating three segments, two of which are congruent. Find the area of one of these two congruent segments.

#11 Alpha Ciphering
MA@ National Convention 2026

An isosceles right triangle is inscribed in a circle of radius 8, creating three segments, two of which are congruent. Find the area of one of these two congruent segments.

#11 Alpha Ciphering
MA@ National Convention 2026

An isosceles right triangle is inscribed in a circle of radius 8, creating three segments, two of which are congruent. Find the area of one of these two congruent segments.

#12 Alpha Ciphering
MA@ National Convention 2026

If $\cos x + \cos^2 x + \cos^3 x + \dots = 24$, find all possible values of $\sin x + \sin^2 x + \sin^3 x + \dots$

#12 Alpha Ciphering
MA@ National Convention 2026

If $\cos x + \cos^2 x + \cos^3 x + \dots = 24$, find all possible values of $\sin x + \sin^2 x + \sin^3 x + \dots$

#12 Alpha Ciphering
MA@ National Convention 2026

If $\cos x + \cos^2 x + \cos^3 x + \dots = 24$, find all possible values of $\sin x + \sin^2 x + \sin^3 x + \dots$

#12 Alpha Ciphering
MA@ National Convention 2026

If $\cos x + \cos^2 x + \cos^3 x + \dots = 24$, find all possible values of $\sin x + \sin^2 x + \sin^3 x + \dots$

#13 Alpha Ciphering
MAΘ National Convention 2026

If $z = (1 + i\sqrt{3})^{100}$, find the value of $\frac{\operatorname{Re}(z)}{\operatorname{Im}(z)}$.

#13 Alpha Ciphering
MAΘ National Convention 2026

If $z = (1 + i\sqrt{3})^{100}$, find the value of $\frac{\operatorname{Re}(z)}{\operatorname{Im}(z)}$.

#13 Alpha Ciphering
MAΘ National Convention 2026

If $z = (1 + i\sqrt{3})^{100}$, find the value of $\frac{\operatorname{Re}(z)}{\operatorname{Im}(z)}$.

#13 Alpha Ciphering
MAΘ National Convention 2026

If $z = (1 + i\sqrt{3})^{100}$, find the value of $\frac{\operatorname{Re}(z)}{\operatorname{Im}(z)}$.

#14 Alpha Ciphering
MA@ National Convention 2026

Two real numbers x and y are chosen randomly from the interval $[0, 1]$. Find the probability that $x + y \leq 0.5$, written as a fraction.

#14 Alpha Ciphering
MA@ National Convention 2026

Two real numbers x and y are chosen randomly from the interval $[0, 1]$. Find the probability that $x + y \leq 0.5$, written as a fraction.

#14 Alpha Ciphering
MA@ National Convention 2026

Two real numbers x and y are chosen randomly from the interval $[0, 1]$. Find the probability that $x + y \leq 0.5$, written as a fraction.

#14 Alpha Ciphering
MA@ National Convention 2026

Two real numbers x and y are chosen randomly from the interval $[0, 1]$. Find the probability that $x + y \leq 0.5$, written as a fraction.

