Theta Ciphering
Question #0

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #0

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #0

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #0

Name:_____

ID#:_____

School:_____

Answer:

**#0 Ciphering – Theta Division**
**MAΘ National Convention 2013**

If $3x + 4 = 6$, find the value of $9x + 12$.

**#0 Ciphering – Theta Division**
**MAΘ National Convention 2013**

If $3x + 4 = 6$, find the value of $9x + 12$.

**#0 Ciphering – Theta Division**
**MAΘ National Convention 2013**

If $3x + 4 = 6$, find the value of $9x + 12$.

**#0 Ciphering – Theta Division**
**MAΘ National Convention 2013**

If $3x + 4 = 6$, find the value of $9x + 12$.

Theta Ciphering
Question #1

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #1

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #1

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #1

Name:_____

ID#:_____

School:_____

Answer:

**#1 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Evaluate:

$$\Big(\big(\ldots\big(\big((1-2)+3\big)-4\big)+\cdots-2012\big)+2013\Big)$$

**#1 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Evaluate:

$$\Big(\big(\ldots\big(\big((1-2)+3\big)-4\big)+\cdots-2012\big)+2013\Big)$$

**#1 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Evaluate:

$$\Big(\big(\ldots\big(\big((1-2)+3\big)-4\big)+\cdots-2012\big)+2013\Big)$$

**#1 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Evaluate:

$$\Big(\big(\ldots\big(\big((1-2)+3\big)-4\big)+\cdots-2012\big)+2013\Big)$$

Theta Ciphering
Question #2

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #2

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #2

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #2

Name:_____

ID#:_____

School:_____

Answer:

**#2 Ciphering – Theta Division**
**MAΘ National Convention 2013**

The number halfway between $\frac{1}{4}$ and .652, when written as a decimal, is equal to $.abc$, where $a$, $b$, and $c$ are the digits.

Find the value of $a + b + c$.

**#2 Ciphering – Theta Division**
**MAΘ National Convention 2013**

The number halfway between $\frac{1}{4}$ and .652, when written as a decimal, is equal to $.abc$, where $a$, $b$, and $c$ are the digits.

Find the value of $a + b + c$.

**#2 Ciphering – Theta Division**
**MAΘ National Convention 2013**

The number halfway between $\frac{1}{4}$ and .652, when written as a decimal, is equal to $.abc$, where $a$, $b$, and $c$ are the digits.

Find the value of $a + b + c$.

**#2 Ciphering – Theta Division**
**MAΘ National Convention 2013**

The number halfway between $\frac{1}{4}$ and .652, when written as a decimal, is equal to $.abc$, where $a$, $b$, and $c$ are the digits.

Find the value of $a + b + c$.

Theta Ciphering
Question #3

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #3

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #3

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #3

Name:_____

ID#:_____

School:_____

Answer:

**#3 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Compute the sum of all possible values of $e^x$, given that $x$ is a real number and

$$e^{2x+2} - e^{x+2} = 20e^2.$$

**#3 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Compute the sum of all possible values of $e^x$, given that $x$ is a real number and

$$e^{2x+2} - e^{x+2} = 20e^2.$$

**#3 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Compute the sum of all possible values of $e^x$, given that $x$ is a real number and

$$e^{2x+2} - e^{x+2} = 20e^2.$$

**#3 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Compute the sum of all possible values of $e^x$, given that $x$ is a real number and

$$e^{2x+2} - e^{x+2} = 20e^2.$$

Theta Ciphering
Question #4

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #4

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #4

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #4

Name:_____

ID#:_____

School:_____

Answer:

**#4 Ciphering – Theta Division**
**MAΘ National Convention 2013**

In regular nonagon ABCDEFGHI, find the degree measure of angle GIH.

**#4 Ciphering – Theta Division**
**MAΘ National Convention 2013**

In regular nonagon ABCDEFGHI, find the degree measure of angle GIH.

**#4 Ciphering – Theta Division**
**MAΘ National Convention 2013**

In regular nonagon ABCDEFGHI, find the degree measure of angle GIH.

**#4 Ciphering – Theta Division**
**MAΘ National Convention 2013**

In regular nonagon ABCDEFGHI, find the degree measure of angle GIH.

Theta Ciphering
Question #5

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #5

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #5

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #5

Name:_____

ID#:_____

School:_____

Answer:

**#5 Ciphering – Theta Division**
**MAΘ National Convention 2013**

The roots of $f(x) = x^2 - 14x + K$ are $a$ and $b$, both positive prime numbers.

Find the numerical value of: $a^3 + b^3$

**#5 Ciphering – Theta Division**
**MAΘ National Convention 2013**

The roots of $f(x) = x^2 - 14x + K$ are $a$ and $b$, both positive prime numbers.

Find the numerical value of: $a^3 + b^3$

**#5 Ciphering – Theta Division**
**MAΘ National Convention 2013**

The roots of $f(x) = x^2 - 14x + K$ are $a$ and $b$, both positive prime numbers.

Find the numerical value of: $a^3 + b^3$

**#5 Ciphering – Theta Division**
**MAΘ National Convention 2013**

The roots of $f(x) = x^2 - 14x + K$ are $a$ and $b$, both positive prime numbers.

