

**#1 Algebra - Hustle**  
**MA $\odot$  National Convention 2017**

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The asymptotes of

$$y = \frac{x^4 + 3x^3 - 15x^2 - 19x + 30}{x^3 - x^2 - 30x + 72} \text{ are in the form}$$

$x = a, x = b, y = cx + d$ . Find the value of  
 $a + b + c + d$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#1 Algebra - Hustle**  
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**#2 Algebra - Hustle**  
**MA@ National Convention 2017**

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Evaluate  $\sum_{n=2}^{16807} \log_7 \left( \frac{n-1}{n} \right)$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#2 Algebra - Hustle**  
**MA@ National Convention 2017**

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**MA@ National Convention 2017**

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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#3 Algebra - Hustle****MA© National Convention 2017**

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Given that  $AB=C$ , find the value of  $a+b+c$  if

$$A = \begin{bmatrix} a & 2 & 5 \\ 0 & 1 & 4 \\ 2 & 3 & 6 \end{bmatrix}, B = \begin{bmatrix} 1 & 5 & 3 \\ 2 & b & 7 \\ 1 & 0 & 5 \end{bmatrix}, \text{ and}$$

$$C = \begin{bmatrix} 10 & 7 & 42 \\ 6 & 1 & 27 \\ 14 & 13 & c \end{bmatrix}.$$

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#3 Algebra - Hustle****MA© National Convention 2017**

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Round 1 2 3 4 5

**#4 Algebra - Hustle**  
**MA@ National Convention 2017**

---

Evaluate the nested radical

$$\sqrt{15(1+i)^8 + \sqrt{15(1+i)^8 + \dots}}, \text{ where } i = \sqrt{-1}.$$

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#4 Algebra - Hustle**  
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Round 1 2 3 4 5

**#5 Algebra - Hustle**

**MA $\odot$  National Convention 2017**

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If  $f(ax) = af(x)$  for all real  $a$  and  $f(3) = 2$ , find  $f(13)$ , written as an improper fraction.

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#5 Algebra - Hustle**

**MA $\odot$  National Convention 2017**

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Round 1 2 3 4 5

**#6 Algebra - Hustle**  
**MA $\odot$  National Convention 2017**

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If  $z_1 = 5 - 12i$ ,  $z_2 = 3 + 4i$ , and  $i = \sqrt{-1}$ , find the value of  $\left| \frac{z_1}{z_2} \right|$ , written as a decimal.

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#6 Algebra - Hustle**  
**MA $\odot$  National Convention 2017**

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**#6 Algebra - Hustle**  
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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#7 Algebra - Hustle**  
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Evaluate  $\sum_{n=1}^8 (2n^2 + n + 1)$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#7 Algebra - Hustle**  
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---

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**MA@ National Convention 2017**

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Round 1 2 3 4 5

**#8 Algebra - Hustle**  
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---

Find the product  $ab$  if  $\begin{cases} a^3 + b^3 = 468 \\ (a+b)^3 = 1728 \end{cases}$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#8 Algebra - Hustle**  
**MA© National Convention 2017**

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Find the product  $ab$  if  $\begin{cases} a^3 + b^3 = 468 \\ (a+b)^3 = 1728 \end{cases}$ .

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Round 1 2 3 4 5



**#9 Algebra - Hustle**

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---

A third-degree polynomial  $P(x)$  has only three distinct roots: 3, -4, and -3. If  $P(0) = -72$ , find  $P(5)$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#9 Algebra - Hustle**

**MA $\odot$  National Convention 2017**

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**#9 Algebra - Hustle**

**MA $\odot$  National Convention 2017**

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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#10 Algebra - Hustle**  
**MA@ National Convention 2017**

---

Find the number of consecutive terminating zeros in 2017!.

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#10 Algebra - Hustle**  
**MA@ National Convention 2017**

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Round 1 2 3 4 5

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Round 1 2 3 4 5

**#10 Algebra - Hustle**  
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Find the number of consecutive terminating zeros in 2017!.

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Round 1 2 3 4 5

**#11 Algebra - Hustle**  
**MA@ National Convention 2017**

---

Find the third term in the expansion of  $\left(\frac{x}{2} + 3\right)^5$  when the terms are written in descending order of exponent of  $x$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#11 Algebra - Hustle**  
**MA@ National Convention 2017**

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**MA@ National Convention 2017**

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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#12 Algebra - Hustle**  
**MA@ National Convention 2017**

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Find the sum of the reciprocals of the positive integral divisors of 496.

