Mathematics Department Workshops
Topic: Place Value

Overview

Objectives related to this topic are:
- understand and use decimal notation and place value; multiply and divide integers and decimals by 10, 100, 1000, and explain the effect (Year 7)

- read and write positive integer powers of 10; multiply and divide integers and decimals by 0.1, 0.01 (Year 8)

- extend knowledge of integer powers of 10; recognise the equivalence of 0.1, $\frac{1}{10}$ and 10^{-1}; multiply and divide by any integer power of 10 (Year 9)

Materials required

- Resource Sheet **HT2.PLV.1** to **HT2. PLV.8**

- Large sheets of paper to create posters, glue sticks and pens.

- Data projector and internet access

Suggested activities

Activity 1: Getting Started

Visit the primary framework at **http://www.standards.dfes.gov.uk/primaryframework/mathematics** to explore the expected progression in place value throughout the primary phase. Pose questions to your team such as:
- Is there anything here which surprises you?

- Would anything you have found alter the way in which you approach the topic of place value in the future?

- How can you use this knowledge to ensure a smooth progression from the primary phase?

Activity 2: Is place value under-rated?
Having explored the national expectations of children up to Year 6, now consider what you might do for learners who struggle to meet those expectations. Discuss in your team what you currently do to assist learners for whom this is the case. Consider whether any of the following activities would be appropriate:
The first two activities, **HT2.PLV.1** and **HT2.PLV.2** allow the teacher to assess the learner's elementary knowledge of the decimal number system. The first activity checks that the learners are aware of the value of the places in the decimal number system and the second activity checks that learners know what is meant by placing a digit in a particular position.

The next activity, **HT2 PLV.3**, uses the game of hangman, to encourage learners to reason their way through a challenge, whilst at the same rehearsing elementary knowledge about the decimal number system.
Ask your team for other topics where the presence of elementary knowledge is often overlooked and discuss effective activities that allow teachers to assess the learner's level of knowledge.

Activity 3: Sample Learning Activities
As a team, explore the following learning activities (instructions for each one are on the sheets)

HT2.PLV.4: In between
Here you begin with 7 boxes stacked on top of each other. You enter a value in the top box and ask for a value lower than this which you enter in the bottom box. You then begin the process of getting values in between these numbers. The activity can be expanded to get the decimal numbers between ever closer values.

HT2.PLV.5: Am I right?
Here some statements are presented for learners to discuss and come to a decision about whether or not they are

true. They then display them on a poster.

HT2.PLV.6a,b,c,d: Jigsaw
This is the format for a hexagonal jigsaw. The jigsaw is constructed in two stages. The inner-most hexagon checks that the learners have the necessary understanding before the second set of cards are issued and the hexagonal puzzle is completed. You might like to discuss, as a department, this approach to using hexagonal jigsaws.

HT2.PLV.7: Connect 10
Here a set of cards have the same digits, in the same sequence but the decimal point varies. Learners take it in turns to turn over a card and connect the numbers together by inserting the correct multiplication or division by 10.

Activity 4: Probing Questions
Challenge members of your team to write some probing questions using the question stems on resource sheet **HT2.PLV.8**. Share ideas and consider how such questioning techniques could be used in their teaching.

Activity 5: Reflection
It is easy to overlook the importance of the nature of our number system as it appears so obvious. Consider the Roman Numerals hook for learning below and discuss how you could share this with your learners – potentially as part of the 'Key Concepts' requirement of the new secondary curriculum.

Embedding in practice

Hooks for Learning

Placing digits in an agreed order of values makes arithmetic easier. The Romans did not use place value and this website: http://www.sizes.com/numbers/roman_numerals.htm, explains the problems this leads to. Doing XXIII – XIX and CXX111 – CXIX is a lot easier using place value! If you want a challenge there is also a Roman numeral converter. Palindromic numbers are ones that read the same written from left-to-right or right-to-left. For example, 11, 121, 202 or 3113 are all palindromic numbers.

By reversing the digits of a number, their place values change, but by adding the reverse of a number to itself, many numbers become palindromic. The peculiar properties of these numbers and the list of numbers that become palidromic by reversing their digits is shown at **http://nrich.maths.org/public/viewer.php?obj_id=2574**. There is a long list of numbers and an indication of when they become palindromic by adding their reverse, at this web site. **http://mathforum.org/library/drmath/view/51508.html**

If you want to break new ground try writing palindromic Roman numerals and see if there is a pattern!

Action points

At the end of the session, spend time recording some actions. What do you need to do:
- Next day?
- Next week?
- Next year?

Further reading

- **http://mathforum.org/dr.math/**

  you can search for palindromic numbers here
- **http://www.maxmon.com/1900bc.htm**

  useful brief discussion about early place value systems