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Resources

National Centre
for Excellence in the
Teaching of Mathematics

Mastery Professional Development

Fractions

PDF

Spine 3 Overview

Teacher guides | Years 3–6 (and Key Stage 1)

Key Stage 1

3.0 Guidance on the teaching of fractions in Key Stage 1

Cover the Key Stage 1 statutory requirements for fractions, including recognising, finding, naming and writing one-quarter, one-third, one-half/two-quarters, and three-quarters of an object, shape or quantity.

Suggested teaching progression

- **1:** Name the fractions 'one-half', 'one-quarter' and 'one-third' in relation to a fraction of a length, shape or set of objects.

- **2:** Read and write the fraction notation $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$, and relate this to a fraction of a length, shape or set of objects.

- **3:** Find half of numbers.

- **4:** Find $\frac{1}{3}$ or $\frac{1}{4}$ of a number.

- **5:** Find $\frac{2}{4}$ and $\frac{3}{4}$ of an object, shape, set of objects, length or quantity; recognise the equivalence of $\frac{2}{4}$ and $\frac{1}{2}$.

Year 3

3.1 Preparing for fractions: the part–whole relationship

Identify parts and wholes of areas, lengths and sets. Identify equal and unequal parts; make judgements about the relative size of a part to a whole. Find the whole when the size of a part and number of equal parts is known.

- **Teaching point 1:** Any element of a whole is a part; if a whole is defined, then a part of this whole can be defined.
- **Teaching point 2:** A whole can be divided into equal parts or unequal parts.
- **Teaching point 3:** The relative size of parts can be compared.
- **Teaching point 4:** If one of the equal parts and the number of equal parts are known, these can be used to construct the whole.

3.2 Unit fractions: identifying, representing and comparing

Learn to name and write unit fractions. Recognise and show unit fractions of areas, lengths and quantities. Relate numerators and denominators to parts and wholes; explore how the greater the denominators, the smaller the unit fraction.

- **Teaching point 1:** A whole can be divided into any number of equal parts.
- **Teaching point 2:** Fraction notation can be used to describe an equal part of the whole. One equal part of a whole is called a unit fraction. Each unit fraction has a name.
- **Teaching point 3:** Fractional notation can be applied to represent one part of a whole in different contexts.
- **Teaching point 4:** Equal parts do not need to look the same.
- **Teaching point 5:** Unit fractions can be compared and ordered by looking at the denominator. The greater the denominator, the smaller the fraction.
- **Teaching point 6:** If the size of a unit fraction is known, the size of the whole can be worked out by repeated addition of that unit fraction.

3.3 Non-unit fractions: identifying, representing and comparing

Learn to name and write non-unit fractions, recognising them as multiples of unit fractions. Learn that fractions are numbers that can be positioned on a number line. Compare and order fractions with the same denominator or same numerator.

Non-unit fractions
- **Teaching point 1:** All non-unit fractions are made up of more than one of the same unit fraction.
- **Teaching point 2:** Non-unit fractions are written using the same convention as unit fractions. A non-unit fraction has a numerator greater than one.
- **Teaching point 3:** When the numerator and the denominator in a fraction are the same, the fraction is equivalent to one whole.

Fractions as numbers

- **Teaching point 4:** All unit and non-unit fractions are numbers that can be placed on a number line.
- **Teaching point 5:** Repeated addition of a unit fraction results in a non-unit fraction.
- **Teaching point 6:** When the numerator and the denominator are the same, the value of the fraction is one.

Comparing fractions

- **Teaching point 7:** Non-unit fractions with the same denominator can be compared. If the denominators are the same, then the greater the numerator, the greater the fraction.
- **Teaching point 8:** Non-unit fractions with the same numerator can be compared. If the numerators are the same, then the greater the denominator, the smaller the fraction.

3.4 Adding and subtracting within one whole

Explore how to add and subtract fractions within one whole where the denominators are the same. Apply prior knowledge of the inverse relationship of addition and subtraction with whole numbers, to fractions.

- **Teaching point 1:** When adding fractions with the same denominators, just add the numerators.
- **Teaching point 2:** When subtracting fractions with the same denominators, just subtract the numerators.
- **Teaching point 3:** Addition and subtraction of fractions are the inverse of each other, just as they are for whole numbers.
- **Teaching point 4:** To subtract from one whole, first convert the whole to a fraction where the denominator and numerator are the same.

Year 4

3.5 Working across one whole: improper fractions and mixed numbers

Meet mixed numbers and improper fractions, and learn to convert between them; compare, order and place them on a number line. Extend addition and subtraction from within a whole to numbers greater than one whole.

- **Teaching point 1:** Quantities made up of both wholes and parts can be expressed as mixed numbers.
- **Teaching point 2:** Mixed numbers can be placed on a number line.
- **Teaching point 3:** Understanding how to compare and order proper fractions supports the comparison and ordering of mixed numbers.
- **Teaching point 4:** Mixed numbers can be partitioned and combined in the same way as whole numbers.
- **Teaching point 5:** Mixed numbers can be written as improper fractions.
- **Teaching point 6:** Improper fractions can be added and subtracted in the same way as proper fractions.

3.6 Multiplying whole numbers and fractions

Consider multiplication of whole numbers and proper fractions as both repeated addition and scaling. Understand that multiplication of a whole number by a proper fraction results in a smaller number.

- **Teaching point 1:** Repeated addition of proper and improper fractions can be expressed as multiplication of a fraction by a whole number.
- **Teaching point 2:** Repeated addition of a mixed number can be expressed as multiplication of a mixed number by a whole number.
- **Teaching point 3:** Finding a unit fraction of a quantity can be expressed as a multiplication of a whole number by a fraction.
- **Teaching point 4:** A non-unit fraction of a quantity can be calculated by first finding a unit fraction of that quantity.
- **Teaching point 5:** If the size of a non-unit fraction is known, the size of the unit fraction and then the size of the whole can be found.

Year 5

3.7 Finding equivalent fractions and simplifying fractions

Discover how equivalent fractions have the same proportional relationship between the numerator and denominator, and therefore have the same numerical value. Convert between equivalent fractions and simplify fractions.

- **Teaching point 1:** When two fractions have different numerators and denominators to one another but share the same numerical value, they are called 'equivalent fractions'.
- **Teaching point 2:** Equivalent fractions share the same proportional (multiplicative) relationship between the numerator and denominator. Equivalent fractions can be generated by maintaining that relationship through the process of multiplication and division.
- **Teaching point 3:** Fractions can be simplified by dividing both the numerator and denominator by a common factor.

3.8 Common denomination: more adding and subtracting

Learn to add and subtract fractions with different denominators by first finding a common denominator. Compare fractions using a range of methods, including converting to a common denominator.

- **Teaching point 1:** In order to add related fractions, first convert one fraction so that both share the same denominator (a *'common denominator'*).
- **Teaching point 2:** To subtract related fractions, first convert one fraction so that both share a common denominator.
- **Teaching point 3:** The common denominator method can be extended to adding and subtracting non unit related fractions.
- **Teaching point 4:** To add and subtract *non-related* fractions, the product of the two denominators provides a common denominator.
- **Teaching point 5:** Converting to common denominators is one of several methods that can be used to compare fractions.

Year 6

3.9 Multiplying fractions and dividing fractions by a whole number

Explore how to multiply two fractions. Learn how to divide a fraction by a whole number by first converting to an equivalent multiplication. Review how multiplying by a proper fraction makes a number smaller.

- **Teaching point 1:** When a fraction is multiplied by a proper fraction, it makes it smaller. To multiply two fractions, multiply the numerators and multiply the denominators.
- **Teaching point 2:** When a fraction is divided by a whole number, it makes it smaller. To divide a fraction by a whole number, convert it to an equivalent multiplication.
- **Teaching point 3:** A more efficient method can be used to divide a fraction by a whole number when the whole number is a factor of the numerator.

3.10 Linking fractions, decimals and percentages

Make connections between fractions and previous work on decimals. Learn common fraction and decimal equivalences. Understand that percentages tell us about the proportion being considered. Find percentages of quantities.

- **Teaching point 1:** Some fractions are easily converted to decimals.
- **Teaching point 2:** These fraction–decimal equivalents can be found throughout the number system.
- **Teaching point 3:** Fraction–decimal equivalence can sometimes be used to simplify calculations.
- **Teaching point 4:** *'Percent'* means number of parts per hundred. A percentage can be an operator on a quantity, indicating the proportion of a quantity being considered.
- **Teaching point 5:** Percentages have fraction and decimal equivalents.
- **Teaching point 6:** If the value of a whole is known, a percentage of that number or amount can be calculated.