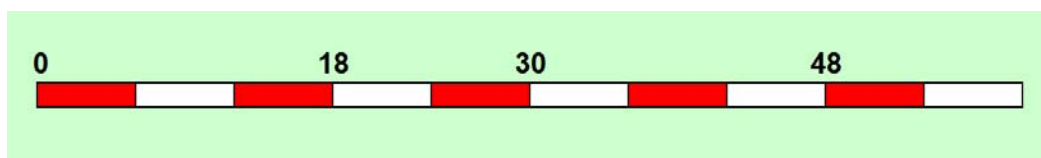


## Can I make use of my understanding of place value to explain how to multiply or divide a decimal number by an integer?

### Starter activities

#### Counting stick with further options spreadsheet

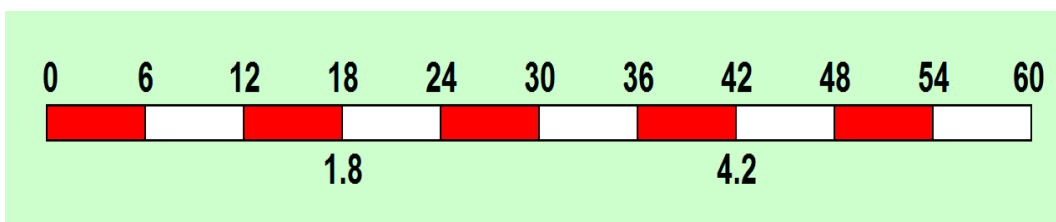
- On the front page of the spreadsheet, select the 'Decimals' option.
- Ensure that Macros are enabled.
- Without children seeing, use the control boxes at the bottom of the sheet to set both start numbers to zero. Set the step value above the stick by typing 6 into the box. Set the step number below the stick to be 0.6.
- Hide the numbers in the control boxes.
- Click in the appropriate boxes above the counting stick to reveal some of the numbers in the top sequence.



*Q: Look at the numbers in this sequence. What is the step size? How do you know?*

Establish that the sequence goes up in sixes. Ask children to predict other numbers on the counting stick and to state the multiplication statement that goes with each number; for instance they might predict 24, explaining that  $6 \times 4 = 24$ .

Once all the multiples of six are revealed above the line, explain that there is a related sequence below the line. Reveal two numbers.



*Q: What is the relationship between the numbers above the line and the numbers below the line?*

Ask children to talk with a partner to discuss this question. Ensure that they appreciate that the numbers below the stick are the numbers above the stick divided by ten, in other words they are ten times smaller than the number above the stick.

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*Q: What is the step size for the sequence below the stick? How do you know?*

Establish that the sequence goes up in steps of 0.6. Ask children to predict other numbers on the counting stick and to state the multiplication statement that goes with each number; for example they might predict 2.4, explaining that  $0.6 \times 4 = 2.4$ .

Once you have revealed all of the numbers ask some related quickfire questions, such as: *What is  $6 \times 3$ ? What is  $0.6 \times 3$ ? What is 5.4 divided by 9? How do you know?*

Ask children to hold the picture of the two related sequences in their heads. Shut the spreadsheet and continue to ask multiplication and division facts related to the six times and 0.6 times tables.

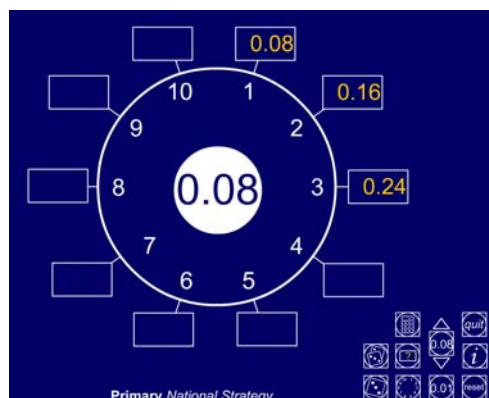
When children answer a multiplication or division fact using decimal numbers, encourage them to give the linked whole number fact, for example  $54 \div 9 = 6$  so  $5.4 \div 9 = 0.6$ .

You might wish to repeat the activity the next day in a similar way, building on the image that children have developed in their heads. Ask children to use individual whiteboards to draw out their own counting stick. Above the stick, they should write multiples of three. Below the stick they should put the linked sequence of facts from the 0.3 times table. Ask children to respond to quickfire questions, explaining their answers. You may wish to repeat the activity using the 0.03 times table.

### Number dials ITP

This program encourages children to consider the sequences created when you count in equal decimal steps such as 0.3 or 0.08.

- Click on the button showing the number one until it says 0.01.
- Click on the up arrow of the step button above it until the step size shown in the middle of the dial is 0.08.
- Click on the first three answer boxes around the dial to reveal the first three numbers in the sequence 0.08, 0.16, 0.24, ...



*Q: What is the step size of this sequence? Use this to predict the other numbers that will appear in the sequence.*

Ask children to compare their answers with a partner, discussing any differences.

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*Q: What is  $0.08 \times 7$  and where will it appear on the dial? Where will the number 0.4 go on the dial? State the multiplication statement and the linked division statement for this fact.*

Continue to ask questions in this way. Ensure that children are able to give multiplication and linked division facts, for example stating that  $0.08 \times 9 = 0.72$  and  $0.72 \div 9 = 0.08$ .

*Q: What multiplication table is this dial related to?*

Establish that all of these multiplication and division facts are related to the eight times table.

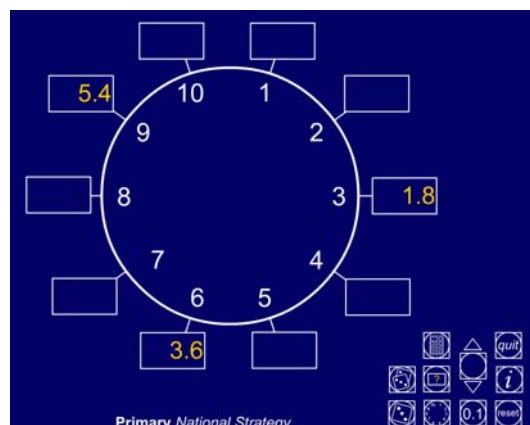
Write the two facts:  $9 \times 8 = 72$        $9 \times 0.08 = 0.72$

*Q: How could you use the first fact to explain the answer to the second one?*

Establish that if we know that nine lots of eight are 72, then nine lots of eight hundredths are 72 hundredths, that is 0.72. Alternatively, children may explain that 0.08 is 100 times smaller than eight so the answer to  $9 \times 0.08$  will be 100 times smaller than  $9 \times 8$ .

If necessary, repeat the activity in a similar way for another decimal number, such as 0.3.

- Change the 0.01 button to show 0.1. This will give a number of tenths in the middle of the dial. Click on the bottom left button showing a single dice. This creates a secret random multiple of tenths in the middle of the dial.
- Click to reveal three numbers around the edge of the dial.



*Q: What number do you think belongs in the middle of the dial? Discuss this with a partner. Work out the other numbers that belong around the edge of the dial.*

Ask a pair to explain how they knew the number that was in the middle of the dial and ask others to comment on the explanation. Do they agree? Did they have another way of explaining their reasoning? Click in the middle of the dial to reveal the number.

Ask other pairs to suggest one of the missing numbers around the edge of the dial and to give the multiplication and division facts that link to it.

You may wish to lead a similar starter the next day, developing the visual image of the dials. Ask children to use individual whiteboards and to draw a dial with the numbers one to ten around the inside. They should complete the dial for the number 0.6 and use these to write down multiplication and division facts using the number 0.6.