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#12 Algebra - Hustle**  
**MA@ National Convention 2017**

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**#12 Algebra - Hustle**  
**MA@ National Convention 2017**

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**#12 Algebra - Hustle**  
**MA@ National Convention 2017**

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Round 1 2 3 4 5

**#13 Algebra - Hustle**  
**MA $\odot$  National Convention 2017**

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A continuous function  $f(x)$  has domain  $[-48,56]$ . If the domain of  $|f(3x-6)|+12$  is written as  $[a,b]$ , find the value of  $a+b$ , written as an improper fraction.

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#13 Algebra - Hustle**  
**MA $\odot$  National Convention 2017**

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Round 1 2 3 4 5

**#14 Algebra - Hustle**  
**MA@ National Convention 2017**

---

Evaluate  $\sum_{i=1}^{99} \lfloor 0.67i \rfloor$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#14 Algebra - Hustle**  
**MA@ National Convention 2017**

---

Evaluate  $\sum_{i=1}^{99} \lfloor 0.67i \rfloor$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#14 Algebra - Hustle**  
**MA@ National Convention 2017**

---

Evaluate  $\sum_{i=1}^{99} \lfloor 0.67i \rfloor$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#14 Algebra - Hustle**  
**MA@ National Convention 2017**

---

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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#15 Algebra - Hustle**  
**MA@ National Convention 2017**

---

When 0.5 (base 10) is expressed in base 5 notation, what is the sum of the first six digits after the decimal point?

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#15 Algebra - Hustle**  
**MA@ National Convention 2017**

---

When 0.5 (base 10) is expressed in base 5 notation, what is the sum of the first six digits after the decimal point?

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Round 1 2 3 4 5

**#15 Algebra - Hustle**  
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**MA@ National Convention 2017**

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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#16 Algebra - Hustle**

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---

An integer between 100,000 and 199,999 becomes three times as large as it was when the 1 is moved from the leftmost position to the rightmost position. What is the sum of the digits of this six-digit number?

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#16 Algebra - Hustle**

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---

An integer between 100,000 and 199,999 becomes three times as large as it was when the 1 is moved from the leftmost position to the rightmost position. What is the sum of the digits of this six-digit number?

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**#16 Algebra - Hustle**

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Answer : \_\_\_\_\_

Round 1 2 3 4 5



**#17 Algebra - Hustle**  
**MA $\odot$  National Convention 2017**

---

Find the positive value(s) of  $x$  for which

$$\begin{vmatrix} 2 & -x & 5 \\ 1 & -3 & 4 \\ -1 & 3 & x \end{vmatrix} = 0.$$

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#17 Algebra - Hustle**  
**MA $\odot$  National Convention 2017**

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Round 1 2 3 4 5

**#18 Algebra - Hustle**

**MA $\odot$  National Convention 2017**

---

Find the equation, in slope-intercept form, for the line tangent to a circle with center  $(-3,2)$  at the point  $(3,7)$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#18 Algebra - Hustle**

**MA $\odot$  National Convention 2017**

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Find the equation, in slope-intercept form, for the line tangent to a circle with center  $(-3,2)$  at the point  $(3,7)$ .

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Round 1 2 3 4 5

**#19 Algebra - Hustle**  
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---

Apollonius went fishing at a perfectly elliptical pond. From a point on the shore of the pond, he rowed to one focus, then to the other focus, and then back to his starting point on the shore. If the pond has a maximum width of length 144 feet and a maximum length 240 feet, how far, in feet, did he row?

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#19 Algebra - Hustle**  
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---

Apollonius went fishing at a perfectly elliptical pond. From a point on the shore of the pond, he rowed to one focus, then to the other focus, and then back to his starting point on the shore. If the pond has a maximum width of length 144 feet and a maximum length 240 feet, how far, in feet, did he row?

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**#19 Algebra - Hustle**  
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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#20 Algebra - Hustle**  
**MA@ National Convention 2017**

---

A multiple-choice test has six questions with five answer choices for each question and only one correct answer per question. By merely guessing, what is the probability that you get exactly four answers correct?

