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Welcome…

to the fifth and final issue of the 2021 Record of Mathematics! As five weeks of levity-infused, collaborative mathematics comes to a close, we look back at the events of this 54th ever week of MathILy. Branch Class was marked by ponderings on origami, robots, revolution, colonization, stained glass art, spider cults, and pants… lots of pants… Also check out the Daily Gather Summaries to learn about our Lord and Saviour, the Woozle Wizard, or alternatively, Danger Geese. Lastly, gaze upon the the Gallery of Doodles and Spirals of Strange Foods, and make sure to consult the contact information section to keep in touch with your fellow peers!

In this issue…

2.2 Tuesday - DANGER GEESE by Hana

We entered daily gather today to find a king, two peasants, two scholars and a Woozle Wizard. They are MathILy-EST– The college students that you may be one day, if you work really hard, and act really cool.
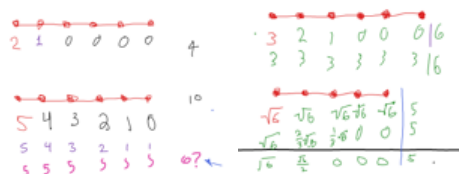
Setting the Scene: We are all captains on the wall of Maxberg, a series of six towers connected by walls. Each turret has a bonfire whose flames can be set to a certain height. Each day the king sends a hawk to tell you how high the leftmost tower flame should be. Your job is to decide how high the other towers should be lit, if they are lit at all. We must appease the laser geese and the knife geese, otherwise they will ravage the land!

Geese Things Our goal is to minimize TGA, or total geese angriness where $TGA = KGA + LGA$. Knife geese hate any fire, so the KGA, or knife geese angriness, = the number of fires. Laser geese hate variances, so the LGA, or laser geese angriness, =

$$\sum_{\{x,y\} adjacent} (f(x) - f(y))^2$$

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Our Thoughts We found the optimal solutions for four cases of fires:

We found that the optimal solution will either be a linear decrease or constants. Additionally, we found that for some starting fire value $\sqrt{n} = \sqrt{a} \cdot \sqrt{b}$ then a linear decrease of $\frac{\sqrt{n}}{a}$ or of $\frac{\sqrt{n}}{b}$ give the same TGA.

Food for Thought We have managed to save the city, but what about the future? What is the optimal strategy for looping walls, or branching walls? What if the king wants to assign more than one fire height? Hurry, good people of Maxberg, for the geese grow ever closer, and ever more angry.