1.1 Place Value

- We have a strange way of writing numbers, where the same digit represents a different amount depending on where it comes in the number. When reading long numbers, pupils need to count the columns from the *right* and then read the number from the *left*. Spaces between Th and H, M and HTh, etc., are difficult for many pupils to "see".
- House prices: The value of a house (a "place" where you live) depends on
  - what it's like (number of rooms, condition, age, etc.); and
  - where it is (near to shops/schools, quiet neighbourhood, etc.).

  Two identical houses in different streets can be worth very different amounts: location matters.
  Similarly, a number **4** is worth very different amounts in 2**4**78.63 and 36.87**4**2.
- Why it matters: Being one column out can make a very big difference; e.g.,
  - a nurse giving an injection – is it 0.01 cm^3 or 0.001 cm^3? (10 × difference!)
  - writing a cheque – is it £340.00 or £3400.00? (10 × difference!)
- Can continue the "houses" analogy by relating place value columns to streets:

M	HTh	TTh	Th	H	T	U	t	h	th	tth
	4	0	0	0	0	0				

M is the "up-market" end of town (where the millionaires live): a number-4-house in M-street is worth ten times as much as a number-4-house in HTh street.

1.1.1 Imagine I have just one each of the digits 1, 4 and 5 (could write them on cards to emphasise only one of each).
What different numbers can I make?
How much is the 4 worth in each number?

Answers: 145, 154, 451, 415, 514, 541; not including decimals (could write them in a systematic order so we know we've got them all).
e.g., in 145, value of "4" = 4 × 10 = 40

1.1.2 Oral work:
How much is the 4 worth in these numbers?

3**4**3	**4**333	333**4**.33	33.**4**33	33.3**4**

*Answers: not just "hundreds" but "**four** hundred".*

40	*4000*	*4 or 4 units*	*0.4*	*0.04*

1.1.3 Use all the digits 1,2,3,4,5 and 6, once each to make numbers in which the 4 is worth 40 000, 4000, 400, 40, 4, 0.4, 0.04, 0.004.

*e.g., 1**4**6 532, 36**4** 215, etc.*

1.1.4 **NEED** newspaper pages containing numbers.
Find numbers containing a 4 that is worth these amounts: 40 000, 4000, 400, 40, 4, 0.4, 0.04 and 0.004.

Could be money, numbers of people or anything else. It's possible to do this with all kinds of newspapers or magazines.

1.1.5 Why do we have zero? What's the point of a number that isn't worth anything?

The symbol "0" holds place differently in bases other than 10; e.g., in base 2 the number "100" is actually 4.

Answer: it's a "place holder" – it shows how much the other digits are worth.
Other cultures have used different number systems (e.g., Roman numerals have no zero). "Zero" wasn't counted as a "number" until relatively late.

1.1.6 Popeye. Find out what place value has to do with the history of the cartoon character Popeye.

Apparently spinach isn't quite as good a source of iron as was originally thought. A decimal point in the wrong place gave a false impression in a scientific report!