N2.7 Positioning decimals on a number line

objectives

- Understand and use decimal notation and place value.
- Compare and order decimals.

starter

Vocabulary
tens
hundreds

Resources
counting stick

Use a counting stick.

Tell the class that one end is nought or zero, and the other end is 10. Point to 2 on the stick, and ask:

Q What number is this?

Repeat with 6. Now tell the class that the far end of the stick has changed to 100. Point to 20 and repeat the question, then to 60. Confirm by counting along the stick and back in tens. Change the far end of the stick to 1000, point to 200 and to 600, and repeat the question each time. Confirm by counting along and back in hundreds.

Now tell the class that one end of the stick is 17, and the other is 27. Point to the position for 19, asking:

Q What number is this? How do you know?

Establish that the ten intervals between 17 and 27 must each represent one. Count on in ones from 17 to confirm the positions. Repeat with 23 and 33.

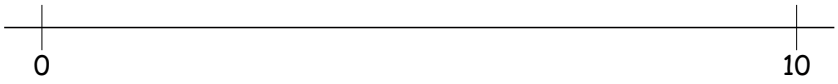
Repeat with ends of 247 and 347 (intervals of 10), and 3650 and 4650 (intervals of 100), each time counting along the stick to confirm positions.

main activity

Vocabulary
halfway
tenths
hundredths
position

Resources
OHTs N2.7a, N2.7b, N2.7c

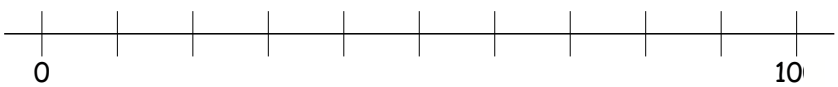
Explain that the class is going to identify decimal numbers 'hidden between' whole numbers on a number line. Draw this line on the board.



Point about halfway between 0 and 10.

Q What number am I pointing at? How do you know?

Draw in the markers for the whole numbers, without numbering them.



Point first to where 7 would go, and then where 8 would go. Each time ask:

Q What number goes here? Explain why.

Write in the numbers 7 and 8, then point somewhere between them and repeat the question. Establish that it is difficult to say exactly what number you are pointing at, but that it is a number more than 7 and less than 8.

Q What number is halfway between 7 and 8? Where is it on the line?

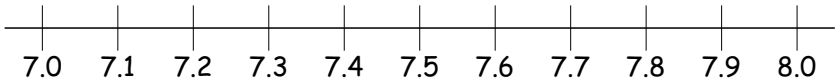
Establish the approximate position of 7.5 on the line.

Say that you are now going to zoom in on the part of the line from 7 to 8, as though you were looking at it under a microscope. Show **OHT N2.7a**, an enlarged segment of the number line from 7 to 8.

Q What numbers do the marks on this line show? (tenths from 7 to 8)

Q What number is the arrow pointing to? (7.4) **How did you work it out?**

Invite a pupil to write in the decimal number at each marker.



Explain that the markers at 7 and 8 can be written as 7.0 and 8.0, because the line is marked in intervals of one tenth, or 0.1. Count together forwards and backwards along the line, saying seven, seven and one tenth, seven and two tenths, seven and three tenths, …, then seven, seven point one, seven point two, seven point three, …

Q What number is one tenth more than 7.3? Three tenths less than 7.8?

Q What number is two tenths more than 7.9? Three tenths less than 7.1?

Write the following on the board, point to each in turn, and ask for the answer:

7.5 + 0.3	7.8 + 0.5	7.6 + 0.4
7.9 – 0.4	7.4 – 0.6	7.3 – 0.3

Say that you will zoom in again, this time between the 7 and the 7.1. Show **OHT N2.7b**, the segment of the line from 7.0 to 7.1, with ten intervals. Explain that the new line is marked in intervals of one tenth of one tenth, or one hundredth. Point to different markers.

Q What number am I pointing to?

Get pupils to call out the number at each marker as you write them in. Count on and back along the line from 7 to 7.1, in hundredths: seven, seven point nought one, seven point nought two, …, seven point nought nine, seven point one.

Q What number is one hundredth more than 7.04? Two hundredths less than 7.05?

Write on the board: 7.07 + 0.02.

Q What is the answer?

Repeat with 7.08 – 0.04.

Show **OHT N2.7c**. Say that this line goes from 1 to 2, and label each end. Point to the divisions for the tenths.

Q What are these markers? (tenths) **How do you know?**

Confirm by counting along the line in tenths: one, one point one, one point two, one point three, …, two.

Point to the mark for 1.7 and ask:

Q What is this number? (one point seven)

Q What would it be as a fraction? (one and seven tenths)

Repeat for 1.4 and 1.9.

Point to the divisions for hundredths between 1.3 and 1.4.

Q What are these markers? (hundredths)

Confirm by counting along the line from 1.3 in hundredths: one point three, one point three one, one point three two, …, one point four.

Remind the class that each small interval is one hundredth. Point to the mark for 1.32, and ask:

Q Which 'tenths' does this number lie between? (1.3 and 1.4)

Q What is this number? (one point three two) **How did you know?**

Q What is the value of the digit 3? (three tenths) **Of the digit 2?** (two hundredths)

Stress that 1.32 is one whole and three tenths and two hundredths.

Q What would this be as a fraction? (one and thirty-two hundredths)

Repeat, choosing different pupils to come and point to 1.46 and 1.08.

