N2.5 Decimal notation and place value

objectives

- Read and write whole numbers in figures and words.

- Understand and use decimal notation and place value.

- Count on in steps of 0.1 and 0.01.

starter

Vocabulary
value
digit
zero
nought

Resources
mini-whiteboards

Write 87 063 on the board. Ask the class to read the number aloud in words. Discuss the value of different digits.

Q   What is the value of the digit 6? Of the 8?

Q   Why is there a zero or nought in the hundreds column?

Explain that 'zero' and 'nought' are used interchangeably, and that the zero is used as a place holder.

Q   What number is 100 more than 87 063? 100 less than 87 063?

Talk through writing 86 963 in an expanded form. Use this to help correct any errors in pupils' answers.

$$86\,963 = 80\,000 + 6000 + 900 + 60 + 3$$

Now ask pupils to write these numbers in figures on their whiteboards:

- nine thousand three hundred;

- fourteen thousand and six;

- one hundred and twenty thousand and thirty.

Check and correct errors by writing numbers in an expanded form.

Ask a few questions about adding and subtracting small numbers across multiples of 10, 100 and 1000. For example:

Q   What is three more than one hundred and ninety-eight? Two less than five thousand and one?

main activity

Vocabulary
decimal place
tenth
hundredth
thousandth

Resources
mini-whiteboards
calculators
OHP calculator

Write 63.47 on the board. Ask pupils to read the number aloud in words (sixty-three point four seven). Remind them that the first place after the decimal point is called the first decimal place and is for tenths; the second decimal place is for hundredths. Ask:

Q   What is the value of the digit 3? Of the 6? Of the 4? Of the 7?

Stress that the part of the number before the decimal point is the whole-number part and is read in the same way as a whole number. The part after the decimal point is the decimal fraction, and is read digit by digit.

Q   How would we write 63.47 in expanded form?

$$63.47 = 60 + 3 + 0.4 + 0.07$$

Read this aloud together, pointing as you go: sixty-three point four seven equals sixty plus three plus four tenths plus seven hundredths.

Write 46.05 on the board. Ask pupils to read the number aloud in words (forty-six point nought five). Say that some people might say forty-six point zero five. Discuss the value of different digits.

Q What is the value of the digit 6? Of the 4? Of the 5?

Q Why is there a zero in the tenths column?

Q How would we write and read 46.05 in expanded form?

(46.05 = 40 + 6 + 0.05)

Reinforce by writing on the board 20.6, 2.06 and 0.206. Ask pupils to read each number aloud. Point out that the third place after the decimal point is for thousandths. Discuss the part played by the zeros in each number, and write and read each of the numbers in expanded form.

Ask pupils to write these numbers in figures on their whiteboards:

- ten point nought three;

- one hundred and six point nought four;

- nought point five nought two.

Check and correct errors by writing the numbers in an expanded form.

Now write on the board a target number such as 68.47, and these numbers:

10   1   0.1   0.01

Point to one of them (e.g. 10) and start the class counting in multiples of that number: for example, ten, twenty, thirty, forty, … Call 'Stop!', point to one of the other numbers (e.g. 0.1, one tenth), and continue counting: forty point one, forty point two, forty point three, … Call 'Stop!', point to one of the other numbers (e.g. 0.01, one hundredth), and continue counting: forty point three one, forty point three two, forty point three three, … Call 'Stop!', point to the last of the four numbers (1), and continue counting: forty-one point three three, forty-two point three three, and so on. Call 'Stop!' again, and remind pupils of the target number.

Q What shall we count in to reach the target number: tens, units or ones, tenths or hundredths?

Choose a pupil to call 'Stop!', and continue counting as suggested by the class. Repeat the question above each time 'Stop!' is called until the target number is reached. If appropriate, extend to thousandths.

Repeat the activity by counting down from a target number to zero.

Ask pupils to enter two hundred and four point seven two into their calculators. Check that all pupils have entered the correct number by demonstrating on the OHP calculator. Then ask:

Q What is one tenth more than the number in your display? What do you think the display will show? What keys should you press?

Q What is one hundredth more than the number that is now in your display?

Make sure that pupils know that to add one tenth they key in + 0.1, and to add one hundredth they key in + 0.01. Read aloud the new number. Then ask:

Q **What is three tenths more than the number now in your display?**
What will the display show next?
What is one and two tenths more? Four hundredths more?

Ask pupils to clear the display and enter twenty point nought six. This time ask:

Q **What is one tenth less than the number in your display? What do you**
think the display will show? What keys should you press?

Q **What is one hundredth less than the number that is now in your display?**
Two tenths less? Three hundredths less? One and four tenths less?

Repeat with:

- nought point nine;

- four thousand and thirty point nought eight.

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plenary

Resources
mini-whiteboards

Write on the board: 14.99, 7.01, 13.9.

Point to one of the numbers and ask pupils to read it aloud (e.g. fourteen point nine nine). Point to particular digits.

Q **What is the value of this digit?**

Invite a pupil to the board to write the number in expanded form. Ask the class to read it aloud (e.g. fourteen and nine tenths and nine hundredths). Then ask them to write on their whiteboards the number that is one tenth more, one tenth less, one hundredth more, one hundredth less.

Repeat with the other two numbers.

> **Remember**
>
> - The decimal point separates the whole number from the decimal fraction.
>
> - Each digit in a decimal number has a value, according to its position.
>
> - The first decimal place is for tenths, the second decimal place is for hundredths, the third decimal place is for thousandths, and so on.

N2.6 Equivalence of tenths and hundredths

- Understand and use decimal notation and place value.

- Compare two simple fractions by using a diagram.

