Alpha Ciphering
Question #0

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #0

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #0

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #0

Name:_____

ID#:_____

School:_____

Answer:

#0 Ciphering – Alpha Division
MAΘ National Convention 2013

If $7^x = 4$, find the value of 343^x.

#0 Ciphering – Alpha Division
MAΘ National Convention 2013

If $7^x = 4$, find the value of 343^x.

#0 Ciphering – Alpha Division
MAΘ National Convention 2013

If $7^x = 4$, find the value of 343^x.

#0 Ciphering – Alpha Division
MAΘ National Convention 2013

If $7^x = 4$, find the value of 343^x.

Alpha Ciphering
Question #1

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #1

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #1

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #1

Name:_____

ID#:_____

School:_____

Answer:

#1 Ciphering – Alpha Division
MAΘ National Convention 2013

Evaluate:

$$\sqrt{5 + 6 + 7 + 8 + 9 + 10 + 11 + 12 + 13}$$

#1 Ciphering – Alpha Division
MAΘ National Convention 2013

Evaluate:

$$\sqrt{5 + 6 + 7 + 8 + 9 + 10 + 11 + 12 + 13}$$

#1 Ciphering – Alpha Division
MAΘ National Convention 2013

Evaluate:

$$\sqrt{5 + 6 + 7 + 8 + 9 + 10 + 11 + 12 + 13}$$

#1 Ciphering – Alpha Division
MAΘ National Convention 2013

Evaluate:

$$\sqrt{5 + 6 + 7 + 8 + 9 + 10 + 11 + 12 + 13}$$

Alpha Ciphering
Question #2

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #2

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #2

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #2

Name:_____

ID#:_____

School:_____

Answer:

#2 Ciphering – Alpha Division
MAΘ National Convention 2013

Let $i = \sqrt{-1}$.

Find the absolute value of $65 - 72i$.

#2 Ciphering – Alpha Division
MAΘ National Convention 2013

Let $i = \sqrt{-1}$.

Find the absolute value of $65 - 72i$.

#2 Ciphering – Alpha Division
MAΘ National Convention 2013

Let $i = \sqrt{-1}$.

Find the absolute value of $65 - 72i$.

#2 Ciphering – Alpha Division
MAΘ National Convention 2013

Let $i = \sqrt{-1}$.

Find the absolute value of $65 - 72i$.

Alpha Ciphering
Question #3

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #3

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #3

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #3

Name:_____

ID#:_____

School:_____

Answer:

#3 Ciphering – Alpha Division
MAΘ National Convention 2013

Evaluate: $100 \sin^2 9300°$

#3 Ciphering – Alpha Division
MAΘ National Convention 2013

Evaluate: $100 \sin^2 9300°$

#3 Ciphering – Alpha Division
MAΘ National Convention 2013

Evaluate: $100 \sin^2 9300°$

#3 Ciphering – Alpha Division
MAΘ National Convention 2013

Evaluate: $100 \sin^2 9300°$

Alpha Ciphering
Question #4

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #4

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #4

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #4

Name:_____

ID#:_____

School:_____

Answer:

#4 Ciphering – Alpha Division
MAΘ National Convention 2013

Let ABCD be a parallelogram. If P is a point inside ABCD such that the area of triangle PAD is 12 square meters and the area of triangle PBC is 6 square meters, find the area of ABCD. Express your answer in square meters.

#4 Ciphering – Alpha Division
MAΘ National Convention 2013

Let ABCD be a parallelogram. If P is a point inside ABCD such that the area of triangle PAD is 12 square meters and the area of triangle PBC is 6 square meters, find the area of ABCD. Express your answer in square meters.

#4 Ciphering – Alpha Division
MAΘ National Convention 2013

Let ABCD be a parallelogram. If P is a point inside ABCD such that the area of triangle PAD is 12 square meters and the area of triangle PBC is 6 square meters, find the area of ABCD. Express your answer in square meters.

#4 Ciphering – Alpha Division
MAΘ National Convention 2013

Let ABCD be a parallelogram. If P is a point inside ABCD such that the area of triangle PAD is 12 square meters and the area of triangle PBC is 6 square meters, find the area of ABCD. Express your answer in square meters.

Alpha Ciphering
Question #5

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #5

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #5

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #5

Name:_____

ID#:_____

School:_____

Answer:

#5 Ciphering – Alpha Division
MAΘ National Convention 2013

A sequence is defined recursively as $a_1 = 1$ and for $n \geq 1$,

$$a_{n+1} = a_n + 8n.$$

Evaluate: $\sqrt{a_{2013}}$

#5 Ciphering – Alpha Division
MAΘ National Convention 2013

A sequence is defined recursively as $a_1 = 1$ and for $n \geq 1$,

$$a_{n+1} = a_n + 8n.$$

Evaluate: $\sqrt{a_{2013}}$

#5 Ciphering – Alpha Division
MAΘ National Convention 2013

A sequence is defined recursively as $a_1 = 1$ and for $n \geq 1$,

$$a_{n+1} = a_n + 8n.$$

Evaluate: $\sqrt{a_{2013}}$

#5 Ciphering – Alpha Division
MAΘ National Convention 2013

A sequence is defined recursively as $a_1 = 1$ and for $n \geq 1$,

$$a_{n+1} = a_n + 8n.$$

Evaluate: $\sqrt{a_{2013}}$

Alpha Ciphering
Question #6

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #6

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #6

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #6

Name:_____

ID#:_____

School:_____

Answer:

#6 Ciphering – Alpha Division
MAΘ National Convention 2013

If $\sin(2\theta) = .69$, where $0 < \theta < \pi/2$, find the value of $\sin\theta + \cos\theta$ and **express your answer as a decimal.**

