Math Exhibition Project Brainstorm #1

Here is a compilation of all the 37 (*Now 39*) ideas submitted by you (1st and 2nd period) for our project next semester. Please read each of these ideas and choose three that interests you. If you have any questions, or need clarification, on any of these, write a comment on it. This means you also need to find your idea(s) to see if anyone has a question or comment on it.

1. Polar graph art. Using Desmos-or potentially some other type of graphing software-we could construct visuals using polar graphing techniques. Presumably this would be a fairly low-cost endeavor-as it wouldn't require very many materials. They would probably be ways to make this even more interesting and/or artistic.

2. We have to cook marshmallows using the parabolic mirror.

3. This isn't on the quad but we could make our own "whisper room" in the mac or the student center and invite people in to see it. We would have to reshape the room by putting up things to make it the right shape. We could maybe research how ones that already exist have been built, especially in museums where they might be temporary exhibits. This would probably be pretty expensive because we would have to construct something to essentially cut out the space that we didn't want in the room but it would be so cool.

4. I haven't figured out many specifics yet but I envisioned something similar to Alex' idea of graph art where we could use knowledge about different parent functions and their shape and manipulate them to form a graphic of some sort. We then could display the different graphics out on the quad.

5. https://www.exploratorium.edu/snacks/fractal-patterns

6. Some sort of room filled with mirrors at an angle where it appears like it should reflect a person, but it won't (if it's even possible to create without requiring specialized labor costs). Depending on the quality of the mirror, this could range in price from pretty cheap to very expensive.

7. Make objects that roll as of they were a sphere but are not round. they are also known as solids of constant width as that is what gives them the ability to roll

8. We could deconstruct everyday tools such as flashlights, cameras, lasers, etc. to show others the math behind them and how they work. We could have others experiment with constructing different types of lens for the light to reflect onto and explain why the parabolic shape works best in reflecting the light. This exhibit would show others how conics are used in our everyday tools.

9. We could do an exhibit of parabolas in the real world and describe them. We could show different bridges and architecture around the world and find their approximate equations and discuss their significance.

10. https://www.youtube.com/watch?v=8CLRTa_ocmo (Parabolic Mirrors)
This is pretty cool but would most likely be expensive and difficult to make

11.This is more an idea of how to advertise the event, but even in the advertisements we can include mathematical principles. In Graphic Design, the Fibonacci sequence is very important in terms of sizing things, especially text. Usually you'll have your largest text be one Fibonacci number, then for your next text size, you'll skip one number and go to the next, sizing the text that, and so on. This makes the various text ratios more appealing, and can help center the design. When making posters for the event, we can use the various Fibonacci numbers to size the text.
For the backgrounds of the posters, we can use or create images that show the Fibonacci sequence as it appears in nature, such as in plant leaves and in various shells. We could also use some fractal designs, such as Sierpinski's Triangle, to add some more variety to the visual elements. We can also include just various shapes and graphs to add to the visual effect, but we should probably stay away from slapping random equations onto the poster, as that can cause confusion with the text describing the event.
The resources we need to make these posters is pretty much just Adobe Photoshop and perhaps Adobe Illustrator, and then some paper, a printer, and ink. I have the art programs on my computer and Paly has printers we can use. The only costs would be the paper and the ink, but if we keep the posters in black and white and lighter shades of grey, we can cut down on the ink costs and keep it relatively low budget. I believe we would also need to get the posters approved before we could hang them up around campus, but that shouldn't be too difficult of a process.

12. Though this idea is more of something you buy, we could make it humorous. Basically, there would be two concave mirrors (one with a hole at the vertex) and inside those mirrors, there would be a small object. Because of the way light reflects inside the parabolic mirrors, it would seem like the small object is actually on top of the hole, not inside the mirrors (meaning if one were to try and touch what seems like the object, they couldn't because it is just an image in space)
https://www.exploratorium.edu/snacks/parabolas

13. Math can be found in acoustics and optics. Logarithms are found in the form of decibels and f/stops. The inverse square law explains how light and sound can dissipate quickly over time. In fact, the words that I'm writing would not even appear without the binary system and binary code. Applications of math can constructed with an eye for aesthetics and beauty. Why do certain colors look "good"? Why do certain sounds sound "good"? One way to find out is using math. I think a practical example for connecting math and beauty can demonstrated by observing art to find out if math can found in beautiful things. I'm not just talking about the golden ratio or fibonacci's number but how math elicits shape, color, and movement. This procedure of analyzing art for its math needs no experts, nor costs. However, prior knowledge of what makes things beautiful and how math plays a part in that is definitely needed. As for the name of the exhibit: recreational math.

14. I think that things including parabolic mirrors would be super interesting. Also, after doing some research I found that rainbows actually have to do with calculus (and some physics), which I think is pretty cool as well.

15. We can toss balls into the air, take a video of them, and then have students find the equation of their ball's path.

16. We could make our own parabolic microphones and set them all on the quad and have people stand in the middle and talk and then have another set of people with headphones listening in to see if our microphones catch sound from a long distance.

