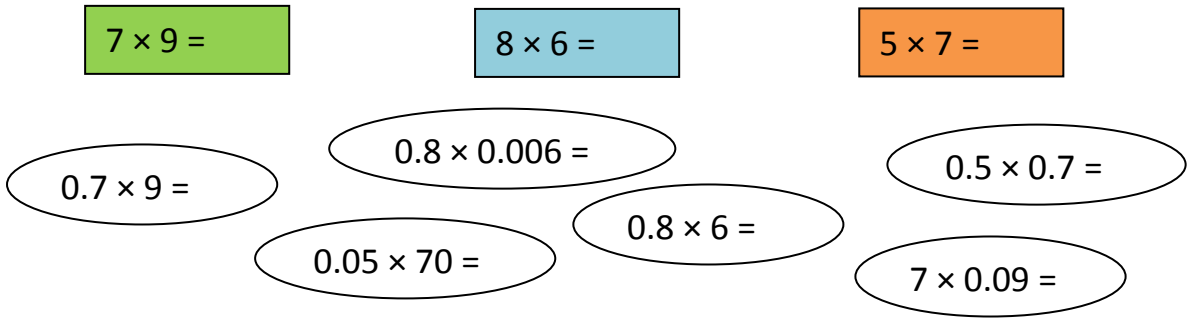
Can I extend my written methods for multiplying whole numbers to multiplying decimals by whole numbers?

A problem-solving teaching activity

Starter

Show the following on the whiteboard:



Ask three children to give you the answers to the whole-number multiplication facts. Explain that each of the decimal facts can be answered by using the appropriate whole-number fact.

Look at one example together.

Q: 7 × 9 = 63. How does this help you to answer 0.7 × 9? Talk with a partner.

Take feedback. Ensure that children appreciate that 0.7 is ten times smaller than seven, so this makes the answer to the calculation ten times smaller, in other words, 6.3.

Give children two minutes to answer as many of these decimal calculations as they can by using the appropriate known number fact.

Take feedback, asking children to compare their answers and explain their reasoning for each calculation.

Main teaching

Explain that in this session you are going to multiply decimal numbers to solve a problem.

Begin by reviewing multiplication of whole numbers. Ask children to work individually to answer 79 × 35 using a written method, recording their method on an individual whiteboard.

Once children have finished, ask them to compare their method and their solution with a partner.

Ask one pair to demonstrate a successful method to everyone else on the whiteboard, then alongside it demonstrate the equivalent method for 7.9 × 3.5, for example:

79		7.9	
× 35		× 3.5	
2100	(70 × 30)	21.00	(7 × 3)
270	(9 × 30)	2.70	(0.9 × 3)
350	(70 × 5)	3.50	(7 × 0.5)
45	(9 × 5)	0.45	(0.9 × 0.5)
2765		27.65	

Establish that the basic method is the same. But the value of each digit is different and so each step needs to be considered carefully.

Then explain the problem to the children:

> Place the digits 3, 5, 7 and 9 once each in these boxes
>
> □.□ × □.□ =
>
> How many ways can you do this so that the product is between 30 and 50?

Ask children to read the problem through to themselves once more.

Q: Think of one way to arrange the digits so that you might get a product between 30 and 50.

Take a suggestion. Explain that you are going to work through one example together before children work in pairs to continue the problem. Talk through the chosen example, working step by step, ensuring that children understand each step of the written method.

Ask children to work in pairs to see how many different ways they can find of arranging the digits so that the product is between 30 and 50.

While children work, observe how children are able to use their written method with decimal numbers, and support any children who are struggling.

Plenary

Establish that there are lots of different arrangements for the four digits.

Q: Did you try every possible combination? How did you choose to work?

Draw out examples where children had used approximation to establish whether or not an arrangement was likely to give a product between 30 and 50. For example, children may well have chosen not to try the combination 3.9 × 5.7 because the answer will be less than 4 × 6.

Ask pairs to compare notes with another pair on how many arrangements they found. Take feedback for suggestions. List these on the board.

There are four possible pairs of numbers, that is:

9.7 × 3.5 = 33.95 9.5 × 3.7 = 35.15

7.9 × 5.3 = 41.87 5.9 × 7.3 = 43.07

so there are eight ways of arranging the digits in the boxes.