

Structured apparatus

Structured apparatus gives a visual and tactile approach that reinforces the underlying concepts of place value and addition and leads naturally to the formal written method. The apparatus comprises small cubes (U), rods (T) equal in length to ten cubes, and squares (H) equal in size to ten rods placed side by side. (Pieces taken from Cuisenaire and Dienes apparatus are a useful resource.)

Baseboards have columns labelled T U (for Step 1) or H T U (for Steps 2 to 6) with three rows making a grid large enough to hold the pieces of structured apparatus. The baseboard represents the rows and columns of the squared paper used by pupils for the formal written method. They can be used in a whole-class introductory discussion and for pupils' own initial work where needed.

Discussion of the addition and the movement of the apparatus give understanding to the recording required for the formal written method. In short, discussion → action → written record.

The boards can be used for Steps 1 to 6.

This example for $537 + 145$ is taken from Step 3: Three-digit addition (carrying one ten).

The teacher's words are in italics; the pupils' answers are in square brackets.

Let us add 537 and 145.

Can anyone work this out in their head?

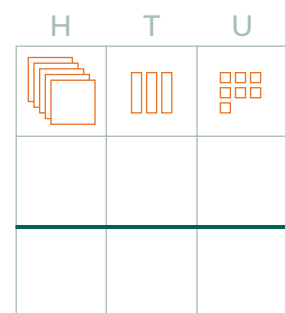
It doesn't matter if you can't, because we are going to work it out in a different way.

How many hundred squares, ten rods and unit cubes does 537 need? [5 squares, 3 rods and 7 units]

Let's place them on the top row of the baseboard.

We write

<i>H</i>	<i>T</i>	<i>U</i>
5	3	7



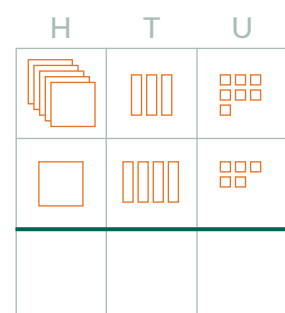
How many hundred squares, ten rods and units does 145 need?

[1 square, 4 rods and 5 units]

Let's place them on the second row of the baseboard.

We write

<i>H</i>	<i>T</i>	<i>U</i>
5	3	7
+ 1	4	5



We want to add them together.

Let's start with the units. Let's bring all the units together into the bottom row.

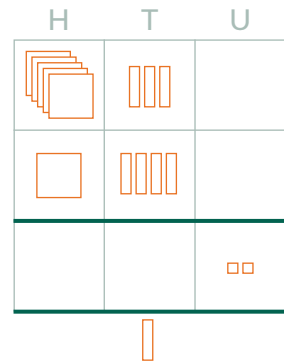
Structured apparatus continued

How many units are in the answer? [7 and 5 make 12 units]

But we can only have 9 units in the U column.

So we change 10 units into one new ten-rod and carry it into the T column.

How many units are left in the U column? [2 units]



We now add all the ten-rods together into the bottom row.

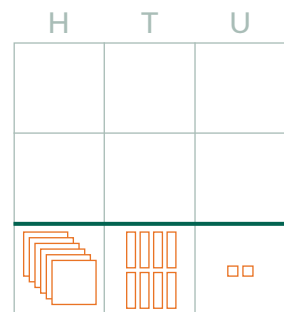
How many ten-rods have we altogether? [3 and 4 and the extra 1 make 8 rods]

So how many tens have we in the answer? [8]

We now add all the hundred-squares into the bottom row.

How many squares have we altogether? [5 and 1 make 6 squares]

So how many hundreds are in the answer? [6]



What is the final answer when we add these two numbers together? [Six hundred and eighty two]