

Mathematical processes and applications

In the new programmes of study at Key Stages 3 and 4 there is a much greater emphasis on the key processes and attainment target 1 is different, now entitled 'Mathematical processes and applications'. This reflects the importance given to key processes in the 2008 curriculum. It also parallels the emphasis on key processes in other subjects and on aspects of process that reach across the curriculum, enshrined in the personal, learning and thinking skills (PLTS). A key aim of the curriculum is that pupils should see themselves more explicitly as learners and become aware of their developing skills, which are central to their work in school and to all aspects of their lives.

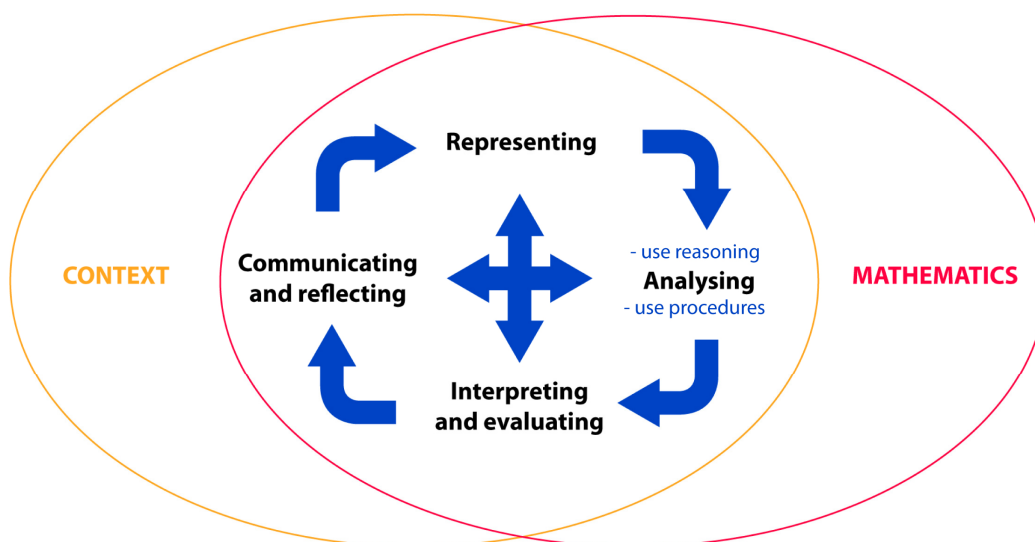
Using and applying mathematics was previously broadly described under the sub-headings of problem-solving, communicating and reasoning. Problem-solving lies at the heart of mathematics and involves a cycle of processes. These are elaborated in the key processes of the curriculum. By including mathematical procedures, well-defined routines and algorithms, a more complete description of process is achieved:

- Representing
- Analysing
 - use mathematical reasoning
 - use appropriate mathematical procedures
- Interpreting and evaluating
- Communicating and reflecting.

The process skills help pupils both to learn mathematics and to apply their mathematical subject knowledge to situations from life and the world of work. To ensure that they make progress in developing these skills and can function mathematically, pupils need to experience a rich 'diet' of applications that includes:

- increasingly **complex** applications, including non-routine or multi-step problems and extended enquiries, that require them to analyse a situation and sustain their thinking
- situations that are **unfamiliar** (in the sense that they are different from the context where the mathematics was developed), including applications to other subjects or aspects of their lives, and that require them to make connections and transfer their skills, sometimes in creative ways
- situations or problems that increase the **technical demand** of the mathematics required to solve them, including the application of more advanced concepts, more difficult procedures, or more rigorous argument and proof
- opportunities to develop greater **independence** and autonomy in problem-solving skills, so that they can select and apply a higher level of mathematics for themselves.

In summary, it is the context, and the mathematics to be applied to it, that determines the nature of the processing skills that pupils need and the level of challenge they face. It is helpful to think of a 'problem-solving cycle' but, as the diagram below shows, many contexts require movement in and out of the cycle. For example, the 'representing' phase of a more complex problem may require some 'analysing', 'interpreting' or 'communicating' in order to set up the model.



Mathematical processes should be embedded within the everyday teaching of the strands of number, algebra, geometry and measures, and statistics, and in all cross-strand work. The related documents listed below give illustrative examples for each of the strands, including some observations of how ICT can be used to engage pupils with the key processes.

- [Key processes in number](#)
- [Key processes in algebra](#)
- [Key processes in geometry and measures](#)
- [Key processes in statistics](#)
- [ICT and the key processes](#)