

Key Concepts in Mathematics –

Proportional Reasoning

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

Proportional Reasoning *“the ability to recognise, to explain, to think about, to make conjectures about, to graph, to transform, to compare, to make judgements about, to represent, or to symbolize relationships of two simple types ... direct ... and inverse proportion”*
Lamon (1999)

How does the concept develop?

Proportional reasoning has been referred to as the capstone of the primary mathematics and the cornerstone of algebra and beyond. It begins with the ability to understand multiplicative relationships, distinguishing them from relationships that are additive.

Proportional reasoning involves some kind of comparison and, at its core, it requires a capacity to identify and describe what is being compared with what. Recognising what is being compared with what, however, is not always straightforward and it can be further complicated by the types of quantities used, how they are represented, and the number of variables involved.

Research (Van de Walle, 2007) has shown that

- proportional reasoning is best developed in investigative problem solving lessons
- students understand best when multiple strategies are shared and discussed
- many of the most valuable activities to develop proportional reasoning do not involve solving proportions at all but rather reasoning about ‘more’ in everyday common situations
- problems should start with high content, hands-on situations.

A proportional thinker

- has a sense of covariation, that is, they understand relationships in which two quantities vary together and are able to see how the variation in one coincides with the variation in another
- can recognise proportional relationships as distinct from non-proportional relationships in real-world contexts
- develops a wide variety of strategies for solving proportions or comparing ratios, most of which are based on informal strategies rather than prescribed algorithms
- understands ratios as distinct entities representing a relationship different from the quantities they compare.

Read the **case studies** and **tasks** for ideas on how you can support and track your students’ development of the concept of Proportional Reasoning.