Core concept 1.3: Ordering and comparing

This document is part of a set that forms the subject knowledge content audit for Key Stage 3 maths. The audit is based on the NCETM Secondary Professional Development materials and there is one document for each of the 17 core concepts. Each document contains audit questions with check boxes you can select to show how confident you are (1 = not at all confident, 2 = not very confident, 3 = fairly confident, 4 = very confident), exemplifications and explanations, and further support links. At the end of each document there is space to type reflections, targets and notes. The document can then be saved for your records.

1.3.1 Work interchangeably with terminating decimals and their corresponding fractions

How confident are you that you can explain how to convert between improper and mixed fractions and between decimals and fractions including using a calculator?

1 ☐ 2 ☐ 3 ☐ 4 ☐

How confident are you that you can explain how to simplify fractions using common factors?

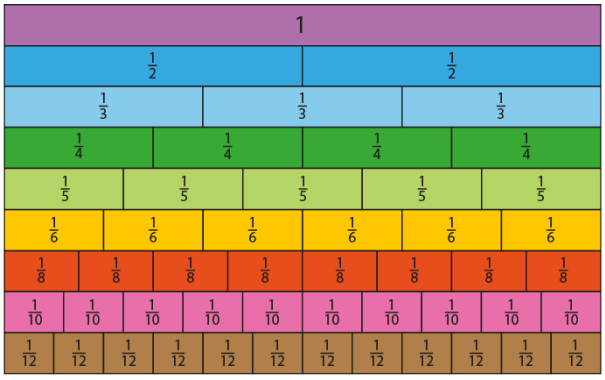
1 ☐ 2 ☐ 3 ☐ 4 ☐

At Key Stage 3, students begin to recognise decimals such as 0.13 not just as one tenth and three hundredths, but also as 13 hundredths, which leads to its expression as a single fraction. An awareness that a fraction represents a division is crucial at this stage, i.e. $\frac{3}{4} = 3 \div 4$, as this will allow a deep understanding of the process of changing fractions to decimals.

Visual images can provide a powerful way of developing conceptual understanding of equivalent fractions. For example, this multiplication grid shows a set of fractions equivalent to $\frac{3}{5}$:

1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	63	70
8	16	24	32	40	48	56	64	72	80

This fraction wall provides a visual representation for equivalent fractions:



Once students are fluent with generating equivalent fractions by multiplying both the numerator and denominator by any integer, their attention can be shifted to noticing whether any common factors can be removed from certain fractions.

Further support links

- NCETM Secondary Professional Development Materials: 1.3 Ordering and comparing, pages 9–12

1.3.2 Compare and order positive and negative integers, decimals and fractions

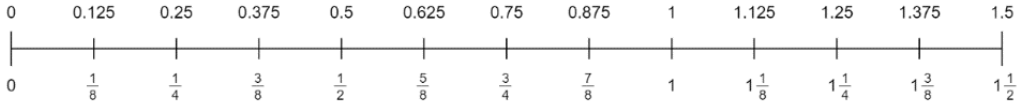
How confident are you that you can explain how to compare and order fractions by reasoning with the numerators and denominators?

1 ☐ 2 ☐ 3 ☐ 4 ☐

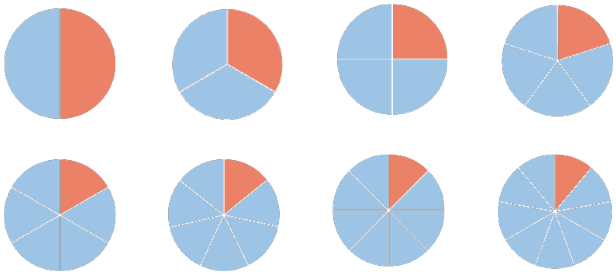
How confident are you that you can explain how to compare positive and negative fractions and decimals?

1 ☐ 2 ☐ 3 ☐ 4 ☐

Visual images can provide powerful support to understanding comparison of fractions. For example, a number line can be a useful tool for comparing and ordering.



Spatial representations can also help with comparing fractions. For example, what fraction of each shape below is shaded red?



This leads on to comparing fractions with the same denominator:

If $\frac{1}{3} > \frac{1}{5}$

Two lots of $\frac{1}{3}$ > two lots of $\frac{1}{5}$

$\frac{2}{3} > \frac{2}{5}$

Students 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).

Further support links

- NCETM: Using Mathematical Representations at KS3: Single number lines page 7

1.3.3 Interpret and compare numbers in standard form $A \times 10^n$, $1 \leq A < 10$

How confident are you that you can write an integer as a power of 10 in multiple ways?

1 ☐ 2 ☐ 3 ☐ 4 ☐

How confident are you that you can explain how to write a large number in standard form?

1 ☐ 2 ☐ 3 ☐ 4 ☐

A key awareness underpinning a deep understanding of standard index form is that numbers can be written in multiple ways by considering multiplication and division by powers of 10.

As students develop their understanding that index notation represents powers of ten, and, later, their understanding of negative powers, they should begin to appreciate that such a representation is a way of writing very large or very small numbers in an efficient manner, and this aids comparison.

When a number is expressed in standard form it is written as a number between 1 and 10 multiplied by a power of ten.

- For example, 193 in standard form is written as 1.93×10^2.
- The number 0.0000345 represented in standard form is 3.45×10^{-5}.

Students need to be fluent when converting between standard and ordinary form.

Connections are better made by visualising 10^3 as 1 000 (for example) and using a clear understanding of the effect of multiplying and dividing by powers of ten. It is best to avoid teaching this concept using the 'rule' of moving the decimal point by the same number of places as the power – though it may well arise as groups of learners analyse and reason with patterns in their work.

Further support links

- NCETM Secondary Professional Development Materials: 1.3 Ordering and comparing, pages 19–22

Notes