How can Solving the World's Hardest Problem inform Mathematics Teaching?

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Mathematics Centre

Our Role

100% professional development... collect & retell stories of success

Mathematics Centre

Core Curriculum

Learning to work like a mathematician

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Core Curriculum

Learning to work like a mathematician

…and the teaching craft that fascinates, captivates & absorbs

Story Tellers

Simon Singh
Fermat's Enigma
Walker and Company
New York, 1997

John Lynch
Fermat's Last Theorem
BBC Horizon Series
The Proof, PBS USA

Fermat's Last Theorem

(The story...) provides a unique insight into what drives mathematics, and perhaps more important, what inspires mathematicians.

Simon Singh, Preface, p. xv

Fermat's Last Theorem

The story of Fermat's Last Theorem is unique. By the time I first met Andrew Wiles, I had come to realize that it is truly one of the greatest stories in the sphere of scientific or academic endeavour.

John Lynch, Foreword, p. viii

Pythagoras Theorem

3 rows of 3 + 4 rows of 4

= 5 rows of 5

x rows of x + y rows of y

= z rows of z

$x^2 + y^2 = z^2$

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What happens if…?

…we build cubes on each side?

Is there an (x, y, z) so that:

$$x^3 + y^3 = z^3$$

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What happens if...?

True or not, is there an (x, y, z) so that:

$$x^4 + y^4 = z^4$$

or

$$x^5 + y^5 = z^5$$

or, in general,

$$x^n + y^n = z^n$$

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Fermat's Last Theorem

For $n > 2$, there are no (x, y, z) such that:

$$x^n + y^n = z^n$$

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Euler's Conjecture

There are no solutions to:

$$x^4 + y^4 + z^4 = w^4$$

For over 200 years no one could prove or disprove this conjecture.

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Noam Elkies' Disproof

In 1988, Elkies made this calculation:

$$2{,}682{,}440^4 + 15{,}365{,}639^4 + 18{,}796{,}760^4 = 20{,}615{,}673^4$$

You are invited to check this if you think I haven't included enough maths yet.

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Learning to work like a mathematician

Mathematicians are real people;
like those in our classrooms.
Mathematians display passion.
Mathematicians work in
community.
It feels good to solve a problem
- even beautiful.

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Learning to work like a mathematician

Mathematics is concrete, visual and makes sense.

Mathematicians proceed by asking questions:

Can I check it another way?

What happens if...?

How many solutions are there?

How do I know I have them all?

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Learning to work like a mathematician

Mathematicians love a challenge.
Doing mathematics involves
revelation ('aha' moments).
Intuition and inspiration are
valued by mathematicians.
Maths is the process of hunting
for solutions, not the process
of spitting out answers.

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Learning to work like a mathematician

Mathematicians:

- learn from each other
- build on each other's work
- engage in higher order thinking
- are content with partial solutions
- expect solutions to take time

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Learning to work like a mathematician

Computers are a tool sometimes used by mathematicians

If I can't do a problem I can put it aside for now.

If one way doesn't work, I just try again another way.

Anthem

Maths teachers all let us rejoice

Our subject is not trite.

It's far more than the daily toil

Of "Is this wrong or right?"

The theme we weave each time we teach

Must challenge students to

Engage with problems in the way

That math'maticians do!

In joyful classrooms let us work

Like math'maticians do!