Compare and order positive and negative integers, decimals and fractions

At Key Stage 2, students developed ways of solving problems extending beyond positive integers. They encountered negative numbers in simple number problems and real-life contexts. At Key Stage 3, students should continue to develop their understanding of negative numbers and potentially reevaluate their understanding of 'smaller' and 'bigger' in negative contexts.

Students also worked with fractions and decimals at Key Stage 2, recognising common fractions and putting fractions in order of size. The focus now will be on developing students' methods for ordering fractions to include converting between equivalent fractions and decimals as appropriate.

Throughout this set of key ideas, students should continue to develop their understanding of how numbers can be represented differently. They should be able to apply different techniques to compare and order numbers in a variety of different contexts and have an appreciation of magnitude. For example, if students know that $0.6 > \frac{1}{2}$ and $\frac{3}{7} < \frac{1}{2}$, they should be able to deduce that $0.6 > \frac{3}{7}$ without resorting to converting to a common format. Such work will support students in being able to find a number in between any other two given numbers (whether two decimals, two fractions or one fraction and one decimal).

Key ideas

- Compare negative integers using < and >
- Compare decimals using < and >
- Compare and order fractions by converting to decimals
- Compare and order fractions by converting to fractions with a common denominator
- Order a variety of positive and negative fractions and decimals using appropriate methods of conversion and recognising when conversion to a common format is not required
- Appreciate that, for any two numbers there is always another number in between them

Know, understand and use fluently a range of calculation strategies for addition and subtraction of fractions

Students will have been taught strategies for the addition and subtraction of fractions with same and different denominators and mixed numbers during Key Stage 2. The focus in this set of key ideas is to use addition and subtraction of fractions to further expand the range of possible examples that students are able to explore as their understanding of additive structures grows and matures.

Unitising is again a key idea here, and one that is particularly evident when working with fractions. For example, adding halves and thirds is not using the same 'unit'; however,

converting both to sixths means that both have the same unit and addition is relatively straightforward.

Students should develop an understanding of the additive structures underpinning the operations, as well as fluency with strategies for adding and subtracting a wide range of types of fractions (including improper fractions).

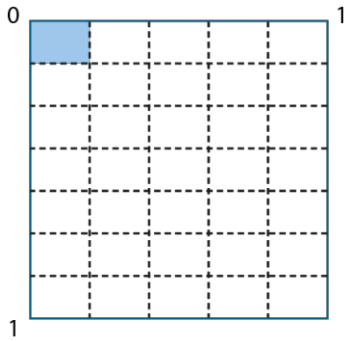
Key ideas

- Understand the mathematical structures that underpin the addition and subtraction of fractions
- Generalise and fluently use addition and subtraction strategies to calculate with fractions and mixed numbers

Know, understand and use fluently a range of calculation strategies for multiplication and division of fractions

Students having an unconnected view of the curriculum can result in an entirely instrumental and procedural approach to mathematics, with no sense of conceptual coherence. It is, therefore, important that students see fractions or rational numbers as a part of a unified number system and that the operations on such numbers are related and connected to previously taught and learnt concepts for integers. For instance, the area model used for multiplication with integers can also be used for fractions.

For example, $\frac{1}{7} \times \frac{1}{5}$ can be represented as:



$\frac{1}{7} \times \frac{1}{5}$

In the key ideas below, multiplication with mixed numbers has been given a separate focus. The rationale for this is that the different possible representations for multiplying mixed numbers – such as converting to improper fractions or partitioning as a pair of binomials, e.g. $(2 + \frac{3}{4})(1+ \frac{2}{3})$ – may offer different and deeper insights into multiplication.

Key ideas

- Understand the mathematical structures that underpin the multiplication of fractions*
- Understand how to multiply unit, non-unit and improper fractions*