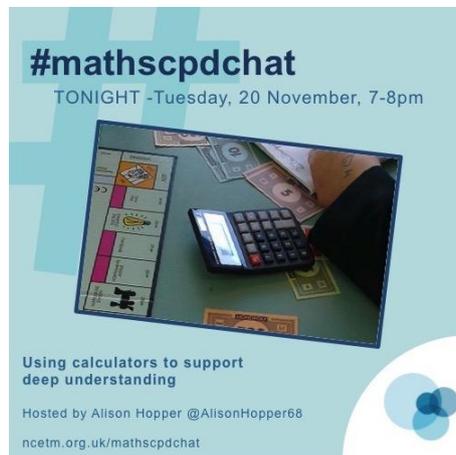# #mathscpdchat 20 November 2018

**Using calculators to support deep understanding**

Hosted by @AlisonHopper68

*This is a brief summary of the discussion – to see all the tweets, follow the hashtag*
***#mathscpdchat*** *in Twitter*



Some of the areas where discussion focussed were:

- **research and advice about using calculators** to support learning that was provided **in years gone by** … for example, in 'Mathematics counts' (the Cockcroft Report) 1982, in the Numeracy Strategy calculator booklet 2006, in 'Towards a calculator-aware number curriculum' by Kenneth Ruthven (CAN project) 2009, and in SMILE resources available from the STEM library;

- that/how the CAN (Calculator Aware Number) project **impacted on pupils' mental methods** and approaches to **problem solving**;

- pupils **estimating** the result of a calculation **before using a calculator** to do the calculation … as well as estimating after doing the calculation to check whether the result given is reasonable;

- knowing what the result of a calculation given on a calculator **represents in the context of a problem** …implications of this when pupils need to decide whether to **round up or down**;

- whether **two pupils sharing one calculator** when solving problems might facilitate helpful discussion about how to use the calculator;

- the value of **'free play' with calculators** for young pupils … eg starting with any number and repeatedly pressing the '√' key … and playing calculator games;

- **very young pupils seeing 'magic' in results and patterns** of numerical calculations carried out using a calculator;

- **very young pupils' explorations** (using calculators) of addition/subtraction **supporting their mental methods and knowledge of number bonds to 10**;

- concentrating on **efficient calculator use (with pencil and paper to hand) in Y7/8**, before returning the focus to written calculations in Y9 … that calculator-use can **support improved written methods**.

- using calculators to **convert fractions to decimals** … recurring decimals;

An interesting 'conversation' of tweets, about estimating and interpreting the results of calculations carried-out using calculators, followed from this tweet by Alison Hopper:

Alison Hopper @AlisonHopper68 · 18h
With a few minutes to go, who remembers the Numeracy Strategy Calculator Booklet? content.ncetm.org.uk/itt/sec/KeeleP…

including this one from Jenny Hill-Parker:

Jenny Hill-Parker @JennyHillParker · 18h
Replying to @AlisonHopper68 @PardoeMary
Blast from the past! #mathscpdchat

this from Mary Pardoe

Mary Pardoe @PardoeMary · 18h
Replying to @JennyHillParker @AlisonHopper68
This is another 'blast from the past' ... it's part of what was 'said' in 'Mathematics Counts' (the Cockcroft Report) published in 1982 ... have ideas changed? #mathscpdchat

> 385 There are other ways in which a calculator can be used as an aid to teaching. For example, by entering the number 572 and then asking a child to change the display to 502, to 5720 or to 57.2, in each case by means of a single arithmetical operation, it is possible to reinforce understanding of place value. If the child cannot carry out the necessary operations the teacher is enabled to locate the area in which lack of understanding exists and to provide

this from QAMAcalculator



QAMAcalculator @QAMAcalculator · 18h

Replying to @PardoeMary @JennyHillParker @AlisonHopper68

Cockroft report alsop said this. #mathscpdchat

> 260 A second aspect of estimation may be described as 'realising whether the answer is reasonable'. Many pupils find it difficult to develop this ability. In some instances it is concerned, as is the previous aspect, merely with computation but, as is frequently the case when using a calculator, after the calculation rather than before.

this from Alison Hopper:



Alison Hopper @AlisonHopper68 · 18h

I'd add the importance of knowing what the answer represents. In the account of solutions to the problem in the image, it was clear that the students didn't know that the decimal in the display was a number of coaches #mathscpdchat

> The 'coach problem' was a close variant of an example in the national curriculum: *313 people are going on a coach trip. Each coach can carry up to 42 passengers. How many coaches will be needed? How many spare places will be left on the coaches.*

and this one from Heather Scott:



Heather Scott @MathsladyScott · 18h

Yes - I try to ask my students to draw pictures about the question ... so some bus pictures to get into the situation #mathscpdchat ... that's the hard part, getting them to use pen and paper with calculators and not to just press buttons!

this from Heather Scott:



Heather Scott @MathsladyScott · 18h

I think the idea of checking if an answer is reasonable is also to do with situation. Many of my yr 11 students rounded down when doing a fencing around a field problem ... so the animals all escaped ... when rounding check if answer is reasonable #mathscpdchat

this from Alison Hopper:



