Math Team Notes

MSHSML Meet 4 Events C and D Problems 1-2 (2018-19 and 2019-20)

Event C

Problem #1 ("Quickie"; 1 point)

Try to solve each problem within one minute.

1. Determine exactly the value of this infinite geometric sum: $\frac{2}{125} + \frac{4}{625} + \frac{8}{3125} + \cdots$. [calculator allowed] {MSHSML 2019-20 4C #1)

1. Determine exactly the value of this infinite sum: $4 + \frac{4}{3} + \frac{4}{9} + \cdots$. (MSHSML 2018-19 4C #1)

Event C

Problem #2 ("Textbook"; 2 points)

Try to solve each problem within two minutes.

2. $a_1 = 3$, $a_2 = 6$, and $a_n = \frac{a_{n-1}}{a_{n-2}}$ is a periodic sequence with a period of 6. Determine exactly the value of a_{2020}. [calculator allowed] (MSHSML 2019-20 4C #2)

2. What is the value of the sum $1 + 2 - 3 + 4 + 5 - 6 + 7 + 8 - 9 + \cdots + 242 - 243$? (MSHSML 2018-19 4C #2)

Event D

Problem #1 ("Quickie"; 1 point)

Try to solve each problem within one minute.

1. A parabola has a minimum value of -7 and x-intercepts of -2 and 16. What are the coordinates of its vertex? (MSHSML 2019-20 4D #1)

1. What are the coordinates of the vertex of the parabola $y = 3x^2 - 12x + 7$? (MSHSML 2018-19 4D #1)

Event D

Problem #2 ("Textbook"; 2 points)

Try to solve each problem within two minutes.

2. Determine exactly the distance between the vertices of the two parabolas determined by $y_1 = -x^2 + 2x$ and $y_2 = 2x^2 + 4x + 3$. (MSHSML 2019-20 4D #2)

2. A hyperbola has $y = \frac{5}{2}x + 24$ and $y = -\frac{5}{2}x + 4$ as its asymptotes and has a vertex at $(-4,19)$. What are the coordinates of the other vertex? (MSHSML 2018-19 4D #2)