

LEARNING and TEACHING POINTS
for
Chapter 10
Multiplication and Division Structures

Familiarity with the range of multiplication and division structures discussed in this chapter will enable children to interpret multiplication and division calculations in a variety of ways and hence increase their ability to handle these calculations by a range of mental and written methods.

There is no need to make a fuss about whether $a \cdot b$ means 'a lots of b' or 'b lots of a'. Instead, work hard with children to establish as soon as possible the commutative principle in multiplication: that $a \cdot b$ and $b \cdot a$ are equal.

Primary school children's main experience of multiplication will be through the structure of repeated aggregation, although they may also meet some examples of multiplication used for scaling, particularly doubling.

Teach children how to use the commutative principle to help in learning multiplications facts. For example, if they know seven 5s then they know five 7s.

The key language to be developed in the repeated aggregation structure of multiplication includes: *so many lots (sets) of so many, how many (how much) altogether, per, each.*

Use rectangular arrays frequently to illustrate and to support your explanations about multiplication, particularly for reinforcing the commutative principle.

The key language to be developed in the scaling structure of multiplication includes: *scaling, scale factor, doubling, trebling, so many times bigger than (longer than, heavier than, and so on), so many times as much as (or as many as).*

Help children to use the word *per* with confidence and to associate the practical problems about *unit cost* and *cost per unit of measurement* with the corresponding multiplications.

Division is not just 'sharing'. Equal sharing is only one division structure. Teachers should not overemphasize the language and imagery of sharing at the expense of the other important language and imagery that is associated with division, particularly division as the inverse of multiplication.

Children should experience all the division structures in a range of practical and relevant contexts, including especially shopping, rates of pay and the many kinds of problems associated with the word *per*, such as *price per unit*.

The key phrases to use in problems with the equal-sharing structure of division are *sharing equally between* and *how many (much) each?*

Give children plenty of experience of real-life situations involving repeated addition to reach a target and repeated subtraction from a given quantity, making the connection with division. These processes are the basis for the most effective mental and written methods for doing division calculations.

Younger children should have plenty of practical experience of equal sharing between and sorting sets of objects into equal subsets, and the associated informal language, before they meet the formal language and the symbol for division.

Primary children can be introduced to the idea of using division to find the ratio between two quantities in order to compare them, but the results are difficult to interpret if they are not whole numbers.

As far as possible, avoid talking about 'sharing' when explaining division. Instead, talk about 'sharing equally between'. Each word in this phrase is crucial to children's understanding of the equal-sharing structure.