

## Clicker Question

1. In a wraparound universe, we can head off straight to eventually come back around. Which are wraparound?

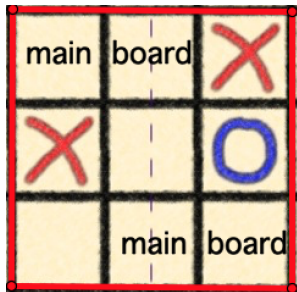
- a) spherical geometry
- b) Euclidean geometry
- c) a Klein bottle
- d) all of the above
- e) exactly two of a), b), c)

## Clicker Question

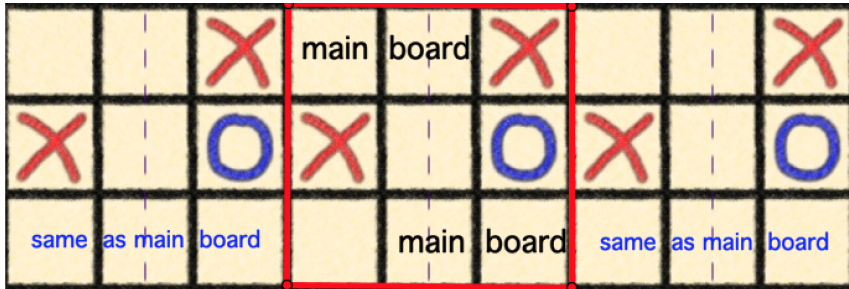
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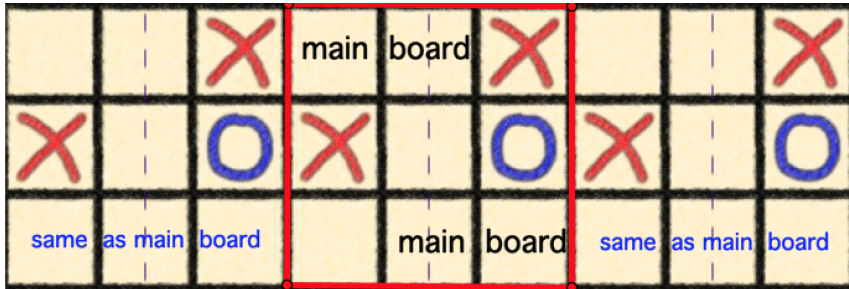
Klein bottle tic-tac-toe: Where should  $\circ$  go next on the main board?



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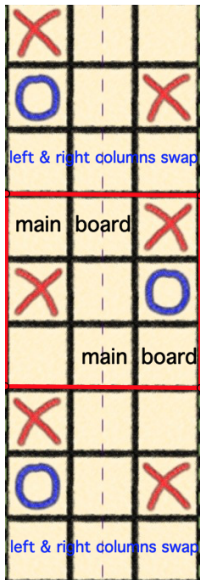


Klein bottle tic-tac-toe: Where should  $\circ$  go next on the main board?



bottom middle to block  $\times$

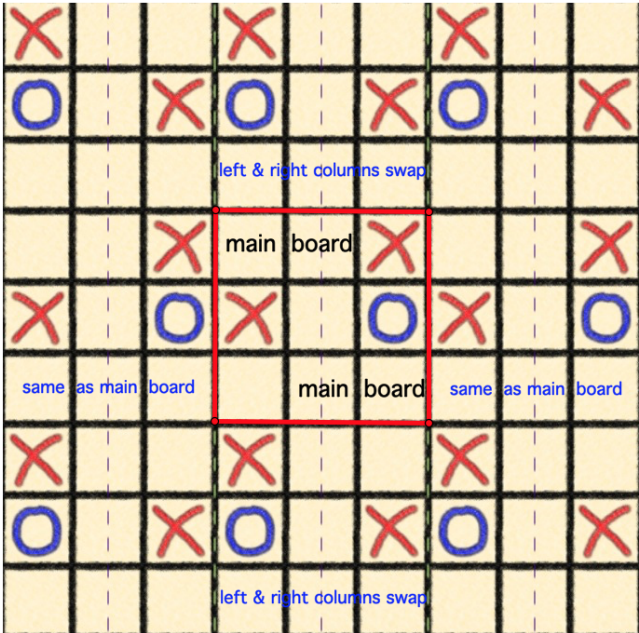
Klein bottle tic-tac-toe: Where should **o** go next on the main board?



