Is technology changing maths for the better?

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Our big debate

Technology has changed the *focus* and the range of applicability of mathematics.

- How should mathematics be taught ***to beginners***?
- Clear agreement that something in England needs serious attention.

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Our big debate

What is mathematics?

- Maths is a uniquely *precise way of thinking* about certain ***mental*** *constructions.*
- Its methods are not hard-wired into the brain, but the mathematical way of thinking **can be learned**.
- **Certain ideas *hold the key* to enabling *pupils* to master this complex 'mental universe'**.

  The known ways of improving maths education focus on mastery of **these key ideas**.

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Our big debate

The **adult** world may be dominated by computing for the foreseeable future.

How relevant is this to how we teach mathematics **to children?**

- "Math ≠ calculating"
- "Math >> calculating"

- Math = calculation **++ …**

"Math has been liberated from calculation; but that liberation didn't get into education"

- For ***adults*** it may sometimes be true that "calculation used to be the **limiting** part [which computers can now do]".
- ***Learners*** are in a different position: struggling to **construct** their own '***mental* universe**' of maths ...
- … to *connect* marks … with *decisions …* and *instructions* … so this complex of skills will become robustly available for subsequent similar challenges.

Our big debate

Such 'calculation' is the (the main?) way the relevant skills *get wired into the brain.*

- *Mathematics* >> calculating, but …
- … calculation is a crucial part of *maths* ***education*** (through engaging with 'sequences of calculation')

We have **deprived** our children of this experience.

- So attempts to focus on the "missing ingredients" in
  Math = calculation **++ …**
  are no better than
  "Let them eat cake!"

- Can ***individuals*** learn elementary maths more effectively by exploiting the power of computing? If "Yes", can we recommend such an approach on a **large** scale? (Or does roll-out → degeneration?)