

Maple's Day in a Sixth Form Presentation at MathSpeak 2014

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- RGS** Royal Grammar School, Newcastle: “a leading independent day school” ; Sixth Form of 340
- Syllabus** OCR (MEI): requires a minimum A at GCSE, preferably A*
more specifically
- FPT** Further Pure Mathematics with Technology

MEI recommends the use of TI-Nspire for FPT (and the teaching and learning resources are written in this).

Alternative software that is appropriate for FPT:

- GeoGebra and Python*
- * “will need to learn a small number of additional processes”
- Maple
- Casio ClassPad

it is acceptable for candidates to have access to Autograph and Excel in the exam but these alone will not be sufficient

JHD’s personal view: this is the closest A-level comes to the “real world” of using mathematics

David Wilson 3rd year PhD student at Bath, ex MMath at Oxford and MS at Rutgers

PhD is in Maple, and frequent connections with core Maple developers

Now in Silicon Valley, so you've got the supervisor instead

Invitation School direct to David, having heard of him via family connections

Aim show Maple worksheets demonstrating key FPT ideas (Year13, teachers), general (Yr 11/12)

The four sessions (13,11/12, 2× teachers) were mainly spent working from a blank workbook and demo-ing in real time.

The worksheets were left behind for the teachers, though!

The conclusion is that the pupils (at years 11-13!) find the technology fascinating, even though they have seen and used symbolic calculators. While 'plot' and the visual commands were interesting, they were not the main focus, rather "hard calculations".

Questions about Maple/Computer Algebra/A level

- ① Yr 11/12, not studying FPT yet, were also fascinated: would this be the case if FPT were not the “carrot”?
- ② Is this therefore repeatable outside the context of FPT, or indeed of MEI?
 - * JHD’s gut feeling, having demoed computer algebra on various occasions, is positive

NB The 2016 OfQual states “No computer algebra in examinations” for Mathematics

But not a blanket ban for Further Mathematics

- ③ How much longer can this line hold?
 - shades of the calculator debate

David: “the teachers were really interested in my comments about applications of maths/computer science”

Is the research community doing enough to tell teachers that

- 1 Google is based around graph theory and matrices

JHD has talked about this, ending up “you’ll meet eigenvectors, the key tool, at university”

- 2 The “Padlock” icon in secure websites is based around public-key cryptography and hence Maths

JHD has demonstrated this to primary schools

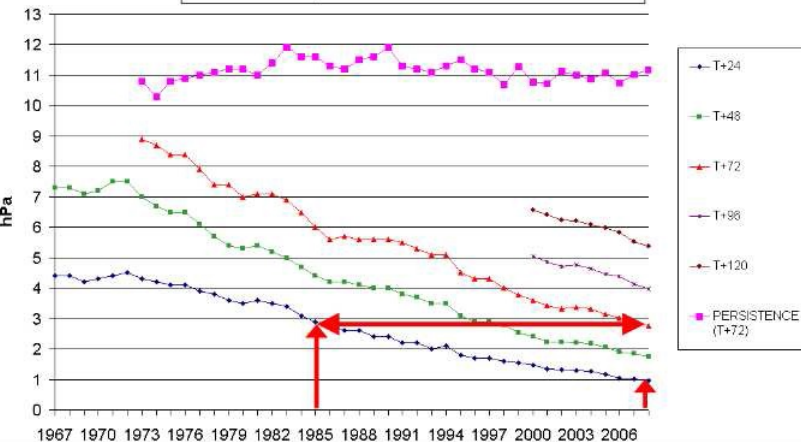
- 3 Weather forecasting is based around mathematics

Error in Weather Forecasting



Accuracy

RMS surface pressure error over the NE Atlantic



Progress due to Maths/
Hardware/
Data, about equally

An aside, prompted by $(2a + 1)|_{a=5}$ gives $25 + 1 = 26$

Table: Meanings of juxtaposition in Mathematics

left	right	meaning	example
weight	weight		
normal	normal	lexical	sin
normal	italic	application	$\sin x$
italic	italic	multiplication	xy
		(or <code>&InvisibleComma;</code>)	M_{ij}
italic	normal	multiplication	$a \sin x$
digit	digit	lexical	42
		(or <code>&InvisibleComma;</code>)	M_{12}
digit	italic	multiplication	$2x$
digit	normal	multiplication	$2 \sin x$
normal	digit	application	$\sin 2$
		(but note the precedence in $2 \sin 3x$)	
italic	digit	error	$x2$
		(but reconsider)	x^2 or $x_2?$
digit	fraction	addition	$4\frac{1}{2}$
italic	greek	application ⁻¹	$a\phi$
		(as in group theory)	i.e. $\phi(a)$
italic	(unclear	$f(y + z)$ or $x(y + z)$