

Unit Outline: Mathematics and Knowledge

I: Scope

KQs:

- Should mathematics be defined as a language?
- Why is mathematics so important in other AoKs, particularly, the natural sciences?
- How have technological innovations, such as developments in computing, affected the scope and nature of mathematics as an AoK?

Introduction to Mathematics and Knowledge Unit

Helmenstine Why Math is a Language

Conversant in the language of the Universe
“Math is Miraculous”

Math invented or discovered?
P.Ball—Why do human’s have numbers?

II: Perspective

KQs

- If mathematics is created by humans is it still possible to accept mathematical truths as objective facts about the world?
- Is mathematical knowledge embedded in particular cultures or traditions?
- Does personal experience play any role in the formation of claims in mathematics?

Zeno’s Paradox and Infinity (w/ video clip)
Watch TED talk—Vijaya Nagarajan: Kolam

Math Cultural or Universal
Watch TED talk—Ron Eglash: African Fractals

Math Cultural or Universal—Case Study
Read Brodie Mathematics can be decolonized

Diversity in Mathematics
Mathematics must prepare to test their truths

III: Methods and Tools

KQs

- What is meant by the term “proof” in mathematics, and how is this similar to, or different from what is meant by this term in other AoKs?
- How do mathematics reconcile the fact that some conclusions seem to conflict with our intuitions?
- Do mathematical symbols have meaning in the same way that words have meaning? Is personal experience more important or less important in mathematical compared to other AoKs?

‘Eternal Truth’ of Mathematics
Quanta In Computers we Trust

Mathematics and computers
Boaler Everyone can Learn Mathematics

“Beauty” of Mathematics
Oakley How I Rewired by Brain

How should Mathematics be Taught?
Wertheim—How to Play Mathematics

IV: Ethics

KQs:

- How are unethical practices, such as ‘data dredging’ used by statisticians by deliberately manipulate and mislead?
- Is it ethically justifiable for academic mathematicians to spend time doing research that does not have immediate use or applications?
- Are mathematicians the people best placed to create codes of ethics for professional mathematicians?

Mathematics as Ethically Neutral
Nasar & Gruber Manifold Destiny pages 1-6
Ethics and algorithmic bias

Ethical use of Statistics—w/ video link
Nasar & Gruber Manifold Destiny pages 7-12

