# Place value: tools and games

Number expanders

Number expanders are useful tools because they offer a hands-on way of manipulating the symbolic representation (numeral) of a number. They make a bridge from physical to symbolic models for number. Opening and closing the number expander acts as a reminder of the actions with materials (but not as a replacement for this). Because they do not physically model the size of the number, number expanders can be made with any number of place value columns and so can represent very large or very small numbers at more advanced levels.

Below are some illustrations of number expanders with three place value columns, showing various ways of 'expanding' (or renaming) 236. They include the following:

- A fully open blank number expander with three blank place value columns
- An expander where the number 236 has been written in the blank place value columns. This shows 236 = 2 hundreds + 3 tens + 6 ones
- An expander showing 236 = 2 hundreds + 36 ones
- An expander showing 236 = 23 tens + 6 ones
- An expander showing 236 = 236 ones
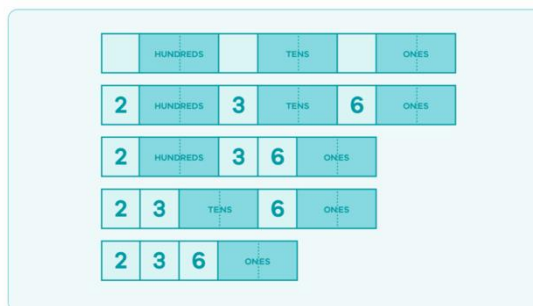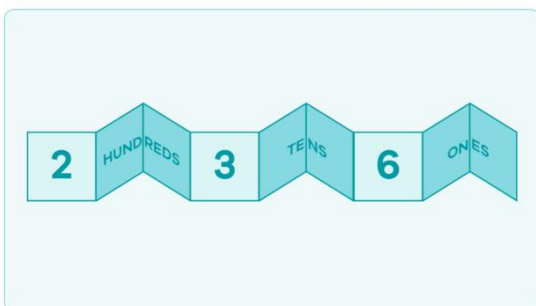
Using number expanders

Provide students with a copy of the number expanders below.

Ask students to write their own three-digit whole number (e.g. 517) into the three blank rectangles of one of the expanders.

Show students how to fold the expander: the shaded rectangles are folded in half with a 'valley fold' and then a 'mountain fold' is used to put the shaded rectangle behind the white rectangle on its left.

Ask them to fold and unfold at various places to make as many different expansions as they can.

Discuss and explore interesting examples such as numbers with zeros. For example, 410 is 41 tens 0 ones; 507 is 50 tens 7 ones; 700 is 7 hundreds, 70 tens and 700 ones.

Use the photocopier to enlarge a few number expanders and make a wall display for future reference.

ONES		ONES		ONES		ONES		ONES
TENS		TENS		TENS		TENS		TENS
HUNDREDS		HUNDREDS		HUNDREDS		HUNDREDS		HUNDREDS

What is my number?

A whole-class game

Each student will need a sticky note to write a three-digit number on. They then stick the sticky note on the back of another child who hasn't seen the number.

Students move around the room, asking 'yes' and 'no' questions (one question per person), to determine their number.

As a group, discuss the strategies used to identify numbers, such as odd or even, higher than/less than and place value.