IDEA 12

EXPLORING UNIT DIGITS

This idea is about students exploring the unit digits for different sequences of numbers. The important issue is for students to learn more about the properties of numbers which exist in different patterns.

For example:

The unit digits for multiples of two are:
2, 4, 6, 8, 0, 2, 4, etc.

The unit digits for multiples of three are:
3, 6, 9, 2, 5, 8, 1, 4, 7, 0, 3, 6, 9, etc.

Upon analysis, the multiples of two contain just five of the digits whereas multiples of three contain all ten digits.

- What unit digit patterns exist for other sets of multiples?
- How are the unit digits of multiples of three and multiples of seven connected?
- What is the pattern of unit digits for the sequence of square numbers?
- Which numbers do not appear as unit digits for square numbers?
- Is there a pattern of unit digits for the sequence of cube numbers?
- Start with 1 and keep doubling: 2, 4, 8, 16, 32, 64, 128 . . . . What, therefore, is the pattern in the unit digits, (excluding the first term of 1), for powers of 2? What happens if we start with 3 and keep doubling?
- Start with 1 and start trebling (i.e. 1, 3, 27, 81, 243 . . . the powers of 3). What is the pattern of the units digits now?
- What happens if we start with 2 and keep trebling?
- Is there any pattern of unit digits in the Fibonacci sequence? You will need to be quite persistent to be sure you have answered this question.
- What groups or sequences of numbers are there which do not appear to have any pattern in the unit digits?

IDEA 13

FIVE DICE/FIVE CARDS TO A HUNDRED

One of the complexities of teaching, particularly in a secondary school, is that of waiting for a class to arrive. This can take several minutes, particularly if the class arrives from different subject areas. The following idea is typical of the kind of puzzling out type of task I have used with classes in order to bridge the time between the first and the last student arriving.

This and similar tasks are ones I offer only as a way of getting a class engaged with something as soon as they enter the room and which I can describe by displaying a few instructions on the board/screen, for example:

1 Throw five dice (e.g. 3, 3, 5, 1, 6).
2 Try to make a total of 100 using the following rules:
   - you have to use every number once only in any order;
   - each number must be used as a single digit;
   - you can use any combination of +, −, ×, ÷ and brackets.

For the numbers 3, 3, 5, 1, and 6 a possible solution is: $(6 \times 3 + 3 - 1) \times 5$.

With a pack of cards I take out all the court cards and the tens then turn over five of the remaining 36 cards; again the problem is to combine these using the rules to make 100.