#6 Ciphering – Alpha Division
MAΘ National Convention 2013

If $\sin(2\theta) = .69$, where $0 < \theta < \pi/2$, find the value of $\sin\theta + \cos\theta$ and **express your answer as a decimal.**

#6 Ciphering – Alpha Division
MAΘ National Convention 2013

If $\sin(2\theta) = .69$, where $0 < \theta < \pi/2$, find the value of $\sin\theta + \cos\theta$ and **express your answer as a decimal.**

#6 Ciphering – Alpha Division
MAΘ National Convention 2013

If $\sin(2\theta) = .69$, where $0 < \theta < \pi/2$, find the value of $\sin\theta + \cos\theta$ and **express your answer as a decimal.**

Alpha Ciphering
Question #7

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #7

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #7

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #7

Name:_____

ID#:_____

School:_____

Answer:

#7 Ciphering – Alpha Division
MAΘ National Convention 2013

A right triangle has hypotenuse of length 17. A circle is inscribed in this triangle, splitting the hypotenuse into lengths of 5 and 12 at the point of tangency. Find the area of the triangle.

#7 Ciphering – Alpha Division
MAΘ National Convention 2013

A right triangle has hypotenuse of length 17. A circle is inscribed in this triangle, splitting the hypotenuse into lengths of 5 and 12 at the point of tangency. Find the area of the triangle.

#7 Ciphering – Alpha Division
MAΘ National Convention 2013

A right triangle has hypotenuse of length 17. A circle is inscribed in this triangle, splitting the hypotenuse into lengths of 5 and 12 at the point of tangency. Find the area of the triangle.

#7 Ciphering – Alpha Division
MAΘ National Convention 2013

A right triangle has hypotenuse of length 17. A circle is inscribed in this triangle, splitting the hypotenuse into lengths of 5 and 12 at the point of tangency. Find the area of the triangle.

Alpha Ciphering
Question #8

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #8

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #8

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #8

Name:_____

ID#:_____

School:_____

Answer:

#8 Ciphering – Alpha Division
MAΘ National Convention 2013

Define the *flexible factorial* $n_a!$ for positive integers n and a as

$$n_a! = n(n-a)(n-2a)\ldots(n-ka),$$

where k is the greatest integer such that $ka < n$.

If $(18_2!)x = 72_8!$, find $\log_2 x$.

#8 Ciphering – Alpha Division
MAΘ National Convention 2013

Define the *flexible factorial* $n_a!$ for positive integers n and a as

$$n_a! = n(n-a)(n-2a)\ldots(n-ka),$$

where k is the greatest integer such that $ka < n$.

If $(18_2!)x = 72_8!$, find $\log_2 x$.

#8 Ciphering – Alpha Division
MAΘ National Convention 2013

Define the *flexible factorial* $n_a!$ for positive integers n and a as

$$n_a! = n(n-a)(n-2a)\ldots(n-ka),$$

where k is the greatest integer such that $ka < n$.

If $(18_2!)x = 72_8!$, find $\log_2 x$.

#8 Ciphering – Alpha Division
MAΘ National Convention 2013

Define the *flexible factorial* $n_a!$ for positive integers n and a as

$$n_a! = n(n-a)(n-2a)\ldots(n-ka),$$

where k is the greatest integer such that $ka < n$.

If $(18_2!)x = 72_8!$, find $\log_2 x$.

Alpha Ciphering
Question #9

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #9

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #9

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #9

Name:_____

ID#:_____

School:_____

Answer:

#9 Ciphering – Alpha Division
MAΘ National Convention 2013

Evaluate:

$$\sum_{n=0}^{360} \sin^2 n^\circ = \sin^2 0^\circ + \sin^2 1^\circ + \cdots + \sin^2 360^\circ$$

#9 Ciphering – Alpha Division
MAΘ National Convention 2013

Evaluate:

$$\sum_{n=0}^{360} \sin^2 n^\circ = \sin^2 0^\circ + \sin^2 1^\circ + \cdots + \sin^2 360^\circ$$

#9 Ciphering – Alpha Division
MAΘ National Convention 2013

Evaluate:

$$\sum_{n=0}^{360} \sin^2 n^\circ = \sin^2 0^\circ + \sin^2 1^\circ + \cdots + \sin^2 360^\circ$$

#9 Ciphering – Alpha Division
MAΘ National Convention 2013

Evaluate:

$$\sum_{n=0}^{360} \sin^2 n^\circ = \sin^2 0^\circ + \sin^2 1^\circ + \cdots + \sin^2 360^\circ$$

Alpha Ciphering
Question #10

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #10

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #10

Name:_____

ID#:_____

School:_____

Answer:

Alpha Ciphering
Question #10

Name:_____

ID#:_____

School:_____

Answer:

#10 Ciphering – Alpha Division
MAΘ National Convention 2013

If f is an integer-valued function such that

$$f\big(f(x)\big) = f(x+2) - 3$$

for all integers x, find the value of $f(5)$ given that $f(1) = 4$ and $f(4) = 3$.

#10 Ciphering – Alpha Division
MAΘ National Convention 2013

If f is an integer-valued function such that

$$f\big(f(x)\big) = f(x+2) - 3$$

for all integers x, find the value of $f(5)$ given that $f(1) = 4$ and $f(4) = 3$.

#10 Ciphering – Alpha Division
MAΘ National Convention 2013

If f is an integer-valued function such that

$$f\big(f(x)\big) = f(x+2) - 3$$

for all integers x, find the value of $f(5)$ given that $f(1) = 4$ and $f(4) = 3$.

#10 Ciphering – Alpha Division
MAΘ National Convention 2013

If f is an integer-valued function such that

$$f\big(f(x)\big) = f(x+2) - 3$$

for all integers x, find the value of $f(5)$ given that $f(1) = 4$ and $f(4) = 3$.