“Prime” Questions to Consider in Mathematics (from Mr. Mao)

Theory of Knowledge

**Instructions:**

Consider one of the below 11 questions and create a 2-3 paragraph response. The text in blue are some ideas to help shape your discussion courtesy of Mr. Map. You responses are due next lesson.

1. Can mathematics be characterized as a universal language?

If a Lion can speak English can we understand it?

Do you classify Mathematics as the symbols that we use to describe it or the underlying concepts.

2. To what extent is mathematics a product of human social interaction?

3. What is the role of the mathematical community in determining the validity of a mathematical proof?
The guy who ‘proved’ Poincaré - Perelmen wrote it in Russian and it subsequently took Mathematicians almost 6 months before they verified the proof.

4. Why is it that mathematics is considered to be of different value in different cultures?

5. How would you account for the following features that seem to belong particularly to mathematics:

* some people learn it very easily and outperform their peers by years;
* some people find it almost impossible to learn, however hard they try;
* most outstanding mathematicians supposedly achieve their best work before they reach the age of 30?
* Is there a clear-cut distinction between being good or bad at mathematics?

6. What counts as understanding in mathematics? Is it sufficient to get the right answer to a mathematical problem to say that one understands the relevant mathematics?

You know that the derivative of sin(x) is cos(x), but why?

7. Are there aspects of mathematics that one can choose whether or not to believe?

Is there a pattern to prime numbers? – No one can prove one yet… but it’s obvious there should be, right?

8. How do we choose the axioms underlying mathematics? Is this an act of faith?

What’s an axiom?

9. Do the terms “beauty” or “elegance” have a role in mathematical thought?
Some people consider $e^{iπ}+1=0$ as the most beautiful equation in Maths – why?

Multiple ways of solving a problem (in a very simplistic view)

 Solve $x^{2} - 3x + 2 = 0$. You can factorise $\left(x-1\right)\left(x-2\right)=0 ⇒x=1, 2$

 Alternatively you can use the formula: $x=\frac{-\left(-3\right)\pm \sqrt{\left(-3\right)^{2}-4\left(1\right)\left(2\right)}}{2\left(1\right)}$ Looks horrendous… or is it?

 Formula will always work! Factorising is ‘np-complete’ problem (i.e. very hard)

 What does elegance mean?

When Andrew Wiles proved Fermat’s Last Theorem, it was a 200 page proof that few but the top mathematicians around the world would understand. Can you consider this as elegant Mathematics, that it links multitude of Mathematical disciplines together… but it’s 200 pages!

 Return back to the first equation, it links together 5 major concepts in maths… is that why it’s elegant?

10; Is there a correlation between mathematical ability and intelligence?

Arthur Benjamin is widely considered a ‘Mathemagician’ yet he’s displaying very good memory and arithmetic skills is this Mathematics?

11. How have technological innovations, such as developments in computing, affected the nature and practice of mathematics?

This is a scary one – The four-colour theorem has only been proven from computer simulations. – Is that a proof?

To prove a theorem, what level of understanding do we need to understand the proof?

If you use advanced Mathematics that’s