

Event C

Problem #3 (“textbook with a twist”; 2 points)

Try to solve each problem within three minutes.

3. In the complex plane,  $A = \text{cis}(220^\circ)$  and  $B = \text{cis}(40^\circ)$ .  
If  $A^k$  lies in the first quadrant and  $A^k$ , the origin, and  $B$  are all collinear, what is the least positive integer value of  $k$ ? (MSHSML 2019-20 3C #3)

Math Team

Meet 3 Events C and D Problems 3 Practice 2018-19 and 2019-20

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3. If  $\cos(\arctan x) = x$ , then  $x^2$  can be expressed exactly in the form  $\frac{a+\sqrt{b}}{2}$ . Calculate  $a + b$ . (MSHSML 2018-19 3C #3)

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Event D

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4. Find the sum of all the solutions to the equation

$$(x^2 + 5x + 5)^{x^2 - 10x + 21} = 1. \text{ (MSHSML 2019-20 3D #3)}$$

Event D

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3. Let  $Q = \log_3 15$ . If the number  $\log_3 375$  can be determined exactly in the form  $a \cdot Q + b$ , for some integers  $a$  and  $b$ , determine  $a$  and  $b$ . (MSHSML 2018-19 3D #3)