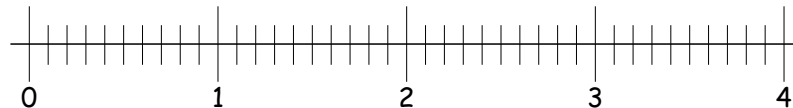- Find fraction and decimal equivalents for tenths and hundredths.

starter

Vocabulary
fraction
decimal
tenth
whole

Resources
OHT N2.6a
interlocking cubes

Draw on the board a number line from 0 to 4, marked in tenths, or use **OHT N2.6a**.

Hold up a stick of ten cubes.

Q   How many cubes in this stick? Count them with me: one, two, three, …, nine, ten.

Hold up one cube.

Q   What fraction – what part – of the whole stick is this? (one tenth)

Write $\frac{1}{10}$ on the board. Tell the class that the fraction can also be written as a decimal number, and write 0.1 on the board.

Hold up seven cubes.

Q   What part of the whole stick is this? (seven tenths)

Write $\frac{7}{10}$ on the board.

Q   How else could you write this? (0.7)

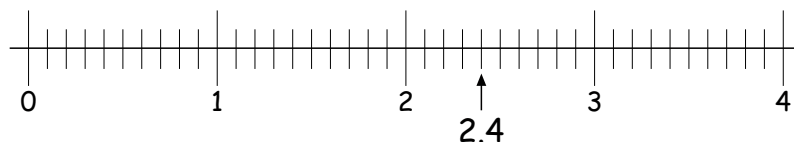Hold up two whole sticks of ten cubes, and four single cubes.

Q   How many whole sticks? (two)
Q   How many parts of a whole stick? (four tenths)

Write $2\frac{4}{10}$ on the board.

Q   Where is two and four tenths on the line?

Point to 2, saying: 'Two whole ones'. Count on four tenths from 2: one tenth, two tenths, three tenths, four tenths. Mark it with an arrow.

Repeat by holding up whole sticks of cubes and single cubes for 1.7, 3.6, 0.9.
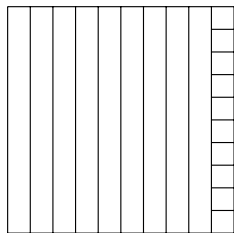
Vocabulary
hundredth
equivalent

Resources
prepared paper
    squares

Prepare several large paper squares, all the same size. Mark one in ten equal strips, with one strip marked in ten equal small squares. Make another copy of this square, and cut it into nine strips and ten small squares.

Hold up the square marked in strips. Tell the class that this is one whole square, which you have cut into ten equal strips. Hold up one of the prepared strips, matching it to a strip on the whole square.

Q   What fraction – or part – of the whole square is this? (one tenth)

Write $\frac{1}{10}$ on the board.

Q   How do you write one tenth as a decimal number? (0.1)

Write 0.1 next to $\frac{1}{10}$ on the board. Point to each in turn, saying: 'one tenth, zero point one'. Remind the class that some people might say 'nought point one', and that zero and nought have the same meaning.

Choose seven pupils to help you. Give four of them a large paper square, and three of them a paper strip.

Q   How many whole squares? (four) **How many tenths?** (three)
     How many tenths altogether? (forty-three)

Write $\frac{43}{10}$, $4\frac{3}{10}$ and 4.3 on the board. Point to each in turn, saying: 'forty-three tenths, four and three tenths, four point three'. Repeat with 6.2.

Hold up the strip marked in ten small squares. Tell the class that you have cut this strip into ten small squares. Hold up one of the small squares, matching it to a small square on the strip.

**Q   How many of these small squares are in a whole square? How did you
     work that out?**

Establish that there are 100 small squares in the large square, because there are ten small squares in a strip, and ten strips in the whole square. Ten lots of ten make one hundred.

Point again to the small square.

Q   What fraction – or part – of the whole square is this? (one hundredth)

Write $\frac{1}{100}$ on the board.

Q   How do you write one hundredth as a decimal number? (0.01)

Write 0.01 next to $\frac{1}{100}$ on the board. Point to each in turn, saying: 'one hundredth, zero point zero one'.

Choose six pupils to help you: two to hold up two large squares each, one to hold up two strips, and three to hold up two small squares each.

Q   How many squares can you see?

Establish that this is four and two tenths and six hundredths. Write 4.26 on the board. Point to each digit in turn, saying 'four, the whole number; two, the number of tenths; six, the number of hundredths'.

Ask the class to think about two tenths and six hundredths. Write 0.26 on the board. Refer again to the pupil holding the two strips and say 'two tenths', and to the pupils holding the six small squares, saying 'six hundredths'.

Q How many hundredths are equivalent to or the same as two tenths and six hundredths?

Establish that there are ten hundredths in every tenth, so there are twenty hundredths in two tenths. Altogether, there are twenty-six hundredths. Write on the board: $0.26 = \frac{26}{100}$.

Repeat with other decimals.

other tasks	**Unit 5 section 3: Decimals**
	1 Tenths as fractions and decimals page 185
Springboard 7	2 Tenths and hundredths as fractions and decimals page 185
Unit 5	Star challenge 3: Matching pairs page 187

plenary	Write on the board 8.1 and 8.01. Ask the class:
	Q How would you explain to a friend what is different about these two numbers?
Resources	
mini-whiteboards	**Q Which of the two numbers do you think is the larger? Why?**
	Q What number is one tenth more than 8.1? Than 8.01?
	Repeat with one tenth less, one hundredth more, and one hundredth less.

> **Remember**
>
> • Fractions can be seen as parts of a whole or as points on a line.
>
> • Equivalent fractions have the same value but are written in different ways.
>
> • One whole is equivalent to ten tenths, or one hundred hundredths.
>
> • One tenth is equivalent to ten hundredths.