Fractions

This document is part of a set that forms the subject knowledge content audit for Key Stage 1 and Key Stage 2 maths. Each document contains: audit questions with tick boxes that 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; explanations; and further support links. At the end of each document, there is space to type notes to capture your learning and implications for practice. The document can then be saved for your records.

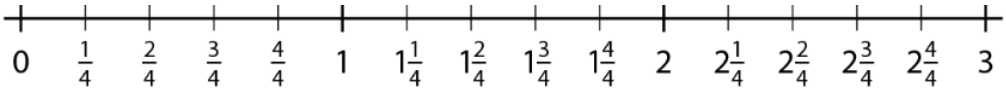
Question 9

How confident are you that you understand and can support children to work with fractions that are greater than one whole?

1 ☑ 2 ☐ 3 ☐ 4 ☐

How would you respond …?

a. Sonny has labelled this number line incorrectly. Explain his mistake.



b. What is the same? What is different? Explain your thoughts as clearly as you can.

$$\frac{17}{3} = \square \frac{\square}{\square}$$

$$17 \div 3 = \square \text{ remainder } \square$$

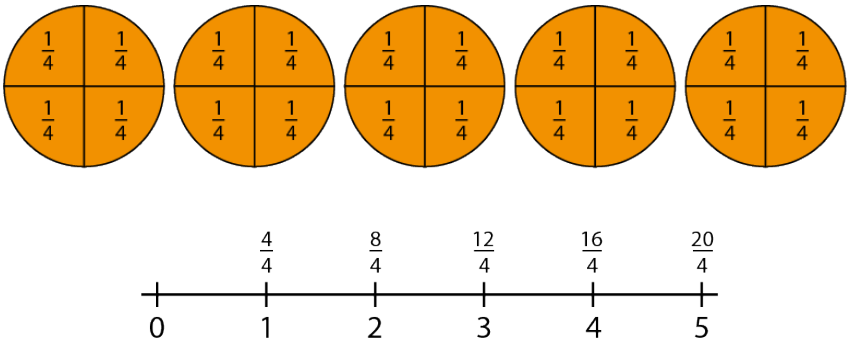
Responses

Note your responses to the questions here before you engage with the rest of this section:

Did you notice that…?

a. In this example, Sonny has not recognised that $\frac{4}{4}$ are equal to one whole or he has not understood how to represent this on the number line, i.e. that one point can be represented in different ways.

Sonny may need a visual representation to develop this understanding. Counting up in the fractional amount will not support his understanding that $\frac{4}{4}$ are equal to 1. In this case, using an animation where the children count as the $\frac{1}{4}$s appear and recognise when a whole has been reached is key. Seeing this recorded alongside the count is important and will mitigate misconceptions.



b. $\frac{17}{3}$ is five groups of three-thirds, with two-thirds left over ($5\frac{2}{3}$) and 17 ÷ 3 gives five groups of three with two left over (5, remainder 2).

While the digits in the answer may look the same, the values that these digits represent are different.

In the first example, the 17 is worth 17 thirds and in the second example, the 17 is worth 17 ones.

In the first example, the digit 3 represents thirds and in the second example, the digit 3 represents groups of three ones.

In the first example the digit 5 in the answer represents five wholes, and in the second example it represents 5 groups of 3.

In the first example the digit 2 represents two thirds, and in the second example the digit 2 represents two ones that cannot be put into a whole group of three.

Working with fractions greater than 1

Children will initially discover that fractions can be larger than 1 by learning about mixed numbers, before progressing to improper fractions. Mixed numbers are a combination of a whole number and a fraction. It is recommended that children become familiar working with mixed numbers before improper fractions as they may already be familiar with talking about mixed numbers in some contexts. For example, *'I am eight and three-quarters'* or *'I've eaten one-and-a-half biscuits'*.

They will also have a secure understanding of whole numbers (e.g. 2) and fractions less than one (e.g. $\frac{3}{4}$), so their new learning at this stage is the combination of these numbers to form a mixed number (e.g. $2\frac{3}{4}$).