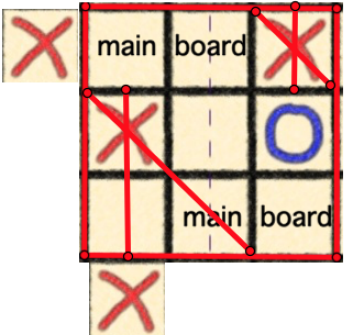
also bottom left to block **x**, so **o** has no chance of winning



# Klein bottle tic-tac-toe: Where should o go next?



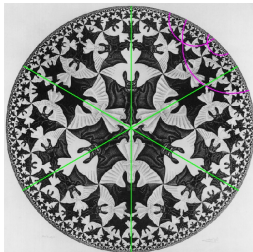
Klein bottle tic-tac-toe: Where should  $\circ$  go next?



$\circ$  has no chance of winning

## Clicker Question

2. What are real-life applications of hyperbolic geometry?
- a) modeling the internet to reduce the load on routers
  - b) modeling the folds of the brain and Mercury's orbit
  - c) building crystal structures to store more hydrogen or absorb more toxic metals
  - d) more than one of the above
  - e) none of the above



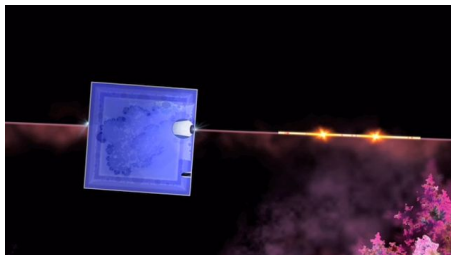
Latvian/US mathematician Daina Taimina *Crocheting  
Adventures with Hyperbolic Planes*



## Clicker Question

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

- a) one and I have a good reason why
- b) one but I am unsure of why
- c) two but I am unsure of why
- d) two and I have a good reason why
- e) other

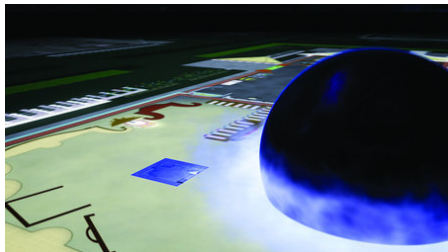


## Clicker Question

4. Which of the following could Arthur Square see at some point in time if a donut is dunked with the hole facing him?

Hint: What are cross sections? What would Arthur square see?

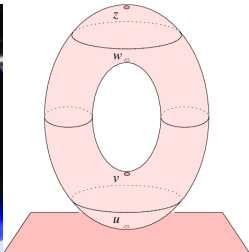
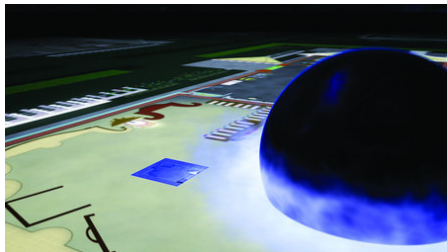
- a) 
- b) 
- c) both
- d) neither



## Clicker Question

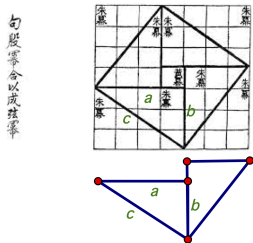
4. Which of the following could Arthur Square see at some point in time if a donut is dunked with the hole facing him?  
Hint: What are cross sections? What would Arthur square see?

- a) 
- b) 
- c) both
- d) neither



## Clicker Question

5. 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