Friday Math Team Practice: Online Edition

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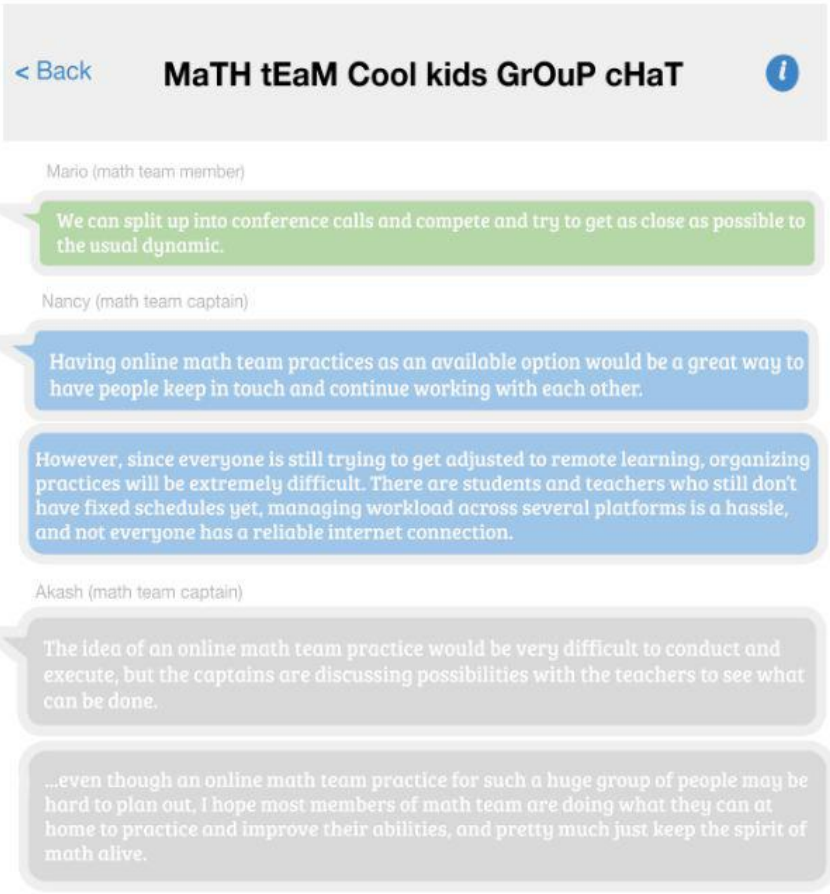
Every Friday afternoon, there is a mysterious veil of excitement outside room 407. Although the weekend break has just started, math team students enthusiastically fathom the great mysteries of mathematics. When the novel coronavirus forced school closures, students had only one chance to prove that online practices were in fact feasible.

And so, despite the many concerns, the dedicated students set out to seamlessly collaborate through *Zoom* and *Microsoft Whiteboard*. The captains began a new whiteboard and inscribed in grandiose red letters at the top of the screen:

> *Okay Zoomers, this is our new sign-in sheet. Please sign next to your name for attendance.*



Unfortunately, before anyone had a chance to sign their name, a few mischievous freshmen scribbled *"Nine plus ten is twenty one"* and *"Two plus two is four minus one that's three, quik mafs"* all over the whiteboard. After permanently banning those freshmen, the math team captains created four Zoom call meetings for each grade. The freshmen, sophomores, juniors, and seniors funneled into their respective meetings. Some Stuyvesant alumni and Hunter students were also invited to join to solve problems and flex on the freshmen. Afterwards, each room was assigned an HMMT team contest for the day.

When they began, some inconspicuous students refused to use their microphone and insisted on communicating solely on the chat feature. Others obnoxiously turned on their webcams and gave everyone a virtual tour of their own home. The meetings were filled with sporadic random voices.

"Guys, here's my dog. His name is Euclid. I named him after the Greek geome..."

"Turn off your microphone. No one cares about your dog."

