



The Liberal Arts Tradition

with Dr. Kevin Clark and Ravi Jain

Lesson 11: Arithmetic and Geometry

Outline:

Arithmetic and Geometry

- Arithmetic and geometry are part of the synthesis of the discrete and the continuous.
- The discrete can be added into a multitude.
- A line segment is continuous. It is infinitely and arbitrarily divisible.

Arithmetic

- Aristotle says that you can see anything as either continuous or discrete. Discrete humans add up to a multitude, but the human's height is a continuous magnitude. The height is indeterminately divisible.
 - This was part of the mystery of arithmetic for Plato.
 - Discrete things participate in continuity. Plato thought arithmetic might be the apex of the Quadrivium.
- For Plato, arithmetic and geometry were about counting correctly.
 - We can count by different numbers (multiplication).
 - Triangular & square numbers: This offers an opportunity to encounter numbers in wonder and play.
 - For the ancients the discrete and the continuous played at each other. Ideas of discrete number give insight into continuous number.
- *There is insight in the tradition when we are willing to attend to the synthesis of the discrete and the continuous.*

Geometry

- Euclid actually demonstrates the algebraic principle through shapes in Euclid's *Elements*.
- What would it look like if there was an interplay between looking at square numbers and square shapes as a way to animate puzzle within the curriculum?
- Algebra becomes the name for concepts that students already know. Students get their mathematical learning through embodied play.

Wonder in the Pedagogy of Mathematics

- Euclid's geometry is actually a series of proofs, but Euclid was not the first one to prove all of the geometric theorems. He was the summary of many proofs that had gone before him.
- Euclid offers a presentation of what has been found through puzzle and play.



- When the Church fathers were struggling with questions of how Christ can come in the flesh but be with the Father at Creation:
 - The tradition of the discrete and the continuous occurred to them.
 - There is a way that anything can be seen as discrete or as continuous.
 - *Maximus the Confessors says that it is no surprise that we should see the Christ and the Trinity as the synthesis of one and many because we see so many syntheses in nature where it seems like so many paradoxes are held in tension.*

How are deductive geometrical proofs linked to art joining imitation with reason?

- If we understand our students as having loves that need to be cultivated and shaped, then math pedagogy looks more like play.
- If students have gone through the process of discovery and following questions, then they can go back through with reason and logic and organize those discoveries into a deductive system (from first principles).
- Dialectic is its own art. It is the art of following the question and participating in dialogue through question. The art of dialectic is helpful as students engage the art of geometry.

Meditation in a Toolshed, God in the Dock, C.S. Lewis

- Lewis could see a ray of light and everything else falls in darkness around it. If you look alongside the ray of light, it opens to the outside.
- Look alongside of the teacher (Plato, Pythagoras, Galileo, Kepler). We can start to see things that they saw. We can find out what they were really fascinated by in the world.