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#20 Algebra - Hustle**  
**MA@ National Convention 2017**

---

A multiple-choice test has six questions with five answer choices for each question and only one correct answer per question. By merely guessing, what is the probability that you get exactly four answers correct?

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Round 1 2 3 4 5

**#20 Algebra - Hustle**  
**MA@ National Convention 2017**

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Round 1 2 3 4 5

**#21 Algebra - Hustle**  
**MA@ National Convention 2017**

---

Find the sum of the imaginary roots of  
 $8x^5 + 16x^3 + 64x^2 + 128 = 0$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#21 Algebra - Hustle**  
**MA@ National Convention 2017**

---

Find the sum of the imaginary roots of  
 $8x^5 + 16x^3 + 64x^2 + 128 = 0$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#21 Algebra - Hustle**  
**MA@ National Convention 2017**

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Find the sum of the imaginary roots of  
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Round 1 2 3 4 5

**#21 Algebra - Hustle**  
**MA@ National Convention 2017**

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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#22 Algebra - Hustle**  
**MA@ National Convention 2017**

---

If  
 $f(x) = x^{10} + 2x^9 - 2x^8 - 2x^7 + x^6 + 3x^2 + 6x + 1$ ,  
find  $f(\sqrt{2} - 1)$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#22 Algebra - Hustle**  
**MA@ National Convention 2017**

---

If  
 $f(x) = x^{10} + 2x^9 - 2x^8 - 2x^7 + x^6 + 3x^2 + 6x + 1$ ,  
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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#22 Algebra - Hustle**  
**MA@ National Convention 2017**

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Round 1 2 3 4 5

**#22 Algebra - Hustle**  
**MA@ National Convention 2017**

---

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 $f(x) = x^{10} + 2x^9 - 2x^8 - 2x^7 + x^6 + 3x^2 + 6x + 1$ ,  
find  $f(\sqrt{2} - 1)$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#23 Algebra - Hustle**  
**MA@ National Convention 2017**

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If  $f(x+1) = x^2 - 7x + 8$ , find  $f(x)$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#23 Algebra - Hustle**  
**MA@ National Convention 2017**

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If  $f(x+1) = x^2 - 7x + 8$ , find  $f(x)$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#23 Algebra - Hustle**  
**MA@ National Convention 2017**

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If  $f(x+1) = x^2 - 7x + 8$ , find  $f(x)$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#23 Algebra - Hustle**  
**MA@ National Convention 2017**

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If  $f(x+1) = x^2 - 7x + 8$ , find  $f(x)$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#24 Algebra - Hustle**  
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Simplify  $\sqrt{(e^{2x} - e^{-2x})^2 + 4}$ , where  $e$  represents Euler's number.

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#24 Algebra - Hustle**  
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Simplify  $\sqrt{(e^{2x} - e^{-2x})^2 + 4}$ , where  $e$  represents Euler's number.

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#24 Algebra - Hustle**  
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---

Simplify  $\sqrt{(e^{2x} - e^{-2x})^2 + 4}$ , where  $e$  represents Euler's number.

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#24 Algebra - Hustle**  
**MA@ National Convention 2017**

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Simplify  $\sqrt{(e^{2x} - e^{-2x})^2 + 4}$ , where  $e$  represents Euler's number.

Answer : \_\_\_\_\_

Round 1 2 3 4 5



**#25 Algebra - Hustle**  
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Solve for all real  $x$ :

$$4x^2 + 8x - 2\sqrt{4x^2 + 8x - 3} = 6.$$

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#25 Algebra - Hustle**  
**MA $\odot$  National Convention 2017**

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Solve for all real  $x$ :

$$4x^2 + 8x - 2\sqrt{4x^2 + 8x - 3} = 6.$$

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#25 Algebra - Hustle**  
**MA $\odot$  National Convention 2017**

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Solve for all real  $x$ :

$$4x^2 + 8x - 2\sqrt{4x^2 + 8x - 3} = 6.$$

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#25 Algebra - Hustle**  
**MA $\odot$  National Convention 2017**

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Solve for all real  $x$ :

$$4x^2 + 8x - 2\sqrt{4x^2 + 8x - 3} = 6.$$

Answer : \_\_\_\_\_

Round 1 2 3 4 5

