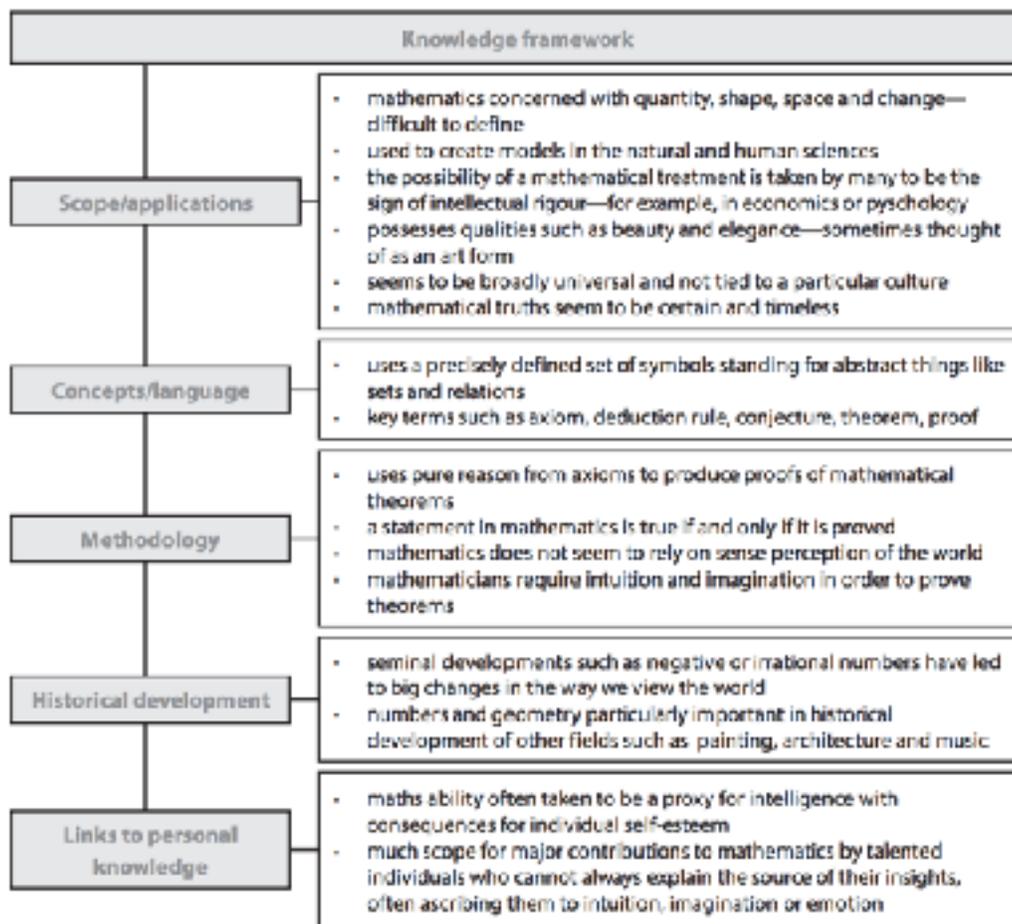The Historical Development of Math: a Conversation

Form groups of four (there will be two groups of three). In these groups I would like to see at least one person that self assesses as good in math and at least one person that self assess as someone who finds math a challenge to somewhat overwhelming (this would be me). I would like to see groups that are at least slightly different than the groups we usually see.

In your groups, choose one of the following people/topics that you wish to explore:

> Pythagoras
> Euclid
> Fibonacci
> Newton and Leibniz
> Euler
> Brahmagupta
> Muhammad Al-Khwarizmi
> Boole
> Gauss
> Reimann

Your group will be leading the part of the discussion that is focused on your person/topic. Discussions must:

- Provide some brief context for your person/topic
- Identify the most significant conceptual contribution made by this person/topic to the field of math (this will, in some cases, be a judgement call). Demonstrate this concept mathematically (with a simple proof) if possible.
- Connect your person/topic's contribution to the historical development of math in general and to advances made by previous persons/topics and to advances of the persons/topics that came afterwords.   Groups should be prepared to add to or question other groups when connections arise.
- Explain your person/topic in terms of at least three elements of the IB ToK mathematics knowledge framework reproduced below.
- Address how your person/topic sheds light on at least two of the four central math KQs
    - Is mathematics invented or discovered? Or, put differently, If mathematics is created by man, why do we sometimes feel that mathematical truths are objective facts about the world rather than something constructed by human beings (think about mathematics in nature)?
    - If mathematics is an abstract intellectual game, why is it so good at describing the real world?
    - What is the relationship of elegance and beauty to mathematical truth?
    - To what extent is mathematics an emotional and imaginative pursuit rather than simply the exercise of pure reason?
- Provide a three entry annotated bibliography of sources that you used to put this exploration together. Annotations should be 100-150 words apiece. Use the THSSSWG for formatting guidance.
- Achieve all of these objectives not as a point by point presentation, but as part of a conversation about the nature of mathematical knowledge.
- Not use powerpoint or other presentation software (white boards, however, are fine)

Knowledge framework

Scope/applications

- mathematics concerned with quantity, shape, space and change—difficult to define
- used to create models in the natural and human sciences
- the possibility of a mathematical treatment is taken by many to be the sign of intellectual rigour—for example, in economics or psychology
- possesses qualities such as beauty and elegance—sometimes thought of as an art form
- seems to be broadly universal and not tied to a particular culture
- mathematical truths seem to be certain and timeless

Concepts/language

- uses a precisely defined set of symbols standing for abstract things like sets and relations
- key terms such as axiom, deduction rule, conjecture, theorem, proof

Methodology

- uses pure reason from axioms to produce proofs of mathematical theorems
- a statement in mathematics is true if and only if it is proved
- mathematics does not seem to rely on sense perception of the world
- mathematicians require intuition and imagination in order to prove theorems

Historical development

- seminal developments such as negative or irrational numbers have led to big changes in the way we view the world
- numbers and geometry particularly important in historical development of other fields such as painting, architecture and music

Links to personal knowledge

- maths ability often taken to be a proxy for intelligence with consequences for individual self-esteem
- much scope for major contributions to mathematics by talented individuals who cannot always explain the source of their insights, often ascribing them to intuition, imagination or emotion

Other Details
- The goal is an ongoing round-table discussion, not a series of presentations. Groups should feel free to interject and add as appropriate
- This will be worth five annotations and potentially five bonus participation points
- The conversation will start on Tuesday, November 14. I anticipate It will last 3-4 class sessions. All groups should be prepared to engage on the first day.
- Your group should prepare a brief handout regarding your person/topic that lays out the key aspects of the concept you will discuss. The annotated bibliography should be part of this handout.

I want to do the math unit differently this year. Historically, I have taught this unit much like I teach the other AoKs, with a fair amount of direct instruction and the assignment of primary readings to illustrate key concepts. This year I would like to approach the unit differently for a couple of reasons. First, the PE topic you all chose to write on this term speaks directly to the idea of historical development.

"The quality of knowledge produced by an academic discipline is directly proportional to the duration of historical development of that discipline." Explore this claim with reference to two disciplines.

Second, I want to make students more directly responsible for the conduct of this unit. Too often, we slip into patterns where we simply sit back and wait to be fed - by the teacher, the documents or the more vocal members of the class.