Find the numerical value of: $a^3 + b^3$

Theta Ciphering
Question #6

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #6

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #6

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #6

Name:_____

ID#:_____

School:_____

Answer:

**#6 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Find the determinant of the following matrix:

$$\begin{bmatrix} 46 & -34 \\ 2 & 76 \end{bmatrix}$$

**#6 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Find the determinant of the following matrix:

$$\begin{bmatrix} 46 & -34 \\ 2 & 76 \end{bmatrix}$$

**#6 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Find the determinant of the following matrix:

$$\begin{bmatrix} 46 & -34 \\ 2 & 76 \end{bmatrix}$$

**#6 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Find the determinant of the following matrix:

$$\begin{bmatrix} 46 & -34 \\ 2 & 76 \end{bmatrix}$$

Theta Ciphering
Question #7

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #7

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #7

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #7

Name:_____

ID#:_____

School:_____

Answer:

**#7 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Find the perimeter of a right triangle with area 480 and whose side lengths are all integers.

**#7 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Find the perimeter of a right triangle with area 480 and whose side lengths are all integers.

**#7 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Find the perimeter of a right triangle with area 480 and whose side lengths are all integers.

**#7 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Find the perimeter of a right triangle with area 480 and whose side lengths are all integers.

Theta Ciphering
Question #8

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #8

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #8

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #8

Name:_____

ID#:_____

School:_____

Answer:

**#8 Ciphering – Theta Division**
**MAΘ National Convention 2013**

A five-digit integer is created by using the digits 3, 4, 5, 7, and 8 exactly once. Find the probability the number created is a multiple of 4. Express your answer as a common fraction.

**#8 Ciphering – Theta Division**
**MAΘ National Convention 2013**

A five-digit integer is created by using the digits 3, 4, 5, 7, and 8 exactly once. Find the probability the number created is a multiple of 4. Express your answer as a common fraction.

**#8 Ciphering – Theta Division**
**MAΘ National Convention 2013**

A five-digit integer is created by using the digits 3, 4, 5, 7, and 8 exactly once. Find the probability the number created is a multiple of 4. Express your answer as a common fraction.

**#8 Ciphering – Theta Division**
**MAΘ National Convention 2013**

A five-digit integer is created by using the digits 3, 4, 5, 7, and 8 exactly once. Find the probability the number created is a multiple of 4. Express your answer as a common fraction.

Theta Ciphering
Question #9

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #9

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #9

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #9

Name:_____

ID#:_____

School:_____

Answer:

**#9 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Find the largest integer $n$ such that $2500^n$ divides 2013!.

**#9 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Find the largest integer $n$ such that $2500^n$ divides 2013!.

**#9 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Find the largest integer $n$ such that $2500^n$ divides 2013!.

**#9 Ciphering – Theta Division**
**MAΘ National Convention 2013**

Find the largest integer $n$ such that $2500^n$ divides 2013!.

Theta Ciphering
Question #10

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #10

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #10

Name:_____

ID#:_____

School:_____

Answer:

Theta Ciphering
Question #10

Name:_____

ID#:_____

School:_____

Answer:

**#10 Ciphering – Theta Division**
**MAΘ National Convention 2013**

For positive integer $x$, define $D(x)$ as the result of the following: First, convert $x$ to base 2. Then, add up the digits of the result and express it in base 10.

For example, since $46 = 101110_2$, we have $D(46) = 1 + 0 + 1 + 1 + 1 + 0 = 4$.

If $n > 2$ satisfies $\prod_{k=2}^{n} \log_k(k+1) = 2013$, find $D(n)$.

**#10 Ciphering – Theta Division**
**MAΘ National Convention 2013**

For positive integer $x$, define $D(x)$ as the result of the following: First, convert $x$ to base 2. Then, add up the digits of the result and express it in base 10.

For example, since $46 = 101110_2$, we have $D(46) = 1 + 0 + 1 + 1 + 1 + 0 = 4$.

If $n > 2$ satisfies $\prod_{k=2}^{n} \log_k(k+1) = 2013$, find $D(n)$.

**#10 Ciphering – Theta Division**
**MAΘ National Convention 2013**

For positive integer $x$, define $D(x)$ as the result of the following: First, convert $x$ to base 2. Then, add up the digits of the result and express it in base 10.

For example, since $46 = 101110_2$, we have $D(46) = 1 + 0 + 1 + 1 + 1 + 0 = 4$.

If $n > 2$ satisfies $\prod_{k=2}^{n} \log_k(k+1) = 2013$, find $D(n)$.

**#10 Ciphering – Theta Division**
**MAΘ National Convention 2013**

For positive integer $x$, define $D(x)$ as the result of the following: First, convert $x$ to base 2. Then, add up the digits of the result and express it in base 10.

For example, since $46 = 101110_2$, we have $D(46) = 1 + 0 + 1 + 1 + 1 + 0 = 4$.

If $n > 2$ satisfies $\prod_{k=2}^{n} \log_k(k+1) = 2013$, find $D(n)$.