Questions Pupils Ask!

Can I just move the decimal point?

by **Colin Foster**

How would you work out 12·345 × 10? I could move the decimal point one space to the right, leaving all the digits where they are, to obtain 123·45. But I have frequently heard mathematics teachers telling pupils (and each other) that this is really bad. Apparently the really important thing to understand about multiplying and dividing decimals by powers of 10 is that 'The decimal point never moves!' The hundreds-tens-units-etc. column headings, along with the decimal point, stay right where they are, and it is the *digits* that move – all together – to the left n spaces for multiplication by 10^n.

Is this important? I have heard teachers admit that, of course, moving the decimal point gives the correct answer, but it is not the 'mathematically correct' way of doing it. Or that moving the decimal point is just a 'trick' or a 'procedure' that happens to work, but is not a 'teaching-for-understanding' approach. Is this right?

The problem I always have when wanting to move all the digits along is that it is very fiddly to show on paper. On an electronic whiteboard you can put the digits on a transparent background and nicely show how they all slide along underneath the column headings (which stay fixed in position). (In the old days, I used to use a transparency on an overhead projector to do the same thing.) Or pupils can sit on chairs with each pupil holding a sheet of paper showing one of the digits, and then everyone shifts one place along to the next chair to show multiplication or division by 10. But when you are limited to writing on a piece of paper it is quite hard to show a whole string of digits all moving to new positions, especially if they are each moving more than one space. You end up having to write all the digits again underneath, whereas illustrating 12·345 × 10 by showing the decimal point leaping over the 3 is very easy.

$$12{\cdot}345 \times 10 = 123{\cdot}45$$

Sometimes zeroes need to be added in so that the decimal point has something to leap over. For example,

$$003{\cdot}456 \div 100 = 0{\cdot}034\,56$$

or

$$3{\cdot}456\,00 \times 100\,000 = 345\,600$$

When you want to leap, but there's nothing to leap over, you put in the implicit zero(es). But apart from that it's quite easy.

But does this easiness come at the cost of understanding? I am not sure that it does. On the face of it, this would appear to be a case of relative motion: the decimal point and column headings moving to the right is exactly equivalent to, and indistinguishable from, the digits moving to the left. How can one be terrible and the other correct? What matters is the *relative* position of digits and the decimal point, surely? If you write 2·5 on a piece of paper and then slide the piece of paper along the table, no one thinks that the decimal point has moved, because the digits have moved along with it! It's the relative position of the point and the digits that is important.

I don't mind if pupils or teachers think it's clearer or easier to move the digits than the decimal point. But I worry if the message is given that moving the decimal point is *mathematically wrong*, or constitutes evidence of a misconception or lack of understanding. What exactly is this misconception? I have heard people complain that the way that the decimal point appears to move on some calculator displays when you go from 12·345 to 123·45 encourages this 'error'. But is it an error or actually a perfectly legitimate way of thinking?

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Author Colin Foster, School of Education, University of Nottingham, Jubilee Campus, Wollaton Road, Nottingham NG8 1BB.
e-mail: **c@foster77.co.uk**
website: **www.foster77.co.uk**