17. Fractions and recipes. We can do math in this application by modifying the recipe to a certain food to double or even triple the recipe. We would need a very good recipe, and the ability to do math. I would say we also would need some kind of kitchen. I would name this **Fraction Fun.**

18. Applications of math are all over sciences like aeronautics, aerospace, physics etc. I think that building a model of some sort of flight "machine" would be interesting. Obviously it would be very simple to keep costs down, some other restraints would be testing the model etc.

19. Minecraft world

20. One could create a parabolic mirror that directs sunlight. A parabolic mirror can heat something further away to approximately 500 degrees. (https://www.youtube.com/watch?v=FyCLOXF1188&t=236s)

21. A lot of art has to do with math because precision, symmetry, geometry, etc. is what makes pieces of art so appealing and attractive. Also, robotics create a lot of math and it would be cool to make a machine or a type of vehicle like Peter has done with the desk. We have a lot of "expert" classmates who we could ask and consult.

22. https://math.stackexchange.com/questions/733754/visually-stunning-math-concepts-which-are-easy-to-explain

23. Fibonacci Rabbits

24. One idea would be to build a 3-D structure, marrying geometry and architecture to create some sort of building that people could walk through. One example of this would be The Gherkin in London. This project might be expensive because it would require lots of supplies like nails and wood.

25. Another idea would be to hold a raffle to demonstrate probability. This could be fun to get students to come to the event.

26. Visualization of sorting algorithms (bubble, selection, ect.)
https://www.youtube.com/watch?v=kPRA0W1kECg

27. We could have an exhibit on string art construction (starting at 2:16 in this video) where people get to make their own string art. This video also talks about how parabolas are used in animated movies, such as Brave, to construct the grass. It would be interesting to talk about that as well, since I think a lot of people don't realize how math and art are connected.
https://www.khanacademy.org/partner-content/pixar/environment-modeling-2/animating-parabolas-ver2/v/parabolic-arcs-1

28. Slow Cooker!
https://www.youtube.com/watch?v=bPoOvy3elD8

29. An exhibit of another type of calendar, maybe from a culture that has a different number system than ours like the Aztecs. Wouldn't be too hard to keep costs down as it is mostly research.

30. Graphs of car's velocity as they merge onto the freeway or come to a stop.

31. https://momath.org/explore/exhibits/
There was this exhibit that I went to at the MoMath and it was a maze where I think you could only take right turns to get out. I'm not sure how the maze would be constructed, but building it on the quad would be easy because we could just spray paint the course on the grass.

32. We can build geometric shapes using marshmallows and toothpicks. We would only use those materials, so it is a cheap project. We could name the exhibit "Sticky Geometrics".

33. We can build a dog house using geometry and trigonometry!!

34. One potential math project idea could be to build a bridge with some sort of parabolic shape. The way that this can be done using is math is that in the process, the topics of of conic sections can be applied to the building and development of the bridge itself. It could be similar to a bridge that exists somewhere around the world in the present day, or alternatively an entirely new one. Keeping with the shape of a parabola, it may prove interesting to consult fellow students, math and physics teachers in order to see how the bridge should be built so that it is sturdy and if possible walkable in the event that I can find materials that are affordable to produce this masterpiece. The resources that would be needed are some sort of building material that has a strong foundation in order to hold passerbys who crossover. I could also have some cool designs on the side of the bridge that make it visually appealing as an exhibit for people to check it out. I don't have a name at the moment but something involving "crossing" or "the road to...".

To construct bridges takes lots of precision. Engineers and architects use geometry to build bridges to support the most weight possible. Someone could create a bridge out of rope and wood using geometry to hold a lot of weight. It won't cost that much and the exhibit could be called Geometry within Bridges.
https://ceas.uc.edu/special_programs/ceems/CEEMS_Pathways/SIT/CEEMS_InstructionalMaterials/MathUnits/MeganWalker_Bridges.html

35. Also, instruments have everything to do with math. Students can create guitars, drums, flutes, etc. using math and perform as a band on the quad.

36. We could examine the close-up shapes of reflective surfaces such as road signs and what makes them appear bright even at night so drivers can see them. A scale model of a sign section could be created, and the reflection angles would be mapped out as well. This idea would somewhat incorporate physics as well. This project would likely be inexpensive, likely requiring only cardboard, paper, plastic, and other cheap materials. The name could be something like "Why Are Stop Signs Bright?", although that isn't very creative so I would probably think of something else.

37. origami 3-d geometry

38. "Derivative Dash!" We create an escape room that utilizes different math principles as modules for the escape room. For instance, the graph of a pendulum swinging inside the room being the code to a box unlocking. Or the escapee having to pour exactly 4oz of water into a bowl with only 3 and 5oz bottles. We can incorporate many of the ideas on this doc in this room and it let's us put a lot of creativity into the project. We would also designate groups of students into different roles of the planning process. This will require materials,

but with the talent and dedication of our students, the majority of the modules can be hopefully be homemade.

39. The Golden Ratio and where it appears in nature.