1.3 Multiplying and Dividing by Powers of 10

- Some pupils see this as completely different from "normal" multiplying; it isn't, it's still repeated addition. Ten of every digit moves it one more column to the left.
- It may be better to think of the **digits** all shifting rather than the decimal point leaping (although calculator displays give the opposite impression).

So the key question is "What happens to all the digits when we multiply/divide by 10/100/1000?" "They move" "Which way?" "How far?" Need to see that \times 100 is \times 10 followed by \times 10, etc.

1.3.1 It may be helpful to draw place value columns or use pre-printed sheets (see sheets).

Diagonal arrows can show the movement of the digits to the left or the right.

e.g., one question could be 0.045×10 Each question has two lines: on the 1st line write 0.045 in the correct columns; then on the 2nd line write 0.450 in the correct columns – diagonal arrows show that each digit has moved 1 place to the left.

units	_	tenths	hundredths	thousandths		
1's	٠	0.1's	0.01's	0.001's		
0	•/	/ 0	4	/ 5		
0	•	4	5	0		

1.3.2 Use questions such as $3.4 \times ? = 34000$

Pupils can make up their own and check using a calculator.

1.3.3 "To multiply by 10, add a zero onto the right-hand end of the number."

When does this rule work and when doesn't it?

A5 sheets work well; the A4 one is suitable either for a pupil who needs more space or for putting onto an acetate.

Write questions on the board or use ones from a textbook.

You can use different coloured diagonal arrows for multiplying (shifts to the left) and dividing (shifts to the right).

Some pupils won't need to use the sheets for long; some not at all. But others will see them as a resource and ask for them again and again, or they can draw their own.

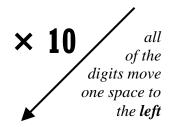
Answer 10 000

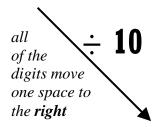
This can lead in to standard form; 3.4×10^5 means 3.4×10 "five times"; 3.4×10^{-5} means $3.4 \div 10$ "five times".

Answer: Fine for integers, but not for decimals. The corresponding rule for dividing by 10 (take off a zero) works only for multiples of 10; i.e., when the answer is an integer.

This is an example of a rule that is appropriate in certain contexts but not in others (as most rules are).

The Decimal System





	thousands 1000's	hundreds 100's	tens 10's	units 1's	•	tenths 0.1's	hundredths 0.01's	thousandths 0.001's
1					•			
					•			
2					•			
					•			
3					•			
					•			
4					•			
_					•			
5					•			
					•			
6								
7								
,					1.			
8					•			
					1.			
9					1.			
					•			
		•					•	
ſ	thousands 1000's	hundreds 100's	tens 10's	units 1's	•	tenths 0.1's	hundredths 0.01's	thousandths 0.001's
1	thousands 1000's	hundreds 100's	tens 10's	units 1's		tenths 0.1's	hundredths 0.01's	thousandths 0.001's
	thousands 1000's	hundreds 100's	tens 10's	units 1's	1 1	tenths 0.1's	hundredths 0.01's	thousandths 0.001's
1 2	thousands 1000's	hundreds 100's	tens 10's	units 1's	•	tenths 0.1's	hundredths 0.01's	thousandths 0.001's
2	thousands 1000's	hundreds 100's	tens 10's	units 1's	•	tenths 0.1's	hundredths 0.01's	thousandths 0.001's
	thousands 1000's	hundreds 100's	tens 10's	units 1's	•	tenths 0.1's	hundredths 0.01's	thousandths 0.001's
2	thousands 1000's	hundreds 100's	tens 10's	units 1's	•	tenths 0.1's	hundredths 0.01's	thousandths 0.001's
2	thousands 1000's	hundreds 100's	tens 10's	units 1's	•	tenths 0.1's	hundredths 0.01's	thousandths 0.001's
2 3 4	thousands 1000's	hundreds 100's	tens 10's	units 1's	•	tenths 0.1's	hundredths 0.01's	thousandths 0.001's
2	thousands 1000's	hundreds 100's	tens 10's	units 1's	•	tenths 0.1's	hundredths 0.01's	thousandths 0.001's
2 3 4 5	thousands 1000's	hundreds 100's	tens 10's	units 1's	•	tenths 0.1's	hundredths 0.01's	thousandths 0.001's
2 3 4	thousands 1000's	hundreds 100's	tens 10's	units 1's	•	tenths 0.1's	hundredths 0.01's	thousandths 0.001's
2 3 4 5	thousands 1000's	hundreds 100's	tens 10's	units 1's	•	tenths 0.1's	hundredths 0.01's	thousandths 0.001's
3456	thousands 1000's	hundreds 100's	tens 10's	units 1's	•	tenths 0.1's	hundredths 0.01's	thousandths 0.001's
3456	thousands 1000's	hundreds 100's	tens 10's	units 1's	•	tenths 0.1's	hundredths 0.01's	thousandths 0.001's
2 3 4 5 6	thousands 1000's	hundreds 100's	tens 10's	units 1's	•	tenths 0.1's	hundredths 0.01's	thousandths 0.001's
2 3 4 5 6	thousands 1000's	hundreds 100's	tens 10's	units 1's	•	tenths 0.1's	hundredths 0.01's	thousandths 0.001's

į	thousands 1000's	hundreds 100's	tens 10's	units 1's	•	tenths 0.1's	hundredths 0.01's	thousandths 0.001's
1					•			
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