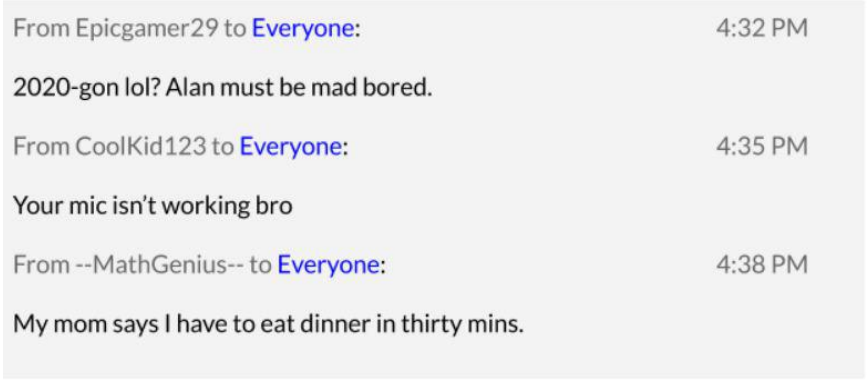
Every student reminisced about the excitement of their former Fridays, especially when they chased each other in the hallways while waiting for practice to start. They remembered the times they wasted all the expensive Hagoromo chalk drawing dotted lines on the green chalkboard, or beat each other up with erasers after all the teachers had left. The students were surprised to see how many former aspects of practice were indeed preserved. Jerry instinctively made Google Sheets to divvy up the problems as he usually did. They still enjoyed the company of their friends, more so now that they did not have to hear their pestering voices with the mute function. However, the most important aspect preserved was the excitement that they had improved over last month.

After an hour, the math team captains checked on each room's progress. In the first fifteen minutes, the freshmen had only solved the first two problems, and had decided to give up and play Minecraft for the remainder of the time. The sophomores had collectively also solved two problems. When the captains inspected the sophomore meeting, they were still working on problem 4 which began:

> 4. **[35]** Alan draws a convex 2020-gon $\mathcal{A} = A_1A_2\cdots A_{2020}$ with vertices in clockwise order and chooses 2020 angles $\theta_1, \theta_2, \ldots, \theta_{2020} \in (0, \pi)$ in radians with sum 1010π. He then constructs isosceles triangles $\triangle A_iB_iA_{i+1}$ on the exterior of $\mathcal{A}$ with $B_iA_i = B_iA_{i+1}$ and $\angle A_iB_iA_{i+1} = \theta_i$. (Here, $A_{2021} = A_1$.) Finally, he erases $\mathcal{A}$ and the point B_1. He then tells Jason the angles $\theta_1, \theta_2, \ldots, \theta_{2020}$ he chose. Show that Jason can determine where B_1 was from the remaining 2019 points, i.e. show that B_1 is uniquely determined by the information Jason has.

The captains noticed that the students made very insightful and intelligent observations

such as:



Eventually, the sophomores succumbed as well and virtually walked around the world Minecraft, shooting at each other with their enchanted bow and arrows. In the junior meeting, the math team captains found this room had successfully solved seven problems. Nevertheless, their progression was thwarted by number eight, a geometry problem. The captains noticed someone articulating their ideas to the class using their self-drawn diagram on Microsoft Whiteboard. Strangely, though the student mentioned "triangle ABC," the captains could only see what could be best described as an egg-shaped figure. In fact, they couldn't see any aforementioned median AD, angle bisector AF, or centroid G.

"And thus by *Ceva's Theorem*, all the cevians of this triangle are *obviously* concurrent," said Ethan as he proudly concluded his explanation. Everyone bore a wildly confused countenance.

"Aight, sounds legit," commented Allen, a junior math team member, validating the jumbled proof. After that, they decided to call it quits and join a Minecraft server.

Finally, the captains moved to the seniors to find that the members had completed every single problem and disbanded. They had reorganized into a Minecraft server to play Pixelmon. The captains realized that today's meeting was a disaster, just as they had suspected. When Zoom finally asked them "How was your meeting?" they gave it a one star rating and typed, "It was so cringey. We should have just used Minecraft."