

## LESSON

# 9N3.1

# Place value

### OBJECTIVES

- Understand and use decimal notation and place value; multiply and divide integers and decimals by 10, 100, 1000, and explain the effect.
- Read and write positive integer powers of 10.
- Extend knowledge of integer powers of 10.
- Multiply and divide integers and decimals by 0.1, 0.01.

### STARTER

10 minutes

**Vocabulary**  
See list below

**Resources**  
OHT 9N3.1a

Ask pupils to write the number 5.7, multiply it by 10 and record their answer.

Ask a pupil to read their answer aloud and to explain how they arrived at it.

**Q What has happened to the digits?** (Note that the decimal point does not move; the digits shift one place to the left.)

Repeat with numbers involving one and two places of decimals, asking pupils to multiply and divide by 100 and 1000.

**Q What do  $10^2$  and  $10^3$  mean?**

**Q How do you write 10 000 as a power of 10? How do you write 10 as a power of 10? What about 1?**

Ensure that pupils recognise that increasing powers of 10 underpin decimal notation.

Extend to division to cover  $10^0$  and negative powers of 10.

Choose numbers from the place value chart (OHT 9N3.1a) and ask pupils to multiply and divide them by integer powers of 10 (using powers of 10).

### MAIN ACTIVITY

40 minutes

**Vocabulary**  
equivalence  
equivalent  
hundredths  
index  
place value  
power  
tenths  
thousandths  
zero place holder

**Resources**  
Handouts of 9N3.1a  
(if required for support)  
OHT 9N3.1b  
Framework examples,  
page 39

Introduce the spider diagram (OHT 9N3.1b). Ask pupils to explain the results and to consider other solutions, using the digits 4, 0 and 1 only. Invite pupils to show their responses and to talk through their reasoning. Make sure that  $4 = 0.04 \div 0.01$  is considered.

Discuss what happens when a number is multiplied/divided by a number less than 1.

**Q Does division always make a number smaller?  
Does multiplication always make a number larger?**

Repeat with 5.7 in the centre of the spider diagram and record pupils' responses. Establish that there are several different ways of recording the answers. For example:

$$\begin{array}{lcl} 0.057 \times 100 & = & 5.7 \\ 0.057 \times 10 \times 10 & = & 5.7 \\ 0.057 \times 10^2 & = & 5.7 \end{array} \qquad \begin{array}{lcl} 0.057 \div 0.01 & = & 5.7 \\ 0.057 \div 0.1 \div 0.1 & = & 5.7 \\ 0.057 \div 10^{-2} & = & 5.7 \end{array}$$

Ask pupils to work in groups to develop their own spider diagram showing equivalent calculations for other numbers (e.g. 3.2, 67.3, 0.43).

Remind them that their work should be recorded clearly.

Use place value charts (handout 9N3.1a) to support pupils as appropriate.

Differentiate by using different starting numbers for different ability groups and encourage pupils to record their responses in whichever ways they feel confident.

Move pupils on to develop their understanding of place value and notation through the following stages:

- multiplication/division by 10, 100 and 1000;
- multiplication/division by positive integer powers of 10;
- multiplication/division by 0.1 and 0.01;
- multiplication/division by negative integer powers of 10.

### PLENARY

10 minutes

Resources  
OHT 9N3.1c

Use the place value target number board (OHT 9N3.1c).

**Q** If I divide a number by 0.1 and then again by 0.1 the answer is 0.03.  
What number did I start with? How do you know?

**Q** Why do  $3.3 \times 10 \times 10$  and  $3.3 \div 0.01$  give the same answer?

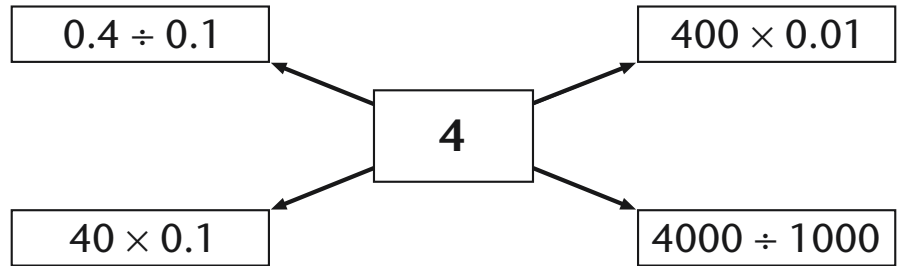
Ask similar questions to check pupils' understanding.

### KEY IDEAS FOR PUPILS

- When a number is multiplied by 10/100/1000, the digits move one/two/three places to the left.
- When a number is divided by 10/100/1000, the digits move one/two/three places to the right.
- Multiplying by 0.1 has the same effect as dividing by 10.
- Multiplying by 0.01 and dividing by 100 are equivalent.
- Multiplying by  $10^{-3}$  and dividing by  $10^3$  are equivalent.

## 9N3.1a Place value chart

0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1	2	3	4	5	6	7	8	9
10	20	30	40	50	60	70	80	90
100	200	300	400	500	600	700	800	900
1000	2000	3000	4000	5000	6000	7000	8000	9000



## Place value target number board

0.4	17.6	3
0.33	30	156
4000	1.56	1.76
3.3	0.0176	0.0003