N4.1 Multiplying and dividing decimals by 10 or 100

objectives

- Multiply and divide decimals by 10 or 100.
- Convert one metric unit to another.

starter

Vocabulary
multiply
divide
value
digit
place

Resources
mini-whiteboards

Write 41 × 10 = 410 on the board. Remind pupils that when a number is multiplied by 10, the value of each digit is made ten times bigger. The digits move one place to the left and a nought or zero is put in as a place holder.

hundreds	tens	units	tenths
	4	1	
4	1	0	

Write 41 × 20 on the board.

Q Can you work this out and explain how you did it?

Point out that 20 = 2 × 10, so that 41 × 20 = 41 × 2 × 10.

Record the interim step as 82 × 10, and work this out mentally. Ask pupils to work out 41 × 30 and 41 × 60, and show the answer on their whiteboards. Encourage them to jot down interim steps on their whiteboards.

Write 240 ÷ 10 = 24.0 on the board. Stress that when a number is divided by 10, the digits move one place to the right. Noughts or zeros at the end of the number after the decimal point are not needed, so the answer is written as 24.

Write 240 ÷ 20 on the board.

Q How can we work this out?

Establish that 240 ÷ 20 = 240 ÷ 10 ÷ 2 or 24 ÷ 2. Ask pupils to work out mentally the answers to 240 ÷ 30 and 240 ÷ 60, using jottings to help.

Write 300 × 20 on the board, with four possible answers: 60, 600, 6000, 60 000. Ask the class:

Q Which answer is correct?

Check by multiplying 300 by 2, then by 10. Repeat with 210 × 50 and 150 × 300.

main activity

Vocabulary
equivalent

Resources
OHT N4.1a, a place value board
mini-whiteboards

Write 3.27 on the place value board on **OHT N4.1a**. Get pupils to read the number aloud in words.

Q What is 3.27 multiplied by 10?

Demonstrate how to find the answer by making the value of each digit ten times bigger and moving all the digits one place to the left. Get pupils to read the answer aloud. Repeat by demonstrating how to multiply 32.7 by 10.

Repeat once more by multiplying 327 by 10.

Q What do we have to do about the empty place?

Check that pupils know that the empty place gets filled with a nought or zero (saying 'add a nought' is not helpful, as it does not work with decimals).

Now start again with 3.27. This time multiply by 100. Make the value of each digit one hundred times bigger and move all the digits two places to the left.

Q What do you notice? (this time the digits move two places to the left)

Check that pupils are aware that 3.27 × 10 × 10 is equivalent to 3.27 × 100. Repeat with 3.27 × 1000; move the digits three places to the left, and fill the empty place with a 0. Stress that this is equivalent to 3.27 × 10 × 10 × 10.

Q How would you explain to a friend how to multiply a decimal number by 10? By 100? By 1000?

Establish that when multiplying a number by 10, the digits move left by one place. To multiply by 100, or 10 × 10, the digits move left by two places, and to multiply by 1000, or 10 × 10 × 10, the digits move left by three places.

Ask pupils to answer some questions using their whiteboards.

Q What is 4.6 multiplied by 10? By 100? By 1000?

Q What is 0.46 multiplied by 10? By 100? By 1000?

Demonstrate for division. Start with 5.9, divide by 10, and then by 10 again. Check that pupils know that the empty place gets filled with a nought or zero. Demonstrate that the result is equivalent to 5.9 ÷ 100.

Establish that when dividing a number by 10, the value of each digit is made ten times smaller. The digits move one place to the right. To divide by 100, the digits move right by two places, and to divide by 1000, the digits move right by three places.

Remind pupils that dividing a number by 10 is the same as finding one tenth of it, dividing by 100 is the same as finding one hundredth of it, and dividing by 1000 is the same as finding one thousandth of it.

Ask pupils to answer some questions using their whiteboards.

Q What is 46 divided by 10? 46 divided by 100? 46 divided by 1000?

Q What is 4.6 divided by 10? 4.6 divided by 100?

Remind pupils of the abbreviations for kilometre (km), metre (m), centimetre (cm) and millimetre (mm). Write on the board:

    1 km = 1000 m
    1 m   = 100 cm
    1 cm = 10 mm

Explain that because there are 100 centimetres in every metre and 10 millimetres in every centimetre, there are 100 × 10 = 1000 millimetres in every metre. Add this to the list.

    1 m = 1000 mm

Q How can we convert or change kilometres to metres? (multiply by 1000)

Q How can we convert or change metres to kilometres? (divide by 1000)

Ask similar questions about changing metres to centimetres, centimetres to millimetres and metres to millimetres, and vice versa. Demonstrate a few examples, changing these to metres: 1.3 km, 254 cm, 2100 mm, using the place value board on **OHT N4.1a** in support.

Add to the list on the board, pointing out the abbreviations for the units:

    1 kg   =   1000 g
    1 litre =   1000 ml

Q How can we convert or change kilograms to grams? (multiply by 1000)

Q How can we convert or change millilitres to litres? (divide by 1000)

Demonstrate a few examples. Change 3.5 litres to millilitres, 250 g to kg.

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plenary

Resources
self-prepared OHT of numbers (optional)

Prepare an OHT of the set of numbers below, scattered randomly, or write them on the board.

    4.6   0.64   406   6.4

        4060   0.46   640   460

    40.6   64   46   4.06

Ask the class to identify as many pairs of numbers as possible where one number is 10 times or 100 times the other. Each pair of numbers must be different but a number can be used in more than one pair.

Give pupils two or three minutes to work with a partner to find and jot down as many pairs of numbers as they can, then take feedback. There are 15 possible pairs in the set of numbers above: nine pairs where one number is 10 times another, and six pairs where one number is 100 times the other.

> **Remember**
>
> - Multiplying by 10 moves the digits one place to the left; dividing by 10 moves the digits one place to the right. An empty place is filled with 0.
>
> - When you multiply or divide by 100, the digits move two places.
>
> - When you multiply or divide by 1000, the digits move three places.

thousands	hundreds	tens	units	tenths	hundredths	thousandths
			•			
			•			
			•			
			•			