After the introduction of mixed numbers, children make the natural progression to improper fractions. Improper fractions are another way of expressing a mixed number so the equivalence here should be highlighted.

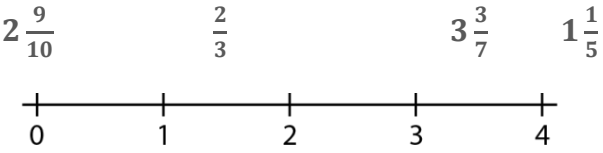
Ensure children are comfortable with the fact that an improper fraction has a numerator which is greater than the denominator, whereas proper fractions have a numerator which is less than the

denominator. While it will sometimes be important to refer to particular numbers using more precise language, such as fraction, mixed number, improper fraction or proper fraction, at other times make sure that you refer to them as numbers. This will reinforce that (just as for whole numbers) fractions are numbers that can be positioned on a number line and used in a calculation.

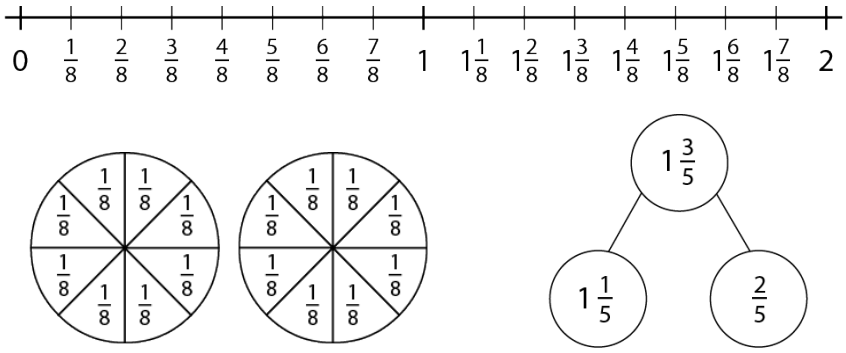
Fluency in the times tables is essential when converting mixed numbers to improper fractions (and vice versa). Converting an improper fraction to a mixed number draws very heavily on the concept of division with remainders. For example, $\frac{17}{3}$ is five groups of three-thirds, with two-thirds left over ($5\frac{2}{3}$) and 17 ÷ 3 gives five groups of three with two left over (five, remainder two). If children are not fluent in times table facts, then much of their working memory will be occupied with performing the calculation, meaning they may struggle to focus on the concept of an improper fraction.

It is important to continue to develop children's fraction sense. They could estimate the position of mixed numbers on partially labelled number lines to develop confidence positioning fractions within the number system.

Estimate the position of these numbers on this number line.



Along with the number line, two other key models can help children visualise the concept of fractions larger than 1: the area model and the part–part–whole model. The area models are mostly in a linear form (similar to the bar model) or in a circular form (showing segments, similar to a pie chart). It is important that children are exposed to both models.



Having established a grounding in the concepts of mixed numbers and improper fractions, children will apply their prior learning around addition and subtraction of whole numbers and proper fractions, to addition and subtraction of mixed numbers and improper fractions. Initially, the focus is solely on calculations that do not bridge whole numbers and representing the calculations using appropriate manipulatives. Children are taught to use their knowledge of the composition of mixed numbers, and how these can be partitioned and combined, to support them in solving calculations. Once improper fractions have been introduced, further calculations that involve bridging whole numbers can then be taught.

Common errors in this area may include:

- not recognising that fractions can be greater than one
- not being able to express one as a fraction in a range of ways, e.g. $\frac{4}{4}, \frac{5}{5}, \frac{6}{6}$
- not being secure with recording equivalence at a given point on a number line.

What to look for

Can a child:

- count beyond one in different fractional steps?
- identify one whole with different denominators?
- identify given points on a number line using mixed numbers and improper fractions?

Links to supporting materials:

NCETM Primary Professional Development materials, Spine 3: Fractions:

- Topic 3.5: Working across one whole: improper fractions and mixed numbers

Notes:

Key learning from support material and self-study:

What I will focus on developing in my classroom practice: