

Teaching part-whole relationships : Fractions

John Munro

The recommended sequence for learning fractional knowledge : students

- talk about a fractional amount in quantities where the whole is perceptually defined .
- use terms such as "two thirds" or "three quarters" in mathematically correct ways;
 - describe parts of quantities divided into 2, 3, 4, 5, 6 and 10 equal parts,
 - say the number of parts that make a whole when told the name of each part
 - divide wholes into halves, thirds, quarters, fifths, sixths, eighths and tenths.
- write or select the number for a fractional quantity, match quantity with a number
- describe the meaning provided by the numerator and the denominator
- compare two fractions in size, where both have either the same numerator or denominator
- write the numbers in order, beginning with the first number in the sequence.
 - automatize what a written fractional numeral means;
 - rapidly recall what the numerator and denominator mean,
 - visualise the essential features of the fraction
 - decide whether it is larger / smaller than another fraction
 - explain how a fractional numeral is different from a whole number.
- describe a fractional quantity in different ways, eg., 3 quarters in eighths, twelfths
- use a procedure for producing equivalent fractions
- simplify fractions by producing equivalent fractions
- calculate fractional portions of a set of items
- find the lowest common denominator for two or more fractions and compare two fractions.
- describe a fractional quantity in different ways, for example, 7 fourths
- convert improper fractions to mixed numbers and vice versa.
- estimate the value of fractions and mixed numbers.
- add or subtract two or more fractions with the same denominator
- add or subtract two or more fractions with different denominators
- multiply two or more fractions.
- multiply two or more fractions and mixed numbers, cancelling where necessary.
- divide whole numbers, fractions and mixed numbers by fractions cancelling where necessary.

Part-whole relationships : Decimals and percentages

Teach decimal knowledge in three areas or strands; a comprehension of

- the tenth-whole relationship in quantities and the symbolism used to specify individual fraction quantities,
- the sequencing-counting properties of decimals, sequencing and relating decimals numbers to each other, arranging decimal numbers in order and
- the algorithms associated with fractions; develop these for
 - addition of decimals
 - subtraction of decimals
 - multiplication of decimal by whole numbers
 - division of decimal by whole numbers
 - multiplication of decimal by decimal numbers
 - conversion of decimals to fractions and vice versa.

Develop this for the following types of quantities

- quantities of < a whole divided into tenths
- quantities comprising wholes and tenths
- quantities of < a whole divided into twentieths, thirtieths, ... hundredths
- quantities of < a whole comprising tenths and hundredths
- quantities comprising wholes, tenths and hundredths

For each area

- introduce the idea to be learnt as problems to be solved
- introduce the operations as physical actions that pupils gradually internalize
- have pupils draw pictures of the ideas they are learning and act on these.
- provide activities for pupils to look for patterns and to generalize from specific instances .
- have pupils share ideas, work co-operatively on problems

- have students talk about ideas
- have pupils express new ideas first in familiar language formats and later to learn conventional, abstract formats
- present ideas in 'learner-friendly' with concrete or pictorial referents.