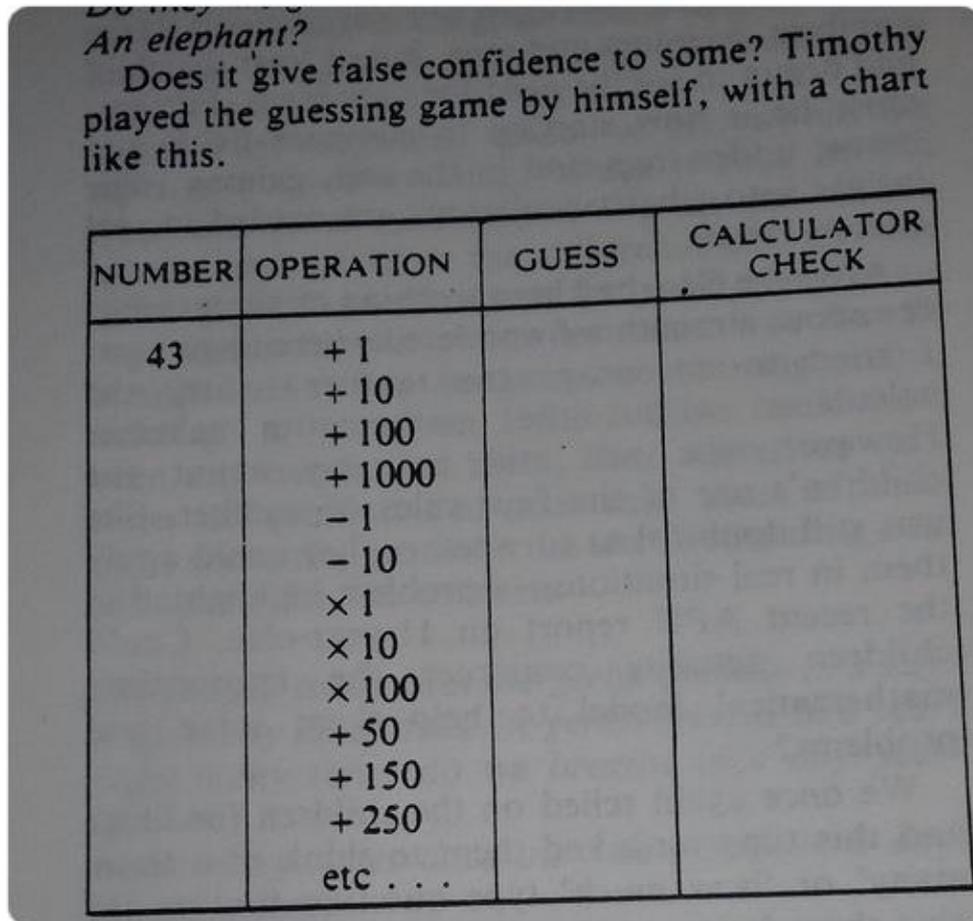Alison Hopper @AlisonHopper68 · 19h

Replying to @MathsladyScott

With calculators vanishing from some primary schools (not @martynyeouk 's), what are the key skills that you are teaching them in Y7 and 8 and how can we promote more primary schools to get back in touch with them? #mathscpdchat

this from Mary Pardoe

**Mary Pardoe** @PardoeMary · 18h

'Going back a long way', here is a small bit from an article in 'Mathematics Teaching 93' (1980 ... before some of you were born) called 'Using Calculators with Juniors' by Brian Davies atm.org.uk/Mathematics-Te... (photo from my own copy kept since I was a new teacher) #mathscpdchat

> An elephant?
> Does it give false confidence to some? Timothy played the guessing game by himself, with a chart like this.

| NUMBER | OPERATION | GUESS | CALCULATOR CHECK |
|--------|-----------|-------|------------------|
| 43 | + 1 | | |
| | + 10 | | |
| | + 100 | | |
| | + 1000 | | |
| | − 1 | | |
| | − 10 | | |
| | × 1 | | |
| | × 10 | | |
| | × 100 | | |
| | + 50 | | |
| | + 150 | | |
| | + 250 | | |
| | etc . . . | | |

and this one from Jenny Hill-Parker:

**Jenny Hill-Parker** @JennyHillParker · 18h

Replying to @AlisonHopper68 @MathsladyScott

I like the idea of the 'guess' column in one of the calculator tasks prior the students working out the answer - a low threat bit of independent thinking that should start to solidify understanding #mathscpdchat

(to read the discussion-sequence generated by any tweet look at the 'replies' to that tweet)

Among the links shared were:

Towards a calculator-aware number curriculum, by Kenneth Ruthven, which is a paper reviewing a pioneering effort to craft a 'calculator-aware' number curriculum, shared by Alison Hopper

The Calculator-Aware Number Curriculum (CAN) which is a book from Simon and Shuster and the NCC about the work which the PrIME Project undertook, between 1986 and 1989, to develop a 'calculator-aware' number curriculum for children in the primary years, shared by Alison Hopper

SMILE Cards (Secondary Mathematics Individualised Learning Experiment) which was initially developed by practising teachers as a series of practical activities for secondary school students, shared by Heather Scott

The National Numeracy Strategy Calculator Activities which is a collection of tasks in which pupils use calculators to support learning, shared by Alison Hopper

Using Calculators with Juniors by Brian Davies, which is an article in Mathematics Teaching 93 from the ATM (Association of Teachers of Mathematics), in which the author describes interesting ways of working with primary-school pupils using calculators, shared by Mary Pardoe

As Easy as 1,2,3 which is an ingenious task (about an unusual calculator!) from NRICH, shared by Mary Pardoe