Using TI-Nspire to Teach Factors

Case Study 14

Researcher – Alison Clark-Wilson, University of Chichester

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Teacher/Researchers	Alison Clark-Wilson, University of Chichester
Location	Blue Coat School in Walsall, UK
Course	Year 8, Set 1
Grade	Year 8
Student Profile	approximate NC level: 6
Technology	TI-Nspire

The pupils were able to see for themselves the 'product of prime factors' representation of any integer they chose. They were able to use the results that they had found so far to try and work out the next factorisation. They were able to see if they had correctly prime factorised a number without any intervention.

CURRICULUM:

Q. What did you want the pupils to learn?

A. The mathematical objective was to understand how to write a natural number as a product of prime numbers, and to recognise that the prime factorisation of a number is unique. The TI-Nspire objective was to learn how to use the factor() command and also how to copy and paste items from the history on the calculator page.

Q. What activity did you choose (or develop)?

A. I chose to use the factor() function on the calculator screen, which factorises numbers into prime factors and expresses the result as a product of powers.

Q. And what mathematical learning took place?

The pupils worked with the TI-Nspire, typing factor(200) then other factors and noting what happens. I asked them to try and predict what the outcome would be given any number. As they worked through from factor(1), many of the pupils themselves noticed that "the prime numbers came out as themselves", eg factor(13)=13. This was quite a significant moment in the lesson. Some pupils also spotted that all the factorisations were equal to the number being factorised, having applied their knowledge of indices (which took a few minutes for them to remember).

Q. How did you introduce the activity?

A. Type factor(200)… what do you see? Ok, let's write that down. Now try factor(12)… Ok let's write that down as well. I wonder if we can predict what the answer is going to be… Start with factor(1) then do factor(2) then factor(3)…. Yes you do need to write these down… I want you to be able to tell me what the next answer is going to be.

Q. What were pupils' initial reactions/questions?

A. How much does it cost? Where's the on button?

Q. Approximately how many of the pupils could develop strategies to fully pursue the activity with little or no guidance from you?

All but two or three were able to enter the factor() command successfully. Five or six needed help with copying and pasting from the line above.

Q. What, if any, guidance did you have to give to the other pupils? Please indicate how many pupils approximately needed additional guidance?

Q. How did the activity enable pupils to take more responsibility for their mathematical learning?
A. The pupils were able to see for themselves the 'product of prime factors' representation of any integer they chose. They were able to use the results that they had found so far to try and work out the next factorisation. They were able to see if they had correctly prime factorised a number without any intervention from me.

Q. Can you give a brief summary of the pupils' work/conclusions
A. Most pupils noticed that factor(prime)=prime. Most pupils noticed that the prime factorisation, when multiplied, gave the number being factorised. Some noticed that the prime factorisations consisted only of products of primes and were then able to correctly predict other factorisations.

Q. How did the idea influence further work?
A. The activity led to input from me demonstrating that by factorisation (e.g. 12=4x3) can be factorised further (12=2x2x3) until only prime numbers are left.

Q. What aspect(s) of the idea would you use again?
A. I liked the pupils recording factor(1), factor(2), factor(3) etc. in their books and comparing their results to see what they noticed.

Q. What changes would you make?
A. I would probably start by deliberately choosing numbers that are a product of exactly two primes (each to the power 1) in order to encourage pupils to begin to generalise:
Factor(6)=2x3
Factor(35)=5x7
Factor(14)=2x7

I would then ask them what they thought the output of, say factor(21) and factor(55) might be. Just when the pupils thought they were getting the hang of this I would throw in a question where the prime factoristaion contained an index, such as factor(16). I would look surprised at the outcome and ask them to investigate further.

Feedback from learners

"Sir didn't give us the answer straight away instead we worked it out for ourselves which made our brains work harder. Now I understand prime factorisation more than I would have done and learned a bit about how the TI-Nspire worked."

"I enjoyed using the TI-Nspire especially the mystery of how they work it (prime factorisations) out, but it was very fun as I love finding mysteries."

"...we were not told the strategy of how the calculator came up with the answers as we had to find out ourselves first."

"I had thought that this was going to be hard, but I soon found that it was really easy to do. The device helped me to do this because it automatically told us the prime numbers abs - we just had to find out what it was doing."

Further teacher feedback

Q. In your view, did the use of TI-Nspire enhance the mathematical understanding of the learners? If yes, what evidence would you use to support this?

A. TI-Nspire gave the pupils the opportunity to attempt to work out how factorisation works, by trying out their own ideas and testing them in a way that would not have been possible in more directed learning. They could factorise any number that they wanted to and instantly see the prime factorisation, thus giving them further evidence to support or contradict any ideas that they were developing.

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