Key Concepts in Mathematics - Generalising

If these concepts are not fully developed students' will find it difficult to engage meaningfully with core aspects of the Number, Algebra and Functions strands in later years

Generalising Claiming that something is always true

How does the concept develop?

''*Generalisation is a heartbeat of mathematics. If the teachers are unaware of its presence, and are not in the habit of getting students to work at expressing their own generalisations, then mathematical thinking is not taking place''* Mason (1996) (p. 65).

Students begin to make ***generalisations*** when they begin to address the question ***Does this always work?*** When they begin to justify their own generalisations, they tend to use diagrams, concrete objects and words to do so. As their statements become more complicated they begin to need other ways to point at 'the first number', or 'the bigger number'. This is the beginnings of what later becomes conventional algebraic notation. As they move from particular numbers and actions to patterns of results, they start viewing numbers and operations as a system. This reasoning about operations rather than the notation is part of the work of the bridging period in algebra. Looking for pattern and generalising it, the other area of focus during this period.

Students are ready to engage with the learning outcomes associated with generalisation when they can

- deal with equivalent forms of expressions
- recognise and describe number properties and patterns
- work with the complexities of algebraic text

Difficulties may arise if students

- do not have an understanding of equality as a relationship between number sentences
- have limited access to multiplicative thinking and proportional reasoning

Reasoning about mathematics is an objective of the syllabus and students can begin to show formal reasoning by generalising patterns to fit various situations. In the bridging period we want students to be able to do the following:

- Reason about a problem
- Extend what they already know
- Make a conjecture
- Provide a convincing argument
- Refine their thinking
- Defend or modify their arguments

For many students, this will not be formal proof, but it will help them be better prepared to use proof in a more formal context later in post primary school. More importantly, as students become more adept in explaining and justifying their thinking, the mathematics they are learning will make sense which is what mathematics should be for all students – sensible and reasonable.
Read the ***case studies*** and ***tasks*** for ideas on how you can support and track your students' development of the concept of ***Generalising*** and their ***Understanding of equality***.