Change the numbers at the end of the line to 26 and 27, and repeat. Stress that to find the number at a given position, they must look first at the whole number, then at the tenths, and then at the hundredths.

other tasks

Springboard 7
Units 5 and 13
Assess and review 2

Unit 5 section 3: Decimals

3	Number lines	page 186
4	Zooming in	page 186

Unit 13 section 4: Ordering fractions and decimals

Star challenge 8: Putting numbers in their place	page 434

Assess and review 2

Question 5	page 292

plenary

Resources
OHT N2.7d

Show **OHT N2.7d**, and work through the questions with the class. Ask pupils to explain their reasoning as they work out the answers.

Remember

- Like whole numbers, decimals can be placed in order on a line.
- Between any two numbers on a line, there are always more numbers.

N2.8 Ordering decimals

objectives

- Understand and use decimal notation and place value.
- Compare and order decimals.

starter

Vocabulary
most significant digit

Write on the board 5132 and 987, side by side. Point out that they are both whole numbers.

Q Which is the bigger number? How do you know?

Say that, when we compare the size of numbers, we look at the most significant or important digit first, and that this is on the left. We then compare like with like: thousands with thousands, then if necessary hundreds with hundreds, then if necessary tens with tens, and so on.

In a column, the numbers would appear as:

5132
 987

It is now easy to see that 5132 is bigger than 987, which has no thousands.

Repeat with 7256 and 7265. Explain that this time we compare 7 thousands with 7 thousands, then because they are the same we compare 2 hundreds with 2 hundreds, and because these too are the same, we compare 5 tens or fifty with 6 tens or sixty. This tells us that 7265 is the bigger number.

main activity

Vocabulary
amount
order
lies between
decimal place(s)

Resources
OHTs N2.8a, N2.8b
Resources N2.8c and N2.8d, made into decimal cards
Resource N2.8e

Explain that when numbers are written in a column (for example, as on a shop till receipt), they are always lined up so that the decimal points are one underneath the other. The reason for doing this is that it makes it easier to compare the numbers, or to add or subtract them.

Show **OHT N2.8a**, a 'till receipt' with about a dozen sums of money less than £10, some differing by less than 40p. Ask pupils in pairs to order the amounts of money from the highest price to the lowest price, writing them in a list in their exercise books. Take feedback on the three cheapest and three most expensive items.

Q How did you go about this task? What did you look for?

Stress that it was easy to compare the digits, working from the left: each figure had the same number of decimal places and all the decimal points were under each other. What if the numbers had a different number of decimal places? Write on the board 0.59 and 4, side by side, one whole number and one decimal number less than 1.

Q Which is the bigger number? How do you know?

Say that, in a column with the decimal points lined up, they would appear as:

0.59
4

Establish that 4 is bigger because it has 4 units, compared with none in 0.59.

Write on the board the two numbers 0.6 and 0.59. Point out that they are both decimal numbers less than 1.

Q Are these decimals more or less than one half? How do you know?

Q Which is the bigger number? How do you know?

Say that, in a column with the decimal points lined up, they would appear as:

0.6
0.59

Stress that, comparing from the left, there are no units or ones in either numbers, so we compare the number of tenths with the number of tenths. This tells us that 0.6 is the bigger number. Only if the tenths are the same do we then compare the number of hundredths in each number. Repeat with 7.08 and 7.8, then 5.48 and 5.488.

Q Can a two-digit decimal number be bigger than a three-digit decimal number?

If necessary, refer back to 7.08 and 7.8.

Show **OHT N2.8b**. Invite pupils to the projector to complete the table. Each time ask the pupils to explain their reasoning.

Write a group of decimal numbers on the board.

32.6	32.06	33.2	32.12
33.01	3.32	32	
3.12	0.32	33.03	320.1

Q Which is the smallest number? How do you know?

Ask a pupil to come and write that number on the left of the board at the bottom, and tick off the number in the group.

Q Which is the next smallest number? How do you know?

Ask another pupil to write that number next to the first number, and to tick off the number in the group. Continue until all the numbers are used up.

Q When we are ordering a set of numbers with decimal places, what is a good starting point? How do we continue?

Make a set of 100 decimal cards from 0.0 to 9.9 by enlarging **Resources N2.8c and N2.8d** on to A3 paper. Put the cards in a box and shuffle them. Ask each pupil to draw a ladder with 10 boxes (or duplicate a worksheet from **Resource N2.8e**).

Tell pupils that you are going to pick out the decimal cards one by one. They must write the number in an empty box on their ladder if they can. Their aim is to get the numbers in order, with the smallest number at the bottom of the ladder. They may write only one number in each box and may not change the position of a number once they have written it in a box. If there is no suitable empty box, they must wait for the next number.

The winner is the person who fills the ladder first.

Play one game, then discuss strategies for playing the game with the class, such as positioning decimals between 3.0 and 3.9 in the third space up on the ladder in the early stages of the game. Play a second game, concentrating on the strategies.

other tasks

Springboard 7
Units 11 and 13

Unit 11 section 3: Capacity

Star challenge 9: Who drinks the most? page 378

Unit 13 section 4: Ordering fractions and decimals

2 Ordering decimals page 433
3 Halfway between page 433

plenary

Secretly choose a decimal number, with tenths, lying between 0 and 10 (e.g. 4.6). Pupils take turns to ask a question that can only be answered with 'yes' or 'no': for example, 'Is the number more than 6?' 'Does the number lie between 8 and 9?'. The class pays a penalty point for every question they ask. Play continues until the number is guessed.

Repeat by choosing a decimal number, with tenths and hundredths, lying between 0 and 1 (e.g. 0.76).

Remember

- You can write decimal numbers in order on a number line.
- When writing decimal numbers in a column, line up the decimal points under each other. This makes it easy to compare them.
- To order numbers, identify the number or numbers with the lowest whole number, including zero. After that, tenths must be compared with tenths, then if necessary hundredths with hundredths.