2D universes think-pair-share
Dr. Sarah's MAT 1010: Introduction to Mathematics

Part A: Answer all fourteen questions below and type your responses for the forum. Add a new discussion topic with the subject as your preferred name and the post as your responses and any questions you have.

Part B: Respond separately to at least two of your classmates postings in a meaningful way. Use their preferred name (like Dr. Sarah is mine), with something new that justifies your position on (at least) one of the questions. Don't just say, "Yeah, I agree." Instead, say, "Yes preferred name, but we also need to consider..." Or, "Preferred name, I don't agree because..." You might also pose questions, answer questions, extend ideas, or compare and contrast your responses and summarize what you chose and why. After the deadline, I'll respond to the shared posts within the successive days activities (in the next day or two) or within a class announcement.

1. In a wraparound universe, we can head off on a path that feels straight to us and eventually come back around. Which are wraparound?
   a) Pac-Man's universe, a flat Euclidean torus
   b) Klein bottle tic-tac-toe, a flat Euclidean Klein bottle
   c) the infinite flat Euclidean plane
   d) both a) and b)
   e) all of the above

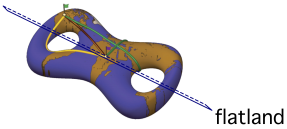
2. How many dimensions does lineland have in *Flatland the Movie*?

3. Which of the following could Arthur Square see at some point in time if a donut is dunked with the hole facing him? First think about what are cross sections in the 2D Flatland universe and then think about what would Arthur square could actually see (assume he can only see in the 2D universe)?

   a) 
   b) 
   c) both
   d) neither

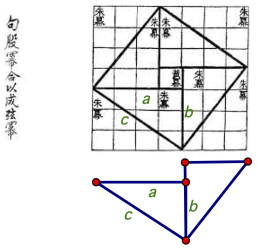
4. A 2-holed donut arose in the 2D universe intro, readings, and hand in assignment when we distorted the flat hyperbolic octagon to fit it in our space.

   a) Sketch what the full cross section would be when a 2-holed donut passes through Flatland, in a view that includes the two holes, and then describe your sketch.




   b) Sketch what Arthur square would see when a 2-holed donut passes by him in Flatland (assume that he can only see in the 2D universe), in a view that includes the two holes, and then describe your sketch.

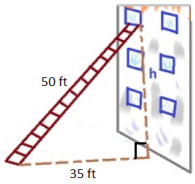
5. The Pythagorean theorem is named for Pythagoras of Samos (˜569 BCE –475 BCE). Which of the following arose to demonstrate the Pythagorean theorem based on the picture in the *Zhou Bi Suan Jing* or *Chou Pei Suan Ching*?




a) large square has area $c^2$
b) large square also has area $(a-b)^2 + 4(\frac{ab}{2})$
c) both
d) neither

In your notes, write out the full reasoning and steps. In your post, list your multiple choice response.

6. My husband is a professional musician who, in his spare time, volunteers for our local fire department and the rescue squad, as an EMT. If the firefighters have a 50 ft ladder and angle it towards the building, 35 ft away from the fire, how many feet high will it reach?




7. In flat Euclidean geometry of the infinite blackboard from high school, named for Euclid of Alexandria (˜325 BCE–265 BCE), what is the sum of the angles in a triangle?

8. In M.C. Escher's (1898-1972) *Circle Limit 4: Heaven and Hell* representation of hyperbolic geometry from the 2D universes hand in assignment, what is the sum of the angles?

9. If we had another work from Escher where there were 5 creatures around one point, 6 creatures around another, and 8 creatures around the third, respond to **all of the following**

   9a) What would the sum of the angles be?

   9b) Would the space be hyperbolic?

   9c) What would the angle sum tell you in terms of how curved the triangle is—is it very curvy?

10. How many parallels are there to a line through a given point in flat Euclidean geometry?

11. Are there any parallels in perspective drawing (projective geometry)?

12. Is there more than one parallel in hyperbolic geometry?

13. Research the web to find one or two real-life applications of hyperbolic geometry, and list the application(s) and your source.

14. What would Spherius say to the idea of more than three dimensions existing, do you think?